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The Role of Usability, Usefulness and Frame in Persuasive Health Communication

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THE ROLE OF USABILITY, USEFULNESS AND
FRAME IN PERSUASIVE HEALTH
COMMUNICATION

BY JOANNA LEAVISS
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Abstract

Background: A large proportion of ill-health is preventable (Signorelli 1993). A goal for health promoters is to provide information about health risks with the aim of persuading individuals to modify their behaviour. Previous research suggests that the readability of many health promotion materials is too low for effective comprehension. Evidence suggests that much of the health information available is written at a level that is too difficult for the target populations (e.g. Dollahite et al. 1996, Meade & Byrd 1989, Greenfield et al. 2005). Whilst this work is useful in identifying barriers to accessibility to health information, there has been little research that systematically explores the concept of usability within the context of health information.

Objectives: The first objective of the thesis was to examine whether the concepts of usability and usefulness as outlined in the Technology Acceptance Model (Davis 1993) can be applied to the domain of health promotion and used to predict intentions to follow the advice given in health promotion leaflets. Second, the studies sought to make distinctions between subjective and objective usability and to explore the factors underlying subjective ratings of the usability of health information. Further, the thesis sought to demonstrate that both objective and subjective usability would influence the persuasive effect of health promotion materials. Finally, using theory from dual-processing models of persuasion (e.g. Elaboration Likelihood Model, Petty and Cacioppo 1986) it was predicted that when usability of leaflets was high, participants would be more likely to make judgements about their intentions to follow the advice given in the leaflets based on peripheral cues

such as frame (Tversky and Kahneman 1981, Rothman and Salovey 1997, Levin et al. 1998).

Methodology: 5 empirical studies examined the research questions. The first study consisted of two samples from working populations (n=441), and explored manual handling and use of hearing protection. Participants evaluated existing health and safety leaflets in relations to their usability and usefulness, and rated their intentions to follow the advice in the leaflets. The second study, also conducted on a working population (n=97), used experimentally manipulated leaflets on safe manual handling to test the hypothesis that framing effects would be found when usability of leaflets was high. The third study used a student sample (n=127) to explore factors that influence subjective usability. The study used experimentally manipulated leaflets about safe alcohol consumption to examine whether the concept of subjective usability is a function of reader characteristics (psychological constructs, mood, past exposure to the health problem) and leaflet characteristics (frame, objective reading ease). The fourth study used a student sample (n=238) to test the effect of objective reading ease on recall, in order to test for differences in processing of two experimentally manipulated leaflets about safe alcohol consumption. It was predicted that easy leaflets would be processed at a more shallow level than difficult leaflets. The fifth study, also conducted on a student sample using experimentally manipulated safe alcohol leaflets (n=135), used pre and post testing to further explore the effects of usability on framing effects, and to test for a moderating role of prior knowledge on the effect of usability on intentions.

Results: The studies showed that readers distinguish two separate components to health information leaflets: usability and usefulness. Subjective perceptions of usability and perceived usefulness predicted intentions to follow the advice given in the leaflets. Objective usability (reading ease) influenced the persuasive effect of the leaflets, with easy leaflets being more persuasive than difficult leaflets. Perceived usefulness partially mediated the relationship between subjective usability and intentions. Objective reading ease affected recall, with easy leaflets resulting in higher levels of both accurate and false recall of the information in the leaflets. Prior knowledge moderated the relationship between usability and intentions. Those with low prior knowledge were more persuaded when usability was high. Usability influenced the effect of frame on intentions. Framing effects were only found where usability was high. Where framing effects were found, negative frame was more persuasive than positive frame, offering support for Levin et al.'s (1998) typology of framing effects.

Conclusions: Results from the studies show that the concepts of usability and usefulness, formalised in models of technology acceptance (TAM), can be applied to health information and used to predict intentions to follow health promotion recommendations. A distinction can be made between subjective and objective usability, and both of these can influence persuasion. Using theory from dual-processing models of persuasion, usability of health information leaflets can influence the effect of frame on intentions to follow the health promotion advice.

CHAPTER 1

The Role of Frame and Usability on the Persuasiveness of Written Messages for Health Prevention Behaviours

1.1 Background – Message Design for Health Promotion

Persuading individuals to change their behaviour in order to prevent ill-health is a major goal for health promoters. The prevention of ill-health has important personal and financial implications. Signorelli (1993) estimates that between 40% and 70% of all premature deaths and up to 66% of disabilities could be prevented by controlling just 10 health risk factors, e.g. poor diet, alcohol abuse, smoking and lack of exercise. The 2004 NHS White Paper 'Choosing health, making healthier choices easier' highlights the need for an increased focus on the prevention of ill-health. Part of the UK Government strategy for achieving this goal is to equip health care providers with the means to 'get the right message across' (NHS 2004). Previous research has identified characteristics of messages and message recipients that may influence persuasion in the health domain, for example message vividness (Kisielius & Sternthal 1984, 1986), language intensity (Buller et al. 1998), repetition of important phrases (Paul et al. 2003), Need for Cognition (Williams-Piehota et al. 2003), age and gender (Kreuter et al. 1999, Skinner et al. 1999). This research underscores the importance of optimising the persuasive impact of a message designed to promote uptake of healthy behaviours in order to prevent ill-health.

1.1.1 Overview of Thesis

The current thesis seeks to further explore the effect that design features of health promotion messages have on decision-making for health behaviours. This research will focus on the role of the usability and usefulness of health information leaflets. The concept of usability will be explored in respect to both subjective ratings of a leaflet's usability, and objective manipulation of a leaflet's readability. The definition of and distinction between these concepts is discussed below. Subjective ratings of technology applications have been shown to be reliable predictors of their use (Davis et al. 1989, Mathieson 1992, Adams et al. 1992, Pavvi 1988, Thompson et al. 1991). Little attention has been given to the predictive ability of subjective ratings of usability and usefulness to the use of written health information. Further, to the authors knowledge, no research has attempted to explore the link between subjective ratings of the usability and usefulness of written health information leaflets and their ability to predict intentions to follow the advice given in the leaflets. This thesis seeks to explore the ability of these concepts to predict intentions to follow the advice in the leaflet over and above factors that have previously been shown to predict intentions for a range of health behaviours. These factors include demographics and cognitive and affective factors, and these will be discussed in more depth later in the chapter.

The thesis will also explore the relationship between subjective and objective usability and the 'frame' of health promotion leaflets. The term 'framing' is used to describe whether a message emphasises either the desirable effects or benefits of following the recommended advice (commonly termed 'gain'

Ch.1 – Introduction to the Role of Usability and Frame on the Persuasiveness of Written Messages for Health Prevention Behaviours

frame or ‘positive’ frame) versus emphasising the undesirable effects or disadvantages of not following the recommended advice (‘loss’ or ‘negative’ frame). Framing of health information in this way has been shown to influence intentions to follow the recommended advice (e.g. Banks et al. 1995, Mann et al. 2004, McCaul et al. 2002, McKee et al. 2004, Meyerowitz & Chaiken 1987, Rivers et al. 2005, Rothman & Salovey 1997, Schneider et al. 2001). The theoretical background to framing effects is discussed later in this chapter. The thesis draws on theories of dual-processing models of processing e.g. the Elaboration Likelihood Model (Petty and Cacioppo 1986), and the Heuristic-Systematic Model (Chaiken 1980), to predict an interaction between usability (objective and subjective), usefulness and frame. This interaction has to date not been explored within the context of health behaviours.

The main aims of the thesis are, therefore, to 1) examine the ability of subjective usability and usefulness of health information leaflets to predict intentions to follow the recommended advice, over and above the influence of a range of cognitive beliefs, 2) test the hypothesis that objective usability will predict intentions by manipulating objective usability via reading ease scores in a health promotion leaflet and exploring the subsequent effects on influencing intentions to follow the advice given in the leaflets, 3) to explore the interactive effects of subjective and objective usability and ‘frame’ on intentions to follow advice given in health promotion leaflets and 4) to explore whether subjective ratings of usability and usefulness are a function of personality factors, prior intentions or prior knowledge.

1.1.2 Definition of usability

Definitions of the concept of 'usability' has developed from the concept of 'ease of use' (Miller 1971, Bennett 1979, 1984), originally applied in the field of ergonomics and human computer interaction. Shackel (1981) is credited with the introduction of the term 'usability', which Navon (1984) defines as 'mental workload'. Usability has subsequently been defined as 'the capability (of a product) in human functional terms to be used easily and effectively' (Shackel 1991 pp24). However, the concept of 'usability' is not straightforward. Baber (1993) highlights the importance of the interaction between user characteristics and the 'product', with usability taking on individual meaning to each person involved in the evaluation. 'Usability' can therefore be defined as a complex interaction between product and user characteristics. Maissel et al (1993) highlight that it is the quality of the interaction between the user and the 'product' or 'system' that defines usability. Subjective usability has been associated with prior experiences, expectations and attitudes of users, knowledge, skills and motivation. (Baber 2002). Therefore the current thesis will explore factors that may influence leaflet users' subjective ratings of its usability. These include prior experience, prior knowledge and personality factors. Whilst these factors may be predicted to influence subjective ratings of usability, they may also interact in a similar way with objective manipulation of usability. This thesis will therefore use both subjective ratings and objective manipulation of usability in exploring their effect on intentions to follow health advice in a written leaflet. Issues of usability are also intertwined with perceptions of utility, (i.e. perceived usefulness) (Stanton and Baber 1992). A major indicator of usability is

whether a product is used (Eason 1984). Perceptions of usefulness are shown to mediate the relationship between subjective usability and intentions to use information technology (e.g. Mathieson 1992, Adams et al. 1992, Pavvi 1988). Therefore this thesis will also explore the role of perceived usefulness on intentions to follow the advice in health promotion leaflets.

1.1.3 The benefits of leaflets for health promotion

This series of studies will focus on design features of health promotion *leaflets*. Leaflets are commonly used as a method of persuasion by health promoters. Communicating health risks via leaflets offers a range of benefits. Leaflets allow the reader to learn at his own time and pace (Bernier 1993), and they are relatively cheap to produce and easy to distribute. Mass mailings of health promotion leaflets have been shown to be read by large numbers of their target audience, (O'Loughlin et al. 1997). They are portable, and can contain more detailed information than a poster. Furthermore, they can be used alone or in conjunction with additional learning methods.

Previous research supports the use of leaflets as an effective method of health promotion. Leaflets have been shown to improve knowledge of a health risk for example increase knowledge of arthritis (Barlow et al. 1997); increased knowledge of hypertension (Watkins et al. 1987); increased knowledge of drug information (Gibbs et al. 1989); increased knowledge of oral cancer (Humphris et al. 1999); increased knowledge of skin cancer risks (Castle et al. 1999). Further, leaflets have also been shown to be an effective intervention in persuading recipients to follow some health behaviours, for example readiness

to stop smoking (Hall et al. 2003): exercise, abstinence from alcohol and smoking, and eating breakfast (Sanders-Phillips 1996): increased intentions to participate in colorectal screening (Hart et al. 1997). Leaflets have also been shown to be as effective in promoting behaviour change as multimedia methods of providing health information e.g. CD ROM, websites (Homer et al. 2000, Redsall et al. 2003).

1.1.4 Factors influencing the effectiveness of health promotion leaflets

Some leaflets are more effective than others. Many factors have been shown to influence the effectiveness of health promotion materials include design features of the materials themselves and characteristics of the individuals who read them (e.g. use of pictures, graphic support, headings, contents and tabs Kools et al. 2006, 2007; see Glanz et al. 2002 for review). In relation to leaflets, previous research has found that the use of leaflets to promote health behaviours can sometimes be ineffective (e.g. Pye et al 1988) – reading a leaflet *reduces* the likelihood that recipients will undertake screening for cancer; (Nichols et al. 1986) – failure to persuade people to undertake colonoscopy. Researchers have sought to identify the factors that may make leaflets a more effective tool for health promotion.

The current thesis will focus on two characteristics of leaflet design that have been shown to be influential for leaflet persuasiveness. These are usability and framing. Although the usability and frame of health information have been studied previously independently of one another (Daghio 2006; Friedman and Hoffman-Goetz 2007; Greenfield et al. 2005, Smith et al. 2008; Rothman and

Salovey 1997; Schneider et al. 2001). the interaction of usability and frame has received little attention (but see Bower and Taylor 2003). The underlying mechanisms that may underlie any interaction between usability and frame will be explored within the context of dual processing theories of persuasion the Elaboration Likelihood Model, (Petty and Caccioppo 1986): and the Heuristic-Systematic Model of Persuasion, (Chaiken 1987). This thesis will suggest that the usability of a written information leaflet will affect the way in which recipients process the information. therefore creating conditions that may leave the recipient sensitive to peripheral cues (such as frame) in the decision-making process. This potential interaction is important for designers of health information leaflets. The most persuasive frame to use (i.e. positive or negative) may be dependent on whether the leaflet is easy or difficult to read (both objectively and subjectively). The thesis will study this potential interaction for both subjective and objective usability. The theoretical basis for these hypotheses follow.

1.2 Theoretical Issues

1.2.1 Usability as a predictor of intentions

For messages to be effective they must motivate the recipient to act (Murray-Johnson and Witte 2003). Presentation of risk information is insufficient unless it motivates the recipient to act, but it may also be unsuccessful if the recipient does not have the ability to process the information (Petty and Cacioppo 2006). Whilst knowledge of a health risk itself is not considered to be sufficient to motivate behavioural change, it is thought to be a pre-requisite for movement to a stage where an individual contemplates a change

(Baronowski 1992-3). A serious barrier to acquiring this knowledge and therefore to effective risk communication is illiteracy. One fifth of the UK population is estimated to be functionally illiterate (Moser Report 2000). In relation to health literacy, 1 in 5 UK adults do not have the required literacy skills required to understand basic information that could improve health (NCC 2004). Low literacy levels have been linked to poorer overall health (Pirisi 2004), lower levels of knowledge about disease and poorer self-care (DeWalt et al. 2004), and have been shown to have a negative effect on chronic health conditions such as diabetes, asthma and HIV (Williams et al. 1998 a&b, Schillinger et al. 2002, Kalichman et al. 1999). Further, literacy skills have been shown to be the strongest predictor of health status, over and above age, income, education level, or employment status (Kellerman 1999). Any intervention that aims to increase uptake of safe practice, therefore, needs to be designed to be easy to read and understand. Several studies have highlighted a need for increased usability of health promotion materials. Studies that assess the readability of health information materials have found the reading level to be frequently higher than the reading ability of the target population, (e.g. Dollahite et al. 1996, Meade and Byrd 1989, Greenfield et al. 2005, Daghio et al. 2006, Griffin et al. 2006, Glazer et al. 1996, Slaten et al. 1999, Guidry et al. 1998, Wang et al. 2009, Ngoh 2009, Greywood et al. 2009, Vives et al. 2009, Clauson et al. 2010, Todhunter. 2010). There is some evidence that the readability of health promotion materials influences comprehension (Friedman & Hoffman-Goetz 2007), and ultimately their persuasive effect (Calabro et al. 1996).

Ch.1 – Introduction to the Role of Usability and Frame on the Persuasiveness of Written Messages for Health Prevention Behaviours

There is some empirical support for the influence of language complexity on persuasion. Anderson and Jolson (1980) found that highly technical language evokes negative attitudes, although when this technical language is accompanied by explanatory phrases then this evoked more positive attitudes and increased learning about the products (Meeds 1999). Bower and Taylor (2003) studied the effect of ‘plain language’ versus medical jargon on intentions to comply with pharmaceutical product instructions. They also manipulated frame, hypothesising that a negative frame would induce a higher level of fear and that this would result in greater intentions to comply with the product instructions. Plain language was more effective than medical jargon in influencing compliance intention. Negative frame was more persuasive than positive frame in influencing intentions to comply with pharmaceutical product instructions, however there was no interaction with language condition. This thesis will further explore the relationship between objective readability, frame and intentions to follow advice in health information leaflets, predicting that, consistent with dual-processing models of persuasion (ELM, Petty & Cacioppo 1986, HSM, Chaiken 1980) framing effects will only be observed for easy-to-read, i.e. high readability leaflets.

1.2.2 Relationships Between Usability and Usefulness

Eason (1984), and Stanton and Baber (1992) highlighted the importance of perceived usefulness as an indicator of perceived usability. Pantazi et al. (2006) highlight the paradox of usability and usefulness for medical information processing. The ‘usability axiom’ states that ‘Information systems must be, at the same time, *usable* and *useful*. However, because usable user

interfaces need to be simple and because useful information systems able to solve complex problems require complex problem-solving engines. the usability axiom is also a paradox: Information systems must be, at the same time, *simple* and *complex*. This relationship between usability and usefulness is important for health information leaflets as the ability to convey complex health information in a way that reflects health literacy issues may impact on persuasiveness. These relationships have to date not been studied within the context of health information leaflets. They have, however, been studied within the field on information technology. The Technology Acceptance Model (Davis, 1989) explores the relationships between usability, usefulness and predictions of use of Information Technology.

1.2.3 The Technology Acceptance Model

The Technology Acceptance Model (TAM) is a popular model used for predicting acceptance and use of Information Technology. Central to the TAM are the concepts of usability and usefulness. The model is based on Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). The key features of the TRA used to develop the TAM were: specifying how to measure the behaviour-relevant components of attitudes; distinguishing between beliefs and attitudes; and specifying how external stimuli, such as the objective features of an attitude object (i.e. an Information System IS) are causally linked to beliefs, attitudes and behaviour (Davis, 1993). The TRA predicts that the external stimuli will indirectly influence a person's attitudes towards a behaviour by influencing their beliefs about performing the behaviour. Consequently this will influence intentions to perform that behaviour.

The TAM incorporates two specific user beliefs into the TRA and uses this model to predict IT users actual usage of the relevant technology. These two beliefs are ‘perceived ease of use’ and ‘perceived usefulness’. Perceived ease of use is defined as ‘the degree to which an individual believes that using a particular system would be free of physical and mental effort’, whilst perceived usefulness is defined as ‘the degree to which an individual believes that using a particular system would enhance his or her job performance’ (Davis, 1989 pp320). These concepts were validated by the authors in two separate factor analyses as being statistically distinct from one another, and have subsequently been shown to be reliable and valid (Adams et al. 1992; Doll et al. 1997). The model proposes that design features of an IS have a direct effect on perceptions of ease of use and usefulness. Perceived usefulness is predicted by the model to be substantially influenced by perceived ease of use (usability). Each of these perceptions influence the user’s attitudes towards using the IS, which in turn have a direct influence on actual use of the IS. (i.e. whether or not the information system will be accepted or rejected by the user). As predicted by the TRA, the TAM also predicts that behavioural intention to use is the single best predictor of actual usage. Whilst the TRA predicts that the impact of beliefs on intentions should be completely mediated by attitudes towards the behaviour, the TAM also predicts that the effect of perceived usefulness on behaviour may be only partially mediated by attitudes. This is explained by looking at the situations where IT may be used. For example, if a worker is provided with an IS that is lacking in design features that promote ease of use, the user may still choose to use that system

because of the benefits that it conveys. (i.e. how useful it is for their work) (Davis 1993).

Many external variables are theorised by the TAM to affect intentions to use and actual usage of the system. These include features of the system itself, for example objective design characteristics, but also characteristics of the user, for example their level of involvement with the system, their experience, IT self-efficacy and the level of training they have received. Although the TAM is widely used to predict intentions and actual usage of *Information Systems*, (i.e. Information Technology), the concept of an IS may be broadened to include other *Information Sources*, and therefore it is proposed that predictions made by the TAM with regards the influence of usability and usefulness on intentions may be applied to health information leaflets.

The current thesis uses these concepts of usability and usefulness and explores whether they can predict intentions to use information and advice given in written health information leaflets. The fundamental difference will be applying the concepts of usability and usefulness of an information system (i.e. a written leaflet) to predict whether they will influence a user to both engage with the information, and also to make a judgement about whether to modify their behaviour in the way prescribed by the leaflet. This thesis uses the concepts of usability and usefulness as described in the TAM as a starting point to explore the influence of external stimuli on perceptions of usability and usefulness, and consequently to predict the influence of an information

source on persuasion to modify behaviour, that behaviour being distinct from use of the actual IS.

This thesis will also explore the mechanisms underlying the effects of usability and usefulness on persuasion. External variables may influence a users perceptions of the usability and usefulness of a health information leaflet, at the level of the user: level of involvement with the risk behaviour in question; level of experience with the relevant health problem, either personally or knowing someone with the problem; and at the level of the leaflet itself, objective readability and frame (positive or negative) that the message is written in may be shown to influence perceptions of usability and usefulness. Research has previously shown a relationship between objective and subjective usability for leaflets on prostate cancer (Rees et al. 2003), therefore in this thesis objective readability is predicted to influence subjective usability. Frame will be manipulated as it is proposed that usability will affect the user's level of information processing which, according to dual processing models of persuasion (e.g. ELM Petty and Cacioppo 1986 and HSM Chaiken 1987) will in turn affect his/her sensitivity to frame as a peripheral cue (Rothman & Salovey 1997). Dual processing models of persuasion are discussed below.

1.2.4 Dual processing models of persuasion

Dual processing models, (e.g. the Elaboration Likelihood Model) (Petty and Cacioppo 1986) and the Heuristic-Systematic Model (Chaiken 1987) propose two separate routes for information processing. Systematic, deep processing

results in decision-making made using cognitive evaluations of the information. Shallow, heuristic processing leads to judgements using peripheral cues such as affect and decision-making biases. This can be demonstrated with text complexity. Lowrey (1998) found that whilst text complexity had a negative effect on recall and recognition in a broadcast message that the viewer could not control, when this was transferred to a print medium syntactic complexity positively affected attitudes. Bradley and Meeds (2002) found that complex syntax in advertising was more likely to require more processing effort.

Readability studies showed that health information leaflets were often written at a level that was too high for much of the population. This has led to recommendations that leaflets should be written at a more easy or usable level (Glazer et al. 1996; Guidry et al. 1998; Slaten et al 1999.). The effects of reducing reading difficulty have been demonstrated in terms of increases in knowledge, recall and comprehension (McKenna & Scott 2006). However, the interaction of reading ease with other message characteristics has received less attention. ‘Framing’ the information in a health leaflet, as positive or negative, has been shown to influence its persuasiveness. It is suggested that ‘frame’ acts as a peripheral cue (Rothman & Salovey 1997). Framing theories and research are discussed in depth below. This thesis will explore whether framing effects can be predicted under conditions of both high and low reading ease. It is proposed that objective reading ease and subjective perceptions of usability will have a differential effect on the judgement strategies of the leaflet recipients, with high usability causing shallow

processing and low usability requiring more systematic processing. Judgements made under shallow processing conditions will be more likely to be made using peripheral cues i.e. frame. Judgements made under systematic processing will be more likely to be made using cognitive evaluations and therefore will be less likely to use peripheral cues (i.e. frame).

1.2.5 Message Framing Theory

1.2.5.1 Fear appeals

Researchers in persuasion and decision-making have been interested the concept of asymmetries between positive and negative information for many years (e.g. Hovland et al. 1953, Sternthal & Craig, 1974, Witte 1994). Fear appeals have traditionally been shown to increase persuasion by increasing perceived threat to moderate levels (e.g. Keller & Block, 1996, Keller 1999, Sternthal & Craig 1974). Some of the first research into this area used the drive-reduction model (Hovland et al. 1953) as a basis for predicting persuasion. This model suggests that if the threat created by a message arouses sufficient fear to compel the recipient to reduce that fear, then this will motivate an individual to act. The actions contained in the message subsequently provide the recipient with a method of reducing the fear. Fear inducing messages have also been shown to induce high levels of message processing, which can strengthen attitude change (Baron et al. 1994, Meijnders et al 2001). Further, research into affect suggests a 'negativity bias', whereby negative information is given more weight than positive information (Meyerowitz & Chaiken 1987, Fiske & Taylor 1991, Peeters & Czapinski 1990).

1.2.6 Prospect Theory

The application of message framing to health promotion evolved from work on human decision making processes. The development of Prospect Theory (Kahneman & Tversky 1979, 1984) demonstrated how information about risk can become distorted by cognitive biases. Decision-makers are influenced to choose different courses of action when presented with factually equivalent alternatives, depending on whether the given information highlights associated benefits (gain frames) or associated costs (loss frames). In the original studies, Tversky and Kahneman (1981) manipulated decision options to be 'risky' or 'non-risky'. The classic scenario involved an up-coming hypothetical outbreak of 'Asian flu' in the United States. Participants were told that they must choose a course of action based on probabilistically equivalent yet risk diverse options. The scenario presented is that 600 people will die if nothing is done. If option A is chosen, 200 people will be saved. This certainty of saving *some* people represents the non-risky option. If option B is chosen, there is a one third chance that 600 people will be saved, and a two thirds chance that no one will be saved. This 'gamble' represents the risky choice. The options are then 'framed' negatively, focusing on lives lost rather than lives saved. Option C is identical to option A, but is worded to emphasise the negative potential outcomes (i.e. lives lost) rather than positive potential outcomes (i.e. lives saved). So, participants are told that if option C is chosen, 400 people will die, whilst if option D is chosen there is a one third probability that nobody will die, and a two thirds probability that 600 people will die.

Prospect theory predicts that when faced with gains, people will be risk averse, but when faced with losses, they will be risk-seeking. The Theory has been extensively studied with consistent results that demonstrate a reversal in preference dependent on the frame of the message. When faced with gains (options A and B), people consistently choose the non risky option. However, when faced with losses (options C and D), people are more likely to choose the risky option.

This finding has been applied to numerous decision-making domains, with researchers manipulating various aspects of the problem. It is believed that ‘losses loom larger than gains’, so when gains are made salient, individuals will seek to maximise these gains by avoiding negative consequences. Conversely, when losses are made salient, individuals will try to minimise losses by taking chances, (i.e. taking the risky choice). Examples of decision-making domains where typical ‘framing effects’ have been found include: bargaining behaviours (Neale & Bazerman 1985); industrial buying decisions (Qualls & Puto 1989); financial planning (Roszkowski & Snelbecker 1990); jobs and assets (Schneider & Eble 1994); time allocation decisions (Paese 1995); life, property and money (Wang 1996). Manipulations of the Asian flu scenario include: substituting Asian flu for ‘AIDS’ (Levin & Chapman 1990); (framing effects lost when decision was for undesirable outgroups); manipulating the number of people threatened by the flu (Bohm & Lind 1992) (framing effect reduced with fewer people threatened); forced elaboration about the decision (Takemura 1994) (framing effect reduced when asked to think about the decision for 3 minutes).

1.2.7 Levin et al. Typology of Framing Effects

Since the original experiments, prospect theory-based research into decision-making has expanded away from the Asian flu type scenarios. Levin et al. (1998) developed a typology of framing effects which categorised research to distinguish between operational differences of framing. They distinguish 3 different types of framing manipulations. The first, encompassing the classic Tversky and Kahneman Asian flu decision problem, is termed 'risky choice framing'. In risky choice framing, the outcomes of a potential choice involving options differing in level of risk are described in different ways (Levin et al 1998). A second type of framing is termed 'attribute framing'. In studies employing this type of manipulation, a characteristic of an object or event is evaluated. These evaluations could be yes/no judgements or ratings of favourability. For attribute framing, a positive advantage is predicted.

For example Levin and Gaeth (1988) found more favourable evaluations of beef when it was labelled as '75% lean' rather than '25% fat'. Frame consistent shifts in outcomes have been found consistently in a range of task domains for this type of framing. Examples include: evaluating toasters for purchase (Beach et al. 1996); evaluation of medical treatments (Levin et al. 1988); judging the effectiveness of condoms (Linville et al. 1993); evaluating surgery (Wilson et al 1987); selection of automobiles (Levin et al. 1996).

The third and final type of framing manipulation identified in the Levin et al. Typology is that of 'goal framing'. It is this manipulation that has come to be associated most frequently with persuasion and in particular with health

behaviours. Goal framing manipulations involve highlighting the gains or losses/costs or benefits/positives or negatives/advantages or disadvantages of a given recommendation in order to attempt to influence persuasion and increase the likelihood of the adoption of an end goal. These principles have been refined and extended in order to apply them to health promotion. However, the results of goal framing studies, and specifically those involving health promotion, have not shown the consistency of those studies that involve the classic risky-choice decision-making problems e.g. Berry and Carson (2010) no effects for frame, van't Riet et al. (2010) gain framed advantage for physical activity behaviour. This thesis is concerned with goal framing. Experimental leaflets will try to persuade recipients to modify their behavioural intentions by following the advice given in the leaflets.

1.2.8 Rothman and Salovey's Framework

Research in health promotion had typically predicted an advantage for messages that evoked a fear response. However, as the study of these effects began to gain more momentum in the field of health promotion, inconsistencies in the results of such studies became apparent. A review of these studies by Rothman and Salovey (1997) sought to explain the inconsistent findings. This led to a distinction in type of health behaviour studied – prevention versus detection behaviours. They categorised health behaviour framing studies by the type of desired behavioural outcome – prevention or detection behaviours. Their review indicated an advantage of gain framing for prevention behaviours, and an advantage of loss framing for detection behaviours. Using Prospect Theory as a theoretical framework, they

explained this finding in terms of risky decision making. Prevention behaviours have relatively safe, certain outcomes, for example using sun cream to prevent skin cancer (Rothman & Salovey 1997), or avoiding smoking to prevent lung cancer (Schneider et al. 2001). Therefore a gain frame message would promote the risk-averse/safe option, (i.e. performing the desired prevention behaviour). Conversely detection behaviours have risky outcomes – by performing these behaviours one runs the risk of discovering a potentially serious problem. For detection behaviours, for example breast self examination (Meyerowitz & Chaiken, 1987), or mammography screening (Banks et al. 1995), loss frames would be more persuasive as they promote a risky choice. This thesis will focus on goal framing – (i.e. trying to persuade people to modify their intentions to follow advice in a health information leaflet). Rothman and Salovey's (1997) prevention detection framework would predict a gain framed advantage for prevention behaviours, (i.e. the positively framed leaflet would be more persuasive), whilst Levin (1998) would predict a negativity bias – (i.e. the negatively framed leaflet would be more persuasive).

1.2.9 Evidence For and Against Framing for Health Promotion

Results of framing studies are not always consistent. Support for framing effects for prevention behaviours is provided in a meta-analysis of goal framing effects (O'Keefe and Jensen 2006) identified 165 framing studies and classified these by message topic. These topics included both disease prevention and disease detection behaviours. O'Keefe's meta-analysis showed that for all cases (representing a total N of 50,780) there was no significant

advantage of one frame over another. The only topic that showed any significant advantage for one frame over another was that of disease prevention behaviours. Gain framed messages were more persuasive than loss framed messages for disease prevention behaviours. This finding is consistent with the theory developed by Rothman and Salovey (1997), who, based on prior inconsistent findings for framing effects in the health domain, proposed a gain frame advantage for prevention behaviours and a loss framed advantage for disease detection behaviours.

Whilst the O'Keefe and Jensen (2006) meta-analysis supported the gain framed advantages for prevention behaviours described by Rothman and Salovey, it did not, however, find any significant advantage for either loss or gain frame for detection behaviours. These findings raise questions regarding which is the optimal frame to use when designing health promotion messages. Whether intentional or not, the information in health promotion leaflets is inevitably framed in one way or another. For example, a study by Ferguson et al. (2003) analysed the content of a sample of Health and Safety Executive leaflets. The study found the majority of statements that were positive or negative to be framed in a negative way. Only a small proportion of information was framed positively. It is therefore important when designing such leaflets to know under what circumstances a positive frame is more useful than a negative one, or vice versa. This thesis seeks to explore further the conditions that may make one frame more persuasive than another. The studies will manipulate the reading ease of health promotion leaflets for prevention behaviours (manual handling and use of ear defenders at work, and

alcohol consumption within safe limits), and frame (positive or negative). Using the theories of information processing of the ELM and HSM, it is predicted that framing effects will be observed where reading ease is 'easy', but not when reading ease is 'difficult'.

Possible explanations for the lack of framing differential as predicted by Prospect Theory are suggested. For example it is possible that some framed messages contain a stronger 'dose' (O'Keefe & Jensen 2006/2007) of the framing manipulation than do others. Many of these studies fail to find overall effects for frame, but framing advantages are found when moderating factors are taken into consideration. Message framing has been shown to interact with a number of variables. These variables include: Self-efficacy (Block and Keller 1995, negative frame best for low efficacy), Wilson et al. 1990; Anticipated affect (Detweiler et al.1999); self-discrepancy (Tyckocinski et al.1994); Involvement (Donovan & Jalleh 2000), positive frame best for low involvement, Maheswaran & Meyer-Levy (1990), positive frame best for low involvement, negative frame best for high involvement); and motivation (Wilson et al. 1990), Dijkstra et al. (2009) negative best for ought discrepancy. It is therefore important to identify what causes these particular variables to moderate framing effects in the way that they do. If the mechanism underlying the different framing effects can be identified, then it may be possible to predict which recipients will be better persuaded by a particular frame. This thesis will seek to explore which leaflets may be more likely to produce sensitivity to frame as a decision-making cue. It is proposed that the usability of the leaflet will determine whether frame is used as a decision-making

strategy. To date, research has supported the hypothesis that increased attention to a framed message will result in deeper processing and therefore less predictable framing effects (see O’Keefe and Jensen 2006 for review). Social cognitive theories postulate that the amount of processing that a message is subjected to by the recipient will affect the persuasive influence that the message exerts. One such model that has been used as a framework to explain observed framing effects is the Elaboration Likelihood Model.

1.2.10 Elaboration Likelihood Model (Petty and Cacioppo 1986)

The ELM is a dual process model of persuasion that emphasises the importance of elaboration of thoughts relating to a message to induce persuasion or attitude change. According to the ELM, persuasion may be induced by processing of a message through one of 2 routes – the central or peripheral route. Central or systematic processing involves high levels of elaboration and careful scrutiny of the message by the recipient. Acceptance or rejection of the message will depend on an individual’s own cognitive responses to the arguments presented to him/her. Central processing may only occur if the message recipient has the motivation and opportunity to do so. The ELM proposes that attitudes formed via central processing will be stronger, more predictive of behaviour, more stable over time and more resistant to counter-persuasion.

Alternatively, a message may be processed via a peripheral route. In this case, elaboration is low, and persuasion is more likely to be induced by peripheral factors such as characteristics of the source of the message such as

attractiveness or credibility, or the quality of the presentation of the message such as use of images. Where a message has been processed peripherally, ELM predicts resultant attitudes to be less resistant to persuasion, less stable over time and less predictive of behaviour.

Petty and Cacioppo (2006) maintain that any variable that has an effect on the level or direction of thinking, the structural features of thoughts or that serves as an argument or cue, can influence attitude change. These variables may be related to the message source, the characteristics of the message or the characteristics of the receiver. Issue relevant elaboration results in increased scrutiny of the message. Motivation to process a health message is imperative for it to be scrutinised and processed deeply and hence change attitudes in a stable and coherent manner. Personal relevance can increase processing of a message. Burnkrant and Unnava (1989) induced increased levels of processing of a message simply by manipulating the pronouns contained in the message from 'he' and 'she' to 'you'. Similar effects were found by Rothman et al (1993) when trying to persuade women to attend for a mammogram.

In addition to motivation, people must have the ability i.e. opportunity to process a message. Cacioppo and Petty (1989) found that complex or long messages required more than one exposure for maximal processing. Recipient characteristics, for example health anxiety, may also reduce the ability to process health messages. Any source, message, recipient or context variables may affect processing of a message or may act as a peripheral cue. These variables are so numerous and so specific to the individual that it becomes

increasingly difficult to make general predictions about the effect of a message type (e.g. frame) on message processing on persuasion. This may help to explain inconsistencies in findings of the effect of frame on levels of processing and consequent persuasion, as it becomes difficult to control for all potential moderators of framing effects.

1.2.11 Moderators of framing effects

Several framing studies explore the role of processing of message content on its persuasive effect. These studies typically look at moderating variables that may operate via high or low levels of processing of the message. Block and Keller (1995) found negative framing to be more effective at influencing persuasion when the level of cognitive elaboration was high, with no difference between gain and loss frames for low elaboration. Maheswaran and Meyers-Levy (1990) found negative framing to be more effective for high elaboration, with positive framing more effective for low elaboration. Rothman et al. (1993) found negative framing to be more effective when elaboration was high, and positive best when elaboration was low. Moderators such as issue involvement and efficacy are also thought to operate via increasing depth of processing. In general, the literature supports the theory that negative frames are more effective when processing (or as deduced by issue involvement/efficacy etc.) is systematic/central, whilst gain frames are more effective when processing is peripheral/heuristic, although a recent meta analysis (O’Keefe 2007) shows no overall effect for frame on level of processing.

Contradictory evidence in these areas makes prediction of *general* effects for frame on persuasion or depth of processing difficult. However this is unsurprising given the complexity of the processes involved in receiving and responding to a message. The ELM provides a theoretical basis within which potential moderators of framing effects can be studied – factors that may influence that level of processing an individual gives to a message may moderate the effects of frame on persuasion. This thesis predicts that usability of a health information leaflet will act as such a moderator. Easy to read leaflets will be subject to less processing and therefore framing effects will be more likely. Difficult to read leaflets will be subject to deeper processing, therefore framing effects will be less likely. As all behaviours in this series of studies are prevention behaviours, according to Rothman and Salovey (1997), positively framed leaflets will be more persuasive in the easy condition. Using Levin's (1998) framework, negatively framed leaflets would be more persuasive for easy to read leaflets. For difficult leaflets, neither frame will be more persuasive, as judgements will be based on cognitive factors not peripheral cues.

The classic Tversky and Kahneman (1981) studies of preference reversal focused on decision-making under uncertainty. In these experiments, participants have to choose between one of two options. As framing theory has been applied to an increasing number of domains, the decision task is often fundamentally different to the original Asian Flu type choices. Goal framing tasks in the health domain often require participants to indicate to what extent they intend to modify their behaviour under differing experimental conditions.

In these cases, judgements rather than decisions are being made. Judgements can be defined as an explicit evaluation of each alternative, typically using a continuous or multilevel scale, whereas choices (decisions) require only that one alternative be selected and the rest rejected (Billings and Scherer 1988 pp2). Historically, the distinction between choices (decisions) and judgements has been blurred, and the terms used interchangeably (see review by Slovic and Lichtenstein 1971). However, in later definitions a distinction between these concepts has been increasingly recognised. 'Judgement may precede and aid choice, it is neither nor sufficient for choice. A choice can be made with incomplete alternatives, and judgements can be made in the absence of choice'. (Billings and Scherer 1988 pp2.)

The tasks in the series of studies reported in this thesis involve participants rating their intentions to follow advice in a series of health promotion leaflets. Therefore, it is important to note that rather than making a choice (decision) between alternatives, they are making judgements about their behavioural intentions.

1.3 Testing these theories in this thesis

Usability can be both subjective and objective. Several factors may influence a reader's judgement of the perceived usability of an information system, for example prior experience, knowledge, or attitudes (Baber 2002, Maissel et al. 1993). Subjective usability and usefulness will be measured using ratings scales. Objective usability can also be manipulated in a number of ways in order to try to induce conditions of low and high usability e.g. use of pictures.

graphic support, headings, contents pages (Kools et al. 2006, 2007); type size, line spacing (Krass et al. 2002). The studies in this thesis will manipulate functional reading ease, as many research projects that find readability to be poor for health information leaflets make the recommendation to improve the readability of future leaflets (e.g. Greenfield et al. 2005, Griffin et al. 2006). Functional reading ease can be assessed and manipulated using a variety of readability formulas, (e.g. Simple Measure of Gobbledegook (SMOG), McLaughlin 1969; Fry Readability Formula (Fry 1968); FOG index (Gunning 1968); Flesch Reading Ease Score (Flesch 1948). The studies in this thesis will use the Flesch Reading Ease Score and Flesch-Kincaid Reading Grade Level (Flesch 1973) to create easy and difficult leaflets. The Flesch formula scores text by assessing its difficulty by measuring sentence length and number of passive sentences. A score of between 0 and 100 is generated, with 100 being easiest to read, and 0 being most difficult. By creating easy and difficult leaflets, the interaction with frame can be studied.

1.4 The influence of individual characteristics on behavioural change

Decision-making in health behaviour has been shown to be influenced by a range of psychological constructs. These are formalised in several health behaviour model which are outlined briefly below, and have been shown to predict a range of health behaviours. Therefore, measures of a selection of these factors will be taken in order to look at the influence of usability and usefulness on intentions over and above the influence of these factors.

Ch.1 – Introduction to the Role of Usability and Frame on the Persuasiveness of Written Messages for Health Prevention Behaviours

Research into optimising health promotion efficacy has been informed by a range of theoretical perspectives. These have their roots in the general persuasion literature and the literature surrounding behavioural change. The Health Belief Model (Rosenstock et al. 1966) focuses on the importance of threat beliefs (perceptions of susceptibility to and severity of the health risk), and beliefs about the effectiveness of the protective behaviour; The Theory of Reasoned Action (Fishbein and Ajzen 1975), assumes that intentions to perform a given behaviour are influenced by an individual's attitudes towards that behaviour (e.g. beliefs about the outcome of that behaviour, the outcomes of performing that behaviour, normative beliefs (i.e. whether friends/family/peers think the behaviour should be performed); and motivation to comply with these norms. The Theory of Planned Behaviour (Ajzen 1991) builds on the TRA to include the role of behavioural control on intentions and actual behaviour. Protection Motivation Theory (Rogers 1975) is based on the use of fear arousal as a motivator of behavioural change. Perceived severity of an illness, perceived susceptibility to that illness and perceived efficacy of the recommended behaviour combine to influence the individual's motivation to protect themselves from the risk.

Health interventions are often based upon one of these models of health behaviour, for example (Kimlin Ashing-Giwa 1999), HBM, TPB/TRA and breast cancer screening; (Lien et al. 2002), TPB and fruit and vegetable consumption; (Conner et al. 2002) TPB and healthy eating; (Faulkener and Biddle 2001), HBM and TPB and exercise; (Abraham et al. 1992), HBM and HIV prevention; Lusk et al. 1994 HBM and use of hearing protection.

All of these models have been shown to predict intentions and behaviour when used as a basis for health interventions, for a range of behaviours (see reviews by Stroebe 2000, Armitage et al. 2001, Floyd et al. 2000). The current series of studies therefore includes the measurement of a range of behaviour-related attitudes and emotions taken from these models in order to explore the additional influence of usability and 'frame' in relation to these variables. These factors are perceived risk (from the HBM and PMT) severity from the HBM, attitudes, perceived behavioural control, and social norms from the TPB. Worry will also be measured, which is not formalised in any health model but has received increasing attention for its potential to predict health behaviours (McCaul and Mullens 2003).

1.5 Summary of themes examined in the current thesis

The current thesis has three main aims. Firstly, based on theory from the TAM (Davis 1989), it aims to find a relationship between subjective ratings of the usability and usefulness of health promotion leaflets and intentions to follow the advice in those leaflets. Secondly, it aims to explore the nature of subjective ratings of usability as compared to objective readability manipulations, prior intentions, prior knowledge and personality measures. Thirdly, it seeks to experimentally manipulate the objective reading ease of leaflets relating to safe alcohol consumption, to test the relative persuasiveness of easy versus difficult to read messages. Frame (positive or negative) will also be manipulated. Based on the ELM (Petty and Cacioppo 1986) an interaction between frame and usability is predicted, with framing effects only

expected in the easy to read condition. As the behaviours in these studies are prevention behaviours, Rothman and Salovey's (1997) theory of framing effects would predict a more persuasive effect for the positively framed leaflet. Levin's typology of framing effects would predict a more persuasive effect for the negatively framed leaflet for goal frames, due to the negativity bias. The studies in this thesis will be conducted in both workplace settings (manual handling in health care and use of ear protection in heavy industry), and within a student environment (consumption of alcohol).

1.5.1 Behaviours to be studied

The current series of studies will include the study of the role of leaflets in worksite health and safety promotion. Workplace health and safety behaviours are important because employees face exposure to hazards as an integral part of their daily lives. Work-related ill-health as a result of these hazards can often be avoided by use of protective equipment or by following prescribed safe practice. The effective design of workplace health and safety promotion messages can therefore have an important influence in persuading individuals to protect themselves from harm. Few previous studies have looked at the underlying mechanisms behind recipient's perceptions of the usability of health promotion leaflets. Harvey et al. (2000) evaluated current worksite health and safety leaflets in relation to their usability and usefulness. They showed that these leaflets were considered to be comprehensible and acceptable by recipients, however objective usability was not studied.

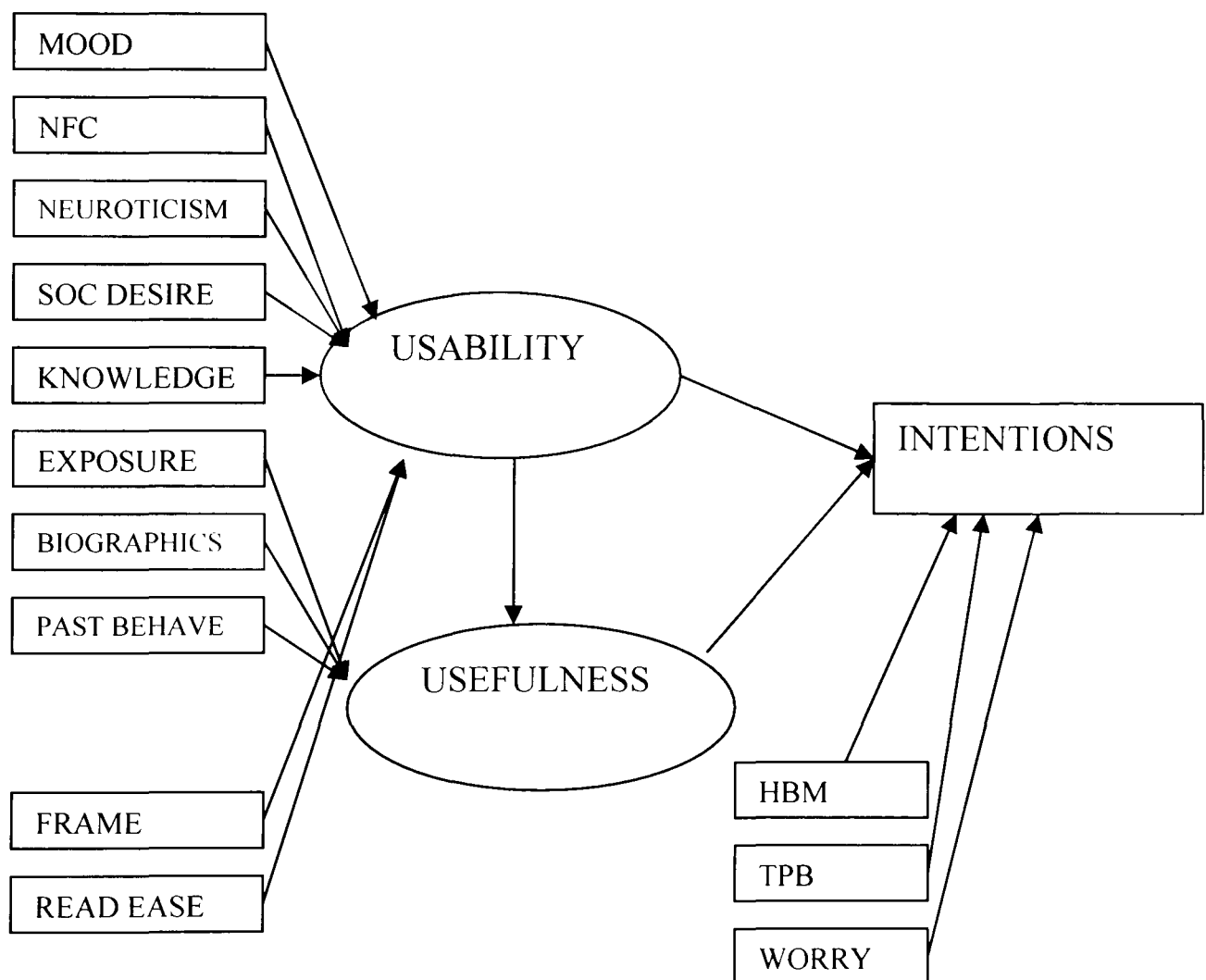
Ch.1 – Introduction to the Role of Usability and Frame on the Persuasiveness of Written Messages for Health Prevention Behaviours

The series of studies examined workplace behaviours (manual handling in health care settings, and use of ear defenders in heavy industry). In these settings, individuals have little choice as to exposure to the health risks. Outside of the workplace, individuals may have more of a choice as to whether they engage in risky behaviours or not. This is the case for alcohol consumption. The risks of excess alcohol consumption are well documented, and have been the subject of many public health campaigns. In 2004 alcohol-related ill-health in the UK was estimated to cost the health service between £1.4 and £1.7 billion. Numbers of alcohol related hospital admissions have risen by 50% in the past 10 years. In a recent survey (NHS 2007) 69% of UK adults reported that they had heard the governments' guidelines on alcohol consumption. Of these, one third could not remember what they were. The survey found 34% of men and 20% of women drank more than the recommended number of weekly units.

The role of usability, both perceived and objective, and usefulness in persuading recipients to follow the recommendations in the leaflets will be explored by measures of intentions. Studies have shown intentions be to a reliable precursor to actual behaviour (Sheeran 2002). The role of usability and usefulness will be studied to see if it predicts intentions over and above the contribution of the cognitive and emotional variables included. Figure 1.1 shows a map of the concepts to be studied in this thesis. Both reader and leaflet characteristics are predicted to influence perceptions of (i.e. subjective) usability. Background variables such as biographics, past behaviour and past exposure to the health problem are predicted to influence perceptions of

usefulness. Both usability and usefulness are expected to influence intentions to follow the advice in the leaflets, as are health beliefs from formal models of health behaviour (Health Belief Model and Theory of Planned Behaviour).

Figure 1.1. Figure to show map of concepts to be measured in the series of studies reported in this thesis.



1.6 Hypotheses

The studies will test the following main hypotheses:

- 1) Perceptions of usability and usefulness will positively predict intentions to follow the recommendations given in the leaflet. Usability and usefulness

will predict intentions over and above the predictive ability of cognitive and emotional variables.

- 2) Subjective usability is a function of personality factors, prior intentions or prior knowledge.
- 3) Objective readability will predict intentions to follow safe practice. Leaflets that are easy to read will be more persuasive than leaflets that are hard to read.
- 4) Frame will predict intentions to follow safe practice. Rothman and Salovey's (1997) framework would predict an advantage for positive frame. Levin et al.'s (1998) typology would predict an advantage for negative frame
- 5) There will be a significant interaction between usability and frame on intentions. Framing effects will be observed only when reading ease is high.

1.7 Next Chapter

The next chapter will develop a two factor model of usability and usefulness, and explore the effects on intentions to follow the advice in workplace safety leaflets.

CHAPTER 2

Exploring the perceived usability and usefulness of health and safety leaflets and intentions to follow safe practice for two workplace behaviours

2.1 Overview

The purpose of the chapter was to explore worker's subjective evaluations of the usability and usefulness of a sample of existing Health and Safety leaflets, and the relationship of those evaluations to their intentions to follow the advice given in those leaflets. The study focuses on two workplace self-protective behaviours. These are correct manual handling, which will be studied within the context of NHS nursing staff, and appropriate use of ear defenders in an industrial sample (foundry and mine workers). The study of leaflets within a workplace context is appropriate as leaflets have an important role in the promotion of workplace self-protective behaviours (Harvey et al. 2000). Information highlighting potential risks and outlining risk-appropriate self-protective behaviour is often distributed to workers in leaflet form as these leaflets are a cost-effective method of providing often mandatory information. The main aims of this chapter were to (1) test whether individuals evaluating health information leaflets distinguish two separate factors to the leaflets (i.e. perceptions of the usability and usefulness), (2) test whether subjective perceptions of usability and usefulness predict intentions to follow the advice given in the leaflets, (3) explore the factors that influence perceptions of usability and usefulness of the leaflets, and (4) test whether the

effect of perceived usability on intentions is mediated by perceptions of the usefulness of the leaflets. These aims will be discussed in more depth below.

2.2 Do leaflet recipients distinguish two separate factors (usability and usefulness) when evaluating health information leaflets?

Research in the fields of ergonomics, information technology and medical informatics has shown that individuals make a distinction between the usability and usefulness of information systems, and that both these factors are important predictors of actual usage (e.g. Eason 1984, Stanton and Baber 1992, Davis 1989, Adams et al. 1992, Doll et al. 1997, Pantazi et al. 2006, Krass et al. 2002). The first aim of the current study was, therefore, to test whether readers distinguished these two factors (usability and usefulness) as separate when evaluating health promotion leaflets. The Technology Acceptance Model (Davis 1989) distinguishes between perceptions of usability and usefulness of information systems. Usability is defined as 'the degree to which an individual believes that using a particular system would be free of physical and mental effort' (Davis 1989 pp320). Usefulness is defined as 'the degree to which an individual believes that using a particular system would enhance his/her job performance' (Davis 1989 pp320).

Perceptions of usability and usefulness have been shown to be valid, distinct concepts when used in the context of Information Technology (Davis 1989, Adams et al. 1992, Doll et al. 1997). The first aim of the present chapter is to show whether perceptions of usability and usefulness are distinct concepts

within the context of evaluating health promotion leaflets. Items used to measure perceived usability were how easy the leaflet was to read, understand and remember. These items have been used to measure subjective ratings of patient information leaflets (the Consumer Information Rating Form, Krass et al. 2002,). Perceived usefulness was measured using four additional items. These were how informative, relevant, helpful and accurate the leaflets were. These items have been used previously to evaluate perceived usefulness of information systems (Larcker and Lessig 1980, Jeong and Lambert 2001, Miller 1996, Astor and Choo 1993, Smith 1996, Tillman 1996). Construct validity and internal reliability of these items as distinct concepts will be assessed using Principal Axis Factoring and Confirmatory Factor Analysis.

2.2.1 Usability as a predictor of intentions

Previous findings have shown that perceptions of usability predict intentions to use Information Systems (e.g. TAM Davis 1989, 1993). The current study tests the relationship between perceptions of the usability of a workplace health and safety leaflet and the recipient's intentions to follow the advice given in the leaflet. This relationship has not been tested to date in a work-based sample, studying workplace self-protective behaviour. The fundamental difference of the current study to those conducted in the field of ergonomics and IT is that this study predicts that perceptions of usability will predict intentions to follow the advice given in the leaflet, not just intentions to use the information system (the leaflet). Within the health domain, research has shown that *objective* usability (i.e. readability) of a leaflet can influence health intentions and behaviour (e.g. Hall et al. 2003, readiness to stop smoking,

Bower and Taylor 2003 intentions to comply with pharmaceutical instructions). This study will therefore extend this research to test whether *subjective* usability can influence behavioural intentions.

2.2.2 Usefulness as a mediator of the relationship between usability and intentions.

The TAM proposes that the relationship between usability and intentions to use Information Systems is mediated through perceptions of the usefulness of the system (Davis 1989). This mediating relationship has been demonstrated within the domain of Information Technology (Karahanna and Straub, 1999, Mathieson, 1992, Adams et al. 1992, Pavri 1988). Perceptions of usefulness have also been shown to predict intentions to use IT where usability has not (Subramanian 1994). Therefore, the current study will explore both the direct and mediating role of perceptions of usefulness of health and safety leaflets on intentions to follow the advice given in the leaflet. The mediating role of usefulness on the effect of usability on intentions will be tested using mediation analysis as described by Baron and Kenny (1986). This method is described in detail in the methods section. The predicted relationship is shown in figure 2.1 below:

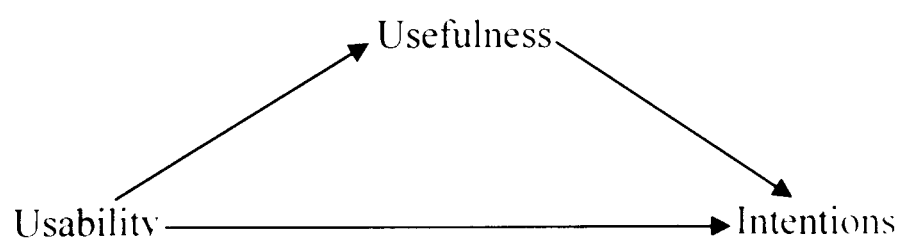


Figure 2.1 Diagram to show the potential mediating role of usefulness on the relationship between usability and intentions to follow the advice given in the leaflet.

2.2.3 The influence of perceived risk, severity, worry and exposure to the health problem on intentions

The concepts of perceived risk, severity, worry and prior exposure to health problems have been studied with regards their ability to predict health behaviours. Descriptions of these concepts and research relating them to health behaviours are outlined below. Measures of these variables were therefore included in the study to test the incremental validity of subjective usability to predict intentions over and above these items.

2.2.3.1 Perceived risk and severity

Perceived risk and severity have been integrated into models of decision-making, with perceived risk/susceptibility and severity formal components of the Health Belief Model (Rosenstock 1974), and perceived risk also a component of Protection Motivation Theory (Rogers 1975), and the Extended Parallel Process Model (Leventhal et al. 1980). Perceived risk has been shown in empirical studies to positively influence intentions and actual behaviour (see meta-analyses by Floyd, Prentice-Dunn & Rogers 2000, Harrison, Mullen & Green 1992.), as has perceived severity (see reviews by Floyd, Prentice-Dunn & Rogers 2000 and Janz & Becker 1984). As these constructs have been shown previously to predict intentions and behaviour, the inclusion of perceived risk and severity offers the opportunity to examine whether usability predicts intentions over and above the contribution of these cognitive beliefs.

2.2.3.2 Worry

The concept of worry has to date not been incorporated into the majority of formal theories of health decision-making (McCaul & Mullens 2003). However there has been an increased interest into the role of affective cues in decision-making in the health domain (Loewenstein et al. 2001, Slovic et al. 2005). Worry can be described as an emotional response to a threat (Schmiege et al. 2009), and has been both positively and negatively associated with a range of health outcomes (see McCaul & Mullens 2003 for a review), including for self-protective behaviours (e.g. Easterling & Leventhal 1989, Mullens et al. 2004,). Research has suggested that perceived risk and worry may be positively correlated with one another (Sjoberg, 1998, Collins et al. 2000). As worry has been shown to be related to intentions to perform self-protective health behaviours, it is included in this study in order to examine the influence of usability on intentions over and above the contribution of this emotional construct.

2.2.3.3 Past exposure and vicarious past exposure

The Health Belief Model (Rosenstock 1990) proposes that in order to engage in self-protective health behaviour, individuals are influenced by ‘Cues to Action’. These are defined by Rosenstock (1990) as external influences that promote the desired behaviour, including information provided or sought, reminders by powerful others, persuasive communications, and personal experiences. Past exposure to the health problem and vicarious past exposure to the health problem (i.e. knowing someone who has experienced the health problem) have been shown to influence health protective behaviours (e.g.

Weinrich et al. (1998) showed vicarious exposure to cancer positively influenced attendance at a prostate cancer educational program, Fry and Prentice-Dunn 2005 showed prior exposure to breast cancer positively influenced self-protective behavioural intentions (i.e. breast self-exam). and vicarious exposure influenced the interpretation of threatening information about breast cancer). As past exposure and vicarious past exposure have been shown to influence both behavioural intentions and interpretation of threatening information about a health risk, items were included in this study in order to assess these variables as potential predictors of intentions. Inclusion of measures of past exposure, along with perceived risk, severity, and worry will therefore test the incremental validity of usability in predicting intentions.

2.3 Factors influencing perceptions of usability and usefulness.

The concept of subjective usability has been theorised to consist of a combination of factors, and to not simply be a reflection of objective usability (Baber 2002, Navon 1984). The current study will therefore explore the factors that influence perceptions of the usability and usefulness of the health promotion leaflets. Regression analyses will test whether background variables such as sex, age, years experience in addition to risk, severity, worry and prior exposure as described previously influence leaflet recipients' perceptions of the usability and usefulness of the leaflets.

2.4 Hypotheses

Hypotheses tested in the current study were:

- 1) Participants will distinguish 2 separate factors to evaluations of the leaflets – these will be usability and usefulness.
- 2) Reflecting predictions by the TAM (Davis 1989), subjective usability will predict intentions to follow the advice in the leaflets. Subjective usability will predict intentions over and above perceptions of risk, severity, worry and prior exposure.
- 3) The effect of usability on intentions to follow the advice in the leaflet will be mediated by perceptions of usefulness.
- 4) Subjective usability will not simply be a reflection of objective usability. Background variables and demographics will influence perceptions of usability.

2.5 Methods

2.5.1 Participants

Participants were recruited from occupations that reflected their involvement with the health behaviours studied. For manual handling, nurses and nursing staff were selected. Participants were recruited from 3 local hospitals and a medical school. Working nurses were recruited during their mandatory manual handling training sessions, whilst student nurses were recruited during lectures. For noise, participants were recruited from a large mine and from a foundry. At both these sites, noise is an occupational hazard and use of ear protection is promoted. At the foundry, participants were recruited during their

mandatory health and safety training sessions. At the mine, participants were recruited by approaching them at their work stations across the site.

The total sample consisted of 444 participants in total. 245 participants were involved with manual handling at work, and 199 were involved with noise at work. Of those who indicated gender, 224 participants were male, and 220 were female. There was no significant difference in the number of males and females for the total sample ($\chi^2 = .111$, $p=.739$). The majority of participants for manual handling were female ($\chi^2=145.8$, $p<.001$) (females 217, males 28). The majority of participants for noise were males (males 196, females 3) ($\chi^2=187.18$, $p<.001$). Consequently the 3 females were dropped from this sample in order to make it all-male, taking the sample N to 441. The mean age of participants was 34.40 (SD 11.28) Years experience was defined for nursing staff as ‘years in service’, and for noise participants as ‘years in company’ (i.e. therefore known to be exposed to noise at work). The mean years experience was 7.7 (SD 9.67).

2.5.2 Leaflets Studied:

Four leaflets were evaluated by participants, 2 related to noise, and 2 to manual handling. Objective readability of the leaflets was measured using the Flesch/Flesch-Kincaid Grade level system (Flesch 1948, 1973). Flesch scores range from 0-100, with 0 representing the most difficult reading level, and 100 representing the easiest reading level. Flesch-Kincaid Grade scores represent the reading age of the text, (i.e. the reading age that the reader should have in order to be able to read the text). The leaflets were selected for their

reasonably high Flesch scores (i.e. representing fairly easy to read leaflets). 2 leaflets were selected for manual handling. One leaflet was a general guide to manual handling ‘Getting to grips with manual handling’ (Health and Safety Executive). This had a Flesch reading score of 61 (reading age 12.1). The other leaflet was specific to nursing staff ‘Guide to patient handling’ (Royal College of Nursing). This had a Flesch reading score of 46 (reading age 15). Although this had a ‘difficult’ reading age, it was the only leaflet relevant to nursing so was selected on this basis. 2 leaflets were selected for noise. 1 leaflet was a general leaflet about noise at work ‘Noise at work’ (HSE). This had a Flesch score of 71, (reading age 11.9 years). The other was specific to foundry workers ‘Hearing Protection in Foundries’. This had a Flesch score of 65 (reading age 12.8). Table 2.1 shows the leaflets used and their reading ease scores.

Table 2.1 Table of reading ease scores for sample leaflets:

| Leaflet | Behaviour | Flesch Score | Reading Age |
|---------------------------------------|------------------|---------------------|--------------------|
| Getting to Grips with Manual Handling | Manual Handling | 61 | 12.1 |
| Guide to Patient Handling | Manual Handling | 46 | 15 |
| Noise at Work | Noise | 71 | 11.9 |
| Hearing Protection in Foundries | Noise | 65 | 12.8 |

2.5.3 Measures:

Four types of constructs were assessed via a questionnaire. 1) leaflet ratings (perceptions of their usability and usefulness), 2) cognitive and emotional beliefs (perceived risk to self and others, perceived severity and worry), 3) intentions to follow the advice in the leaflets, and 4) past exposure to the health problem.

- 1) Usability and Usefulness: Items used to measure usability and usefulness were adapted from existing items used to measure usability and usefulness of both information technology and health information. These items were: ‘how easy is the leaflet to read’, ‘how easy is the leaflet to understand’, ‘how easy is the information in the leaflet to remember’, ‘how informative do you find the leaflet’, ‘how relevant do you think the information is for your work’, ‘how accurate do you think the information provided is’, and ‘how helpful do you think the information will be in your work’. (Krass et al. 2002, Lacker & Lessig 1980, Jeong & Lambert 2001, Miller 1996, Aster & Choo 1993, Smith 1996, Tillman 1996). All items were scored on a 5-point Likert type scale ranging from 1 (not at all), to 5 (extremely). Factor analysis and reliability scores for these items are described in the results section.
- 2) Cognitions and Emotions: 4 items measured perceived risk to self, perceived risk to others, severity and worry. The items used to measure perceived risk were: ‘how likely do you think you are to suffer from hearing problems/back pain as a result of noise/manual handling at work’, and ‘how likely do you think your co-workers are to suffer from hearing problems/back pain as a result of noise/manual handling at work’. Worry

about the health problem was measured with the item: 'are you worried/concerned about developing hearing problems/back pain as a result of your work', and perceptions of the severity of the health problem were measured with the item: 'do you feel hearing difficulties/back pain are a serious health problem'. These items were all assessed using a 5-point Likert-type scale ranging from 1 (not at all) to 5 (extremely).

- 3) Intentions: Intentions to follow the recommendations in the leaflet were measured with 2 items. These two items were 'How likely is it that you will follow the advice given in the leaflet next time you are exposed to loud noise/handling loads', and 'how likely is it that you will follow the advice given in the leaflet in the future?'. These items were assessed using a 5-point Likert-type scale ranging from 1 (not at all) to 5 (extremely). These items were then scaled to form 1 measure for intentions. This item showed good reliability: Chronbach's $\alpha = .93$.
- 4) Past exposure and vicarious past exposure to the health problem: past exposure and vicarious past exposure to hearing loss or back pain were measured by 2 items. These were: 'Have you ever suffered from hearing problems/back pain/other injury that you feel were caused by loud noise/that you attribute to manual handling at work' and 'do you know anyone who has ever suffered from hearing problems/back pain/other injury that you feel were/as a result of noise/manual handling'. These items were measured with a yes/no tick box.

Single items were used to measure severity, worry and perceived risk. Although single-item variables are not favoured by psychological researchers.

they are frequently used within a number of contexts (Dollinger et al. 2009). Multi-item measures are considered to be inherently more reliable as ‘the computation of correlations between items allows an indication of the ‘internal consistency’ of all the items in representing the presumed underlying attribute’ (Bergkvist and Rossiter 2007 pp176). Multi-item measures are also assumed to capture more information than a single-item measure and are therefore more likely to tap all the facets of the construct of interest (Baumgartner and Homborg 1996). Despite the psychometric benefits of multi-scale measures, the use of single-item measures is commonplace. Robins et al. (2007) argue that redundant items in a scale may compound systematic errors and cause participant boredom and frustration, or lead to random responding. The main benefit of single-item measures is that they minimise respondent refusal, and are brief, therefore increasing response rates where time is limited. Rossiter (2002) argues that single item measures are sufficient if the object of the construct is concrete and singular in the minds of participants.

Several studies have explored the relationships between multi-item and single-item scales. A meta-analysis of job satisfaction scales (Wanous et al. 1997) found a correlation of .63 between single and multi-item scales. Gardner and Cummings (1988) found neither multi or single-item scales to be empirically better than one another for a range of psychological constructs. Preito et al. (2004) developed valid and reliable single-item scales to assess quality of life, whilst Littman et al. (2006) showed single-item scales to measure stress to be reliable and as valid as longer scales. Zimmerman et al. (2006) showed their

single item scales to assess depression symptom severity and quality of life to be valid and reliable. Single items have also been used to measure health beliefs e.g. Deroche et al (2009) (severity) and worry (Gramling et al. 2007). Maiman (1977) showed that both single and multi-item scales for severity and perceived risk demonstrated predictive value.

As three of the studies reported in this thesis were conducted using workplace samples during their working hours, time was limited. Therefore single-items for worry, perceived severity and perceived risk to self and others were used.

2.5.4 Procedure:

Participants were asked to read one of the four occupation relevant leaflets. All participants from the foundry read 'Hearing Protection in Foundries', all participants from the mine read 'Noise at Work'. Nurses and student nurses read one of the two leaflets – either 'Getting to Grips with Manual Handling' or 'Guide to Patient Handling'. Data was collected from the nurses in small groups. Each small group read one of the two leaflets. Where large lectures were involved, both leaflets were distributed in the same lecture so that approximately half received each leaflet. After participants had read the leaflet they were given the questionnaire to complete. Participants were allowed to refer to the leaflets whilst they completed the questionnaire. Participants signed consent forms making them aware that participation was voluntary. Nursing staff were recruited during mandatory small group manual handling training sessions, nursing students were recruited during lectures.

Foundry workers were recruited during small group health and safety training sessions, and mine workers were recruited individually at their work stations.

2.6 Results:

2.6.1 Data Screening and Assumptions:

Univariate normality was checked for each variable using histograms and skew and kurtosis indices. The variable 'severity' showed kurtosis of 5.918. Therefore this variable was modified into a dichotomous variable using a median split. There were no additional problems with normality, with all other skew and kurtosis scores under 3. Therefore the assumptions for conducting MANOVA were met. For regressions, using scattergrams, linearity of the relationships was tested. No issues with linearity were detected, as the scattergrams showed no pattern. Standardised residuals were normally distributed and there was no issue with the relationship between standardised and standardised predicted residuals, with scattergrams showing no patterns. There was no problem with multi-collinearity amongst the variables with all tolerance values being above 2. For all regressions, all the above assumptions were met. For all subsequent studies in the following chapters, the above data screening was conducted, and no problems identified unless explicitly specified.

2.6.2 Confirmation of two factor structure of usability and usefulness scales

A series of factor analyses were conducted in order to test the hypothesis that participants would distinguish 2 separate factors (usability and usefulness)

when evaluating the leaflets. A factor analysis using Principal Axis factoring was conducted on all participants (N=423 after listwise deletion) with Direct Oblimin rotation, on the 7 items used to measure usability and usefulness. KMO Measure of Sampling Adequacy = .811, Bartlett's Test of Sphericity = 1267.01 (p<.001).

The results of this analysis showed 2 factors with eigenvalues above 1. These factors were: 1) usability, which consisted of how easy the leaflet was to read, understand and remember, and 2) usefulness, which consisted of how helpful and relevant the leaflets were considered to be. 2 items cross loaded onto both factors. These were informative and accurate. Therefore these were dropped from the scales and the analysis repeated (n=427). The results of the factor analysis on 5 items also showed 2 factors with eigenvalues over 1. KMO Measure of Sampling Adequacy = .710, Bartlett's Test of Sphericity = 963.9 (p<.001). Factor loadings before and after exclusion of 'accurate' and 'informative' can be seen in tables 2.2 and 2.3 below.

Table 2.2 Factor Loadings with all 7 items (n=423)

| Item | Factor | |
|-------------|--------|-------|
| | 1 | 2 |
| Read | .835 | -.027 |
| Understand | .936 | -.088 |
| Remember | .653 | .025 |
| Informative | .364 | .326 |
| Relevant | .029 | .788 |
| Accurate | .348 | .286 |
| Helpful | -.069 | .962 |
| Eigenvalue | 3.645 | 1.114 |

Table 2.3 Factor Loadings with accurate and informative removed (n=427)

| Item | Factor | |
|----------------------|--------|-------|
| | 1 | 2 |
| Read | .828 | .002 |
| Understand | .919 | -.056 |
| Remember | .629 | .054 |
| Relevant | .023 | .827 |
| Helpful | -.018 | .899 |
| Eigenvalue | 2.884 | 1.110 |
| Chronbach's α | .823 | .856 |

Further factor analyses were run on the remaining 5 items to confirm these 2 factors. The data sample was randomly split using SPSS into 2 separate samples of 50%. Principal Axis Factoring was conducted on one of these samples, and Confirmatory Factor Analysis was run on the other using AMOS 7.0. Results of the Principal Axis Factoring on sample 1 are shown below in table 2.4. KMO Measure of Sampling Adequacy = .729, Bartlett's test of Sphericity = 492.506, $p < .001$. Two factors with eigenvalues over 1 were identified:

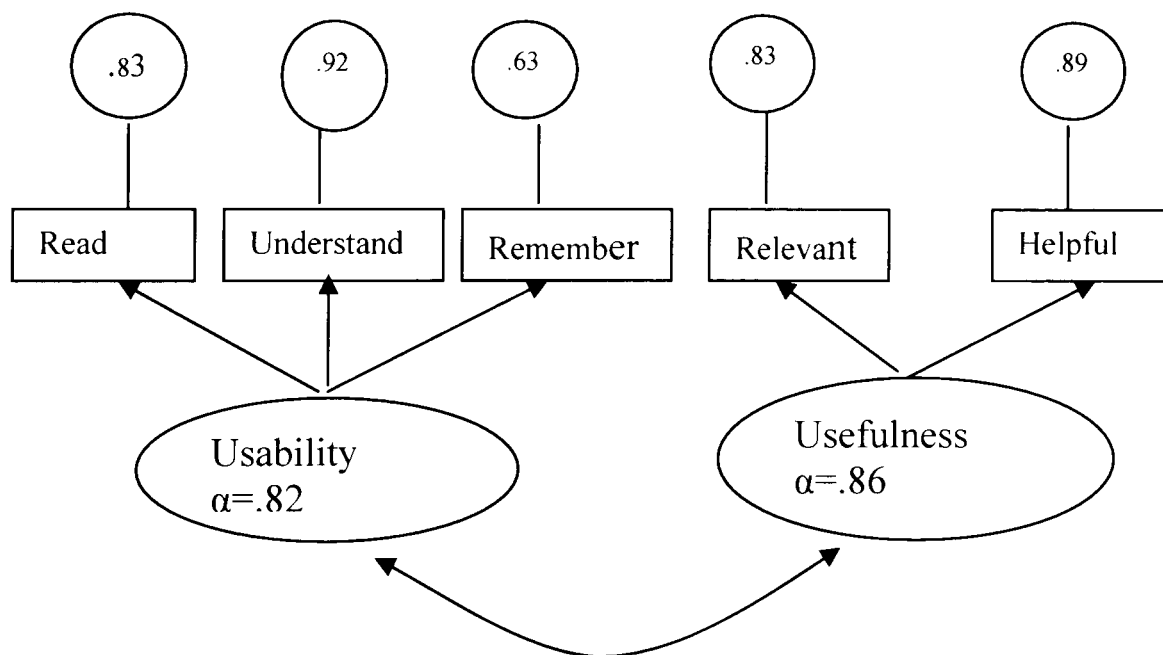
Table 2.4 Factor Loadings the 5 Items for Random Sample 1 (n=217)

| Item | Factor | |
|----------------------|--------|-------|
| | 1 | 2 |
| Read | .857 | -.003 |
| Understand | .871 | -.027 |
| Remember | .705 | .029 |
| Relevant | -.003 | .858 |
| Helpful | .004 | .861 |
| Eigenvalue | 2.938 | 1.114 |
| Chronbach's α | .839 | .854 |

Confirmatory Factor Analysis conducted on random sample 2 showed the model to be an excellent fit: CMIN $\chi^2=5.639$, $p>.05$, TLI =.988, CFI=.997, RMSEA=.043.

Results from the factor analyses confirm that participants distinguish 2 separate factors when evaluating the health promotion leaflets. These 2 factors are usability and usefulness, and are shown with corresponding Chronbach's α to show reliability scores in figure 2.2 below:

Figure 2.2: Usability and usefulness scales as used in all studies with eigenvalues and α



2.6.3 Data Analysis:

Differences in perceptions of the usability and usefulness of the leaflets and of risk-related cognitions and emotions by leaflet read, past exposure to the relevant health problem, and industry setting (i.e. noise or manual handling) was examined by a series of one-way between subjects analyses. Where a

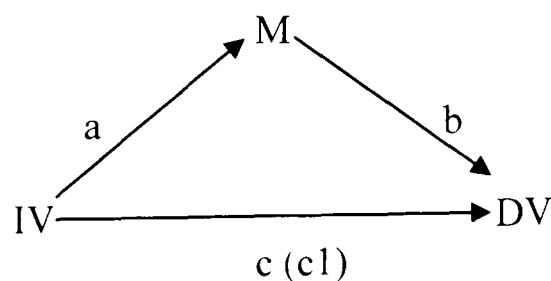
single dependent variable was examined (e.g. intentions). Analysis of Variance (ANOVA) was used. Where there were multiple correlated dependent variables, Multivariate Analysis of Variance (MANOVA) was used. Predictors of intentions, usability and usefulness were examined using multiple hierarchical linear regression. To test for mediating effects, mediation analyses were conducted using methods set out by Baron and Kenny 1986. This method is outlined below:

2.6.4 Mediation Analysis (Baron and Kenny 1986)

The following method is used to test whether the effect of an Independent Variable (IV) on a Dependent Variable (DV) may be mediated by an additional variable (M).

Figure 2.3 shows the mediation model as proposed by Baron and Kenny.

Figure 2.3 Baron and Kenny's (1986) Mediation Model



Step 1: The IV must be shown to be correlated with the DV (direct effect c)

Step 2: The IV must be shown to be correlated with the mediator M (a)

Step 3: The mediator M must be shown to affect the DV, controlling for the IV
(b)

Step 4: To establish full mediation, the effect of the IV on the DV when M is controlled should be zero (total effect c1).

The significance of this effect is tested using the Sobel test (Sobel 1982). This method is used for all mediation analyses within the thesis.

2.6.5 Descriptive Statistics:

Table 2.5 shows means, standard deviations and zero order correlations for all variables. The main hypotheses to be tested in this study were (1) to test whether perceptions of usability and usefulness are related to intentions to follow the advice in the leaflet, (2) to explore factors that influence participants' perceptions of usability and usefulness. Zero order correlations were examined for an initial exploration of these key questions. Significance is reported for correlations, however the issues surrounding multiple testing are acknowledged here. Multiple testing raises the possibility of Type 1 errors. Studies that generate large numbers of measures of association 'have a markedly greater probability of generating false positive results due to random errors than does the stated alpha level for individual comparisons' (Savitz and Olshan 1995 pp904). The issues surrounding multiple comparisons are particularly relevant for Pearson and Spearman correlations (Peres-Neto 1999) – tables of correlations between numerous study variables are often presented in social science research papers with indications of which correlations are statistical significant.

A range of multiple test correction procedures can be employed to prevent type 1 error in multiple testing. The simplest and most straightforward correction is the Bonferroni correction, whereby alpha is divided by the number of comparisons, generating a new, adjusted alpha level. This correction is, however, acknowledged to be substantially conservative (e.g. Perneger 1998). For example, where 10 samples are being compared, and alpha is at the 0.05 level, after Bonferroni correction the adjusted alpha level would be set at 0.005. Peres-Neto (1999) states that using such a small alpha would result in an increase of type 2 errors, and therefore should not be used for large numbers of comparisons.

Rothman (1990) acknowledges that by decreasing the likelihood of Type 1 errors by Bonferroni corrections, one inevitably increases the possibility of Type 2 errors. Indeed, Rothman goes so far as to suggest that ‘a policy of not making adjustments for multiple comparisons is preferable because it will lead to fewer errors of interpretation when the data under evaluation are not random numbers but actual observations on nature’ (pp. 43). Savitz and Olshan (1995) maintain that adjustments for multiple comparisons are unwarranted and a preoccupation with such issues may lead to the ‘unjustified dismissal of meaningful results or exaggerated confidence in weak results’ (pp904). Thomas et al. (1985) and Walker (1986) recommend that where a large number of comparisons are being made, researchers should report unadjusted p values with a warning about the number that might be expected to be significant by chance. This approach is therefore used in the studies in

this thesis. For each correlation table, α (0.05) is multiplied by the number of comparisons, in order to report the number of significant correlations that would be expected by chance for each correlation table.

Table 2.5 Table to show means, standard deviations and zero order correlations for all variables

| | Mean (SD) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|----------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|-----|
| Age (1) | 34.4 (11.3) | 1 | | | | | | | | |
| Years Experience (2) | 7.75 (9.7) | .692** | 1 | | | | | | | |
| Risk- self (3) | 3.61 (1.0) | .084 | .044 | 1 | | | | | | |
| Risk - other (4) | 3.75 (0.9) | .068 | .025 | .806** | 1 | | | | | |
| Worry (5) | 3.95 (1.2) | -.118* | -.093 | .494** | .479** | 1 | | | | |
| Severity (6) | 4.59 (0.7) | .040 | .011 | .168** | .228** | .330** | 1 | | | |
| Usability (7) | 4.02 (0.7) | .197** | .188** | .080 | .069 | -.019 | .113* | 1 | | |
| Usefulness (8) | 3.86 (1.0) | .105* | .120* | .183** | .152** | .131** | .163** | .433** | 1 | |
| Intentions (9) | 4.09 (0.9) | .143** | .167** | .124** | .116* | .091 | .265** | .422** | .390** | 1 |

*p<.05, ** p<.01, ***p<.001

2.6.6 Summary of key findings

This main aims of this chapter are to explore the factors influencing subjective usability and usefulness, and to test the effect of subjective usability and usefulness on intentions to follow the advice in the leaflet. Zero order correlations were examined in relation to these issues. Number of expected false positive results was calculated. $72/2$ comparisons (36), multiplied by $0.05 = 1.8$. Therefore 1.8 false positive results would be expected for this data set. There were large significant positive correlations between perceived usability and usefulness and intentions. This reflects predictions from the TAM.

Perceptions of usability were positively related to age, years experience, perceptions of severity, usefulness and intentions. Perceptions of usefulness were significantly correlated with all other measures, i.e. age, years of experience, risk to self and others, worry, severity, usability and intentions.

2.6.7 Predictors of intentions to follow safe practice:

A hierarchical multiple linear regression was conducted in order to test the hypothesis that perceptions of the usability and usefulness of the leaflets would predict intentions to follow the recommendations given in the leaflets, and to explore whether they would do so over and above the influence of the cognitive, emotional and background variables. The results are presented in table 2.6.

Table 2.6 Table to show significant predictors of intentions to follow the advice given in the leaflet

| | Step 1 β | Step 2 β | Step 3 β |
|------------------|-------------------|-------------------|-------------------|
| Sex | .006 | -.001 | -.002 |
| Age | .295*** | .270** | .197* |
| Industry | -.425*** | -.388*** | -.189 |
| Years Experience | .074 | .099 | .080 |
| Exposure – self | .048 | .007 | .013 |
| Exposure – other | -.032 | -.067 | -.064 |
| Risk – self | | .010 | -.016 |
| Risk – other | | .016 | .033 |
| Worry | | .074 | .051 |
| Severity | | .217*** | .149** |
| Usability | | | .277*** |
| Usefulness | | | .225*** |
| R^2 | .072*** | .133*** | .282*** |
| ΔR^2 | .072*** | .061*** | .150*** |

Note * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

The model accounted for 28.2% of the total variance in intentions to follow the advice given in the leaflet. Being female was a significant predictor of intentions to follow the advice in the leaflets ($\beta = .197$), with step 1 accounting for 7.2% of the variance. Perceived severity of the health problem was also a significant predictor ($\beta = .149$), with this step accounting for 6.1% of the variance in intentions. The biggest predictors of intentions were the perceived usability and usefulness of the leaflets (β s = .277, and .225 respectively). These variables accounted for 15.0 % of the total variance seen for intentions. Further regressions on intentions were conducted for both the noise and manual handling sample independently of one another to explore differences

in the 2 samples. There were no differences in predictors of intentions between the 2 samples. The results indicate that, for this sample, usability and usefulness account for a significant proportion of the variance in intentions to follow the advice in a leaflet, above and beyond the contribution of cognitive and emotional factors, past exposure, and demographics. These results indicate that perceptions of both usability and usefulness of health information leaflets are important determinants of behavioural intentions and are therefore worthy of further study in the health domain.

2.6.8 Factors that influence perceptions of usability and usefulness

1) Objective reading ease and relevance.

Two one-way between subjects MANOVA were conducted to identify differences in perceptions of the usability and usefulness of the leaflets. Analyses were conducted for manual handling and noise samples separately. These analyses allowed a comparison of the perceptions of the usability and usefulness of health promotion materials as compared to their objective readability. Flesch analyses showed that for manual handling, the RCN leaflet had the most difficult objective reading score (46), with the HSE manual handling leaflet being the least difficult (61). For noise leaflets 'Hearing Protection in Foundries' had a reading ease score of 65, and 'Noise at Work' had a reading ease score of 71. Table 2.7 describes the objective reading scores, subjective usability and usefulness ratings and occupational relevance of the four leaflets studied.

Table 2.7 Table to show objective reading scores and subjective ratings of usability and usefulness for each leaflet

| Leaflet | Behaviour | Objective Reading Ease Score | Subjective Usability Mean (SD) | Occupational Relevance | Subjective Usefulness Mean (SD) |
|---------------------------------------|-----------------|------------------------------|--------------------------------|------------------------|---------------------------------|
| Getting to Grips with Manual Handling | Manual handling | 61 | 3.79 (.72) | No | 3.45 (1.1) |
| Guide to Patient Handling | Manual handling | 46 | 3.77 (.66) | Yes | 3.92 (.94) |
| Noise at Work | Noise | 71 | 4.24 (.59) | No | 4.44 (.63) |
| Hearing Protection in Foundries | Noise | 65 | 4.36 (.59) | Yes | 3.86 (.99) |

For manual handling, the multivariate F test showed a significant difference between the leaflets ($F(2,242) = 8.72, p < .001$). Univariate tests showed these differences were significant only for perceptions of usefulness, with the occupationally relevant 'Guide to Patient Handling' rated as significantly more useful than the general 'Getting to Grips to Patient Handling' ($F(1,243) = 13.34, p < .001$). There were no differences in perceptions of usability between the 2 leaflets, despite large differences in their objective reading scores.

For noise, the multivariate F test showed a significant difference between the leaflets ($F(2,193) = 15.938, p < .001$). Univariate tests showed that this effect was significant only for usefulness, with the occupationally relevant 'Hearing

Protection in Foundries' rated as significantly *less* useful than the general 'Noise at Work' ($F(1,194) = 15.23, p < .001$). There were no significant differences for perceptions of usability.

These results indicate that for these samples, objective reading scores did not have a significant influence on subjective ratings of usability. Occupational relevance had a significant influence on perceived usefulness, although this was a negative relationship for the noise sample.

2) Usability as a function of background variables, cognitions, emotions and prior exposure.

Subjective usability is proposed to be function of reader characteristics. A linear regression was conducted on all data ($n=385$) to explore whether background variables (age, sex, years experience, industry, and prior exposure to the health problem), cognitive beliefs or worry influence perceptions of the usability of the leaflets. The results are shown below in table 2.8.

Table 2.8 Table to show significant predictors of perceived usability

| | Step 1 β | Step 2 β | Step 3 β |
|------------------|-------------------|-------------------|-------------------|
| Age | .016 | .011 | .014 |
| Sex | .094 | .082 | .002 |
| Industry | -.470*** | -.464*** | -.350*** |
| Years Experience | .004 | .014 | .011 |
| Exposure – self | .022 | .011 | .026 |
| Exposure – other | -.010 | -.023 | -.027 |
| Risk – self | | -.011 | -.057 |
| Risk – other | | .024 | -.008 |
| Worry | | .030 | .006 |
| Severity | | .121* | .066 |
| Usefulness | | | .356*** |
| R^2 | .161*** | .176*** | .292*** |
| ΔR^2 | .161*** | .015 | .115*** |

Note * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

The model explained 29.2% of the total variance for perceptions of the leaflet's usability. Industry (i.e. noise or manual handling) and perceived usefulness of the leaflet both significantly predicted perceptions of usability.

'Noise' participants were more likely to rate the leaflet as more usable

($\beta = -.351$), with step 1 (background variables) explaining 16.1% of the total variance for usability. Increased perceptions of usefulness increased perceptions of usability ($\beta = .358$). This step accounted for 11.7% of the total variance in intentions to follow the advice in the leaflet. Further regressions were conducted on both the noise and manual handling samples independently of one another to explore potential differences between the 2 samples. For the manual handling sample, usefulness was the only significant predictor of usability. For the noise sample, knowing someone who had suffered hearing loss negatively predicted perceptions of the usability of the leaflet ($\beta = -.219$).

$p < .01$), and perceived severity also predicted perceptions of usability ($\beta = .169, p < .05$).

2.6.9 Predictors of perceptions of usefulness

A hierarchical multiple linear regression was conducted on all data ($n=385$) in order to identify factors that influence perceived usefulness of the leaflets.

Results are shown in table 2.9.

Table 2.9 Table to show significant predictors of perceived usefulness

| | Step 1 Beta | Step 2 Beta | Step 3 Beta |
|------------------|----------------|----------------|----------------|
| Age | -.007 | -.009 | -.013 |
| Sex | .246* | .224* | .192* |
| Industry | -.362*** | -.319** | -.136 |
| Years experience | .052 | .071 | .065 |
| Exposure – self | .010 | -.041 | -.045 |
| Exposure – other | .043 | .013 | .022 |
| Risk – self | | .130 | .134 |
| Risk – other | | -.046 | -.036 |
| Worry | | .068 | .056 |
| Severity | | .155** | .107* |
| Usability | | | .394*** |
| R^2 | .041* | .089*** | .217*** |
| ΔR^2 | .041* | .048*** | .128*** |

Note * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

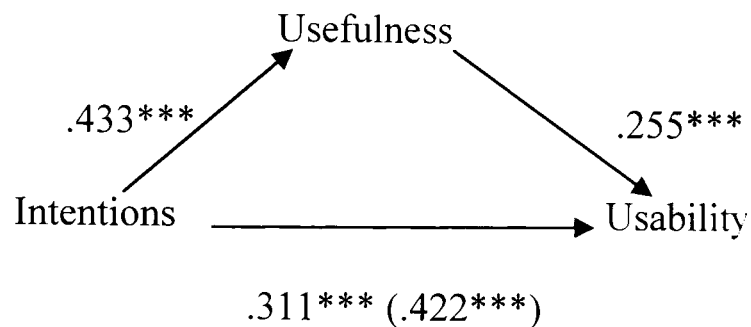
The model explained 21.7% of the total variance seen in perceptions of usefulness. Being female predicted higher perceived usefulness of the leaflets ($\beta = .192$), with step 1 explaining 4.1% of the total variance. Perceptions of the severity of the health problems was also a significant predictor of usefulness ($\beta = .107$), with step 2 explaining 4.8% of the total variance for

perceptions of usefulness. Regressions were also conducted on both the noise and manual handling samples independently of one another. For the noise sample, knowing someone who had suffered hearing loss negatively predicted usefulness ($\beta = .228, p < .01$). Perceived severity was a significant predictor of perceived usefulness only for the manual handling sample ($\beta = .189, p < .01$). No other differences were found between the 2 samples.

2.6.10 Perceived usefulness as a mediator of the relationship between usability and usefulness.

A mediation analysis was conducted on all data in order to test the hypothesis that perceptions of usefulness would mediate the relationship between usability and intentions. The method followed was that prescribed by Baron and Kenny (1986), as described in the analysis section. The analysis showed that usability still affected intentions after usefulness was controlled for. However, Sobel tests showed that the extent of the reduction in strength of the relationship was significant (Sobel $z = 4.75, p < .05$). This indicates that usefulness partially mediated the relationship between usability and intentions. Results are shown in figure 2.4 below.

Figure 2.4 Figure to show mediation model of usefulness on the effect of usability on intentions



Note: $^{***}=p<.001$. Beta coefficients shown are standardised, with the direct effect in parentheses.

2.7 Discussion:

The main findings from the study were (1) to demonstrate that participants distinguished 2 reliable factors when evaluating the health promotion leaflets. These were perceptions of usability and usefulness, (2) to demonstrate that these ratings predicted intentions to follow the advice in the leaflets over and above background variables, perceived risk and severity, worry and previous exposure to the health problems, (3) to show that perceptions of usability and usefulness were influenced by gender, occupation, perceived severity and past exposure to the health problem, and 4) to demonstrate that the effect of perceived usability on intentions is partially mediated by perceptions of the usefulness of the leaflet. These findings are discussed below.

2.7.1 Usability and Usefulness as Distinct Factors in Evaluations of Health Promotion Leaflets.

Consistent with previous research in evaluation of Information Technology (TAM, Davis 1989, 1993, Doll et al. 1997, Adams et al. 1992), participants identified two distinct factors in their evaluations of health promotion leaflets. These were usability and usefulness. Usability consisted of how easy the leaflets were to read, understand and remember, and usefulness consisted of how helpful and relevant the leaflets were perceived to be. These scales were shown to have good reliability and will be used in subsequent chapters. The results highlight both these concepts as important for subjective evaluations of health promotion materials.

2.7.2 Subjective Usability and Usefulness as Predictors of Intentions to Follow the Advice in Health Promotion Leaflets.

Results from this study showed that perceptions of the usability and usefulness of the leaflets predicted intentions to follow the advice given in the leaflets, over and above the contribution of demographics, past exposure to the health problem, and cognitive and emotional reactions. This finding supports previous findings in the field of Information Technology (Davis et al. 1989, 1993, Karahanna and Straub 1999, Doll et al 1997), where ratings of the usability and usefulness of IT are shown to influence users' intentions to use that system. This study differed to those because it looked at users perceptions of a health information leaflet, rather than a technological application. As

such, it was not known whether the concepts and theory of usability and usefulness as predictors of intentions that were developed for use with technology systems could be applied to the use of a written leaflet. Nor was it known whether the usability of a leaflet could predict intentions to perform a behaviour advised in the leaflet, rather than simply predicting intentions to *use* the leaflet. Results showed that the concepts of usability and usefulness of a written health leaflet could be used in this study to predict intentions to follow advice given in a workplace safety leaflet.

2.7.3 The mediating role of usefulness on the effect of usability on intentions.

Research based on the TAM has shown that, for IT use, the effect of usability on intentions is mediated by perceptions of usefulness (Mathieson 1992, Adams et al. 1992, Pavvi 1988, Thompson et al. 1991). Results from this study showed that the effect of usability on intentions was partially mediated by perceptions of usefulness. Usefulness was also shown to have a direct effect on intentions. Perceptions of usefulness have previously been shown to have an effect on intentions even when usability does not (Subramanian 1994).

The results from the current study therefore highlight the importance of perceptions of usefulness in addition to usability in influencing health decision-making. Eason (1984) suggests that a major indicator of usability is whether or not a product is used. Davis (1993) also highlights this relationship, suggesting that workplace IT may be used if it is perceived to be useful for job performance, even if usability is not high. The important relationship between

usability and usefulness is supported by research in ergonomics and IT (e.g. Stanton and Baber 1992, Panzani et al. 2006). For designers of health promotion materials, increasing perceptions of both usability and usefulness is important. This may include targeting to specific groups – in this study leaflets for manual handling were perceived as more useful if they were occupation specific, i.e. written for nursing, despite the objective reading ease of this particular leaflet being graded as ‘difficult’, and being more difficult than the non-specific leaflet.

Results from this study therefore indicate that perceptions of usability and usefulness are both important in predicting intentions to follow advice given in occupational health information leaflets, and that features of the leaflet that can be manipulated to increase the recipients perceptions of usability and usefulness should be considered when designing such leaflets.

2.8 Factors influencing subjective usability and usefulness

Subjective usability may represent a ‘messy collection of disparate concepts’ (Baber 2002), rather than being a simple reflection of objective usability. In this study, subjective ratings of the usability of the leaflets did not differ significantly by leaflet read, despite there being a large difference in objective reading ease for manual handling leaflets. Subjective usability is suggested to be influenced by a combination of user characteristics, such as knowledge, skill, motivation, prior experience, expectations and attitudes (Baber 1993, Navon 1984, Stanton and Baber 1992). The only factors that were shown to influence perceptions of usability in this study were perceptions of usefulness

and the industry setting – (i.e. noise participants). Further research is therefore required in order to identify the factors that influence subjective ratings of the usability of health promotion leaflets. Subsequent studies in this thesis will explore the role of psychological concepts, prior knowledge, prior intentions and attitudes in influencing subjective usability.

2.9 Limitations

The main limitation of the study was the way that the leaflet was presented to recipients. In an ordinary setting, workplace safety leaflets may be distributed in less of a structured manner. In this study, participants were given the leaflet and sat quietly under instructions to read the leaflet. This therefore ensured that they gave it their attention. In order for information to affect persuasion it must at least be attended to (Maguire 1985), therefore the study may not have reflected how, in a real world setting, such leaflets are attended to by recipients. Recipients then had further chance to elaborate on the information as they completed a questionnaire about their thoughts and feelings about the relevant occupational risk behaviour. O’Cathain et al. (2002) found that leaflets were not effective for promoting informal choice in maternity care – they found that only three quarters of potential recipients had seen the leaflet. The distribution of the leaflets in this study therefore may not have reflected real world practice.

2.10 Next chapter

The next chapter will explore the added effect of frame on intentions to follow safe practice at work. The study will explore the relationship between

Chapter 2 – Exploring the perceived usability and usefulness of health and safety leaflets and intentions to follow safe practice for workplace behaviours

perceptions of usability and the frame (positive or negative) of occupational health leaflets.

CHAPTER 3

The Effect of Frame and Perceptions of Usability on Intentions to Follow Safe Practice for Manual Handling for a Sample of Domestic Staff

3.1 Overview

The study described in the previous chapter demonstrated that perceptions of the usability and usefulness of a workplace health and safety leaflet had a significant positive influence on recipients' intentions to follow the advice given in the leaflet. This effect was shown to be significant over and above the influence of a selection of cognitive and emotional variables (perceived risk, perceived severity and worry).

3.2 Aim of the Current Study

The current study seeks to add to the finding by repeating the study with a sample of NHS domestic staff, but this time using experimental leaflets designed to manipulate their 'frame', (i.e. either highlighting the positive consequences of following the advice in the leaflet or negative consequences of not following the advice in the leaflet). The main aims of the study were to (1) test the effect of positive versus negatively framed leaflets on subjective usability and usefulness of the leaflets, (2) to test the differential effect of positive and negatively framed leaflets on intentions to follow the advice given in the leaflets, (3) to test the influence of usability and usefulness on intentions, and (4) to test the interactive effect of frame and subjective usability on intentions. A comparison group evaluated an existing HSE leaflet about manual handling. The purpose of

the comparison group was to test whether newly designed experimental leaflets would be evaluated as more usable and be more persuasive than a normal leaflet that may be distributed in the workplace. These aims are discussed in more detail below.

3.3 The Effect of Frame on Perceptions of Usability.

The effect of frame on perceptions of usability and usefulness was tested. Previous research suggests a role for framing in evaluations of the usability of leaflets. Two possible mechanisms may explain these potential effects. Firstly, reading a positively/negatively framed leaflet may differentially affect positive/negative mood in the reader. Moods have been shown to influence evaluative judgements in a number of domains (Berkowitz & Troccoli 1990, Erber 1991, Fiedler et al. 1986, Isen et al. 1978, Schwarz & Clore 1983), with typical findings showing positive moods to influence more positive evaluations. Reading a positive leaflet may induce a positive mood which will in turn influence leaflet evaluations. Secondly, negative information has been associated with increased message processing. Negative information has been shown to have a disproportionate impact on evaluations (Hamilton & Zanna 1972, Lutz 1975), and negative events have been shown to evoke a greater cognitive workload than positive events (Peeters & Czapinski, 1990). If cognitive workload is increased, reading the negative frame may be harder work for the reader, causing them to rate the leaflet as less usable.

3.4. The Effect of Frame on Intentions to Follow the Advice in the Leaflet

Previous research into framing effects has found effects for frame for a number of health behaviours. Advantages for both positive and negatively framed messages have been found, for example Detweiler et al. 1999, Linville et al. 1993, Rothman et al 2003. Rothman et al. 1999, showed a positive frame advantage, (i.e. the positive frame was more persuasive) whilst Maheswaran & Meyers-Levy, 1990, Banks et al. 1995. Schneider et al. 2001 showed an advantage for negatively framed information. (i.e. the negative frame was more persuasive). Rothman and Salovey (1997) provided a framework within which these different effects could be explained. They proposed that the direction of framing effects was dependent on the type of behaviour studied. A consistent finding with framing studies is that ‘losses loom larger’ (Tversky and Kahneman). Rothman and Salovey’s (1997) framework distinguishes between prevention behaviours (e.g. preventing tooth decay, use of suncream) and detection behaviour and the level of risk that these behaviours represent. Prevention behaviours are proposed to represent relatively safe, risk free behaviours and therefore people will be more influenced by a positive frame. Detection behaviours represent risky behaviours (i.e. the individual runs the risk of detecting a health problem), and therefore negative frames will be more effective. The current study involves following safe practice for manual handling. As this is a prevention behaviour, Rothman and Salovey would predict a more persuasive effect for the positively framed message. They have suggested that frame is a peripheral cue, used to simplify decision-making. Alternatively, a persuasive advantage would be proposed for the negatively framed leaflet according to the Levin et al.

(1998) framework. According to the Levin et al. framework, behaviours that relate to the attainment of goals (i.e. goal framing) are more heavily influenced by negative frames, as negative information exerts a stronger motivational impact.

The Elaboration Likelihood Model (Petty and Cacioppo 1986) suggests dual processes for information processing. Deep processing will result in persuasion based on systematic evaluation of the message content. Shallow processing will result in persuasion based on peripheral cues. Therefore a further possibility is that there will be no overall effect for frame, but that framing effects will only be observed where processing is low. It is hypothesised that subjective usability will influence level of processing. Those who perceive the leaflet to be highly usable will require less processing effort, and will therefore be more likely to use the frame of the information as a judgement cue. Those who perceive the leaflet to be less usable will be required to expend more processing effort and will therefore be more likely to base their judgements on message content. A frame by usability interaction would therefore be predicted.

3.5 Usability and Usefulness as Predictors of Intentions.

Based on principles developed in the Technology Acceptance Model (Davis 1989), it is predicted that perceived usability and usefulness will predict intentions to follow the advice given in a leaflet. The study

described in chapter 2 found that, for 2 work based samples, both usability and usefulness predicted intentions to follow the advice given in health promotion leaflets. This demonstrated that the principles of the TAM could be applied to health promotion leaflets. The current study will seek to extend this finding to a sample of domestic workers in the NHS.

3.6 Hypotheses.

This study seeks to test the following hypotheses:

- 1) Frame will affect perceptions of the usability of the leaflets. Positive leaflets will be evaluated more favourably than negative leaflets. Both experimental leaflets will be perceived as more usable than the comparison leaflet.
- 2) Perceptions of usability and usefulness will predict intentions to follow the advice given in the leaflet.
- 3) There will be an interactive effect between frame and usability. Framing effects will be observed when perceptions of usability are high.

3.7 Methods

3.7.1 Participants

Participants were 97 domestic staff employed by a local NHS Trust. The sample included caterers, porters, secretaries, maintenance staff, electricians, scientists, technicians and administrative staff. Of those who indicated sex, 14 were males and 55 were females. Mean age of participants was 41 years (SD = 11.5), minimum age 17 years to maximum 63 years. Mean number of years in employment with the NHS

was 9.2 years, (SD = 7.8). Participants were recruited during mandatory manual handling training sessions. These were held in small groups of mixed professions.

3.7.2 Leaflets

Three leaflets were used in the study. Two experimental leaflets were specifically developed for the study. The third leaflet was an existing leaflet produced by the HSE entitled 'Getting to Grips with Manual Handling'. This was selected as it was a general guide (i.e not occupation specific) to manual handling at work and had an average reading ease level.

3.7.2.1 Readability

The HSE leaflet was selected due to it having an average readability level (Flesch reading score 61, = reading age 12.1). The loss and the gain framed leaflets were written specifically for the study. They were designed to have an easy reading age, having a Flesch reading score of 73, (= reading age 10.8 years), therefore the leaflets were easier to read than the HSE leaflet.

3.7.2.2. Framing Manipulations

'Framed' information in health information leaflets is typically framed negatively, (i.e. highlighting the potential costs of not following safe practice e.g. 'accidents can cause serious damage to your upper body'). The text in the stimulus materials developed for this study consisted of 27% framed information, i.e. 27% of the text was framed either positively

or negatively. The majority of the framed information was contained in one section of the leaflet, although one framed statement was included in each of the other sections. All remaining statements are identical between leaflets. The amount of information in each leaflet was identical. All statements between leaflets were functionally equivalent, and the order of the information was identical between leaflets. Framing manipulations for each version of the leaflet can be seen on the following pages in table 3.1. Framed statements (i.e. those that differ between leaflets) are shaded in grey.

Table 3.1 Table to show framing manipulation between positive and negative leaflets

| Positive | Negative |
|---|--|
| Nearly a third of all workplace accidents reported to the Health and Safety Executive (HSE) involve manual handling. | Nearly a third of all workplace accidents reported to the Health and Safety Executive (HSE) involve manual handling. |
| About 50% of manual handling accidents cause back injury. | About 50% of manual handling accidents cause back injury. |
| Many of these injuries build up over a period of time rather than being caused by a single handling incident. | Many of these injuries build up over a period of time rather than being caused by a single handling incident. |
| The benefits of protecting yourself from injuries are high. | The costs of not protecting yourself from injuries are high. |
| You can guard against serious and permanent damage to your upper body and avoid the pain and discomfort this can cause. | Accidents can cause serious and permanent damage to your upper body. |
| By looking after your back you can remain mobile, which means you keep your independence. | Injuring your back can result in pain and discomfort and can seriously reduce your mobility. |
| You can avoid the stress, frustration and loss of self-esteem that being dependent on others can cause. | You may lose your independence, which can lower your self-esteem, and lead to stress and frustration. |
| A healthy back helps you take an active part in family life. | Being injured can prevent you from taking an active part in family life. |
| If you follow safe manual handling practice you can continue to participate fully at work and enjoy physical hobbies. | If you do not follow safe manual handling practice you may even have to stop work and give up physical hobbies. |
| You can benefit from being aware of the risks. | You may be particularly at risk. |
| Risk factors include poor posture, such as stooping or stretching. | Risk factors include poor posture such as stooping or stretching. |
| This increases the amount of stress on the spine. | This increases the amount of stress on the spine. |
| Lifting an uneven load with the weight mainly on one side. | Lifting an uneven load with the weight mainly on one side. |
| Lifting with a starting (or finishing position) near the floor. | Lifting with a starting (or finishing position) near the floor. |
| Lifting loads at arms length. | Lifting loads at arms length. |
| Working in cramped conditions. | Working in cramped conditions. |
| By following safe manual handling practice you can decrease your risk of injury. | If you do not follow safe manual handling practice you increase your risk of injury. |
| Follow existing policies on handling and co-operate with any new policies. | Follow existing policies on handling and co-operate with any new policies. |

| | |
|---|---|
| Use handling aids if possible. | Use handling aids if possible. |
| Plan the lift – do you need help with the load. | Plan the lift – do you need help with the load. |
| For a long lift such as floor to shoulder height, think about resting the load mid-way on a table or bench to change grip. | For a long lift such as floor to shoulder height, think about resting the load mid-way on a table or bench to change grip. |
| Position the feet – feet apart, leading leg as far forward as is comfortable. | Position the feet – feet apart, leading leg as far forward as is comfortable. |
| If possible your feet should be pointing in the direction you wish to go. | If possible your feet should be pointing in the direction you wish to go. |
| Adopt a good posture. When lifting from a low level, bend the knees. | Adopt a good posture. When lifting from a low level, bend the knees. |
| Keep the back straight, lean forward a little over the load to get a good grip. | Keep the back straight, lean forward a little over the load to get a good grip. |
| Keep the load close to the trunk for as long as possible. | Keep the load close to the trunk for as long as possible. |
| Don't jerk – lift smoothly raising the chin as the lift begins, keeping control of the load. | Don't jerk – lift smoothly raising the chin as the lift begins, keeping control of the load. |
| Move the feet – don't twist the trunk when turning to the side. | Move the feet – don't twist the trunk when turning to the side. |
| Early assessment of back pain may help treatment. Employees who have back pain or other symptoms cause by manual handling should go to their occupational health service for an assessment. | Early assessment of back pain may help treatment. Employees who have back pain or other symptoms cause by manual handling should go to their occupational health service for an assessment. |

3.7.3. Outcome Measures

Questionnaires developed for the study described in chapter 2 were used for this study.

3.7.4. Usability and usefulness

The usability and usefulness of the leaflets was measured using the 5 item scale developed in chapter 2. Items for usability were 'how easy was the leaflet to read'; 'how easy was the leaflet to understand'; 'how easy was the leaflet to remember'; items for usefulness were 'how relevant was the information contained in the leaflet'; 'how helpful do you think the information in the leaflet will be for your work'; Items were measured using a 5 point Likert-type scale ranging from 1 (not at all), to 5 (extremely).

3.7.5. Cognitive and emotional factors

Items measured participants *perceived risk* of injury from manual handling to themselves and others: 'to what extent do you feel you are personally likely to suffer injury/ill health as a result of manual handling at work'; and 'to what extent do you feel your colleagues are likely to suffer injury/ill health as a result of manual handling at work'; *worry* about the consequences of manual handling at work: 'are you concerned about developing back pain through your work'; and *perceived seriousness* of back pain as a health problem: 'do you feel back pain is a serious health problem'. All these items were also measured on a 5 point Likert-type scale as above.

3.7.6. Intentions

Intentions to follow safe practice were measured using the following two items: 'how likely is it that you will follow the advice given in the leaflet next time you are handling loads at work', and 'how likely is it that you will follow the advice given in the leaflet in the future'. These items were measured on a 5 point Likert-type scale as above, and were scaled to form 1 item 'intentions' (Chronbach's $\alpha = .92$).

3.8. Procedure

Participants were recruited at the start of their mandatory manual handling training sessions. The questionnaire was given out before the start of the session in order to avoid having the participants primed by the manual handling training. Potential participants were informed that their participation was voluntary, however all those attending the training sessions agreed to take part. Participants signed a consent form. Participants in each condition read one leaflet, which related only to the condition to which they were assigned. The sessions were conducted in small groups of between 5 and 15. Participants read either the gain framed, loss framed or existing HSE leaflet. The questionnaires were given out after participants had finished reading the leaflet. Participants were able to refer to the leaflets whilst completing their questionnaires. After completion of their questionnaires, participants were thanked for their time.

3.9 Results

3.9.1 Sample equivalence:

Participants' demographic data was examined to ensure matched groups for the experimental condition (leaflet read). A one-way (positive vs negative vs HSE) between subjects ANOVA was conducted on participants' age. The results showed that there were no significant effects for age by leaflet read. This indicated that subjects were of the same age across each condition. There were significantly more females than males across the sample ($\chi^2 = 24.362$, $p < .001$). However a chi-square test indicated that there were no differences across the groups (leaflet read) for number of males and females ($\chi^2 = 0.9$, $p = 0.623$).

3.9.2 Zero Order Correlations

Means, standard deviations and zero order correlations for all variables are shown in table 3.2. Number of expected false significant findings was calculated. $72/2 = 36$ multiplied by $0.05 = 1.8$. Therefore 1.8 false positive results would be expected by chance.

Table 3.2. Table to show means, standard deviations and zero correlations for all variables

| | Mean (SD) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|----------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|-----|
| Age (1) | 40.9 (11.5) | 1 | | | | | | | | |
| Years Experience (2) | 9.22 (7.9) | .472** | 1 | | | | | | | |
| Risk- self (3) | 3.02 (1.0) | -.09 | -.186 | 1 | | | | | | |
| Risk - other (4) | 3.25 (0.9) | -.07 | -.035 | .767** | 1 | | | | | |
| Worry (5) | 3.59 (1.3) | -.143 | -.104 | .576** | .554** | 1 | | | | |
| Severity (6) | 4.39 (0.9) | .021 | -.123 | .307** | .288** | .588** | 1 | | | |
| Usability (7) | 4.15 (.69) | 0.40 | -.220* | .114 | .186 | .032 | .154 | 1 | | |
| Usefulness (8) | 3.78 (1.1) | -.153 | -.066 | .449** | .430** | .429** | .307** | .198 | 1 | |
| Intentions (9) | 4.11 (0.8) | .089 | -.060 | .160 | .207* | .181 | .303** | .496** | .389** | 1 |

Zero order correlations were examined to test for a relationship between perceptions of usability, usefulness and intentions. Usability and usefulness were significantly positively correlated with intentions. There was a significant negative correlation between years experience and perceptions of usability, with those with more experience rating the leaflets as less usable. Usefulness was significantly positively correlated with perceptions of risk, severity and worry. There was also a significant positive correlation with intentions. Intentions were positively correlated with perceptions of risk, severity and perceptions of usability and usefulness.

3.9.3 Usability and usefulness as a function of leaflet.

Analyses were conducted to test whether perceptions of usability and usefulness were dependent on which leaflet was read. It was predicted that the newly written experimental leaflets would be perceived as more usable than the comparison group, and that the positive leaflet would be perceived as more usable than the negative leaflet. The means and standard deviations for ratings of the usability and usefulness of the leaflets are presented in table 3.3.

Table 3.3 Table to show means and standard deviations for usability and usefulness by frame.

| Usability and Usefulness | | | |
|--------------------------|-----------------|----------------|------------|
| | Positive (n=32) | Negative(n=33) | HSE(n=32) |
| Usability | 4.43 (.47) | 4.19 (.73) | 3.89 (.65) |
| Usefulness | 4.20 (.89) | 3.62 (1.2) | 3.52 (.98) |

A one-way between subjects MANOVA was conducted on ratings of the usability and usefulness of the leaflets by leaflet read. There was a significant main effect for leaflet read ($F(4,186)=4.146, p<.01$). Univariate contrasts showed that the effect was significant for both usability ($F(2,93)=5.706, p<.01$) and usefulness ($F(2,93)=4.129, p<.05$). Post hoc contrasts using Tukey HSD showed that the positively framed leaflet was perceived as both more usable ($p<.01$) and useful ($p<.05$) than the HSE leaflet. The positive leaflet was not rated as more usable or useful than the negative leaflet. The negative leaflet was not rated as more usable or useful than the HSE leaflet.

3.9.4 The Effect of Frame on Intentions

It was predicted that the frame of the leaflet would affect intentions to follow the advice in the leaflet. Therefore the effect of frame on intentions was tested. The means and standard deviations for intentions by leaflet read are presented below in table 3.4

Table 3.4 Table to show means and standard deviations for intentions by leaflet read.

| | Positive (n=32) | Negative(n=33) |
|------------|-----------------|----------------|
| Intentions | 4.44 (.69) | 4.09 (.75) |

A one way between subjects ANOVA for leaflet read was conducted on intentions. There was no significant effect for frame on intentions ($F(1,63) = 3.714, p > .05$). Therefore there was no significant persuasive advantage for the positive frame over the negatively framed leaflet for intentions. Post hoc power calculations were conducted. $\text{Partial } \eta^2 = .057$, Observed power = .49. The study was therefore underpowered. As a small to medium effect size was observed, it is possible that with more participants a significant effect could be found.

3.9.5 Predictors of Intentions

A hierarchical multiple linear regression was conducted to explore the influence of background variables, cognitions and emotions (perceived risk, severity and worry) and leaflet characteristics (frame, usability and usefulness) as predictors of intentions. Missing values analysis showed that there was a large proportion of missing data for demographics of age (10.3% missing) and sex (28% missing). Because of the small sample size in this study, listwise deletion of these missing cases would result in a sample size of only 44. The direct effect of age and sex on intentions was tested. Neither age nor sex was a significant predictor of intentions (age $\beta = .065, p = .604$, sex $\beta = .192, p = .130$). As these variables showed no direct effect with intentions they were omitted

from the subsequent analysis. Results of the regression on intentions are presented in table 3.5 below.

Table 3.5 Regression on Intentions (n=60)

| | Step 1 β | Step 2 β | Step 3 β | Step 4 β |
|---------------------|-------------------|-------------------|-------------------|-------------------|
| Years Experience | -.145 | -.170 | -.079 | .037 |
| Past Exposure-self | .125 | .164 | .175 | .074 |
| Past Exposure-other | -.134 | -.123 | -.110 | -.046 |
| Frame | | .310* | .265 | .210 |
| Risk-self | | | .202 | .253 |
| Risk-other | | | -.169 | -.289 |
| Worry | | | -.198 | -.108 |
| Severity | | | .500** | .369* |
| Usability | | | | .383** |
| Usefulness | | | | .072 |
| R^2 | .047 | .140 | .319** | .427** |
| ΔR^2 | .047 | .093* | .179* | .107* |

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

This model explained 42.7% of the total variance in intentions to follow the advice in the leaflet next time. Perceptions of severity significantly predicted intentions ($\beta = .369$), with step 3 explaining 17.9% of the total variance. Usability was also a significant predictor of intentions ($\beta = .383$), with step 4 explaining 10.7 % of the total variance.

3.9.6 Testing the Interactive Effect of Frame, Usability and Intentions.

A regression analysis was conducted using mean centred variables (Aiken and West 1991) to test the interactive effect of usability and frame on intentions. Subjective usability and frame were entered at step1. An interaction term for usabilityXframe was entered as step 2. Results are presents below in table 3.6.

Table 3.6 Interaction between usability and frame on intentions.

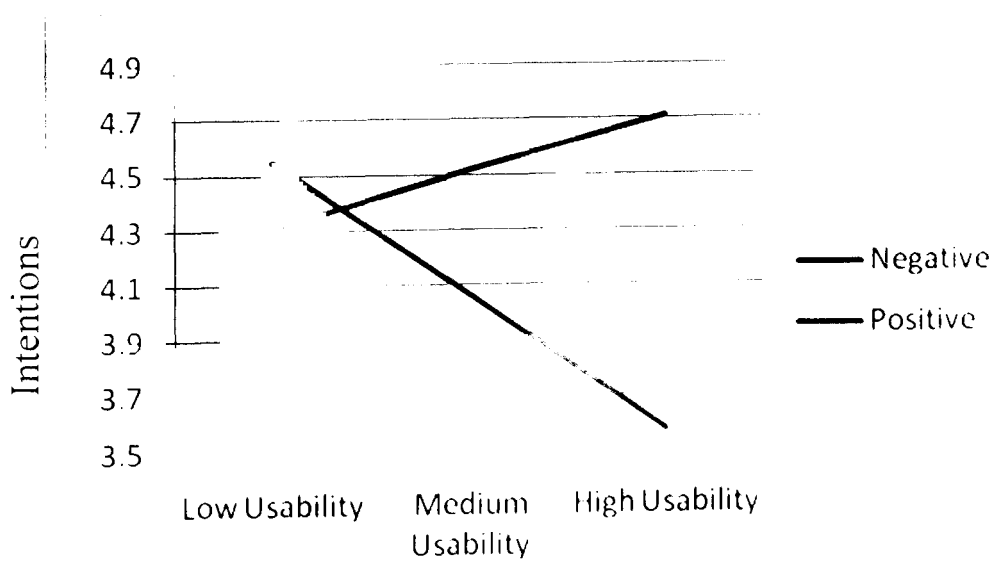
| | Step 1 Beta | Step 2 Beta |
|-----------------|----------------|----------------|
| Usability | .169 | ***.593 |
| Frame | .350 | ***3.109 |
| UsabilityXFrame | | ***-3.019 |
| R ² | .174** | .312** |
| ΔR ₂ | .174** | .138*** |

Note. *p<.05, **p<.01, ***p<.001

R² = R square, ΔR² = Change in R square

Results indicate a significant interaction between usability and frame in predicting intentions. Results are plotted using Modgraph version 2.0 (Jose 2008) and are presented graphically below in figure 3.1:

Figure 3.1. Figure to show interaction between frame and usability on intentions.



Simple slopes analysis showed both slopes to be significant (positive $t=-4.655$, $p<.001$, negative $t=1.1937$, $p=.05$). Framing effects were observed when perceptions of usability were high. Individuals reading the negative frame

reported higher intentions when usability was high, whilst those reading the positive frame reported lower intentions when usability was high.

3.10 Discussion.

3.10.1 Perceptions of usability as a function of frame

The usability of newly designed experimental leaflets was tested against a comparison existing leaflet. Experimental leaflets were designed to be simpler in terms of length and reading ease than the comparison leaflet, and were framed either positively or negatively. Research suggests that negative information has a disproportionate impact on judgements and evaluations than equivalent positive information (e.g. Hamilton & Zanna 1972, Lutz, 1975, Kanouse 1984, Rozin & Royzman 2001, Skowronski & Carlston 1989). It was therefore predicted that participants would judge the negative leaflet as less usable than the positive leaflet. The results showed that although the positive leaflet was rated more highly than the negative leaflet this was not significant.

It was also predicted that both newly developed leaflets would be rated as more usable than the comparison leaflet due to their lower objective reading ease. Only the positive leaflet was rated as significantly more usable than the comparison leaflet – the negative leaflet was rated as no more usable than the comparison leaflet despite the improvements in reading ease. There were no differences in perceptions of usefulness between the positive and negative leaflets, although the positive leaflet was again rated as more usefulness than the comparison leaflet.

3.10.2 Usability and usefulness as predictors of intentions

Subjective usability was identified as a significant predictor of intentions to follow the advice given in the leaflet. This result was also found in the study described in chapter 2. Perceptions of usability and usefulness have been shown to be reliable predictors of intentions within the field of information technology. Results from this and the study described in chapter 2 show that these two concepts are also worthy of further study within the domain of health promotion. Perceived usability and usefulness of health information leaflets can add incremental value when studied alongside cognitive measures from the Health Belief Model (Rosenstock 1990) and worry.

3.10.3 Usability as a moderator of framing effects

An interaction between frame and subjective usability was predicted. Based on the Elaboration Likelihood Model (Petty and Cacioppo 1986), where perceptions of usability were high, information processing was hypothesised to be shallow and therefore readers would be more likely to make judgements based on peripheral cues such as frame. Therefore framing effects were predicted to be seen where perceptions of usability were higher. Results from this study showed a significant interaction between frame and usability on intentions to follow the advice in the leaflet. Differences by frame were observed when usability was perceived to be high. Those reading the positive frame reported *lower* intentions when usability was high, whilst those reading the negative frame reported higher intentions when usability was high.

The observed interaction between frame and usability was demonstrated for *subjective* usability. There were no differences in the objective reading levels of the positive and negative leaflets. This highlights the role of individual differences in subjective usability. Navon (1984) suggests that subjective usability has no value as a concept without the complex interaction of user characteristics that are brought to the product/leaflet. The sample in this study was relatively diverse, consisting of NHS staff from a range of occupations. Perceptions of usability may have been a function of reading ability, education level, prior knowledge, motivation or personality traits (Baber 2002). The role of individual differences will therefore be explored in more depth in the following chapter.

3.10.4 Limitations

The main limitation again was the unnatural way in which the leaflet was distributed. Participants were already on a manual handling course and so their level of attention in the subject had already been raised, although the study was carried out at the beginning of the session before they had received any information. They then sat quietly and read the leaflet, before completing the questionnaire. Attending to a message is a pre-requisite for its comprehension (Maguire 1985), therefore this situation may not reflect the level of attention that a workplace health promotion leaflet would attract under normal circumstances.

3.11 Next Chapter

The next chapter will explore the role of a number of reader and leaflet characteristics in influencing subjective usability. Subjective usability will be studied as a function of mood and the psychological constructs of Need For Cognition, neuroticism and social desirability. Subjective usability will also be explored as a function of objective reading ease and frame.

CHAPTER 4

Subjective Usability as a Function of Individual Differences, Objective Reading Ease and Frame

4.1 Overview

The study described in the previous chapter showed that the relationship between subjective usability and intentions to follow the advice given in a health promotion leaflet was moderated by frame. Usability was positively associated with intentions only for participants reading the negative frame. This chapter will further explore the effects of frame on intentions, under conditions of high and low usability. The previous two chapters have been concerned with the concept of subjective usability, i.e. perceptions of the usability of leaflets. Subjective usability has been theorised to represent more than just objective measures of usability (Navon 1984, Baber 2002), being a function of a number of user characteristics, for example prior knowledge, experience, and motivation. The study described in chapter 2 indicated that where perceptions of usefulness were high, objective reading ease did not affect subjective ratings of the leaflets. Subjective usability may therefore be a combination of objective measures of usability and user characteristics. To date there has been no exploration of the psychological constructs that may underlie subjective usability of health information leaflets. The current study will investigate a number of psychological constructs and their influence on subjective ratings of the usability of leaflets relating to safe alcohol consumption.

The main aims of the current study are therefore (1) to explore whether subjective evaluations of the usability of health promotion leaflets are related to neuroticism, social desirability, positive and negative mood and Need for Cognition (NFC). These concepts will be discussed in more detail below. (2) to test the effect of high and low objective reading ease level on subjective ratings of usability and usefulness (3) to test the effect of high and low objective reading ease on intentions to follow the advice in the leaflet, and (4) to test the possible interaction between objective reading ease and frame. These aims are studied within the context of safe alcohol consumption in a student population.

4.2 Behaviour Studied

The current study will focus on intentions to follow the advice given in a leaflet relating to safe consumption of alcohol. Excess alcohol consumption is related to a range of social and health problems. In the UK, 44% of violent crime is related to excess alcohol consumption. Alcohol is also associated with an estimated 15,000 to 22,000 premature deaths and 150,000 hospital admissions (Choosing Health 2004). A range of strategies designed to reduce the consumption of alcohol have been utilised, including the introduction of legislation to curb the sale and consumption of alcohol and the implementation of interventions designed to persuade individuals to modify their alcohol-related behaviour (e.g. Norman et al. 2000, Rutter & Quine 2002, and see Abraham et al. 2007 for review). Excess alcohol consumption in student populations is also particularly prevalent (Wechsler et al. 1992). Empirical research has used formal theories of health behaviour to identify predictors of

alcohol behaviour (Armitage et al. 2002, Mugraff et al. 1999, Wallston et al. 1978). The role of leaflets to promote safe alcohol behaviour has been studied. Specifically these have examined to what extent alcohol leaflets target specific, relevant cognitions when used as an intervention (Abraham et al. 2007). The current study tests whether manipulating objective features of alcohol leaflets can increase their effectiveness.

4.3 Validity of usability and usefulness measures

Measures of usability and usefulness described in this series of studies were based on items used in usability studies in both IT and health domains (e.g. Aster & Choo 1993, Jeong & Lambert 2001, Krass 2002, Lacker & Lessig 1980, Miller 1996, Smith 1996, Tillman 1996,). Davis (1989) developed scales of usability and usefulness to be used to predict intentions to use Information Technology (Technology Acceptance Model 1989). These have been validated (Adams et al. 1992, Doll et al. 1997) and are widely used (e.g. Adams et al. 1992, Mathieson, 1992, Subramanian 1994, Thompson et al. 1991). The current study therefore seeks to explore both the divergent and convergent validity of the scales of usability and usefulness used in this thesis with items adapted from the usability and usefulness scales developed for the TAM.

4.4 Factors underlying subjective usability

4.4.1 Psychological constructs and mood

The current study aims to identify psychological constructs that may influence perceptions of the usability of health promotion leaflets. This

this thesis seeks to examine factors that may underlie perceptions of the usability of health information materials. The usability literature suggests that individual background variables such as prior knowledge and experience may affect their perceptions of the usability of information systems (Stanton and Baber 2002). No previous research explores the psychological constructs that may affect individual's ratings of the usability of information sources. Therefore the current study makes a preliminary exploration of a sample of psychological constructs that are hypothesised to influence such ratings. Four psychological constructs were selected for this study. These constructs reflect factors that have been shown previously to influence judgements/evaluations and information processing. Two constructs were selected as they have previously been shown to influence how individuals make judgements/evaluations – these factors are mood and social desirability. Two further constructs were selected as they have previously been shown to influence information processing – these factors are Need For Cognition and neuroticism. The contribution of these factors to judgements/evaluations and information processing are discussed below.

4.4.2 Social desirability

The concept of Social Desirability refers to the tendency of respondents to reply in a manner that will be viewed as favourable by others, or in a way that is perceived to be socially acceptable (Maccoby and Maccoby 1954). Respondents may wish to convey a desirable image or seek approval for certain behaviours (Crowne and Marlowe 1960, Larsen et al. 1976). Evidence

for the existence of this response bias has been well-documented (e.g. Arnold et al. 1985, Golembiewski and Musenider 1975, Mick 1996, Schriesheim 1979). Social desirability can affect variable means (Peterson and Kerin 1981) or inflate or moderate the relationships between variables (Zerbe and Paulhaus 1987), and has been evident in a range of self-report measures (e.g. Levy 1981, Peltier and Walsh 1990, Robinette, 1991, Simon and Simon 1975, Zerbe and Paulhaus 1987). It is therefore possible that both leaflet evaluations and intentions will be confounded by this response bias. This would be indicated by correlations between social desirability scores and ratings of usability, usefulness or intentions.

4.4.3 Neuroticism

The trait of neuroticism reflects a tendency towards negative mood states (Costa and McCrae 1980, Gomez et al. 2000, Larsen and Ketalaar 1989, 1991, Robinson et al 2007). The role of neuroticism has been associated with biased processing of information. Highly neurotic individuals have been shown to process negative or unpleasant information more deeply (Chan et al. 2007, Gomez et al. 2002), and to make more negative judgements when in a negative mood (Rafieria et al. 2008). Mood has been shown to affect judgements and evaluations (Barone 2002, Isen et al. 1978), with positive moods related to more positive judgements and negative moods associated with negative judgements (Salovey and Birnbaum 1990, Barone et al. 2000). Therefore negative moods associated with high neuroticism may influence judgements regarding the perceived usability and usefulness of the leaflets.

Neuroticism would therefore be negatively associated with ratings for perceived usability and usefulness of the leaflet.

4.4.4 Mood

Affective associations have been shown to influence decision-making (see Pfister & Bohm 2008, Schwartz & Bless 1991) and behavioural intentions (Kiviniemi et al. 2007, McCormick and McElroy 2009, Richard et al. 1996). Positive or negative moods have been shown to affect evaluative judgements across a number of domains, e.g. satisfaction with consumer goods (Isen et al. 1978, Barone et al. 2000); judgements of others (Berkowitz and Troccoli 1990); and activities (Cunningham 1988), with positive mood associated with more positive evaluations. In the health domain, mood has been shown to be related to cognitions and ratings of health (e.g. Salovey and Birnbaum 1990, Tessler and Mechanic 1978), with unhappy individuals reporting poorer ratings of their own health, and sad moods producing more health symptoms such as aches and pains than happy moods. Therefore, it is possible that judgements of the usability and usefulness of the leaflets are influenced by mood. If subjective usability is a function of mood, positive moods will be associated with higher leaflet ratings, and negative mood will be associated with lower leaflet ratings. Objective reading ease may also have an effect on positive or negative mood. Easy to read leaflets may cause positive moods, whilst difficult leaflets might cause negative moods. The potentially mediating relationship of mood on reading ease and intention will therefore be tested in this study.

4.4.5 Need for Cognition

Need for Cognition (NFC) is defined as an individual's propensity to enjoy and engage in thought (Cacioppo & Petty 1982). It has been shown to be a highly stable personality variable (Sadowski & Guloz 1992), and has also been shown to influence decision-making in a number of domains through the differential use of information processing strategies (Zhang, 1996). Leone and Dalton (1988) showed NFC to be influential in students' ability to comprehend instructional materials, with complex materials being understood more easily by individuals high in NFC, but no difference in the comprehension of easy materials between those low or high in NFC. If high NFC individuals understand difficult materials more easily, it is possible that this will affect their judgements of the usability of health promotion leaflets. A positive correlation between NFC and perceptions of usability would demonstrate that subjective usability is partly a function of trait processing style.

There is also evidence for a moderating role for NFC on the relationship between frame and intentions. NFC has been shown in previous research to moderate the relationship between frame and intentions (Chatterjee et al. 2000, Smith & Levin 1996, Steward et al. 2003, Zhang & Bhuda 1999), with the general finding that framing effects are less evident for those who are high in NFC, and framing effects more likely in those who are low in NFC. This is mainly attributed to dual processing theories of decision-making e.g. the Elaboration Likelihood Model (Cacioppo & Petty 1982). Cacioppo et al. 1996 maintain that individuals higher in NFC are more likely to engage in

systematic processing of a message. Judgements are therefore more likely to be made on the basis of cognitive evaluations than those low in NFC, who will be more likely to attend to peripheral cues. Other studies have failed to replicate these results, however, and have found no interaction between NFC and frame (Levin et al, 2002, LeBoeuf & Shafir 2003). It is therefore hypothesised that NFC may moderate the effect of frame on intentions, with framing effects less likely for those high in NFC, and more likely for those low in NFC. It is also hypothesised that NFC will moderate the effect of objective reading ease on intentions. With a preference for deeper processing, high NFC individuals will be more likely to be persuaded by a difficult message, and low NFC individuals more likely to be persuaded by an easy message.

4.4.6 Objective Reading Ease

The extent to which objective usability influences subjective usability will be tested. Objective usability will be manipulated via reading ease scores (Flesch 1948). The Flesch reading ease score is one of a wide range of formulas used to assess the readability of text (e.g. FOG Index, Gunning 1968, Fry Readability Formula Fry 1968, SMOG simple measure of gobbledegook, McLaughlin et al. 1969). The Flesch scoring system is widely used and has been well validated (Pothier et al. 2008). Readability scores will be manipulated to create ‘easy’ and ‘difficult’ leaflets. It is predicted that objective reading ease will positively influence subjective ratings of usability (e.g. Krass et al 2002, Rees et al. 2003).

4.5 Objective Reading Ease, Frame and Intentions

Leaflets used in this study will also be manipulated by 'frame'. The influence of objective reading ease (easy, difficult) and frame (positive, negative) on intentions to use the information in the leaflet were studied. The ELM proposes that under low processing conditions, decisions/judgements will be made using peripheral cues whilst under high processing conditions, decisions/judgements will be made using systematic evaluations. It is, therefore, predicted that when reading ease is high, (i.e. easy to read), processing will be low and participants will be more likely to make judgements based on peripheral cues such as frame. Therefore, a framing effect will be observed for those reading the easy leaflet, but not for those reading the difficult leaflet, where processing will be high and judgements made using systematic evaluations. Based on previous readability studies in the health domain, an overall effect for reading ease on intentions is also predicted, with those reading the easy leaflet predicted to report higher intentions to use the information in the leaflet. In addition, the TAM predicts that subjective usability will influence intentions. Therefore it is predicted that higher subjective usability will be related to increased intentions to use the information in the leaflet.

4.6 Hypotheses

The following hypotheses are predicted:

- 1) Usability and usefulness scales developed for this thesis will be positively correlated with usability and usefulness items from the TAM.

- 2) A number of psychological constructs may influence subjective ratings of usability. It is predicted that NFC, Mood, Social Desirability and Neuroticism will be related to subjective usability. NFC will moderate the effect of frame, usability and objective reading ease on intentions. Mood will mediate the relationship between objective and subjective usability, and objective reading ease and intentions.
- 3) Objective reading ease will influence subjective ratings of usability. Easy to read leaflets will be rated as more usable than difficult leaflets.
- 4) Subjective usability, objective reading ease and usefulness will predict intentions to use the information in the leaflet. Higher subjective usability and usefulness will be positively related to intentions. Easy to read leaflets will positively influence intentions.
- 5) The effect of frame on intentions will be moderated by objective reading ease. Framing effects will only be observed in the easy to read condition. According to the Rothman and Salovey (1997) framework, for prevention behaviours, positive frame will be more influential than negative frame. Levin et al.'s 1998 typology would predict that negative frame would be more influential due to the negativity bias.

4.7 Methods

4.7.1 Participants:

The following three studies use convenience samples of students and the behaviour of alcohol consumption in order to continue to test the relationship between health information leaflets and intentions and to see how this may be

affected by manipulating frame and usability. A relationship between usability, usefulness and intentions and an interaction between frame and perceived usability was found for the working population sampled in chapters 2 and 3. It is expected that working and student samples differ in terms of their demographics. In addition, the behaviours studied also differ in that safe manual handling and use of ear defenders are self-protective behaviours produced in response to unavoidable hazards at work, whilst alcohol consumption represents a leisure activity for students. However, what is being tested here is theory that should be applicable across behaviours and populations. A full discussion about the use of students to test these theories and the generalisability of the findings to the wider population is provided in the general discussion in Chapter 7.

Participants for this study were a convenience sample of 127 students recruited via an announcement made at the beginning of lectures. Of those who indicated sex, 19 were males and 105 were females. This bias in the males to females ratio was examined in relation to the experimental conditions below. Mean age of participants was 21 years (SD = 2.9), minimum age 19 years to maximum 37 years. Completion of the questionnaire entitled participants to a raffle ticket entered into a prize draw to win £30 in vouchers.

4.7.2 Materials:

Four leaflets were designed for the study. The method used for designing the leaflets is outlined below. These were all entitled 'Think about Drink'. These experimental leaflets were manipulated to be either gain or loss framed, and to have either an 'easy' or 'difficult' objective readability score.

4.7.2.1 Readability

Readability was manipulated by increasing word and sentence length and increasing the number of passive sentences. Readability scores were obtained using the Flesch Reading Ease/Flesch-Kincaid Grade Level scoring system. The final readability scores for each leaflet are shown in table 4.1.

Table 4.1 Table to show readability statistics for alcohol leaflets

| Leaflet Type | Flesch Reading Ease Score | Flesch-Kincaid Grade Level (age) |
|--------------------|---------------------------|----------------------------------|
| Easy-Positive | 69.7 | 7.2 (11 years) |
| Easy-Negative | 68.0 | 7.6 (11 years) |
| Difficult-Positive | 47.0 | 11.0 (15 years) |
| Difficult-Negative | 45.8 | 11.0 (15 years) |

4.7.2.2. Framing

Information in the gain and loss framed leaflet was obtained from existing alcohol information leaflets. Consistent with the previous study, the leaflets contained a balance of information about causes, consequences and solutions. The leaflet contained 2 sections of information about the causes and consequences of excess consumption of alcohol. One of these sections contained information specifically about the long term risks associated with excess alcohol consumption. The other section contained information specifically about the short-term risks associated with one-off ‘binges’ of alcohol consumption. The third and final section of information in the leaflet contained information about how to keep within safe limits of alcohol consumption. The alcohol leaflets sought to ‘frame’ more of the information

contained within the leaflet than in the previous study. Therefore **46 %** of text was ‘framed’,(i.e. differentially loss or gain framed). Framed statements were placed throughout the leaflet. The remaining text was identical between the loss and gain framed leaflets. The amount of information in each leaflet was the same. The order of the information and the number of sections was identical between leaflets. The framing and readability manipulations for the ‘Think About Drink’ leaflets can be seen in the following pages. Table 4.2 shows the framing manipulations for the ‘easy’ leaflets, and table 4.3 shows the framing manipulations for the ‘difficult’ leaflets. Shaded sections show where gain and loss framed leaflets differed. The remainder of the text was identical.

Table 4.2 Table to show framing manipulations for easy alcohol leaflets

| Easy – Positive | Easy – Negative |
|---|--|
| Alcohol is sometimes to be enjoyed and, most of the time, drinking doesn't cause any problems. | Alcohol is sometimes to be enjoyed and, most of the time, drinking doesn't cause any problems. |
| But drinking too much or at the wrong time can be harmful. | But drinking too much or at the wrong time can be harmful. |
| People sometimes dismiss the idea that they need to think about how much they drink. | People sometimes dismiss the idea that they need to think about how much they drink. |
| But drinking within the safe limits can help you reduce the risk of long term damage to your health. | But regularly drinking too much increases the risk of long term damage to your health. |
| By drinking less than the daily benchmarks you can reduce your risk of liver damage, cirrhosis of the liver, and cancers of the mouth and throat. | If you often drink more than the daily benchmarks you increase your risk of liver damage, cirrhosis of the liver, and cancers of the mouth and throat. |
| Drinking alcohol raises blood pressure. | Drinking alcohol raises blood pressure. |
| By keeping your alcohol consumption within the daily benchmarks you can prevent the ill health caused by increased blood pressure. | If you do not keep your alcohol use within the daily benchmarks you increase your risk of ill health caused by high blood pressure. |
| Such problems include coronary heart disease and some kinds of stroke that are related to drinking too much. | Such problems include coronary heart disease and some kinds of stroke that are related to drinking too much. |
| By keeping within the daily guidelines you may also reduce the risk of psychological and emotional problems, for example depression, that are often linked to heavy drinking. | If you do not keep within the daily guidelines you may be at risk of psychological and emotional problems, for example depression, often linked to heavy drinking. |
| Most short-term problems from drinking come from one-off episodes of heavy drinking and drunkenness. | Most short-term problems from drinking come from one-off episodes of heavy drinking and drunkenness. |
| Alcohol affects coordination and reaction times so people who are not drunk are less likely to have accidents. | Alcohol affects coordination and reaction times. People who are drunk are more likely to have accidents. |
| Around half of adult pedestrians killed in road accidents have blood alcohol levels above the legal drink driving limit. | About half of adult pedestrians killed in road accidents have blood alcohol levels above the drink drive limits. |

| | |
|---|---|
| Avoiding large amounts of alcohol drunk in one go can prevent putting a strain on your liver and other parts of your body. | Drinking a lot of alcohol in one go can put a strain on your liver and other parts of your body. |
| Being drunk is also linked to violent crime, domestic violence, and abuse. | Being drunk is also linked to violent crime, domestic violence, and abuse. |
| The daily benchmarks for adult men and women are a guide to how much you can drink without putting your health at risk. | The daily benchmarks for adult men and women are a guide to how much you can drink before you are putting your health at risk. |
| They apply whether you drink every day, once or twice a week, or occasionally. | They apply whether you drink every day, once or twice a week, or occasionally. |
| The benchmarks are not targets to drink up to. | The benchmarks are not targets to drink up to. |
| For men, if you drink less than 4 units a day there are no significant risks to your health. | For men, if you often drink over 4 units a day there is an increasing risk to your health. |
| For women, if you drink less than 3 units a day there are no significant risks to your health. | For women, if you often drink over 3 units a day there is an increasing risk to your health. |
| A rough guide to the number of units in some popular drinks is: 1 half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit. | A rough guide to the number of units in some popular drinks is: 1 half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit. |
| It is not ok to 'save up' units for the weekend. | It is not ok to 'save up' units for the weekend. |
| Avoiding 'binge drinking' or drinking a lot in one go reduces the risk of most of the problems linked with drinking alcohol. | 'Binge drinking' or drinking a lot in one go is very risky and causes most of the problems related to drinking alcohol. |

Table 4.3 Table to show framing manipulations for difficult alcohol leaflets

| Difficult – Positive | Difficult – Negative |
|--|---|
| Alcohol is sometimes to be enjoyed, and the majority of the time, drinking doesn't cause any problems. | Alcohol is sometimes to be enjoyed, and the majority of the time, drinking doesn't cause any problems. |
| But drinking excessively or on inappropriate occasions can be harmful. | But drinking excessively or on inappropriate occasions can be harmful. |
| People sometimes disregard the idea that they need to contemplate the amount of alcohol they consume. | People sometimes disregard the idea that they need to contemplate the amount of alcohol they consume. |
| But drinking within the safe limits can help you decrease the risk of long term damage to your health. | But regular excessive drinking escalates the risk of long term damage to your health. |
| By consuming less alcohol than the daily benchmarks you can reduce the risk of liver damage, cirrhosis of the liver, and oral and oesophageal cancers. | Regular alcohol consumption in excess of the daily benchmarks increases your risk of liver damage, cirrhosis of the liver, and oral and oesophageal cancers. |
| Blood pressure is increased by alcohol consumption. | Blood pressure is increased by alcohol consumption. |
| By maintaining your alcohol consumption at a level within the daily benchmarks you can reduce the risk of ill health caused by increased blood pressure such as coronary heart disease and particular types of stroke that are associated with excess alcohol consumption. | If your alcohol consumption is not maintained to a level within the daily benchmarks you increase your risk of ill health caused by increased blood pressure such as coronary heart disease and particular types of stroke that are associated with excess alcohol consumption. |
| By maintaining alcohol consumption at a level within the daily guidelines you may also reduce the risk of susceptibility to psychological and emotional problems, for example depression, that are frequently associated with heavy drinking. | Not maintaining alcohol consumption at a level within the daily guidelines may in addition render you susceptible to psychological and emotional problems, for example depression, that are frequently associated with heavy drinking. |
| Most short term problems from heavy drinking come from one off episodes of heavy drinking and drunkenness. | Most short term problems from heavy drinking come from one off episodes of heavy drinking and drunkenness. |
| Physical coordination and reaction times are affected by alcohol so people who are not intoxicated are less likely to have accidents. | Physical coordination and reaction times are affected by alcohol so people who are intoxicated are more likely to sustain accidents. |
| In approximately fifty percent of adult pedestrian road accident | In approximately fifty percent of adult pedestrian road accident |

| | |
|---|---|
| fatalities, the victims have blood alcohol levels exceeding the statutory drink drive limit. | fatalities, the victims have blood alcohol levels exceeding the statutory drink drive limit. |
| Avoiding consuming excessive amounts of alcohol in one session can reduce the risk of putting a strain on your liver and other parts of your body. | Excessive amounts of alcohol consumed in one session can put a strain on your liver and other parts of your body. |
| Intoxication is also associated with violent crime, domestic violence, and abuse. | Intoxication is also associated with violent crime, domestic violence, and abuse. |
| A guide to how much alcohol you can consume without putting your health at risk is outlined by the daily benchmarks for men and women. | A guide to how much alcohol you can consume before you are putting your health at risk is outlined by the daily benchmarks for men and women. |
| These are applicable whether you drink every day, once or twice a week, or occasionally. | These are applicable whether you drink every day, once or twice a week, or occasionally. |
| The benchmarks are not targets to drink up to. | The benchmarks are not targets to drink up to. |
| For men, if your alcohol consumption level is below 4 units a day there are no significant risks to your health. | For men, if you regularly consume over 4 units a day there is an increasing risk to your health. |
| For women, if your alcohol consumption level is below 3 units a day there are no significant risks to your health. | For women, if you regularly consume over 3 units a day there is an increasing risk to your health. |
| An approximate guide to the number of units in a selection of popular drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 units; a small glass of wine = 1 unit. | An approximate guide to the number of units in a selection of popular drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 units; a small glass of wine = 1 unit. |
| It is not acceptable to save up units for the weekend. | It is not acceptable to save up units for the weekends. |
| Avoiding binge drinking or consuming large quantities in one session reduces the risk of most of the problems associated with drinking alcohol. | Binge drinking or consuming large quantities in one session is extremely risky and is responsible for most of the problems associated with drinking alcohol. |

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4.7.3 Outcome Measures:

Usability and usefulness: the perceived usability and usefulness of the leaflets was measured using the 5 item scale developed in chapter 2. In addition to this 5 item usability and usefulness scale, 4 items to evaluate perceptions of usability and usefulness were adapted from the Technology Acceptance Model (TAM) and included in the questionnaire. These were included to confirm the relationship between the two sets of usability and usefulness measures. The items adapted from the TAM model were: *Usability:* ‘Reading the leaflet did not require a lot of my mental effort’, and ‘The information in the leaflet was clear and understandable’ (Chronbach’s $\alpha=.57$). *Usefulness:* ‘I find the leaflet to be useful in my life’, and ‘Using the information in the leaflet will enable me to keep my alcohol intake within safe limits’ (Chronbach’s $\alpha=.54$). These items were measured using a 7 point Likert-type scale as used in the TAM, where 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neutral, 5 = somewhat agree, 6 = moderately agree and 7 = strongly agree.

Intentions: Participants intentions to use the information in the leaflet were measured using an item adapted from the TAM. This was ‘I intend to use the information given in the leaflet’. This item was measured on a 7 point Likert-type scale as above.

Biographics: Participants age and sex were recorded.

Prior behaviour: Prior behaviour (i.e. amount of alcohol currently consumed over the course of a typical week) was measured using a chart that asked

participants how many units of alcohol they drank in an average week. Participants were asked to write down the number of units they drank for each individual day of the week. Participants were reminded of the typical number of units in common drinks at the top of the chart, i.e. '1 unit = half pint lager/beer/cider; 25ml spirits or small glass of wine.'

Mood: State mood was assessed using Watson et al.'s (1988) Positive And Negative Affect Schedule (PANAS). Positive mood Chronbach's $\alpha = .92$, negative mood Chronbach's $\alpha = .87$.

Neuroticism: The 12 item EPQ-N was used to assess participants level of neuroticism. Chronbach's $\alpha = .79$

Need for Cognition: Need for Cognition was assessed using Cacioppo and Petty's Need for Cognition (NFC) 18 item scale. Chronbach's $\alpha = .83$

Social desirability: Social desirability was measured using the Marlowe-Crowne 2(10) Social Desirability Scale (Strahan and Gerbasi 1972). This shortened version of the M-C 33 is recommended where time is limited and in situations where the researcher wishes to limit respondent burden (Zook and Sippes 1985). Chronbach's $\alpha = .54$

4.7.4 Procedure:

Participants were asked to read one of the 4 experimental leaflets. Data was collected at the beginning of a large lecture. Immediately after they finished

reading the leaflet participants completed the questionnaire. Participants were able to refer to the leaflets whilst completing their questionnaires. Completion of the questionnaire entitled entry into a raffle, in which one participant would win a £30 shopping voucher. Participants were thanked for their time and given an NHS leaflet on safe alcohol use to take away. Participants were also given information sheets with helpline numbers for various health and alcohol-related organisations.

4.8 Results:

4.8.1. Sample equivalence

Participants' demographic data was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on participants' age. The results showed that there were no significant effects for age by either frame or reading ease group. This indicated that subjects were of the same age across the two conditions for both frame and reading ease. There were significantly more females than males across the sample ($\chi^2 = 5.645$, $p < .001$). A chi-square test indicated that there were no differences across conditions for number of males and females for reading ease group ($\chi^2 = 1.1$, $p = 0.326$). However, the results did indicate a significant difference across groups for frame ($\chi^2 = 8.9$, $p < 0.01$), with more females in the positive group than the negative group, and the opposite pattern for males. For all subsequent analyses, sex was therefore entered as a covariate.

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Participants' past behaviour was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on number of units drunk in an average week. The results showed that there were no significant effects for number of units drunk by either frame or reading ease. This indicated that participants' past drinking behaviour did not vary significantly across the two conditions.

Table 4.4 shows the means, standard deviations and zero order correlations for all variables. Zero order correlations were examined to explore the relationships between usability, usefulness and intentions. There are significant correlations between intentions and both measures of usefulness ($r = .33$ for newly developed measure, and $r = .68$ for TAM measure), but not for intentions and usability. Correlations between subjective usability and the psychological constructs will be discussed below.

Number of expected false positive significant results was calculated. $132/2 = 66$ multiplied by $0.05 = 3.3$. Therefore for this study, 3.3 false positive significant correlations would be expected by chance.

Table 4.4 Table to show means and standard deviations for all variables

| | Mean (SD) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|-----------------------------|-------------|-------|--------|---------|--------|--------|--------|-------|--------|--------|-------|--------|------|
| Age (1) | 20.97 (2.9) | 1 | | | | | | | | | | | |
| Behaviour (units drunk) (2) | 16.36(14.8) | -.09 | 1 | | | | | | | | | | |
| Social Desirability (3) | 4.69 (1.9) | .044 | -.023 | 1 | | | | | | | | | |
| PANASpos (4) | 2.99 (0.8) | .160 | -.112 | .264** | 1 | | | | | | | | |
| PANASneg (5) | 1.98 (0.6) | -.028 | .042 | -.247** | .072 | 1 | | | | | | | |
| Neuroticism (6) | 6.31 (3.1) | -.004 | -.128 | -.241** | -.077 | .517** | 1 | | | | | | |
| NFC (7) | 3.29 (0.5) | .116 | -.176* | .041 | .372** | -.020 | -.192* | 1 | | | | | |
| Usability (8) | 3.96 (0.6) | -.014 | .128 | .112 | .223* | .060 | -.034 | -.064 | 1 | | | | |
| Usefulness (9) | 3.17 (0.9) | -.074 | .346** | .110 | .017 | -.050 | -.062 | -.111 | .245** | 1 | | | |
| TAM usability (10) | 5.41 (1.0) | .117 | .117 | .034 | .190* | .053 | -.068 | .065 | .595** | .196* | 1 | | |
| TAM usefulness (11) | 3.78 (1.2) | .020 | -.038 | .034 | .032 | -.019 | .108 | -.072 | .180* | .487** | .185* | 1 | |
| Intentions (12) | 3.37 (1.4) | .072 | -.166 | .00 | .039 | .037 | .112 | .002 | .130 | .329** | .044 | .682** | 1 |

4.8.2 Convergent and discriminant validity of usability and usefulness scales

Correlations were examined to further validate the scales of usability and usefulness used in this series of studies. Campbell and Fiske (1959) state that ‘any conceptual formulation of trait will usually include implicitly the proposition that this trait is a response tendency which can be observed under more than one experimental condition and that this trait can be meaningfully differentiated from other traits’ (pp 100), i.e. it demonstrates evidence of convergent and discriminant validation. Convergent validity requires that some convergence – but not complete congruence - is demonstrated between two related constructs. Discriminant validity requires low correlations between other tests ‘purporting to measure different things’ (pp84).

There was a large significant positive correlation between the measure of usability used for this series of studies and the measure made up of items from the TAM usability scale ($r = .59, p < .01$). There was a medium to large significant positive correlation between the measure of usefulness used in this series of studies and the measures made up of items from the TAM usefulness scale ($r = .49, p < .01$). This indicates that the scales of usability and usefulness used in this thesis to evaluate health promotion leaflets demonstrated convergent validity with the scales developed for the TAM to evaluate usability and usefulness of Information Technology. There were small significant positive correlations between TAM measures of usability and this study’s measure of usefulness ($r = .19, p < .05$), and TAM usefulness and this study’s measure of usability ($r = .18, p < .05$). Both measures of usability and

usefulness were significantly correlated with one another ($r=.25, p<.01$ for current study measures, $r=.19, p<.05$ for TAM measures). These small correlations indicate that these concepts show discriminant validity, i.e. the concepts are similar but not the same.

4.8.3 Subjective usability as a function of psychological constructs

Neither measure of usability was related to NFC, social desirability or neuroticism. These results indicate that perceptions of usability are not influenced by these personality traits. Both measures of usability were significantly correlated with positive mood ($r=.22, p<.01$ for the usability measure used in this thesis, $r=.19, p<.05$ for TAM), indicating a relationship between these variables. Perceptions of usefulness were not related to any of these psychological constructs. These differences highlight the distinction between usability and usefulness despite their relatedness. Significant negative correlations between social desirability and neuroticism and negative mood were observed. There was also a significant positive correlation between social desirability and positive mood. This raises the possibility that participants displaying higher levels of social desirability were rating their mood and self-reported neuroticism in a way that would present themselves in a more favourable light, rather than reporting their actual mood or neurotic tendencies. If this were the case, it may have implications for the relationship between these constructs and perceptions of usability and usefulness. Therefore, further correlations between positive and negative mood and neuroticism with usability and usefulness, controlling for social desirability, were conducted. These analyses showed that there was no difference in the

significance of any of the results as a result of partialling out social desirability.

4.9 Subjective usability as a function of leaflet characteristics

The effect of objective reading ease and frame on subjective ratings of usability and usefulness was tested. It was predicted that reading ease would affect perceptions of the usability of the leaflets. The means and standard deviations for perceptions of the leaflet's usability and usefulness by each experimental condition (frame and reading ease) are presented in table 4.5.

Table 4.5 Table to show means and standard deviations for perceptions of usability and usefulness by reading ease and frame.

| Perceptions of Usability and Usefulness | | | | | |
|---|--|------------------------|------------------|------------------------|-------------------|
| | | Positive Frame (n=77) | | Negative Frame (n=47) | |
| | | Easy (n=66) | | Difficult (n=58) | |
| | | Positive | | Negative | |
| | | Easy (n=39) | Difficult (n=38) | Easy (n=27) | Difficult (n=20) |
| Usability | | 4.01 (0.7) | 3.92 (0.6) | 4.00 (0.6) | 3.88 (0.5) |
| Usefulness | | 3.18 (1.1) | 3.17 (0.8) | 3.28 (0.8) | 3.05 (0.9) |

A 2 (positive, negative) by 2 (easy, difficult) two-way between groups MANCOVA for frame and reading ease on perceived usability and usefulness, with sex entered as a covariate due to the uneven distribution of males and females between the groups identified earlier. Results showed no significant effects for either frame or reading ease on perceptions of usability or usefulness, nor was there a significant interaction between frame and reading ease. Participants' perceptions of the usability of the leaflet were not influenced by whether it was easy or difficult. Participants' perceptions of the usability and usefulness were not influenced by whether the leaflet was written

in a positive or negative frame, nor were they influenced by whether they were male or female. Post hoc power analyses were conducted: Reading ease partial $\eta^2=.007$, observed power = .117. Frame partial $\eta^2=.0005$, observed power = .054. Both effects had very low power. Effect sizes were also very small for this sample.

4.10 Predictors of subjective usability and usefulness.

Hierarchical multiple linear regressions were conducted in order to explore factors that influenced subjective usability and usefulness. The regression on usability is presented below in table 4.6.

Table 4.6 Regression on Perceived Usability (n=118)

| | Step 1 Beta | Step 2 Beta | Step 3 Beta | Step 4 Beta |
|---------------------|----------------|----------------|----------------|----------------|
| Age | .009 | -.003 | -.023 | -.025 |
| Sex | .030 | .018 | .011 | .055 |
| Units | .138 | .135 | .125 | .031 |
| Reading Ease | | .082 | .119 | .035 |
| Frame | | .002 | .002 | -.005 |
| Social Desirability | | | .056 | .062 |
| NFC | | | -.175 | -.147 |
| Neuroticism | | | -.044 | -.016 |
| Positive Mood | | | .290*** | .172* |
| Negative Mood | | | .048 | .034 |
| Usefulness | | | | .086 |
| TAM Usability | | | | .559*** |
| TAM Usefulness | | | | .008 |
| R^2 | .018 | .025 | .116 | .432*** |
| ΔR^2 | .018 | .007 | .092 | .316*** |

Note * $p<.05$, ** $p<.01$, *** $p<.001$

R^2 = R square, ΔR^2 = Change in R square

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Results showed that these variables explained 43.2% of the total variance in perceptions of usability. The TAM measure of usability was the only significant predictor of usability ($\beta = .559$). The individual significance seen for positive mood reflects the significant positive correlation seen earlier. However the step was not significant. Neither demographics, past behaviour, negative mood, psychological constructs or perceptions of usefulness were significant predictors of subjective usability.

A multiple hierarchical linear regression was conducted to explore factors that influenced perceived usefulness. Results are shown in table 4.7 below

Table 4.7 Regression on Perceived Usefulness (n=118)

| | Step 1 Beta | Step 2 Beta | Step 3 Beta | Step 4 Beta |
|------------------------|----------------|----------------|----------------|----------------|
| Age | -.010 | -.005 | -.024 | -.042 |
| Sex | .101 | .099 | .076 | .019 |
| Units | .343*** | .346*** | .348*** | .328*** |
| Reading Ease | | -.003 | .036 | -.099 |
| Frame | | .017 | -.002 | -.094 |
| Social Desirability | | | .075 | .060 |
| NFC | | | -.070 | -.027 |
| Neuroticism | | | .030 | -.014 |
| Positive Mood | | | .125 | .038 |
| Negative Mood | | | -.114 | -.078 |
| Usability | | | | .053 |
| TAM | | | | .486*** |
| Usefulness | | | | |
| TAM Usability | | | | .092 |
| R ² | .118*** | .119* | .152 | .395*** |
| ΔR^2 | .118** | .000 | .033 | .243*** |

Note *p<.05, **p<.01, ***p<.001

R² = R square, ΔR^2 = Change in R square

Results showed that these variables explained 39.5% of the total variance in perceptions of usefulness. Past behaviour (i.e. number of units drunk in an average week) predicted perceptions of usefulness of the leaflets ($\beta = .328$). Those drinking more units in an average week reported higher perceptions of usefulness. The TAM measure of usability was the only other predictor ($\beta = .486$).

4.11 Effects of Frame and Reading Ease on Intentions

It was predicted that both frame and reading ease would affect intentions to use the information in the leaflet. The means and standard deviations for intentions by each experimental condition (frame and reading ease group) are presented in table 4.8

Table 4.8 Means and standard deviations for intentions by reading ease and frame.

| Intentions | | | |
|-----------------------------------|------------------|-----------------------------------|------------------|
| Positive Frame (n=76) 3.39 (1.4) | | Negative Frame (n=47) 3.34 (1.6) | |
| Easy (n=65) 3.72 (1.5) | | Difficult (n=58) 2.98 (1.2) | |
| Positive | | Negative | |
| Easy (n=38) | Difficult (n=38) | Easy (n=27) | Difficult (n=20) |
| 3.82 (1.4) | 2.97 (1.2) | 3.59 (1.7) | 3.00 (1.3) |

A 2 (positive, negative) by 2 (easy, difficult) two-way between groups ANCOVA for frame, reading ease and sex was conducted on intentions to use the information in the leaflet. Sex was entered as a covariate as preliminary analysis had shown males and females to be unevenly distributed between the experimental conditions. F tests showed that there was a significant effect for reading ease on intentions to use the information in the leaflet

($F(1,118)=7.208, p<.01$). Participants reading the easy leaflet reported higher intentions to use the information in the leaflet than those reading the difficult leaflet. There was no significant effect for frame on intentions. Post hoc power analysis for frame showed partial $\eta^2 = .001$, observed power = .06. There was no significant interaction for frame and reading ease. Post hoc power analysis for the interaction showed partial $\eta^2 = .002$, observed power = .077. These results show again that the study was under powered. There was no significant effect for sex on intentions.

4.12 The moderating role of NFC

It was predicted that NFC would potentially moderate the role of frame on intentions, reading ease on intentions or usability on intentions. Individual regressions were conducted using mean centred variables to test these hypotheses (Aiken and West 1991). There were no significant interactions for frame X NFC ($R^2 = .06, \Delta R^2 = .004$), reading ease x NFC ($R^2 = .05, \Delta R^2 = .001$) and usability X NFC ($R^2 = .012, \Delta R^2 = .000$) on intentions to use the information in the leaflet.

A multiple hierarchical regression was conducted in order to examine the factors that influenced intentions. Results of the regression on intentions are presented in table 4.9 below.

Table 4.9 Regression on intentions (n=117)

| | Step 1 Beta | Step 2 Beta | Step 3 Beta | Step 4 Beta |
|---------------------|----------------|----------------|----------------|----------------|
| Age | .110 | .087 | .087 | .067 |
| Sex | .070 | .031 | .004 | -.101 |
| Units | -.160 | -.163 | -.166 | -.200* |
| Frame | | .048 | .035 | -.084 |
| Reading Ease | | .232* | .236* | .084 |
| Social Desirability | | | .037 | .001 |
| NFC | | | -.027 | .027 |
| Neuroticism | | | .082 | .009 |
| Positive Mood | | | -.045 | -.130 |
| Negative Mood | | | -.048 | .017 |
| Usability | | | | .132 |
| Usefulness | | | | .088 |
| TAM Usability | | | | -.152 |
| TAM Usefulness | | | | .653*** |
| R ² | .045 | .098* | .107 | .535*** |
| ΔR ² | .045 | .053* | .009 | .428*** |

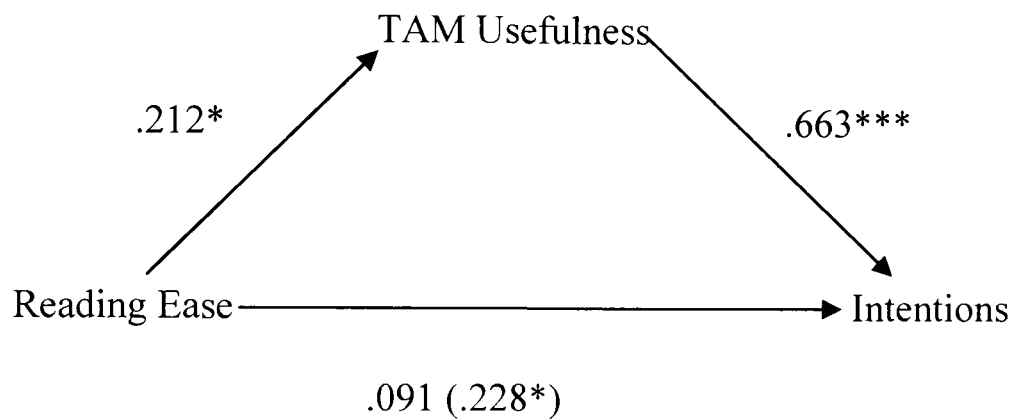
Note *p<.05, **p<.01, ***p<.001

R² = R square, ΔR² = Change in R square

Variables entered in the regression explained a total of 53.5% of the total variance in intentions to follow the advice in the leaflet. Past behaviour i.e. number of units drunk in an average week was a significant predictor of intentions ($\beta = -.200$). Participants who reported higher average weekly levels of alcohol consumption reported lower intentions to follow the advice in the leaflet. Psychological constructs and mood did not explain any additional significant variance to the model. The TAM measure of perceived usefulness was a significant predictor of intentions ($\beta = .653$), but usability was not. Objective reading ease was a significant predictor of intentions until the final step (subjective ratings of usability and usefulness). These results suggest that the perceived usefulness of the leaflet as measured by the TAM items

mediated the effect of objective reading ease on intentions. A mediation analysis (Baron and Kenny 1986) was conducted to test this hypothesis. Figure 4.1 shows the mediation model.

Figure 4.1 TAM usefulness as a mediator of the effect of objective reading ease on intentions



Note: * $p < .05$, *** $p < .001$. Figures are standardised β coefficients, the direct path is in parentheses.

A Sobel test showed that this effect was significant Sobel $z = 2.35$, $p < .05$. Perceptions of the usefulness of the leaflet, as measured by the TAM items, mediated the effect of objective reading ease on intentions to use the information in the leaflet.

4.13 Discussion

Results from this study showed that (1) the two scales used to measure usability and usefulness demonstrated good convergent and divergent validity with the TAM measures, (2) subjective usability was not a function of the psychological constructs measured, i.e. NFC, social desirability and neuroticism, nor was it a function of leaflet characteristics i.e. objective reading ease and frame, 3) subjective usability and usefulness are not

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influenced by the same factors. There was a significant positive correlation between positive mood and perceptions of the usability of the leaflets, but not usefulness. Past behaviour influenced perceptions of the usefulness of the leaflets, but not usability. 4) Objective reading ease affected intentions, with those reading the easy leaflet reporting higher intentions than those reading the difficult leaflet. There was no significant interaction between objective reading ease and frame. Framing effects were not observed for those participants reading the easy leaflet, as was predicted, 5) perceptions of usefulness mediated the relationship between objective reading ease and intentions.

The main aim of the study was to further explore the factors that underlie the concept of subjective usability for evaluations of health promotion leaflets. Subjective usability has been theorised to be a function of an interaction between both user characteristics and system characteristics (Baber 2002). The influence of psychological constructs such as NFC, neuroticism or social desirability on subjective usability has not been studied to date. Therefore this study explored the influence of these factors and leaflet characteristics (objective reading ease score and frame) on perceptions of usability. A further aim was to test the predictions of the TAM in that perceptions of usability and usefulness would predict intentions.

Results showed that the psychological constructs measured did not influence subjective usability, nor did the leaflet characteristics. Social desirability did not confound leaflet evaluation. Neuroticism was correlated with negative mood as expected (Costa & McCrae 1980, Gomez et al. 2000, Larsen &

Ketalaar 1989) but this did not influence leaflet evaluations. NFC did not increase evaluations of the usability of the leaflets. However there was a positive correlation between mood and usability. This result supported previous research that has shown positive mood to be associated with more positive evaluations (Barone et al. 2000, Isen et al. 1978), as positive mood was associated with higher usability ratings of the leaflets.

These results suggest that further research is needed in order to identify the user characteristics that influence subjective usability. These may include reading ability, intelligence, prior knowledge, or educational background. Neither leaflet characteristic (objective reading ease level and frame) was shown to influence subjective usability. This does not support previous research (Krass 2002, Rees et al. 2003), but it may be a result of the population studied. University students may be expected to have higher than average reading skills, therefore they may have found both the easy and the difficult leaflets relatively easy to use. This may also explain the lack of relationship between usability and intentions in this study – the importance of usability of health information leaflets in influencing intentions may be less for individuals with higher reading ability. Further research could target populations of variable reading ability levels to establish the relative importance of usability in predicting intentions. However there was a significant effect for reading ease on intentions. This supports theory that simple text promotes comprehension (McKenna and Scott 2007, Surber 1992), and that good comprehension facilitates persuasion (Chaiken and Eagley 1976, Eagley 1974, Eagley and Warren 1976)

The study also highlighted the importance of the relationship between usability and usefulness (Eason 1984, Davis 1989, Karahanna and Straub 1999, Stanton and Baber 1992,). Perceptions of usefulness were shown to mediate the effect of objective usability on intentions. These results support suggestions that users will choose to use a system even if it is low in usability if it is perceived to be useful (Davis et al. 1993). Therefore increasing features that improve both usability and usefulness (for example relevance) of a health information leaflet may result in the most effective intervention.

4.14 Limitations

Participants in the study were all of above average education level and therefore may be expected to have higher than average reading abilities. This may have had an effect on the leaflet evaluations and the relationship between usability and intentions.

4.15 Next Chapter

The study described in the next chapter will test the hypothesis that easy leaflets will promote shallow processing whilst difficult leaflets will promote deeper processing. This will be tested via a free recall test. This study will test whether the effects of reading ease and frame on intentions will depend on the proximity of the health outcomes.

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Reading Ease and Frame*

Chapter 5

The Effect of Reading Ease and Frame on Recall of Health Information

5.1 Overview

The previous chapter showed that the scales used in this thesis to measure the concepts of usability and usefulness of health promotion materials showed good convergent and discriminant validity with the measures of usability and usefulness developed for the Technology Acceptance Model (Davis 1989). The chapter also described how usability was not found to be a function of the psychological constructs of Social Desirability, Neuroticism and Need for Cognition. Positive mood was positively associated with perceptions of usability, suggesting a role for affect in participants' judgements of perceptions of usability and usefulness. The role of affective cues in reactions to the leaflet will therefore be explored in more depth in the current study. An overall effect for objective reading ease on intentions was demonstrated, but the predicted interaction between reading ease and frame was not found. The current chapter will explore whether differences in the effectiveness of reading ease and frame on intentions are due to the proximity of the outcomes of not practicing safe drinking behaviour. The study described in this chapter also tests whether recall of the information in the leaflets is affected by the reading ease of the leaflet.

5.2 Aims of the Current Study

This chapter will explore (1) the factors that influence perceptions of the usability of health promotion leaflets, with particular attention paid to the role

of mood, and (2) the effects of manipulating the objective usability (by way of reading ease scores) and frame of health promotion leaflets on recall of information and intentions to follow the guidelines. The study described in the previous chapter failed to find effects for either reading ease or frame on intentions to follow the advice in the leaflet, nor was there the predicted interaction between the two – framing effects were not observed for those reading the easy leaflet. The current chapter will explore whether these effects are dependent on the proximity of the health outcomes. (i.e. whether the outcomes are short or long term).

Subjective Usability as a Function of Mood.

The study described in chapter 4 found a positive relationship between perceptions of usability and positive mood. The role of affect in judgements of the usability of health information leaflets has received little attention. However affect has been shown to have an important role in decision-making. This will be discussed below. The term affect is commonly used to refer to moods and emotions (Mayer 1986, Petty et al. 1991). Moods are defined as ‘low-intensity, diffuse and relatively enduring states without a salient antecedent cause and therefore little cognitive content’, whilst emotions are defined as ‘more intense, short-lived and usually have a definite cause and clear cognitive content e.g. anger and fear’ (Forgas 1992 pp.230). Empirical studies have highlighted the important role of affect in decision-making, with positive moods generally influencing more positive judgements and attitudes (see Forgas 1995 for review).

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The effect of mood on decision-making has been shown to be dependent on levels of information processing. It is therefore pertinent to study mood alongside leaflet manipulations that are predicted to cause both shallow and deep levels of processing (i.e. easy versus difficult leaflets). Many of these studies demonstrate that mood is influential in decision-making when elaboration is low, but not high (Batra and Ray 1986, Cacioppo et al. 1992, Batra and Stayman 1990). Later research has shown that under conditions of high elaboration, both systematic and heuristic processing may occur (Chaiken and Maheswaran 1994, Drake et al. 1997). This theory is supported by the Affect Infusion Model (Forgas 1995) which states that affect may influence judgements under both heuristic and systematic processing. Under the *affect-priming principle*, for systematic processing, affect has a selective influence on attention, encoding and retrieval (Bower 1981, 1991, Forgas and Bower 1987, 1988), but judgements are made using both affective cues and cognitive evaluation. Under the *affect-as-information* principle, affect can influence decision-making when heuristic processing is used as it is used to infer evaluative reactions to the object or behaviour. If mood affects decision-making and judgements differently under conditions of high and low processing, then it is predicted that mood will moderate the effect of the two leaflet manipulations on judgements of the usability of the leaflets. Both readability and frame have been proposed to influence level of information processing (e.g. Block and Keller 1993, Britton et al. 1982, Bradley and Meeds 2002, Chamblee et al. 1993, Chebat et al. 2003, Lowry 1998, Macklin et al. 1985, Maheswaran and Meyers-Levy 1990, Millar and Millar 2000, Shiv et al. 2004), with high text complexity associated with deeper processing than

low text complexity, and negative frame associated with deeper processing than positive frame. Therefore affect, as measured in this study as positive/negative mood may be differentially influential under these leaflet conditions.

Alternatively, effects for reading ease and frame on judgements of usability may be mediated through mood. Reading an easy or positively framed leaflet may create a positive mood which then influences positive judgements of the leaflets. The potentially mediating effect of mood on the influence of reading and frame on subjective usability will therefore be tested.

Recall

A recall test will be conducted in order to provide support for the prediction that easy to read leaflets will promote shallow processing, whilst difficult to read leaflets will promote deeper, systematic processing. Text recall has been shown to be an indicator of comprehension (van Eye et al. 1989, Kintsch 1994), with complex text shown to adversely affect comprehension (Johnson 1981). In general, research supports the use of recall tests as indicators of depth of processing. Craik & Lockhart (1972) proposed that the 'retentive value of an item is a function of the level of processing by which it is encoded'. Therefore deeper processing should result in a higher level of accurate recall, whilst shallow processing should result in a decreased level of accurate recall. These propositions have been supported by numerous subsequent studies (e.g. Craik, 1977, 1980, Craik & Tulving 1975, Fischer &

Flannagan & Blick 1989. Rhodes & Anastasi 2000, Tuth, 1996. Vochatzer & Blick 1989).

However, studies in verbal and text complexity have shown that these effects are not always predictable. Complex syntax in advertising messages have been shown to decrease recall (Bradley & Meeds 2002), even though it requires more processing effort (Lowry 1998). Low (difficult) readability has been shown to have a negative effect on recall and persuasion (Chebat et al. 2003). It is also suggested that if too many cognitive resources are being used simply understanding the text, then fewer resources are available for processing the content of the message (Bradley and Meeds 2002, Britton et al. 1982, Kanfer & Ackerman 1989, Lang 2000, Lang et al. 2000, Thomson et al. 1985, Whittingham et al. 2008). When the process of reading the information requires a great deal of attention, then comprehension is reduced. Lowrey (1998) found high syntactic complexity to reduce recall performance. Conversely, messages that are low in complexity have been shown to improve comprehension (e.g. McKenna & Scott 2007, Surber 1992). Good comprehension is associated with increased persuasion (Chaiken & Eagley 1976, Eagley 1974, Eagley and Warren 1976). Therefore a complex message (or one that has a high reading ease score) may increase message processing but actually decrease comprehension and persuasion. The current study will use a free recall test to assess depth of processing and comprehension of the information in the leaflets. Free recall tests typically consist of participants being required to generate a list of information to which they have just been exposed, with the presumption that increased recall is a function of better

learning (Eveland et al. 2004). Free recall is used in this study as opposed to a recognition test as this means there is no cueing or priming of information and therefore ceiling effects are less likely (Gasser et al. 2005).

5.3 The effect of frame and reading ease on short and long-term intentions.

The study described in the previous chapter failed to show an effect for frame on intentions, nor was there any interactive effect. The current study will therefore explore whether these predicted effects are dependent on the proximity of outcomes studied. Social Cognitive Theory (Bandura 1986) highlights the importance of outcome proximity in behaviour. Short-term outcomes may be more salient than long-term outcomes in which case information relating to short-term goals would be processed more deeply. It is therefore possible that recipients' attention to health promotion messages varies as a function of the perceived timescale of the consequences of not following safe practice, and that this may have an effect on their judgement strategy. To test this, the experimental leaflets were designed to highlight both short-term and long-term consequences of excess alcohol consumption. For short-term consequences, the leaflet referred to the consequences of binge drinking, i.e. drinking too much alcohol in one session. For long-term consequences, the leaflet referred to the consequences of regularly drinking more than the recommended weekly limit. Separate measures of short-term and long-term cognitions, affect and intentions were taken. It was predicted that long-term goals would be given less cognitive consideration, and therefore it would more likely to observe framing effects. Conversely,

participants would be more motivated to process short-term goals and would therefore use systematic processing and be less susceptible to framing effects.

5.4 Methods.

5.4.1 Participants:

Participants were a convenience sample of 265 university students. Of those who indicated sex, 36 were males and 225 were females. This bias in males to females ratio will be examined in relation to the experimental conditions below. Mean age of participants was 19.8 years (SD = 2.11), minimum age 18 years to maximum 40 years. Participants were recruited via announcements made by the researcher at the beginning of lectures.

5.4.2 Materials:

The four leaflets designed for the study described in chapter 4 were used for the current study. These were all entitled 'Think about drink'. Leaflets were either easy or difficult to read, and were framed either positively or negatively. Chapter 4 described how the leaflets were developed in terms of their readability and framing manipulations.

5.4.3 Measures:

Usability and usefulness: the usability and usefulness of the leaflets was measured using the 5 item scale developed in chapter 1. Usability items were 'how easy was the leaflet to read'; 'how easy was the leaflet to understand'; 'how easy was the leaflet to remember'; Usefulness items were 'how relevant was the information contained in the leaflet' and 'how helpful do you think the

information in the leaflet will be for your work'. Items were measured using a 5 point Likert-type scale ranging from 1 (not at all), to 5 (extremely). Usability Chronbach's $\alpha = .78$, Usefulness Chronbach's $\alpha = .57$.

Intentions: Intentions to follow the advice in the leaflet was measured by 2 single items. The first of these related to short-term behaviour, (i.e. binge drinking). This item was 'to what extent do you intend to avoid binge drinking?'. The second item related to long-term behaviour, (i.e. keeping within weekly safe limits of alcohol consumption). This item was 'to what extent do you intend keeping your daily alcohol consumption to within the limits outlined in the leaflet?'. These items were measured using a 5 point Likert-type scales ranging from 1 = not at all to 5 = extremely.

Alcohol-related cognitions and emotions: Separate items to measure alcohol-related cognitions and emotions were included for long-term and short-term outcomes. These were included in 2 distinct sections of the questionnaire. To control for order effects, 2 versions of the questionnaire were used. All items in the 2 versions were identical, but in the first version the section containing items about the short-term consequences of excess alcohol consumption came directly before the section on the long-term effects of excess alcohol consumption. In the section version, this order was reversed. Items measured perceptions of risk to self: 'to what extent do you feel you are personally at risk from the *short-term* (*long-term*) consequences associated with excess alcohol consumption'; worry 'how worried are you about suffering the *short-term* (*long-term*) ill health through alcohol consumption'; severity 'how

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serious do you think the *short-term (long-term)* health risks associated with excess alcohol consumption are'; and perceptions of risk to others 'to what extent do you feel your friends are at risk from the *short-term (long-term)* consequences associated with excess alcohol consumption'. These items were measured using a 5 point Likert-type scale ranging from 1 = not at all, to 5 = extremely.

Biographics: Participants age and sex were recorded.

Prior behaviour: Prior behaviour (i.e. amount of alcohol currently consumed over the course of a typical week) was measured using a chart that asked participants how many units of alcohol they drank in an average week. Participants were asked to write down the number of units they drank for each individual day of the week. Participants were reminded of the typical number of units in common drinks at the top of the chart. This line read: '1 unit = half pint lager/beer/cider; 25ml spirits or small glass of wine.'

Mood: State mood was assessed using Watson et al.'s (1988) Positive And Negative Affect Schedule (PANAS). Positive mood Chronbach's $\alpha = .87$. Negative mood Chronbach's $\alpha = .87$.

Recall: Recall of the information contained in the leaflet was measured using a free recall test at the end of the lecture. Participants were given 3 minutes to recall as much information contained in the leaflet as they could onto a blank sheet of paper. This information was scored using the following method:

Accurate Recall: Each item of information contained in the leaflets was given a score of 1 point. Participants therefore scored 1 point for each specific item that they correctly recalled that matched an item in the leaflet ('accurate recall'). Examples of accurate recall include 'drinking causes heart disease' or 'women can drink 3 units per day'. No point was given for a general comment about the leaflet, for example 'drinking is bad for you'.

False Recall: For each item of information that participants wrote down that was *not* contained in the leaflet, 1 point was recorded as 'false recall'. Examples of false recall included either items recalled incorrectly, for example 'men can drink 5 units per day' – (the correct item was 'men can drink 4 units per day'), or items recalled that were not contained in the leaflet, for example 'drinking can cause nausea'.

Inter-Rater Reliability:

Inter-rater reliability for the recall items was tested on a sample of 10% of responses (n=26). There were 107 items of information recalled in total in this sample. Of these, agreement between raters occurred for 103 items, and disagreement for 4 items, representing an inter-rater reliability of 96.3%.

5.4.4 Procedure:

Participants were recruited at the beginning of lectures. All participants signed consent forms making them aware that participation was voluntary. Participants were asked to first read one of the 4 experimental leaflets.

Immediately after they finished reading the leaflet they completed the questionnaire. Participants were able to refer to the leaflets whilst completing their questionnaires. No incentive was offered for completing the questionnaire. After completion of all the items, participants were asked to keep hold of their questionnaires, whilst the leaflets were collected in. At the end of the lecture (approximately 45 minutes) participants were asked to write down as much as they could remember about the information contained in the leaflet. They were given 3 minutes to do this. Participants were then thanked for their time and their completed questionnaires collected in. They were then given an NHS leaflet on safe alcohol use to take away. Participants were also given information sheets with helpline numbers for various health and alcohol-related organisations.

5.5 Results

5.5.1 Sample equivalence

Participants' demographic data was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on participants' age. The results showed that there were no significant effects for age by either frame or reading ease group. This indicated that subjects were of the same age across the two conditions for both frame and reading ease. There were significantly more females than males across the sample ($\chi^2 = 136.992, p < .001$). However a chi-square test indicated that there

were no differences across conditions for number of males and females for either reading ease group ($\chi^2 = 0.5$, $p=.585$) or frame ($\chi^2 = 1.9$, $p=.202$).

Participants' past behaviour was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on number of units drunk in an average week. The results showed that there were no significant effects for number of units drunk by either frame or reading ease. This indicated that participants' past drinking behaviour did not vary significantly across the two conditions.

5.5.2. Question order

A one-way between subjects MANOVA was used to test the difference between the two questionnaire orders on all variables in order to test for question order effects. There was a significant difference between the 2 question order conditions across the variables ($F(18,240) = 2.397$, $p < 0.01$). Univariate F tests showed that questionnaire order had a significant effect on perceived usability ($F(1,257) = 3.981$, $p < .05$) and worry ($F(1,257) = 14.441$, $p < .001$). Participants answering the long-short questionnaire perceived the leaflet to be more usable than those answering the short-long questionnaire. Participants answering the long-short questionnaire reported higher levels of worry than those answering the short-long questionnaire. Question order was entered as a factor for all subsequent analyses on usability and worry, to control for these effects.

5.5.3. Descriptives.

Table 5.1 shows the means, standard deviations and zero order correlations for all variables in the study. The number of expected false positive correlations was calculated. $380/2=190$ multiplied by $0.05 = 9.5$ expected false positive significant correlation due to chance.

There were significant correlations between intentions and all the cognitive/emotional variables with the exception of negative mood. For this sample, perceived usefulness was negatively associated with intentions. This was probably due to the positive relationship between past behaviour and usefulness, with those drinking more finding the leaflet more useful but reporting lower intentions to avoid binge drinking and stay within the daily limits. Usability was correlated with all recall measures and for positive mood, along with worry and severity.

Table 5.1 Means, standard deviations and zero order correlations for all variables

| | Mean (SD) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|------------|--------------|-------|---------|---------|---------|---------|---------|--------|--------|-------|-------|
| Age (1) | 19.76(2.1) | 1 | | | | | | | | | |
| Units (2) | 18.69(16) | -.068 | 1 | | | | | | | | |
| STRisk(3) | 3.08 (1.2) | -.005 | .377** | 1 | | | | | | | |
| LTRisk(4) | 2.39 (1.1) | -.016 | .466** | .410* | 1 | | | | | | |
| STWor(5) | 2.48 (1.1) | -.036 | .227** | .566** | .396** | 1 | | | | | |
| LTWor(6) | 2.24 (1.0) | -.089 | .305** | .290** | .717** | .381** | 1 | | | | |
| STsev(7) | 3.34 (0.9) | .070 | -.137* | .004 | -.066 | .134* | .036 | 1 | | | |
| LTsev(8) | 4.18 (0.9) | -.088 | -.115 | .115 | .054 | .157* | .123* | .311** | 1 | | |
| Mpos(9) | 2.35 (0.7) | .125 | -.213** | -.095 | -.026 | -.058 | -.098 | .091 | .033 | 1 | |
| Mneg(10) | 1.45 (0.6) | -.015 | .032 | .025 | .112 | .060 | .044 | -.022 | -.038 | .086 | 1 |
| False(11) | 0.66 (0.9) | -.084 | .038 | .056 | -.001 | .131* | .067 | .061 | .044 | -.035 | -.079 |
| Total(12) | 5.98 (3.5) | .064 | .143* | .215** | .138* | .238** | .138* | .041 | .141* | .012 | .005 |
| STC (13) | 1.19 (1.3) | .048 | .034 | .047 | .022 | .110 | .042 | .100 | .157* | .047 | .012 |
| LIC (14) | 1.62 (1.4) | -.024 | .078 | .134* | .075 | .145* | .093 | .032 | .170** | -.011 | .017 |
| Solut (15) | 3.02 (2.1) | .084 | .183** | .266** | .175** | .252** | .136* | -.057 | .021 | -.011 | .004 |
| Conse(16) | 2.82 (2.2) | .012 | .069 | .113 | .061 | .153* | .083 | .078 | .200** | .019 | .016 |
| Usabi (17) | 3.97 (0.6) | -.060 | .058 | .134* | .096 | .079 | .122* | .148* | .226** | .198* | -.036 |
| Usef (18) | 3.07 (0.9) | -.111 | .299** | .445** | .407** | .435** | .387** | .030 | .082 | .005 | .075 |
| STInt (19) | 2.62 (1.3) | -.076 | -.462** | -.408** | -.295** | -.191** | -.164** | .064 | .089 | .200* | -.020 |
| LHnt(20) | 2.81 (1.2) | .012 | -.562** | -.387** | -.336** | -.177** | -.191** | .198** | .153* | .247* | -.040 |

Table 5.1 continued...

| | Mean (SD) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) |
|------------|--------------|-------|--------|--------|--------|--------|--------|--------|---------|--------|------|
| False(11) | 0.66 (0.9) | 1 | | | | | | | | | |
| Total(12) | 5.98 (3.5) | 0.064 | 1 | | | | | | | | |
| STC (13) | 1.19 (1.3) | -.033 | .635** | 1 | | | | | | | |
| LTC (14) | 1.62 (1.4) | .134* | .705** | .355** | 1 | | | | | | |
| Solut (15) | 3.02 (2.1) | .029 | .794** | .255** | .295** | 1 | | | | | |
| Conse(16) | 2.82 (2.2) | .064 | .815** | .809** | .836** | .315** | 1 | | | | |
| Usabi (17) | 3.97 (0.6) | .039 | .246** | .153* | .226** | .145* | .233** | 1 | | | |
| Usef (18) | 3.07 (0.9) | .042 | .136* | .066 | .124* | .094 | .121* | .189** | 1 | | |
| STInt (19) | 2.62 (1.3) | .062 | -.036 | -.043 | .030 | -.082 | -.007 | -.003 | -.250** | 1 | |
| LTInt(20) | 2.81 (1.2) | .037 | -.063 | -.061 | .015 | -.103 | -.027 | .027 | -.170** | .576** | 1 |

5.5.4 The Effect of Frame and Reading Ease on Perceptions of Usability and Usefulness.

The effect of frame and objective reading ease on perceptions of usability and usefulness was tested. The means and standard deviations for perceptions of the leaflet’s usability and usefulness by each experimental condition (frame and reading ease) are presented in table 5.2.

Table 5.2 Perceptions of Usability and Usefulness by Frame and Reading Ease.

| Perceptions of Usability and Usefulness | | | | |
|---|-------------|----------------------------------|------------------------|-------------------|
| Positive Frame (n=120) | | | Negative Frame (n=145) | |
| | | Easy (n=143) Difficult (n=122) | | |
| | Positive | | Negative | |
| | Easy (n=40) | Difficult (n=50) | Easy (n=73) | Difficult (n=72) |
| Usability | 3.96 (0.6) | 3.78 (0.6) | 4.14 (0.6) | 3.94 (0.7) |
| Usefulness | 2.99 (0.9) | 3.17 (0.9) | 3.09 (0.8) | 3.05 (0.8) |

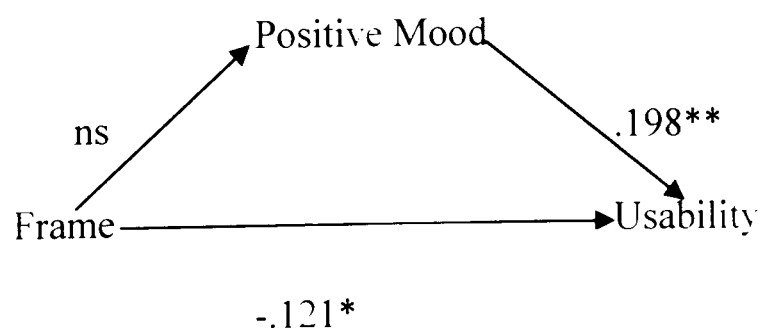
A 2 (frame: positive, negative) by 2 (reading ease: easy, difficult) by 2 (order: short-long, long-short) three-way between groups MANOVA for frame, reading ease and question order was conducted on perceived usability and usefulness. Question order was included as this had been shown to affect perceptions of usability. Multivariate F tests showed that there was a significant main effect for reading ease ($F(2,256)=3.610, p<.05$). The univariate test showed that this effect was significant for perceived usability ($F(1,257)=6.110, p<.05$), but not perceived usefulness. Post hoc power calculations for usefulness were conducted, with partial $\eta^2=.001$ and observed power .089. Participants reading the easy leaflet rated the leaflet as significantly more useable than those reading the difficult leaflet. The multivariate F test showed an effect for frame that almost reached significance

($F(2,256)=2.345$, $p=.098$). The univariate test showed that frame had a significant effect on perceived usability ($F(1,257)=4.429$, $p<.05$), but not for usefulness. Post hoc power analysis for usefulness was conducted. Partial $\eta^2=.00006$, observed power = .052. Participants reading the negative frame rated the leaflet as more usable than those reading the positive leaflet. There was no significant interaction between reading ease and frame. There were no main or interactive effects for question order. Post hoc power analysis for interaction: partial $\eta^2=.005$, observed power = .151. Post hoc power analysis for questions order: Partial $\eta^2=.016$, observed power = .433. Results indicate that the study was under powered.

5.5.5. Positive Mood as a Mediator or Moderator of the Effects of Frame and Reading Ease on Usability.

Mediation analyses were conducted to test the mediating role of positive mood on the relationship between frame and usability, and objective reading ease on usability. Results from these analyses are shown in figures 5.1 and 5.2 below.

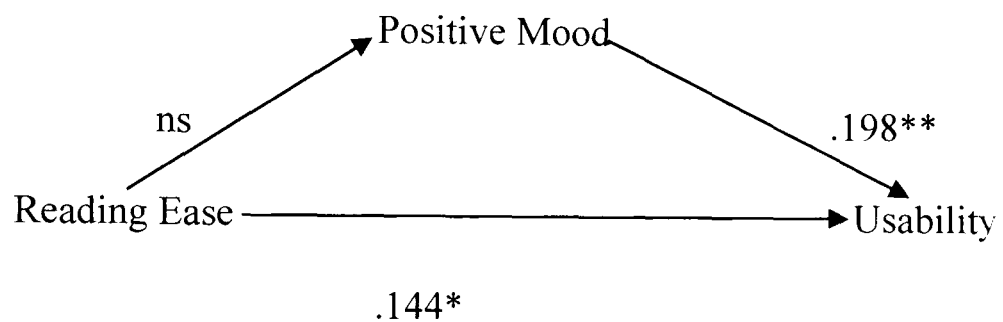
Figure 5.1 Mediating Role of Positive Mood on the Effect of Frame on Subjective Usability.



Figures reported are standardised β coefficients. * $p<.05$, ** $p<.01$.

There was no effect for frame on positive mood. Therefore positive mood did not mediate the relationship between frame and subjective usability. Figure 5.4 shows results from the mediation analysis for positive mood on the relationship between objective and subjective usability.

Figure 5.2. Mediating Role of Positive Mood on the Effect of Objective Reading Ease on Subjective Usability.



Figures reported are standardised β coefficients. *= $p < .05$, **= $p < .01$

There was no effect for objective reading ease on positive mood. Therefore positive mood did not mediate the relationship between objective reading ease and subjective usability.

Two regression analyses using mean centred variables were conducted to test whether positive mood had a moderating role on the relationship between frame and usability and reading ease and usability. Both regressions entered usability as the dependent variable, and entered question order as a first step as this variable was shown to influence perceptions of usability. Regression 1 entered reading ease and positive mood at step 2, and reading ease \times positive mood as an interaction term at the final step. No additional variables were entered. Results showed that there was no significant interactive effect

between reading ease and positive mood on perceptions of the usability of the leaflets ($R^2=.071$, $\Delta R^2=.000$, $p>.05$). Regression 2 entered frame and positive mood as step 2, and frame x positive mood as an interaction term at the final step. No additional variables were entered. Results showed there was no significant interactive effect between frame and mood on perceptions of the usability of the leaflets ($R^2=.062$, $R^2\Delta=.002$ $p>.05$).

These results indicate that, although positive mood influenced perceptions of the usability of the leaflet, it did not mediate or moderate the relationships between objective reading ease or frame on subjective usability.

5.5.6. Effects of Reading Ease and Frame on Recall.

The effect of objective reading ease and frame on recall was tested. Table 5.3 shows the total number of participants recalling each specific item from the leaflets in rank order, from highest to lowest number of participants recalling the item.

Table 5.3. Number of participants recalling each item from the leaflet.

| Rank | Item | Frequency |
|------|---|-----------|
| 1 | Women can drink 3 units per day | 173 |
| 2 | Long-term liver damage | 166 |
| 3 | Men can drink 4 units per day | 149 |
| 4 | Small glass of wine = 1 unit | 109 |
| 5 | 25cl of spirits = 1 unit | 107 |
| 6 | ½ lager = 1 unit | 93 |
| 6 | It is not OK to save up your units | 93 |
| 8 | Binge drinking is a big problem | 77 |
| 9 | Heart disease | 65 |
| 10 | Raised blood pressure | 63 |
| 11 | More likely to have accidents | 57 |
| 12 | Road traffic accidents | 57 |
| 13 | Violent crime | 51 |
| 14 | Depression | 43 |
| 15 | Loss of coordination | 41 |
| 16 | Throat cancer | 32 |
| 17 | Short-term liver strain | 31 |
| 18 | Mouth cancer | 27 |
| 19 | Half drunk | 23 |
| 20 | Decreased reaction times | 21 |
| 21 | Domestic violence | 19 |
| 22 | Abuse | 18 |
| 23 | Psychological problems | 15 |
| 24 | Emotional problems | 12 |
| 25 | Stroke | 10 |
| 25 | One-off drinking episodes a problem | 10 |
| 27 | Limits not guide to drink up to | 6 |
| 27 | Drinking too much is harmful | 6 |
| 29 | Drinking not a problem most of the time | 4 |
| 30 | Benchmarks | 2 |
| 31 | Alcohol to be enjoyed | 1 |
| 32 | People sometimes dismiss problem of drink | 1 |
| 33 | Leaflet outlines safe limits | 1 |

Ch. 5 - The Effect of Reading Ease and Frame on Recall of Health Information

The effect of reading ease and frame on accurate and false recall was tested. The means and standard deviations for recall by each experimental condition (frame and reading ease) are presented in table 5.4.

Table 5.4. Table to Show Means and Standard Deviations for Accurate and False Recall.

| Recall | | | | |
|------------------------|-------------|-------------------|------------------------|------------------|
| Positive Frame (n=119) | | | Negative Frame (n=145) | |
| Easy (n=142) | | Difficult (n=122) | | |
| | Positive | | Negative | |
| | Easy (n=69) | Difficult (n=50) | Easy (n=73) | Difficult (n=72) |
| False | 0.80 (1.1) | 0.40 (0.7) | 0.85 (1.1) | 0.54 (0.9) |
| Accurate | 6.55 (3.4) | 5.42 (3.9) | 6.34 (3.5) | 5.46 (3.1) |

A 2 (positive, negative) by 2 (easy, difficult) two-way between groups MANOVA for frame and reading ease on all recall measures showed no significant effects on recall for frame. Partial $\eta^2=.002$, observed power = .097. However, the multivariate F test showed that reading ease had a significant effect on recall ($F(2,259)=6.730$, $p<.05$). Univariate F tests revealed significant differences for reading ease for false recall ($F(1,260)=8.471$, $p<.01$), and accurate recall ($F(1,260)=5.587$, $p<.05$). Participants who read the easy leaflet recalled both significantly more false information than those in the difficult group, and significantly more accurate information than those reading the difficult leaflet.

2 multiple hierarchical regressions were conducted to look at the factors influencing both accurate recall and false recall. Results of the regression for accurate recall are presented below in table 5.5.

Table 5.5 Regression on Total Recall (n=244)

| | Step 1 | Step 2 | Step 3 | Step 4 |
|--------------|---------|--------|---------|---------|
| | β | B | β | β |
| Age | .060 | .060 | .071 | .082 |
| Sex | -.109 | -.114 | -.074 | -.085 |
| Units | .204 | .195** | .160* | .137 |
| Frame | | .036 | .040 | .073 |
| Reading Ease | | .102 | .100 | .064 |
| STWorry | | | .177* | .199* |
| LTWorry | | | .037 | .023 |
| STRisk | | | .055 | .031 |
| LTRisk | | | -.070 | -.078 |
| STSeverity | | | -.003 | -.026 |
| LTSeverity | | | .125 | .085 |
| Pos Mood | | | .028 | -.023 |
| Neg Mood | | | -.006 | .018 |
| Usability | | | | .237** |
| Usefulness | | | | -.025 |
| R^2 | .042* | .054* | .115** | .159*** |
| ΔR^2 | .042* | .012 | .061* | .044** |

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

Results showed that 15.9% of the total variance in total recall was explained by the model. Worry about short-term consequences ($\beta = .199$) and perceptions of usability ($\beta = .237$) were the only significant predictors of accurate recall. Higher perceptions of usability of the leaflet predicted higher recall, and higher worry also predicting higher recall.

A hierarchical multiple linear regression was conducted with false recall as the dependent variable. Results are presented in table 5.6 below.

Table 5.6 Regression on False Recall (n=245)

| | Step 1 | Step 2 | Step 3 | Step 4 |
|----------------|---------|--------|---------|---------|
| | β | B | β | β |
| Age | .068 | -.070 | -.065 | -.068 |
| Sex | -.019 | -.019 | .004 | .004 |
| Units | .061 | .042 | .051 | .056 |
| Frame | | -.020 | -.024 | -.028 |
| Reading Ease | | .180** | .185** | .189** |
| STWorry | | | .160 | .158 |
| LTWorry | | | .055 | .060 |
| STRisk | | | -.034 | -.028 |
| LTRisk | | | -.117 | -.114 |
| STSeverity | | | .037 | .041 |
| LTSeverity | | | .014 | .020 |
| Pos Mood | | | -.024 | -.015 |
| Neg Mood | | | -.086 | -.090 |
| Usability | | | | -.037 |
| Usefulness | | | | -.008 |
| R ² | .009 | .041 | .076 | .077 |
| ΔR^2 | .009 | .032* | .036 | .001 |

Note * $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

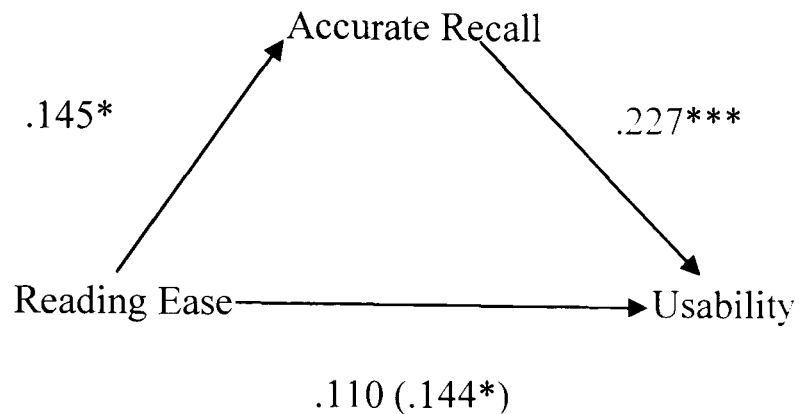
Only 7.7% of the total variance in false recall was explained by the model. Reading ease was individually significant ($\beta = .189$), but the step was not significant overall.

5.5.7. Accurate Recall as a Mediator of the Relationship Between Objective and Subjective Reading Ease.

Accurate recall of the information in the leaflet is used as an indicator of 'comprehension', or 'knowledge uptake'. Mediation analysis was conducted to test whether the effect of reading ease on subjective usability was mediated by accurate recall – i.e. level of comprehension or knowledge uptake of the information in the leaflet. The method for mediation analysis as outlined by

Baron and Kenny (1986) was followed. Results from the analysis are presented in figure 5.3 below.

Figure 5.3. Accurate recall as a mediator of the effect of reading ease on usability



Note. *= $p < .05$, ***= $p < .001$. β coefficients shown are standardised.

Direct path in parentheses.

Sobel test $z = 2.104$, $p < .05$. Results show a significant effect for accurate recall as a mediator of the relationship between objective reading ease and subjective perceptions of usability.

5.5.8. The effect of short-term or long-term health outcomes on perceived risk, severity, worry and intentions.

Perceived risk, severity and worry were measured with both short-term and long-term versions of the items. Short-term outcomes referred to the consequences associated with binge drinking behaviour, and therefore uses intentions to avoid binge drinking as the dependent variable. Long-term outcomes referred to the consequences of consistently drinking beyond the

recommended daily limit, and therefore uses intentions to stay within the daily limits as the dependent variable.

Paired samples t-test were conducted to examine differences in perceived risk, severity, worry and intentions as a function of short or long term drinking behaviour. Means are shown below in table 5.7:

Table 5.7. Table to Show Means and Standard Deviations for Short-Term and Long-Term Outcomes

| Short-term versus Long-term Outcomes Mean (SD) | | |
|--|------------|------------|
| | Short-Term | Long-Term |
| Perceived Risk | 3.08 (1.2) | 2.39 (1.1) |
| Worry | 2.48 (1.1) | 2.24 (1.0) |
| Severity | 3.34 (.95) | 4.18 (.91) |
| Intentions | 2.62 (1.3) | 2.80 (1.2) |

T-tests showed that for perceived risk, participants reported greater perceived risk for short-term drinking than long-term drinking ($t(264)=8.197, p<.001$). Participants were more worried about short term consequences than long-term consequences ($t(264)=3.264, p<.01$). Long term severity was rated as higher than short-term severity ($t(264)=-12.472, p<.001$). Participants reported greater intentions to stay within the daily guidelines than to avoid binge drinking ($t(264)=-2.534, p<.05$).

The means and standard deviations for intentions to avoid binge drinking (short-term intentions) and intentions to follow the daily guidelines (long-term intentions) by each experimental condition (frame and reading ease group) are presented in table 5.8

Table 5.8 Means and standard deviations for intentions to avoid binge drinking and intentions to stay within the daily limits by frame and reading ease.

| Intentions | | | | | |
|--|--|---------------------------------|------------|-------------------------|------------|
| | | Positive Frame (n=119) | | Negative Frame (n=143) | |
| | | Easy (n=142) Difficult (n=120) | | | |
| | | Positive | | Negative | |
| | | Easy | Difficult | Easy | Difficult |
| Intentions to avoid binge drinking | | 2.77 (1.33) | 2.74 (1.2) | 2.49 (1.1) | 2.53 (1.4) |
| Intentions to stay within the daily guidelines | | 2.68 (1.2) | 2.90 (1.3) | 2.73 (1.1) | 2.93 (1.3) |

A 2 (positive, negative) by 2 (easy, difficult) two-way between groups MANOVA for frame and reading ease was conducted on intentions to avoid binge drinking and intentions to stay within the daily guidelines. There was no significant main effect for reading ease group or frame on either measure of intentions, nor was there a significant interaction between the two. These results indicate that for both short-term intentions (binge drinking) and long-term intentions (staying within the daily guidelines) neither of the reading ease manipulations nor the framing manipulations was more effective in influencing intentions. There was no significant interaction between frame and reading ease. Post hoc power calculations were conducted. Reading ease: partial $\eta^2=.011$, observed power = .294. Frame: partial $\eta^2=.017$, observed power = .444. Interaction: partial $\eta^2=.0003$, observed power = .056. These results indicate very small effect sizes, but also that the study was under powered.

5.5.9. Factors influencing intentions

2 multiple hierarchical linear regressions were conducted in order to explore the factors that influenced short term versus long term health consequences. Background variables, perceived risk, severity worry and mood, perceptions of usability and usefulness were included in addition to frame and reading ease. The results of the regression on short-term intentions are presented below in table 5.9.

Table 5.9 Regression on Intentions to Avoid Binge Drinking (n=245)

| | Step 1 β | Step 2 B | Step 3 B | Step 4 B |
|--------------|-------------------|-------------|-------------|-------------|
| Age | -.083 | -.086 | -.073 | -.079 |
| Sex | .056 | .045 | .015 | .006 |
| Units | -.477*** | -.475*** | -.340*** | -.329*** |
| Frame | | .107 | .082 | .090 |
| Reading Ease | | .045 | .060 | .051 |
| Risk | | | -.305*** | -.291*** |
| Worry | | | .072 | .090 |
| Severity | | | .019 | .016 |
| Pos Mood | | | .130 | .128* |
| Neg Mood | | | -.023 | -.018 |
| Usability | | | | .036 |
| Usefulness | | | | -.076 |
| R^2 | .218*** | .232*** | .310*** | .314*** |
| ΔR^2 | .218*** | .014 | .078*** | .004 |

* $p < .05$, ** $p < .01$, *** $p < .001$

R^2 = R square, ΔR^2 = Change in R square

31.4% of the total variance in short-term intentions was explained by the model. Past behaviour ($\beta = -.329$) and risk to self ($\beta = -.291$) both had a negative relationship with short-term intentions, with step 1 (past behaviour) accounting for 21.8% of the total variance and step 3 (cognitions and emotions) accounting for 7.8% of the total variance. Participants who reported a higher amount of units drunk in an average week reported lower intentions

to avoid binge drinking. Participants who perceived themselves to be less at risk reported higher intentions to avoid binge drinking.

The regression was repeated, this time for long-term variables, with the dependent variable being intentions to stay within the daily guidelines. Table 5.10 shows results of the regression.

Table 5.10 Regression on Intentions to Stay Within the Daily Limits (n=243)

| | Step 1 β | Step 2 B | Step 3 B | Step 4 B |
|----------------|-------------------|-------------|-------------|-------------|
| Age | -.002 | -.002 | -.006 | -.005 |
| Sex | .040 | .042 | .038 | .042 |
| Units | -.563*** | -.558*** | -.476*** | -.477*** |
| Frame | | -.028 | -.015 | -.019 |
| Reading Ease | | -.051 | -.049 | -.043 |
| Risk | | | -.168* | -.171* |
| Worry | | | .112 | .110 |
| Severity | | | .086 | .090 |
| Pos Mood | | | .155** | .161** |
| Neg Mood | | | -.019 | -.022 |
| Usability | | | | -.029 |
| Usefulness | | | | .020 |
| R ² | .304*** | .308*** | .347*** | .348*** |
| ΔR^2 | .304*** | .004 | .040* | .001 |

Note*p<.05, **p<.01, ***p<.001
R² = R square, ΔR^2 = Change in R square

34.8% of the total variance in intentions to stay within the daily guidelines was explained by the model. There were only 2 significant predictors of long-term intentions. These were past behaviour ($\beta = -.563$), with step 1 explaining 30% of the total variance, and perceived risk ($\beta = -.171$), with step 3 explaining an additional 4%. Both were negatively associated with long-term intentions – participants who reported a larger number of units consumed each week were less likely to stay within the daily limits, and those who saw the risks as lower

were more likely to stay within the daily limits. The results indicate that there was no difference in predictors of short term and long term intentions.

5.6 Discussion.

5.6.1 Subjective Usability as a Function of Objective Reading Ease, Frame and Mood.

In this study both objective reading ease and frame affected perceptions of the usability of the leaflets. They did not affect perceptions of the usefulness of the leaflets. Easy to read leaflets were rated as more usable than difficult leaflets. Negatively framed leaflets were rated as more usable than positive leaflets. This may be due to the way that people are used to reading about health information. Ferguson et al. (2003) found that in a sample of health and safety leaflets, most of the information was framed negatively. These findings add to the current literature for design of health promotion leaflets by showing how subjective ratings of usability, (which have been shown to influence intentions), can be affected by manipulating reading ease scores and frame of the leaflets.

Positive mood was shown to influence perceptions of the usability of the leaflets. This reflects the findings of the study described in chapter 4, and supports previous research that shows mood can influence evaluations of a range of products/objects (e.g. Gon et al. 1993, Barone et al. 2000, Gardner 1988, Pham et al. 2001). However, results showed that positive mood did not mediate either the effect of objective reading ease on usability or the effect of frame on usability. Mood has previously been shown to moderate the effects

of frame, with positive mood affecting judgements only when the information is written in a positive not negative frame (Wegener et al. 2006). However, in the current study, mood did not moderate the effect of frame on judgements of the usability of the leaflet, nor did it moderate the effect of reading ease on perceptions of usability. Therefore although mood is an important antecedent to perceptions of usability, it does not act through or interact with the features of the leaflets manipulated in this study. These results reinforce the proposition that these characteristics are an important consideration for leaflet designers.

5.6.2 Recall of Information as an Indicator of Information Processing, Comprehension and Knowledge Uptake.

The recall test showed that participants recalled both more accurate and false information after reading the easy leaflet than those reading the difficult leaflet. Typically, increased recall is associated with deeper processing (Craik & Lockhart 1972, Craik & Tulving 1975, Rhodes & Armstrong 2000), therefore these results would suggest that readers of the easy leaflet had processed the information more deeply. This would be contrary to findings that complex messages cause deeper processing (Bradley & Meeds 2002, Kanfer & Ackerman 1989, Lowry 1998, Surber 1992). However, there is evidence to suggest that readers of the easy leaflet had processed the information at a shallow level despite their increased recall of accurate information. Recall is a reflection of the comprehension of text (van Eye et al. 1989, Kintsch 1994). Highly complex messages can adversely affect the encoding and storage of information (Lang 2000, Lang et al. 2000, Thomson

et al. 1985). Specifically, syntactic complexity can interfere with comprehension (Bradley & Meeds 2002, Johnson 1981). It is therefore possible that the greater cognitive effort required to process the difficult text interfered with comprehension. Britton et al (1982), Bradley and Meeds (2002) and Whittingham et al. (2008) suggest that syntactic complexity leaves fewer resources available for processing of the actual substance of the message. Chabet et al 2003 demonstrated that increasing the reading level of text had a negative influence on both recall and persuasion, whilst McKenna and Scott 2007 showed that simply written and clearly presented information improved understanding of health information. The findings from the current study were not inconsistent with this previous research. It is possible that the easy leaflet increased comprehension despite being processed at a shallow level.

Another indication that reading the easy leaflet had caused shallow processing was the higher level of false recall seen for those reading the easy leaflet. Higher levels of false recall in memory tests have been associated with manipulations of processing depth (e.g. Koustaal et al. 1999, McDermott & Watson 2001). Typically, increased false recall occurs when processing is low. False recall is also associated with prior knowledge, with higher levels of prior knowledge increasing false recall (Clark et al. 1999). It is possible that reading the easy leaflet resulted in low level processing of the information, therefore causing readers to rely on either gist based recall or recall based in part on prior knowledge of the topic. Prior knowledge has been shown to be related to information processing and comprehension (e.g. Schneider & Korkel 1989,

Bransford & Johnson 2004). False recall is associated with prior knowledge (Long et al. Year), and prior background knowledge has been shown to predict accurate recall (Morovcsik and Kintsch 1993, Voss et al. 1980).

Results from the current study also showed a mediating role for recall on the effect of objective usability on subjective usability. This may also reflect the important role of knowledge in judgements of usability. Venkatesh & Davis (1990) have previously shown that direct involvement with an information system mediated the relationship between objective and subjective readability. The results of this and the previous study have shown inconsistent findings for the relationship between objective and subjective usability. It is possible then that knowledge mediates that relationship. Reading ease may influence participants' knowledge which in turn influences their perceptions of the usability of the leaflet. The study described in the next chapter will therefore explore the role of knowledge in perceptions of usability and its influence on persuasion.

5.6.3 Reading ease and frame do not affect short or long term intentions.

Despite reading ease influencing perceptions of usability and recall, there were no subsequent effects on intentions. Nor was there any interaction between reading ease and frame. It was predicted that framing effects would be seen for participants reading the easy leaflets. This effect was not seen for either of the temporal conditions (i.e. short term and long term outcomes). It is possible that for this particular sample of university students, higher than average reading ability and education levels may have meant that usability, objective

and subjective, was not an important factor in influencing their intentions to follow the advice in the leaflets, as compared to the sample of workers in chapter 2, where subjective usability was shown to be a good predictor of intentions. In addition, modifying alcohol behaviour in students has been shown to be difficult (Ritter & Cameron 2006). Wechsler et al. (1994) reviewed alcohol consumption statistics in student populations over a number of years. They conclude that ‘the scope of the problem makes immediate results of any intervention seem unlikely’ (pp1677). An alternative explanation to these negative findings are that the studies were underpowered. Post hoc power analyses showed observed power levels that were very low, and it is therefore possible that with more participants significant effects would have been found, although it is noted that the effect sizes found here were also low.

5.6.4 Perceptions of risk, severity and worry differ by proximity of consequences.

Differences were found between the short and long term versions of the variables – participants felt they were more at risk of short-term consequences and were more worried about them, whilst they thought the consequences on long-term alcohol consumption were more serious and intended to stay within the weekly guidelines more than they intended to avoid binge drinking. Students may be more prone to binge drink than to consistently drink more than the daily guidelines. The long-term consequences of excess alcohol consumption might be too distal to be worried about e.g. liver damage and

heart disease for a sample of young students. These differences they were not sensitive to either frame or reading ease.

5.7. Limitations

The recall test for this study was conducted 45 minutes after reading the leaflet. This study did not test the retention of this information over a longer period of time and therefore it is not possible to know whether participants reading the easy leaflet would still be able to recall the information at a later date. Clark et al. (1999) found that differences in recall of information from a nutrition leaflet was transient, lasting less than 30 days after a one time reading. Information obtained by shallow processing methods may not create stable changes in attitudes. Van Nimwegen et al. (2006) suggest that information that is easily learned may be good for immediate persuasion but that it does not create long-term memories unless it is processed deeply. The implications of this possibility for designers of health promotion leaflets, will be discussed in depth in chapter 7.

5.8 Next Chapter

The next chapter will add to the understanding of the concept of subjective usability by exploring the role of prior knowledge and prior intentions on perceptions of the usability of the leaflets. The study will employ pre and post testing in order to gauge a more accurate picture of the differential change in intentions caused by reading easy/difficult and positive negatively framed leaflets.

Ch. 5 - The Effect of Reading Ease and Frame on Recall of Health Information

CHAPTER 6

The Effect of Reading Ease and Frame on Intentions – a Pre and Post Test.

6.1 Overview

The previous chapter showed that both objective reading ease and frame affected judgements of the usability of the leaflet. Perceptions of usefulness were not affected by these factors. Neither reading ease or frame affected short or long term intentions. Objective reading ease affected recall of the information contained in the leaflet, with those reading the easy leaflet recalling more information, although this was true of false recall as well as accurate recall. These findings indicate a possible role for prior knowledge in influencing recall (Koustraal et al. 1999, McDermott and Watson 2001). Accurate recall mediated the relationship between objective and subjective usability. As experience of an information system has been shown previously to mediate this relationship (Ventakesh and Davis 1996), the possible role of prior knowledge in influencing subjective usability may be indicated.

6.2 Aims of the Current Study

The study differed from the previous studies in the thesis in that it employed pre and post measures to test the hypotheses. There were three main aims, these were (1) to further explore the factors that influence subjective usability, specifically prior intentions and prior knowledge (reader characteristics) and objective reading ease and frame (leaflet characteristics), and to explore the incremental validity of these items in respect to variables from the Theory of

Planned Behaviour and Health Belief Model, (2) to study the effect of objective reading ease and frame on intentions to avoid binge drinking and intentions to stay within the daily limits (ie. short and long term intentions), and (3) to test the effect of prior knowledge as a moderator of the effect of subjective usability on intentions. These aims are discussed in more detail below.

6.2.1 Usability as a function of leaflet and reader characteristics

Results from the studies described in chapters 4 and 5 have shown an inconsistent relationship between objective and subjective usability. Chapter 4 showed no effect of reading ease on perceptions of usability, whilst an effect was described in chapter 5, with easy leaflets influencing higher ratings of their usability. Frame has also been inconsistently related to subjective usability, either showing no effect or showing that negatively framed leaflets are perceived as more usable than positively framed leaflets. The current study will again test the effect of both reading ease and frame on perceptions of usability in order to establish a more consistent pattern of results. The current study will include measures from the Theory of Planned Behaviour to explore the role of social norms, attitudes and perceived behavioural control on perceptions of usability. The effect of a sample of reader characteristics (psychological constructs, mood, background variables) on perceptions of usability has also been explored in this series of studies. The current study will add to the understanding of subjective usability of health information leaflets by testing whether it is a function of prior knowledge and prior intentions.

6.2.1.1 Prior knowledge

The role of prior knowledge in information processing has been well documented. Prior word knowledge has been shown to positively affect processing of print adverts (Dirso & Shore 1991), and has been demonstrated to influence recall. Alexander et al. (1994), and Alexander et al. (1995) showed that subject matter knowledge and domain knowledge predict recall and Voss et al (1980) found that high knowledge subjects demonstrated increased recall over low knowledge subjects. This effect has been shown to persist over time. Schneider and Korkel (1989) showed that prior knowledge increased recall 1 year after the exposure to the new information. They found that recall was a function of prior knowledge and was not related to general aptitude. Bransford and Johnson (2004) state that contextual knowledge is a prerequisite for comprehension. Effective comprehension involves linking new information with prior knowledge (Whittingham et al. 2008). Once these connections have been made, the new information can enter into long-term memory. These findings suggest that individuals with high prior knowledge of specific health risks should find new, but related, information easier to comprehend. Therefore their perceptions of the usability of the information would be expected to be higher. Prior knowledge will be measured via 2 items asking respondents how well-informed they feel they are about both short-term and long-term consequences associated with alcohol consumption. Prior knowledge measured here is therefore subjective prior knowledge as no objective test of actual knowledge was administered. It is predicted that subjective usability will be positively associated with perceptions of prior knowledge.

6.2.1.2 Prior Intentions

Subjective usability may also be a function of the recipients' prior intentions to follow safe practice. Individuals must have both the ability and the motivation to process information (Craik & Lockhart 1972, Petty & Cacioppo 1986). Chebat et al (2003) found that motivation moderated the effect of readability on persuasion. Individuals who already intend to follow safe behaviour may therefore be more motivated to process the information in the leaflet and consequently find them more usable. Intentions will be measured both before and after reading the leaflet. It is predicted that prior intentions (i.e. intentions score before reading the leaflet) will be associated with perceptions of the usability of the leaflet.

6.3 Reading ease as a moderator of framing effects

The effect of reading ease and frame on intentions to avoid binge drinking and to stay within the daily guidelines will be tested. A main effect is predicted for reading ease. Good comprehension of arguments has been shown to facilitate persuasion (Chaiken & Eagley 1976, Eagley 1974, Eagley & Warren 1976). Manipulating features of text that reduce its complexity have been shown to promote increased comprehension (Bradley & Meeds 2002, Chebat et al. 2003, McKenna & Scott 2007, Whittingham et al. 2008). Therefore reading the easy leaflet should increase comprehension and therefore result in increased persuasion. Text complexity is also associated with depth of processing, with high complexity text requiring deeper processing (Bradley &

Meeds 2002, Lowry 1998). It is therefore predicted that reading the easy leaflet will result in processing the information at a shallow, heuristic level. According to dual processing models of persuasion for example the Elaboration Likelihood Model (Petty & Cacioppo 1986, and the Heuristic-Systematic Model (Chaiken 1980), deep processing will lead to judgements made using systematic evaluation of the arguments, whilst heuristic processing will lead to judgements being made using peripheral cues such as frame. Therefore it is predicted that framing effects will only be observed for those participants reading the easy leaflet. According to Rothman and Salovey's (1997) framework, as safe alcohol consumption is a prevention behaviour, a positive frame should be more persuasive. Levin et al's (1998) typology of framing effects would predict a more persuasive effect for the negative frame due to the negativity bias.

The influence of frame and reading ease on intentions will be studied in relation to the influence of variables that have previously been shown to be good predictors of health behaviours and behavioural intentions.

6.4 Theory of planned behaviour and health belief model variables as predictors of alcohol behaviour.

The study will test the incremental validity of the leaflet manipulations in respect to variables that have been shown previously to predict alcohol behaviour. Variables from the Theory of Planned Behaviour (TPB) have been shown to be good predictors of alcohol behaviour. The TPB (Ajzen 1991) proposes that attitudes, subjective norms and perceived behavioural control

lead to the formation of behavioural intentions, which in turn will predict intentions. Attitudes are defined as ‘the degree to which performance of the behaviour is positively or negatively associated’, subjective norms as the ‘perceived social pressure to engage or not to engage in the behaviour’, and perceived behavioural control as ‘perceptions of (an individual’s) ability to perform a given behaviour (Ajzen 1991). Typically, more favourable attitudes and higher perceived behavioural control and social norms predict stronger behavioural intentions. A number of studies have shown the TPB to account for on average 30% of the variance in single occasion drinking behaviour (Murgraff et al. 2001, Norman et al. 1998), and more than 45% of binge drinking behaviour (Armitage et al. 2002). This study will use measures of Perceived Behavioural Control, Attitudes and Social Norms from the TPB. Variables from the Health Belief Model (perceptions of risk and severity) and worry will also be included. These items were described and used in the studies described in chapters 2, 3, and 5.

6.5 Prior knowledge as a moderator of the effect of usability on intentions

The persuasive effect of usability on intentions may be moderated by level of prior knowledge. Comprehension involves connecting new information to prior knowledge (Whittingham et al 2008). Comprehension of a health information leaflet may therefore be influenced by the reader’s prior knowledge. As comprehension has been shown to influence persuasion (Chaiken and Eagley 1976, Eagley 1974, Eagley and Warren 1976), the influence of usability on intentions may be moderated by the reader’s level of prior knowledge. Participants’ with a high level of knowledge may find the

leaflet easy to comprehend and therefore not be sensitive to the usability of the leaflet when making judgements. Participants low in knowledge may be more sensitive to the usability of the text for their comprehension, which in turn may affect the persuasive effect of the leaflet. The moderating role of perceived prior knowledge on the relationship between usability and intentions will therefore be tested.

6.6 Hypotheses

- 1) Perceptions of usability will be positively associated with prior knowledge and prior intentions (reader characteristics).
- 2) Objective reading ease and frame (leaflet characteristics) will affect perceptions of usability. Easy to read leaflets will be perceived as more usable than difficult leaflets. Negatively framed leaflets will be perceived as more usable than positively framed leaflets.
- 3) Reading the easy leaflets will be more persuasive than difficult leaflets. Framing effects will be observed only for those reading the easy leaflets.
- 4) Prior knowledge will modify the relationship between usability and intentions.

6.7 Methods

6.7.1 Participants:

Participants were a convenience sample of 135 university students, recruited via an announcement made by the researcher at the start of a lecture. There were 48 females and 78 males in the sample, with a mean age of 18.43 (.76).

6.7.2 Materials:

Four new leaflets were designed for the study. The development of the leaflets is outlined below. The leaflets were modified versions of those used in the previous 2 alcohol studies, entitled ‘Think about drink’. The frame of the leaflets was manipulated – leaflets either highlighted the benefits of drinking safely (positive frame), or highlighted the risks associated with not drinking safely (negative frame). The same information was contained in each statement made, only the frame of the statement differed, for example ‘drinking less than the safe limits can reduce the risk of long-term damage to your health’ (positive frame), versus ‘drinking more than the safe limits can increase the risk of long-term damage to your health’ (negative frame). The leaflets were also manipulated by reading ease. Leaflets were either ‘easy’ to read or ‘difficult’ to read. Reading ease was manipulated via Flesch reading ease scores. Readability and framing manipulations are discussed in more detail below. The order of the information and the number of sections was identical between leaflets. Modifications were made to try to optimise the effect of ‘frame’ on persuasion. The ‘dose’ of framing manipulation was increased to **62%** of the total information in the leaflet. Further slight changes were made to the wording between positive and negative frames. Where a statement was framed, the difference in exact wording between the positive and negative versions was reduced to a minimum where possible in order to reduce any possibility of effects being caused by any other cue than whether the statement was gain or loss framed.

6.7.2.1 Readability

Readability was manipulated by increasing word and sentence length and increasing the number of passive sentences. Readability scores were obtained using the Flesch Reading Ease/Flesch-Kincaid Grade Level scoring system (Flesch 1948). The final readability scores for each leaflet were:

Table 6.1: Table to show readability statistics for modified alcohol leaflets

| Leaflet Type | Flesch Reading Ease Score | Flesch-Kincaid Grade Level (age) |
|--------------------|---------------------------|----------------------------------|
| Easy-Positive | 73.1 | 6.8 (10 years) |
| Easy-Negative | 73.3 | 6.7 (10 years) |
| Difficult-Positive | 47.8 | 10.9 (14 years) |
| Difficult-Negative | 47.8 | 10.9 (14 years) |

6.7.2.2. Framing

Information in the gain and loss framed leaflet was obtained from existing NHS alcohol information leaflets. Consistent with the previous leaflets, the modified leaflets contained a balance of information about causes, consequences and solutions. The leaflet contained 2 sections of information about the causes and consequences of excess consumption of alcohol. One of these sections contained information specifically about the long term risks associated with excess alcohol consumption. The other section contained information specifically about the short-term risks associated with one-off ‘binges’ of alcohol consumption. The third and final section of information in the leaflet contained information about how to keep within safe limits of

alcohol consumption. **62%** of text was 'framed'. (i.e. positive or negative). Framed information was placed throughout all sections the leaflet. The remaining text was identical between the positively and negatively framed leaflets. The modified framing and readability manipulations can be seen on the following pages in tables 6.2 and 6.3. Shaded sections show where gain and loss framed leaflets differed. The remainder of the text was identical.

Table 6.2 Table to show readability and framing manipulations for easy leaflets

| Easy – Positive | Easy – Negative |
|--|--|
| Drinking a small amount of alcohol at the right time can be safe. | Drinking a large amount of alcohol or at the wrong time can be harmful. |
| This leaflet tells you how you can reduce the risks caused by alcohol by drinking safely. | This leaflet tells you how you can increase the risks caused by alcohol by not drinking safely. |
| People sometimes dismiss the idea that they need to think about how much they drink. | People sometimes dismiss the idea that they need to think about how much they drink. |
| But drinking less than the safe limits can reduce the risk of long-term damage to your health. | But drinking more than the safe limits can increase the risk of long-term damage to your health. |
| If you drink less than the daily benchmarks you reduce your risk of liver damage, cirrhosis of the liver, and cancers of the mouth and throat. | If you drink more than the daily benchmarks you increase your risk of liver damage, cirrhosis of the liver, and cancers of the mouth and throat. |
| Drinking alcohol raises blood pressure. | Drinking alcohol raises blood pressure. |
| If you keep your alcohol use within the daily benchmarks you reduce the risk of ill health caused by high blood pressure. | If you do not keep your alcohol use within the daily benchmarks you increase your risk of ill health caused by high blood pressure. |
| Such problems include coronary heart disease and some kinds of stroke that are related to drinking too much. | Such problems include coronary heart disease and some kinds of stroke that are related to drinking too much. |
| If you keep within the daily guidelines you may also reduce the risk of psychological and emotional problems, for example depression. | If you do not keep within the daily guidelines you may also increase the risk of psychological and emotional problems, for example depression. |
| Depression is often linked to heavy drinking. | Depression is often linked to heavy drinking. |

| | |
|---|--|
| Most short-term problems from drinking come from one-off episodes of heavy drinking and drunkenness. | Most short-term problems from drinking come from one-off episodes of heavy drinking and drunkenness. |
| Alcohol affects coordination and reaction times. | Alcohol affects coordination and reaction times. |
| If you are not drunk you are less likely to have accidents. | If you are drunk you are more likely to have accidents. |
| About half of adult pedestrians killed in road accidents have blood alcohol levels above the legal drink drive limit. | About half of adult pedestrians killed in road accidents have blood alcohol levels above the legal drink drive limit. |
| If you do not drink a lot of alcohol in one go you can avoid putting a strain on your liver and other parts of your body. | If you drink a lot of alcohol in one go you can put a strain on your liver and other parts of your body. |
| If you are not drunk, you are less likely to be involved in violent crime, domestic violence, and abuse. | If you are drunk, you are more likely to be involved in violent crime, domestic violence, and abuse. |
| The daily benchmarks for adult men and women are a guide to how much you can drink without putting your health at risk. | The daily benchmarks for adult men and women are a guide to how much you can drink before putting your health at risk. |
| They apply whether you drink every day, once or twice a week, or occasionally. | They apply whether you drink every day, once or twice a week, or occasionally. |
| The benchmarks are not targets to drink up to. | The benchmarks are not targets to drink up to. |
| For men , if you drink less than 4 units a day there is no increased risk to your health. | For men , if you drink more than 4 units a day there is an increased risk to your health. |
| For women , if you drink less than 3 units a day there is no increased risk to your health. | For women , if you drink more than 3 units a day there is an increased risk to your health. |

| | |
|---|--|
| <p><u>A rough guide to the number of units in some popular drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit.</u></p> | <p><u>A rough guide to the number of units in some common drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit.</u></p> |
| <p>It is NOT ok to 'save up' units for the weekend.</p> | <p>It is NOT ok to 'save up' units for the weekend.</p> |
| <p>If you do not 'binge drink' or drink a lot in one go, you reduce your risk of most of the problems linked to drinking alcohol.</p> | <p>If you 'binge drink' or drink a lot in one go, you increase your risk of most of the problems linked to drinking alcohol.</p> |

Table 6.3 Table to show readability and framing manipulations for difficult leaflets.

| Difficult – Positive | Difficult – Negative |
|---|---|
| Drinking sensibly or on appropriate occasions can be safe. | Drinking excessively or on inappropriate occasions can be harmful. |
| This leaflet outlines what can reduce the risks associated with alcohol consumption. | This leaflet outlines what can increase the risks associated with alcohol consumption. |
| People sometimes disregard the idea that they need to contemplate the amount of alcohol they consume. | People sometimes disregard the idea that they need to contemplate the amount of alcohol they consume. |
| But drinking within the safe limits can decrease the risk of long-term damage to your health. | But drinking in excess of the safe limits can increase the risk of long-term damage to your health. |
| By consuming alcohol within the daily benchmarks you reduce your risk of liver damage, cirrhosis of the liver, and oral and oesophageal cancers. | By consuming alcohol in excess of the daily benchmarks you increase your risk of liver damage, cirrhosis of the liver, and oral and oesophageal cancers. |
| Blood pressure is increased by alcohol consumption. | Blood pressure is increased by alcohol consumption. |
| If your alcohol consumption is maintained at a level within the daily benchmarks you reduce the risk of ill health caused by increased blood pressure such as coronary heart disease and particular types of stroke that are associated with excess alcohol consumption. | If your alcohol consumption is not maintained at a level within the daily benchmarks you increase your risk of ill health caused by increased blood pressure such as coronary heart disease and particular types of stroke that are associated with excess alcohol consumption. |
| By maintaining alcohol consumption at a level within the daily guidelines you may in addition reduce the risk of susceptibility to psychological and emotional problems, for example depression, that are frequently associated with heavy drinking. | By not maintaining alcohol consumption at a level within the daily guidelines you may in addition increase the risk of susceptibility to psychological and emotional problems, for example depression, that are frequently associated with heavy drinking. |
| Most short-term problems from drinking come from one-off episodes | Most short-term problems from drinking come from one-off episodes |

| | |
|---|---|
| of heavy drinking and drunkenness. | of heavy drinking and drunkenness. |
| Physical coordination and reaction times are affected by alcohol so by not being intoxicated you are less likely to sustain accidents. | Physical coordination and reaction times are affected by alcohol, so by being intoxicated you are more likely to sustain accidents. |
| In approximately fifty percent of adult pedestrian road accident fatalities, the victims have blood alcohol levels exceeding the statutory drink drive limit. | In approximately fifty percent of adult pedestrian road accident fatalities, the victims have blood alcohol levels exceeding the statutory drink drive limit. |
| By avoiding consuming excessive amounts of alcohol in one session you decrease the risk of putting a strain on your liver and other parts of your body. | By consuming excessive amounts of alcohol in one session you increase the risk of putting a strain on your liver and other parts of your body. |
| By not being intoxicated you decrease your likelihood of being involved in violent crime, domestic violence, and abuse. | By being intoxicated you increase your likelihood of being involved in violent crime, domestic violence, and abuse. |
| A guide to how much alcohol you can consume without putting your health at risk is outlined by the daily benchmarks for men and women. | A guide to how much alcohol you can consume before you are putting your health at risk is outlined by the daily benchmarks for men and women. |
| These are applicable whether you drink every day, once or twice a week, or occasionally. | These are applicable whether you drink every day, once or twice a week, or occasionally. |
| The benchmarks are not targets to drink up to. | The benchmarks are not targets to drink up to. |
| For men , if your alcohol consumption level is below 4 units a day there will be no significant risks to your health. | For men , if your alcohol consumption level is over 4 units a day there will be significant risks to your health. |
| For women , if your alcohol consumption level below 3 units a day there will be no significant risks to your health. | For women , if your alcohol consumption level is over 3 units a day there will be significant risks to your health. |
| An <i>approximate</i> guide to the number of units in a selection of popular | An <i>approximate</i> guide to the number of units in a selection of popular |

| | |
|---|--|
| <u>drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit.</u> | drinks is: a half pint of ordinary strength lager/beer/cider = 1 unit; a 25ml pub measure of spirits = 1 unit; a small glass of wine = 1 unit. |
| It is NOT acceptable to 'save up' units for the weekend. | It is NOT acceptable to 'save up' units for the weekend. |
| Avoiding 'binge drinking' or consuming large quantities in one session reduces the risk of most of the problems associated with drinking alcohol. | 'Binge drinking' or consuming large quantities in one session increases the risk of most of the problems associated with drinking alcohol. |

6.7.3. Measures

2 questionnaires were developed. The first was completed before reading the leaflet to measure existing attitudes and behavioural intentions. The second was completed a short while after reading the leaflet.

6.7.3.1. Pre-leaflet questionnaire:

Alcohol-related cognitions and emotions and intentions: The questionnaire contained items adapted from the Theory of Planned Behaviour to measure social norms, perceived behavioural control and attitudes. All TPB items were adapted from the Azjen website. A short term and long term version of each variable was created. Items to measure long term social norms were: 'most people who are important to me think that I should keep my drinking to within safe limits.', and 'most people with whom I am acquainted keep their drinking to within safe limits' (Chronbach's $\alpha=.60$). Items to measure short-term social norms were 'most people who are important to me think that I should avoid binge drinking' and 'most people with whom I am acquainted avoid binge drinking' (Chronbach's $\alpha=.58$). Items to measure long-term perceived behavioural control were 'whether or not I keep my alcohol consumption within safe limits is completely up to me', and 'I am confident that if I wanted to I could keep my drinking to within safe limits' (Chronbach's $\alpha=.36$). Item to measure short-term perceived behavioural control were 'whether or not I avoid binge drinking is up to me', and 'I am confident that if I wanted to I could avoid binge drinking' (Chronbach's $\alpha=.28$). These items were measured on a 6 point Likert-type scale ranging from 1 = strongly disagree to 6 = strongly agree.

These sections each included an item to measure how well informed participants felt they were about the effects of alcohol ‘to what extent do you feel you are well-informed about short-term (long-term) consequences associated with alcohol intake?’; an item to measure worry ‘how worried are you about suffering short-term (long-term) ill-health through alcohol consumption?’ and one to measure severity ‘how serious do you think the short-term (long-term) health risks associated with excess alcohol consumption are?’. There were also 2 items in each section to measure perceptions of risk (risk to self and risk to others): These were ‘to what extent do you feel you are personally at risk from the short-term (long-term) consequences associated with excess alcohol consumption?’ and ‘to what extent do you feel your friends are at risk from the short-term (long-term) consequences associated with excess alcohol consumption?’.

Long-term and short-term attitudes were measured. Short-term items measured how useful, important, enjoyable and pleasant ‘avoiding drinking too much alcohol in one session’ would be. Long-term items measured how useful, important, enjoyable and pleasant ‘drinking fewer alcoholic drinks than the weekly recommended limit’ (long-term) would be. These items were measured on a 6 point scale where 1 = of no use, unimportant, unenjoyable, unpleasant, and 6 = useful, important, enjoyable, pleasant. Short-term attitudes Chronbach’s $\alpha=.86$, Long-term attitudes Chronbach’s $\alpha=.87$.

In addition to the TPB items, single items from the Health Belief Model measured short term and long term perceived risk ‘to what extent do you

believe you are at risk from the short-term/long-term consequences of excess alcohol consumption?', and perceived severity 'to what extent do you believe that you are at risk from the short-term/long-term consequences of excess alcohol consumption'. Short-term and long-term worry were measured with single items 'how worried are you about the short-term/long-term consequences of excess alcohol consumption'.

Intentions: Short-term and long-term intentions were measured using scales adapted from the TPB (Ajzen 1991). 3 items measured short-term intentions. These were 'to what extent will you make an effort to avoid binge drinking', 'to what extent do you want to avoid binge drinking', and 'to what extent do you intend to avoid binge drinking'. (Cronbach's $\alpha=.96$). 3 items measured long-term intentions 'to what extent will you make an effort to keep your weekly alcohol intake within safe limits' 'to what extent do you want to avoid drinking more than the recommended weekly limits' and 'to what extent do you intend to keep your weekly alcohol consumption to within safe limits' (Cronbach's $\alpha=.92$). These items were measured on a 6 point Likert-type scale ranging from 1 = not at all to 6 = extremely.

Biographics: Participants age and sex were recorded.

Prior behaviour: Prior behaviour (i.e. amount of alcohol currently consumed over the course of a typical week) was measured using a chart that asked participants how many units of alcohol they drank in an average week. Participants were asked to write down the number of units they drank for each

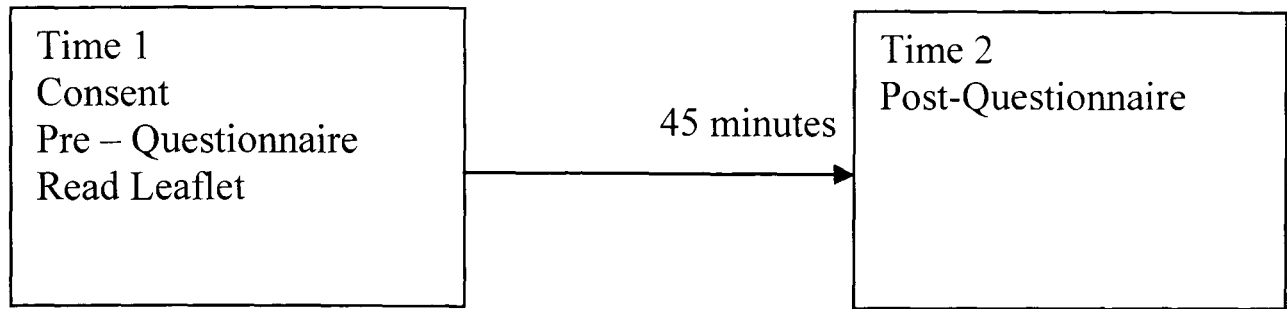
individual day of the week. Participants were reminded of the typical number of units in common drinks at the top of the chart. This line read: '1 unit = half pint lager/beer/cider; 25ml spirits or small glass of wine.'

Post-leaflet questionnaire: The post leaflet questionnaire contained the following items: *Usability and usefulness*: the usability and usefulness of the leaflets was measured using the 5 item scale developed in chapter 2 and used in all studies. The post-leaflet questionnaire also repeated all items from the pre-leaflet questionnaire: apart from age, sex and prior behaviour.

6.7.4 Procedure:

Participants were recruited at the beginning of lectures. All participants signed consent forms making them aware that participation was voluntary. Participants were asked to first complete the pre-leaflet questionnaire. Immediately after they had completed the questionnaire, participants were asked to read one of the 4 experimental leaflets. Pre leaflet questionnaires were collected in, but participants kept the leaflets. Participants then had their lecture, which lasted approximately 45 minutes. At the end of the lecture they were asked to complete the post-leaflet questionnaire. Participants were able to refer to the leaflets whilst completing their questionnaires. Figure 6.1 shows the timeline for the study:

Figure 6.1 Figure to show study timeline:



Participants were then thanked for their time and their completed questionnaires collected in. They were then given an NHS leaflet on safe alcohol use to take away. Participants were also given information sheets with helpline numbers for various health and alcohol-related organisations. Each participant was given a raffle ticket for taking part, with a chance to win a £30 shopping voucher.

6.8 Results

6.8.1 Sample equivalence

Participants' demographic data was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on participants' age. The results showed that there were no significant effects for age by either frame or reading ease group. This indicated that subjects were of the same age across the two conditions for both frame and reading ease. There were significantly more males than females across the sample ($\chi^2 = 7.143$ $p < .01$). However, a chi-square test indicated that there were no

differences across conditions for number of males and females for either reading ease group ($\chi^2 = 0.8$, $p=.464$) or frame ($\chi^2 = 0.9$, $p=.364$).

Participants' past behaviour was examined to ensure matched groups for each experimental condition. A two-way (1) frame (positive vs negative) by (2) reading ease (easy vs difficult) between subjects ANOVA was conducted on number of units drunk in an average week. The results showed that there were no significant effects for number of units drunk by either frame or reading ease. This indicated that participants' past drinking behaviour did not vary significantly across the two conditions.

6.8.2 Means, standard deviations and correlations for all variables

Means, standard deviations and zero order correlations for all variables on all data are presented in table 6.4. Results show positive correlations between the TPB measures and intentions. There were no correlations between usability or usefulness and intentions for this sample. Short-term intentions were correlated with prior knowledge. There were no significant correlation between prior intentions and usability, indicating that usability is not a function of prior intentions.

Table 6.4 All correlations

| | Mean (SD) | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|------------|------------|------------|--------|---------|--------|--------|--------|--------|---------|---------|--------|--------|--------|
| | Pre | Post | | | | | | | | | | | |
| Age (1) | 18.4(0.8) | N/M | 1 | -.092 | -.138 | -.134 | .152 | .136 | -.113 | .065 | .280** | .071 | .181* |
| Units (2) | 18.6(18.7) | N/M | -.092 | 1 | -.107 | -.147 | -.520 | -.450 | -.400** | -.476** | -.120 | -.010 | -.257* |
| STPBC(3) | 5.39 (0.8) | 5.19 (1.0) | -.155 | -.169 | 1 | .828** | .170 | .284** | .189* | .250** | -.116 | -.193* | .073 |
| LTPBC(4) | 5.20 (0.9) | 5.08 (1.0) | -.121 | -.187* | .352** | 1 | .191* | .295** | .178* | .191* | -.108 | -.210* | .116 |
| STAtt(5) | 3.96 (1.3) | 4.17 (1.3) | .043 | -.510** | .004 | .206* | 1 | .833** | .496** | .537** | .251** | .106 | .428* |
| LAtt(6) | 4.00 (1.3) | 4.14 (1.2) | .135 | -.440** | .134 | .322* | .692** | 1 | .412** | .530** | .327** | .133 | .448* |
| STSoc(7) | 3.39 (1.4) | 3.57 (1.2) | -.004 | -.424** | -.016 | .284** | .588** | .484** | 1 | .773** | .195* | .174* | .267* |
| LTSoc(8) | 3.71 (1.3) | 3.69 (1.2) | .011 | -.461** | .019 | .275** | .459** | .487** | .696** | 1 | .261** | .111 | .312* |
| STworr(9) | 2.86 (1.6) | 2.92 (1.4) | .168 | -.234 | -.097 | .038 | .433** | .478** | .264** | .305** | 1 | .594** | .402* |
| LWorr(10) | 2.90 (1.5) | 2.90 (1.5) | .254** | -.138 | -.007 | .086 | .223* | .364** | .168 | .253** | .568** | 1 | .151 |
| STsev(11) | 3.91 (1.3) | 4.09 (1.3) | .081 | -.328** | -.006 | .126 | .360** | .304** | .339** | .190* | .491** | .312** | 1 |
| Lsev(12) | 4.70 (1.3) | 4.68 (1.2) | .054 | -.362** | .287** | .304** | .334** | .472** | .338** | .294** | .277** | .250** | .436* |
| STinf(13) | 4.47 (1.2) | 4.59 (1.1) | -.022 | -.124 | .138 | .277** | -.051 | .041 | .021 | .103 | -.037 | .000 | .063 |
| Linf(14) | 4.41 (1.3) | 4.58 (1.2) | -.064 | -.051 | .098 | .250** | .002 | .079 | .051 | .092 | .063 | .032 | .234* |
| STrisk(15) | 2.50 (1.4) | 2.50 (1.4) | -.045 | .112 | .026 | .003 | .066 | .122 | .043 | .030 | .346** | .245** | .109 |
| LTrisk(16) | 2.33 (1.3) | 3.26 (1.3) | .107 | .134 | .065 | -.158 | .020 | .041 | -.069 | -.057 | .276** | .467** | .062 |
| SToth(17) | 3.11 (1.3) | 2.45 (1.3) | -.069 | -.237** | .179* | -.001 | .313** | .318** | .105 | .140 | .425** | .365** | .299* |
| Ltot(18) | 3.11 (1.3) | 3.10 (1.1) | .035 | -.184* | .160 | -.053 | .319** | .355** | .136 | .093 | .358** | .482** | .207* |
| Usabi(19) | N/M | 4.38 (0.9) | .043 | .009 | -.024 | .090 | .088 | .113 | -.036 | .127 | -.046 | -.117 | .110 |
| Usefu(20) | N/M | 3.10 (1.1) | -.053 | .154 | -.139 | -.207 | -.003 | -.041 | -.037 | -.073 | .153 | .335** | .040 |
| STInt(21) | 3.90 (1.7) | 4.09 (1.5) | .102 | -.596** | .046 | .042 | .646** | .513** | .522** | .407** | .419** | .166 | .493* |
| LInt(22) | 3.96 (1.4) | 4.04 (1.5) | .101 | -.695** | .129 | .175* | .637** | .581** | .540** | .560** | .351** | .225** | .457* |

Table 6.4 continued

| | Mean (SD) | | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
|------------|------------|------------|---------|--------|--------|--------|--------|--------|--------|---------|--------|---------|---------|
| | Pre | Post | | | | | | | | | | | |
| Age (1) | 18.4(0.8) | N/M | .052 | .006 | -.097 | .031 | .042 | .105 | .052 | .043 | -.053 | .174* | .173* |
| Units (2) | 18.6(18.7) | N/M | -.397** | -.051 | -.133 | .165 | .152 | -.202* | -.209* | .009 | .154 | -.565** | -.596** |
| STPBC(3) | 5.39 (0.8) | 5.19 (1.0) | .396** | .456** | .488** | -.207* | -.175* | .027 | -.039 | .213* | -.073 | .109 | .166 |
| LTPBC(4) | 5.20 (0.9) | 5.08 (1.0) | .375** | .482** | .413** | -.172 | -.159 | .080 | -.039 | .264** | -.026 | .112 | .185* |
| STAtt(5) | 3.96 (1.3) | 4.17 (1.3) | .471** | .112 | .206** | -.003 | -.036 | .161 | .204* | .134 | .031 | .734** | .717** |
| LAtt(6) | 4.00 (1.3) | 4.14 (1.2) | .542** | .174* | .273** | .065 | -.030 | .205* | .230** | .172 | .122 | .600** | .652** |
| STSoc(7) | 3.39 (1.4) | 3.57 (1.2) | .284** | .125 | .191* | -.080 | -.031 | .131 | .132 | -.082 | .008 | .529** | .568** |
| LSoc(8) | 3.71 (1.3) | 3.69 (1.2) | .402** | .158 | .279** | -.125 | -.087 | .118 | .105 | .067 | -.015 | .626** | .537** |
| STworr(9) | 2.86 (1.6) | 2.92 (1.4) | .199* | -.003 | .022 | .343** | .284** | .311** | .254** | -.081 | .402** | .240** | .289** |
| LTwor(10) | 2.90 (1.5) | 2.90 (1.5) | .064 | -.067 | -.065 | .488** | .358** | .358** | .445** | -.105 | .443** | .010 | .084 |
| STsev(11) | 3.91 (1.3) | 4.09 (1.3) | .550** | .199* | .263** | .200* | .044 | .190* | .228** | .008 | .105 | .596** | .525** |
| Lsev(12) | 4.70 (1.3) | 4.68 (1.2) | 1 | .379** | .451** | -.028 | -.016 | .199* | .080 | .164 | .075 | .452** | .593** |
| STinf(13) | 4.47 (1.2) | 4.59 (1.1) | .184* | 1 | .709** | .133 | -.044 | .224** | .079 | .400** | .082 | .073 | .126 |
| Linf(14) | 4.41 (1.3) | 4.58 (1.2) | .283** | .646** | 1 | -.049 | -.107 | .107 | .088 | .323** | -.026 | .179* | .254** |
| STrisk(15) | 2.50 (1.4) | 2.50 (1.4) | .125 | -.063 | -.024 | 1 | .504** | .383** | .434** | -.037 | .391** | -.061 | -.026 |
| LTrisk(16) | 2.33 (1.3) | 3.26 (1.3) | .057 | -.119 | -.086 | .486** | 1 | .355** | .774** | -.281** | .269** | -.066 | -.103 |
| SToth(17) | 3.11 (1.3) | 2.45 (1.3) | .225* | -.037 | .025 | .296** | .296** | 1 | .442** | -.026 | .126 | .161 | .246** |
| LTot(18) | 3.11 (1.3) | 3.10 (1.1) | .262** | .032 | .052 | -.104 | .293** | .602** | 1 | -.131 | .103 | .162 | .200* |
| Usabi(19) | N/M | 4.38 (0.9) | -.025 | .215* | .130 | .117 | -.117 | -.097 | -.078 | 1 | .190* | .089 | .129 |
| Usefu(20) | N/M | 3.10 (1.1) | -.097 | -.055 | -.042 | .324** | .356** | .039 | .181* | .190* | 1 | .012 | .034 |
| STInt(21) | 3.90 (1.7) | 4.09 (1.5) | .360** | -.010 | .065 | -.114 | -.092 | .243** | .201* | -.015 | -.151 | 1 | .866** |
| LInt(22) | 3.96 (1.4) | 4.04 (1.5) | .488** | .018 | .145 | -.083 | -.104 | .291** | .242* | .050 | -.097 | .815** | 1 |

6.8.3. Factors influencing perceptions of usability and usefulness.

6.8.3.1 Leaflet characteristics

The effect of frame and reading ease on perceptions of the usability and usefulness of the leaflets were explored. The means and standard deviations for usability and usefulness by reading ease and frame are presented in table 6.5 below.

Table 6.5 Means and standard deviations for usability and usefulness by frame and reading ease

| Perceived Usability and Usefulness | | | | |
|------------------------------------|------------|------------|------------|------------|
| | Positive | | Negative | |
| | Easy | Difficult | Easy | Difficult |
| Usability | 4.49 (0.8) | 4.02 (1.0) | 4.66 (0.8) | 4.30 (0.9) |
| Usefulness | 3.07 (1.2) | 3.09 (1.0) | 3.17 (1.1) | 3.04 (1.0) |

A 2 (frame: positive, negative) by 2 (reading ease: easy, difficult) two-way between subjects MANOVA was conducted on perceptions of usability and usefulness. There was a significant main effect for reading ease ($F(2,129)=3.697, p<.05$). Univariate F tests revealed that this effect was significant only for usability ($F(1,130)=7.393, p<.01$). Participants reading the easy leaflet rated the leaflet as more usable than those reading the difficult leaflet. There were no significant effects for frame on perceived usability or usefulness, nor was there a significant interaction between frame and reading ease. Post hoc power analyses were conducted. Univariate reading ease on usefulness: partial $\eta^2=.001$, observed power = .059; multivariate frame: partial

$\eta^2=.016$, observed power = .230; multivariate interaction: partial $\eta^2=.003$.
observed power = .076. Once again power was low for this study.

6.9 Usability as a function of leaflet characteristics, prior knowledge and prior intentions

A hierarchical multiple linear regression was conducted with usability as the dependent variable to test the influence of leaflet characteristics, prior knowledge and prior intentions on perceptions of usability. Background variables (age, sex, and prior behaviour) were controlled for. Results of the regression are shown below in table 6.6.

Table 6.6 Usability as a function of leaflet characteristics, prior knowledge and prior intentions.

| | Step 1 | Step 2 | Step 3 | Step 4 |
|------------------|---------|---------|---------|--------|
| | β | β | β | B |
| Age | .001 | .014 | .011 | -.018 |
| Sex | .036 | .032 | .045 | .032 |
| Units | .024 | .032 | .079 | .064 |
| ST Well-informed | | .191 | .196 | .179 |
| LT Well-informed | | .006 | -.008 | .029 |
| ST Intentions | | | -.197 | -.185 |
| LT Intentions | | | .241 | .212 |
| Usefulness | | | | .220* |
| Frame | | | | -.113 |
| Reading Ease | | | | .186* |
| R^2 | .002 | .040 | .056 | .158* |
| ΔR^2 | .002 | .038 | .016 | .102** |

Note * $p<.05$, ** $p<.01$, *** $p<.001$

R^2 = R square, ΔR^2 = Change in R square

15.8% of the total variance in perceptions of usability was explained by the model. Perceptions of usefulness ($\beta=.220$) and reading ease ($\beta=.186$) were the only significant predictors of usability, with step 4 explaining 10% of the

variance. Neither prior knowledge nor prior intentions significantly predicted subjective usability.

6.10 The effect of frame and reading ease on short and long-term intentions

The effect of reading ease and frame on intentions to avoid binge drinking and intentions to keep within the daily limits was tested. A 2 (frame: positive, negative) by 2 (reading ease: easy, difficult) by 2 (time: pre and post leaflet) three-way mixed MANOVA was conducted on the short-term and long-term intentions measures (intentions to avoid binge drinking and intentions to keep within the daily limits). Results showed a significant main effect for time approaching significance ($F(2, 123) = 2.996, p = .054$). Univariate F tests revealed that this effect was significant only for short-term intentions ($F(1, 124) = 6.031, p < .05$). There were no significant effects for frame or reading ease, nor was there a significant interaction between these frame and reading ease. Participants' reported intentions to avoid binge drinking increased after reading the leaflet, regardless of its frame or reading ease. There was no significant increase in long-term intentions (to stay within the daily guidelines) after reading the leaflet. Post hoc power analyses were conducted on the non significant results. Short-term intentions: Frame: partial $\eta^2 = .026$, observed power = .336, reading ease partial $\eta^2 = .03$, observed power = .384; Interaction: partial $\eta^2 = .016$, observed power = .215. Long-term intentions: partial $\eta^2 = .013$, observed power = .237. Power was low for these studies.

There was an overall 3 way interaction approaching significance between time, frame and reading ease ($F(2,123)=2.745, p=.068$). Univariate F tests showed this effect to be significant for long-term intentions only ($F(1,124)=4.583, p<.05$). Post hoc power for non significant short term intentions: $\text{partial } \eta^2 = .001, \text{ observed power} = .064$.

Although the multivariate test for these 2 failed to reach the 0.05 level ($p=.054$ and $p=.068$), further univariate testing was conducted. Univariate testing following nonsignificant (or in this case almost significant) main effects may be appropriate where a priori expectations exist. In this case, it was hypothesised that the effects of reading ease on the influence of frame would depend on whether the consequences of not following the advice in the leaflets would have short or long term outcomes. Therefore it was considered appropriate in this case to follow up the multivariate test with univariate tests. 'Tests may arise because of the particular hypotheses the experimenter has which (s)he wants to evaluate. Those hypotheses can be evaluated with or without the overall analysis of variance' (Winer et al. 1991 pp141). For a full discussion about the issues surrounding testing of nonsignificant main effects see Maxwell (2001). Univariate testing for non significant main effects can be seen in the published literature for example Echemendia et al. (2001), Lavy et al. (1993), Graff (2005), Carroll et al. (2003).

Univariate analyses were conducted on the negative and positive data separately to identify where the significant effects lay. There were no significant effects when the positive data was selected. Post hoc power

analysis for positive data: time: partial $\eta^2 = .0001$, observed power = .051, reading ease: partial $\eta^2 = .00004$, observed power = .05. interaction: partial $\eta^2 = .012$, observed power = .136. When the negative data was selected, a significant time by reading ease effect was found ($F(1,65)=4.870$, $p<.05$). The means for negative and positive frame by easy and difficult group before and after reading the leaflet for intentions to stay within the daily limits are presented below in table 6.7.

Table 6.7 Table to show means and standard deviations for intentions to keep within the daily limits

| Intentions to keep within the daily limits | | | | |
|--|-----------------|------------|-----------------|------------|
| | Positive (n=62) | | Negative (n=67) | |
| | Pre | Post | Pre | Post |
| Difficult (n=60) | 3.72 (1.5) | 3.82 (1.4) | 3.82 (1.5) | 3.80 (1.4) |
| Easy (n=69) | 3.81 (1.4) | 3.72 (1.7) | 4.32 (1.3) | 4.67 (1.2) |

A further one way ANOVA was conducted on intentions to follow the daily guidelines to identify significant effects when only negative and difficult data was selected. The F test showed no significant difference in the increase in intentions after reading the leaflet for participants in the negative/difficult condition. Post hoc power analysis showed partial $\eta^2 = .001$. observed power = .053. When only negative frame and easy reading ease were selected, a significant effect was found in reported intentions to follow the daily guidelines ($F(1,36)=11.571$, $p<.01$). The results indicate that only participants reading the negatively framed easy leaflet reported a significant increase in intentions to follow the daily guidelines after reading the leaflet. These results are presented graphically in figures 6.2 and 6.3.

Figure 6.2
Intentions by Reading Ease:
Positive Frame

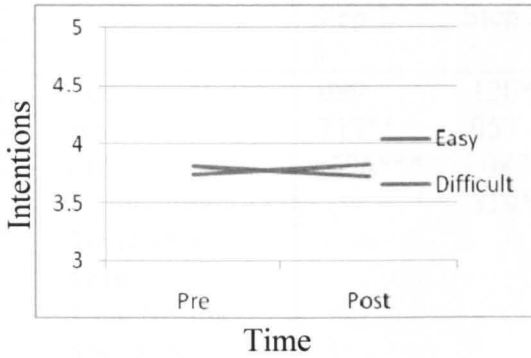
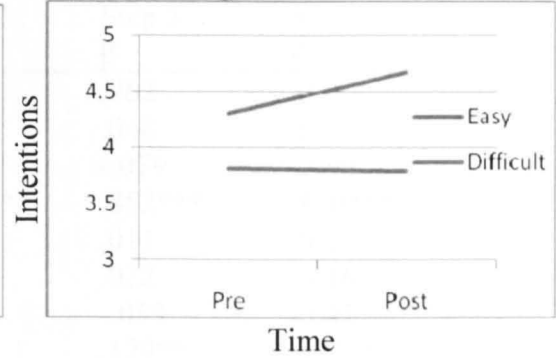


Figure 6.3
Negative Frame



Two hierarchical multiple linear regressions were conducted on time 2 intentions (i.e. intentions scores after reading the leaflet). The first explored predictors of intentions to avoid binge drinking, the second explored entered time 1 intentions (i.e. intentions scores before reading the leaflet) at step 2 as a control. The purpose of the regressions was to test the relative influence of leaflet characteristics (usability, usefulness, frame and reading ease) on time 2 intentions over and above changes in cognitive and emotional factors (TPB items, HBM items and worry) after reading the leaflet. Therefore TPB, HBM and worry variables entered at step 3 were change scores (i.e. time 2 – time 1).

6.12 Predictors of intentions to avoid binge drinking

To examine predictors of intentions to avoid binge drinking (short-term intentions) short-term versions of all variables were entered. The regression model predicting intentions to avoid binge drinking is presented in the table 6.8 below.

Table 6.8 Regression on Time 2 Intentions to Avoid Binge Drinking (n=105)

| | Step 1 β | Step 2 β | Step 3 β | Step 4 β |
|------------------|-------------|-------------|-------------|-------------|
| Age | .099 | .120* | .062 | .071 |
| Sex | .217** | .057 | .048 | .052 |
| Units | -.596*** | -.087 | -.079 | -.094 |
| T1 Intentions | | .819*** | .852*** | .850*** |
| ΔAttitudes | | | .011 | .012 |
| ΔPBC | | | .022 | -.016 |
| ΔSoc Norms | | | -.059 | -.041 |
| ΔSeverity | | | .129** | .133** |
| ΔRisk Self | | | -.026 | -.028 |
| ΔRisk Others | | | .127* | .104* |
| ΔWorry | | | .047 | .012 |
| ΔWell Informed | | | -.046 | -.081 |
| Usability | | | | .095* |
| Usefulness | | | | .131** |
| Frame | | | | -.056 |
| Reading Ease | | | | .022 |
| R ² | .355*** | .782*** | .824*** | .857*** |
| Δ R ² | .355*** | .427*** | .043** | .033** |

Note *p<.05, **p<.01, ***p<.001

R² = R square, ΔR² = Change in R square

85.7% of the total variance for time 2 intentions to avoid binge drinking was explained in the model. Prior intentions explained 42.7% of the total variance (β=.850), and was the largest predictor of time 2 intentions. Step 3 contained change scores for the TPB, HBM and worry variables. Together these explained 4.3% of the total variance. The change in perceptions of severity after reading the leaflet significantly predicted intentions (β=.133), as did the change in perceptions of risk to others (β=.104). Step 4 included characteristics of the leaflet – perceptions of its usability and usefulness and the experimental manipulations of frame and reading ease. Together,

characteristics of the leaflet explained 3.3% of the total variance in time 2 intentions to avoid binge drinking. Leaflet characteristics explained almost as much variance as the cognitive variables in Step 3, indicating good incremental validity for these items.

The regression was then repeated but this time entering long-term versions of the variables and entering Time 2 intentions to stay within the weekly guidelines as the dependent variable. Results of the regression on Time 2 long-term intentions (i.e. keeping within the daily guidelines) are presented below in table 6.9. All variables are long-term versions.

Table 6.9 Regression on time 2 intentions to stay within the daily guidelines

| | Step 1 Beta | Step 2 Beta | Step 3 Beta | Step 4 Beta |
|-----------------|----------------|----------------|----------------|----------------|
| Age | .099 | .074 | .111* | .109* |
| Sex | .132 | .051 | .030 | .045 |
| Units | -.696*** | -.123 | -.118 | -.125* |
| T1 Intentions | | .800*** | .816*** | .818*** |
| ΔAttitudes | | | .107* | .085 |
| ΔPBC | | | -.033 | -.052 |
| ΔSoc Norms | | | .003 | .000 |
| ΔSeverity | | | .045 | .022 |
| ΔRisk Self | | | .074 | .082 |
| ΔRisk Others | | | -.041 | -.022 |
| ΔWorry | | | .098* | .086 |
| ΔWell Informed | | | .074 | .069 |
| Usability | | | | .011 |
| Usefulness | | | | .087 |
| Frame | | | | -.045 |
| Reading Ease | | | | .019 |
| R ² | .473*** | .800*** | .836*** | .845*** |
| ΔR ² | .473*** | .327*** | .036* | .009 |

Note *p<.05, **p<.01, ***p<.001

R² = R square, ΔR² = Change in R square

84.5% of the total variance in intentions to stay within the daily guidelines was explained by the model. Time 1 intentions was again the largest predictor of time 2 intentions ($\beta=.818$), with step 2 explaining 32.7% of the total variance in intentions. Prior behaviour (i.e. number of units drunk in an average week) also significantly negatively predicted intentions ($\beta=.109$), with step 1 explaining 47.3% of the total variance. Those drinking more units reported lower intentions at time 2 to stay within the daily guidelines. Leaflet characteristics (usability, usefulness, frame and reading ease) did not predict intentions to stay within the daily guidelines.

6.13 Prior knowledge as a potential moderator of the effect of usability on intentions.

The potential role of prior knowledge as a moderator of the relationship between usability and change in intentions was tested. A series of regression analyses using mean-centred variables (Aiken and West 1991) examined whether perceptions of prior knowledge (time 1 feeling well informed) moderated the effect of usability on intentions. For both analyses time 1 measures of feeling well informed were used, and usability x (time 1) perceptions of prior knowledge was entered as an interaction term at step 2. Change in intentions to avoid binge drinking (short-term intentions) was the dependent variable for the first regression. The short-term measure of perceptions of prior knowledge was used. Results are presented in table 6.10.

Table 6.10 Regression on change in intentions to avoid binge drinking using short-term version of perceptions of prior knowledge.

| | Step 1 β | Step 2 B |
|------------------------------|-------------------|-------------|
| Usability | -.087 | -.082 |
| Pre Short-Term Well Informed | .112 | .129 |
| UsabilityXWellInformed | | -.215* |
| R ² | .016 | .062* |
| ΔR^2 | .016 | .046* |

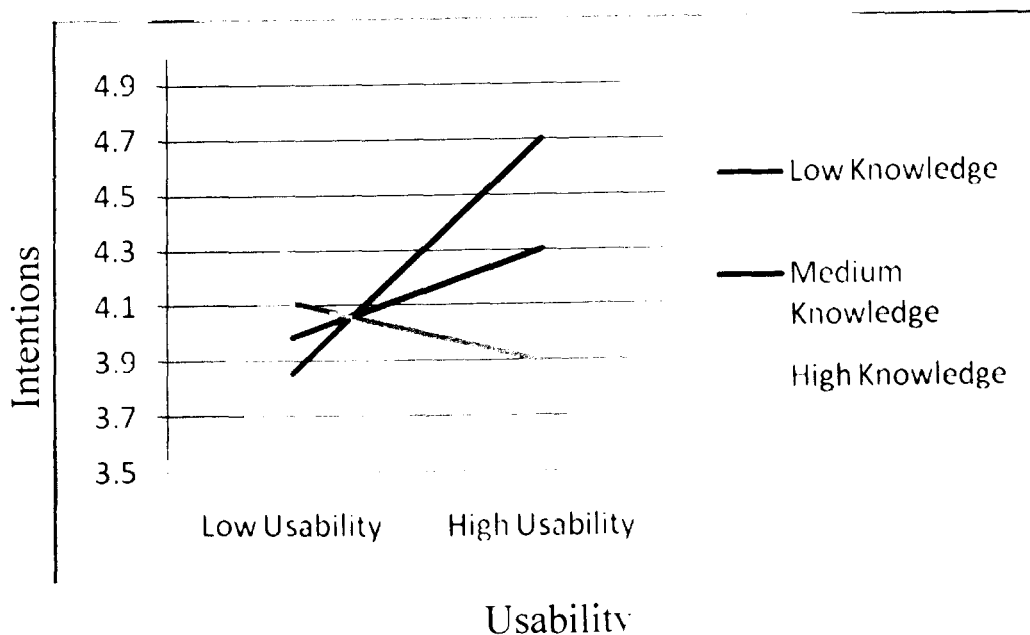
Note *p<.05, **p<.01, ***p<.001

R² = R square, ΔR^2 = Change in R square

Results showed a significant interaction between usability and being well-informed before reading the leaflet on change in intentions to avoid binge drinking.

Results were plotted graphically using Modgraph version 2.0. (Jose 2008) and can be seen in figure 6.4.

Figure 6.4 Intentions to avoid binge drinking



Simple Slopes analysis was conducted in order to identify significant differences for low, medium and high knowledge participants on the effect of perceptions of usability on change in intentions to avoid binge drinking. Results showed a significant difference for the low prior knowledge group: t values for low ($t=.073, p>.05$), no significance for the medium group ($t=.169, p>.05$). The high prior knowledge group almost reached significance ($t=.289, p>.05$) participants.

A further regression was conducted for long-term variables. The dependent variable was change in intentions to stay within the daily limits. The long-term version of feeling well informed was used. Usability X (time 1) long-term well- informed was entered as an interaction term at step 2. Results are presented in table 6.11 below.

Table 6.11 Regression on intentions to stay within the daily limits using long-term version of feeling well-informed.

| | Step 1 | Step 2 |
|-----------------------------|--------|--------|
| | Beta | |
| Usability | -.167 | -.161 |
| Pre Long-Term Well Informed | .149 | .141 |
| UsabilityXWellinformed | | .051 |
| R ² | .044 | .044 |
| ΔR ² | .046 | .002 |

Note * $p<.05$, ** $p<.01$, *** $p<.001$

R² = R square, ΔR² = Change in R square

Results show no significant interaction between usability and feeling well-informed on intentions to stay within the weekly limits.

Two further analyses tested for moderating effects of prior knowledge when reading ease was substituted for usability. Regressions using mean centred variables were conducted as previously, this time with reading ease x (time 1) well-informed as the interaction term. There was no significant interaction between objective reading ease and (time 1) feeling well-informed with change in intentions to avoid binge drinking as the dependent variable ($R^2=.028$, $R^2\Delta=.00$), nor was there a significant interaction between objective reading ease and (time 1) feeling well informed for change in intentions to stay within the daily limits ($R^2=.029$, $R^2\Delta=.00$).

6.14 Discussion

6.14.1 Usability as a function of leaflet and reader characteristics

This chapter further explored the factors that influence perceptions of usability. For leaflet characteristics, objective reading ease predicted subjective usability, but there was no significant effect for frame. Those reading the easy leaflet perceived it to be more usable than those reading the difficult leaflet. The study also explored whether perceived usability was actually a function of prior intentions or prior knowledge. There was no correlation between prior intentions and perceptions of usability. Prior knowledge, measured via self-reports of being well-informed about the issues, was positively correlated with perceptions of usability. However, neither prior

intentions nor prior knowledge predicted perceptions of usability once background variables were controlled for (age, sex, past behaviour). These results offer some support to suggestions from the ergonomics and information technology literature that subjective usability is a function of many disparate concepts, with prior knowledge being one of them (Baber 2002, Navon 1984). The potential moderating role of prior knowledge will be discussed shortly.

Perceptions of the usefulness of the leaflet also predicted usability. When leaflets are perceived as useful they will also be perceived as more usable. With usefulness also found to have a direct effect on intentions in this study, the importance of the relationship between usability and usefulness for health promotion leaflets is once again highlighted. This supports the key role of usefulness in the Technology Acceptance Model (Davis 1989) for understanding the role of usability on behavioural intentions.

6.14.2 The effects of reading ease and frame on intentions

The study described in this chapter explored the effects of manipulating the reading ease of a health promotion leaflet. Based on dual processing models of persuasion (Elaboration Likelihood Model Petty & Cacioppo 1986) a significant interaction between objective reading ease and frame was predicted, with framing effects only predicted to be evident for those reading the easy leaflet. According to Rothman and Salovey's (1997) framework, positive frame would be predicted to be more persuasive, whilst Levin et al.'s 1997 typology of framing effects would suggest an advantage for the negative frame. Results from this study supported the main hypothesis. For long-term

intentions (i.e. intentions to stay within the daily limits), participants reading the easy leaflet were more persuaded by a negative frame. This supports Levin et al.'s (1998) typology. This effect was not evident for short-term intentions (i.e. intentions to avoid binge drinking). This result may indicate a lack of motivation to process the long term health information. Proximal goals have been shown to be more motivating (Manderlink & Harackiewicz 1984), and when proximal outcomes are more salient, behavioural intentions may be increased (Routledge et al. 2004). It is therefore possible that long-term outcomes of excess alcohol consumption are less salient for a young student population, leading to reduced processing of the information in the leaflet that related to long-term outcomes and a greater sensitivity to the reading ease and frame of the information.

This finding is important for designers of health promotion leaflets. Results from this and previous studies in the thesis have demonstrated the importance of subjective and objective usability as predictors of intentions, and the positive role of objective reading ease on subjective usability. However, by manipulating the reading ease of leaflets in order to maximise subjective usability and intentions, the frame (positive or negative) of the leaflet becomes important. For this sample, only easy leaflets framed negatively increased intentions to stay within the daily limits. Levin et al.'s 1998 typology predicts more persuasive effects for information in the negative frame, due to more weight being given to negative information. The result from this study suggests that when leaflets are easy to read, they should be framed negatively to increase their persuasion. The persuasive effect of the negative frame may

be due to the behaviour studied and the consequential role of ambivalence. Individual differences in how people weight the importance of certain consequences has been shown to influence decision-making (Van Der Pligt et al. 2000). Ambivalence is used to describe ‘the extent to which one reacts to a given object or behaviour both positively *and* negatively’ (Broemer 2002 pp685). It may have a role in information processing (Jonas et al, 2000, Maio et al. 1996). Ambivalence may be relevant for alcohol behaviour – it is possible to acknowledge the negative aspects of excess alcohol consumption but also to acknowledge the pleasurable benefits of drinking. Broemer (2002) showed that highly ambivalent individuals are more persuaded by negatively framed message than positive ones. This may be attributable to the negativity bias – where more weight is given to positive than negative information. Cacioppo et al. (1997) showed that the salience of negative information is important where conflicting evaluations occur. It is possible that this bias was used as a strategy when making judgements in the studies reported here.

6.14.3 Incremental validity of objective and subjective usability in predicting intentions

Regression analyses showed incremental validity for usability in predicting intentions compared to TPB, HBM and worry measures. TPB, HBM and worry variables explained 4.3% of the total variance in intentions to avoid binge drinking, whilst leaflet characteristics explained 3.3%. Neither set of measures was a good predictor of long-term intentions, (i.e. staying within the daily limits), with intentions being explained mainly by past behaviour and prior intentions for both short and long term intentions. These results suggest

that a systematic approach to studying usability and usefulness of health promotion leaflets would be beneficial. Reading ease manipulations are easily achieved, and many thousands of health promotion leaflets are distributed in the UK each year. Small improvements in persuasion of these leaflets may still have a significant effect on health promotion goals. These issues will be discussed in more depth in chapter 7.

6.14.4 Prior knowledge as a moderator of the effect of usability on intentions

Results from this study showed a significant interaction between prior knowledge and usability. Those low in knowledge are more persuaded by the usability of the leaflet, with high usability being more persuasive. A more detailed study of prior knowledge would be beneficial. Perceptions of prior knowledge, measured by 1 item asking participants how well informed they felt they were about the consequences of alcohol consumption, may not have been sufficient to fully capture the concept of prior knowledge. Previous studies that have taken objective measures of prior knowledge have shown a role for prior knowledge on information processing (Bransford & Johnson 2004, Schnieder and Korkel 1989, Voss et al. 1980.). Further research into the role of prior knowledge would therefore be useful within the context of information processing for health information leaflets. This would further expand knowledge of the antecedents of perceptions of usability and the subsequent influence on intentions. Results from this study indicate that those low in perceived prior knowledge may be more persuaded when they perceive the leaflet to be highly usable. Conversely those high in perceived

prior knowledge may be more persuaded when they perceive usability to be high. This may be due to prior knowledge influencing comprehension of the text. Comprehension has been shown to influence persuasion (Chaiken & Eagley 1976, Eagley 1974, Eagley & Warren 1976). Leaflet recipients who have low prior knowledge may be less able to comprehend the information if it is not perceived as usable, which may have a detrimental effect on persuasion.

6.15 Limitations

This study discusses knowledge and prior knowledge. However, the measures used to explore these concepts were perceptions of being well-informed, and these may not be an accurate reflection of actual knowledge. For this study, which was conducted in the context of a one-off large lecture, measuring perceptions was felt to be more appropriate as conducting a test of knowledge immediately beforehand may have contaminated the effect of the leaflet, as participants would have already been primed to recall information about alcohol consumption issues. Future studies exploring the role of knowledge in reactions to health communications would need to take account of these factors.

Once again the nature of the sample i.e. students where reading ability would be expected to be high may have influenced results. However it seems likely that the effects of usability and reading ease on intentions would be more marked in a general population where a range of educational and reading abilities are sampled.

As was seen in the previous chapter, post hoc power analyses showed that the studies were under-powered. Therefore it is possible that with a larger sample, significant effects would have been found.

6.16 Next Chapter

The next chapter will summarise findings across all the studies reported in the thesis and discusses their potential application to the field of health promotion.

CHAPTER 7

General Discussion

7.1 Overview

The studies reported in this thesis add to the current knowledge of effective health promotion by emphasising the importance of the systematic study of usability and usefulness for the design of health promotion materials. The concepts of objective and subjective usability showed incremental validity in their prediction of intentions when studied alongside measures of health beliefs from traditional health models. This highlights the benefits of achieving optimal usability and usefulness when designing health promotion materials. Whereas usability models have been formalised and used to predict intentions in the domains of ergonomics and information technology, no such systematic approach has yet been taken within the health promotion domain.

The current research offered insight into the distinction between objective and subjective usability of health promotion leaflets, with subjective usability shown to be a function of both leaflet and reader characteristics. Previous research in health promotion has shown that easy to read materials promote better comprehension and persuasion. The research in this thesis added to this knowledge by demonstrating additional effects of creating easy to read leaflets, such as higher false recall and framing effects. Easy to read leaflet do not simply improve persuasion. These effects were also shown to be dependent on the proximity of the outcome. Knowledge of these potential effects is important if optimal effectiveness of a health leaflet is to be achieved. The important role of perceived usefulness in persuasion was also demonstrated, with perceptions of usefulness having a direct effect on intentions, and also partially mediating the relationship between usability

and intentions. The studies in this thesis extended understanding of the concept of usefulness for health promotion materials, showing that although usability and usefulness are closely related, and that both have an effect on intentions, they are influenced by different factors. These findings will be discussed in more depth in this chapter.

7.2 Usability as a function of leaflet and reader characteristics.

The studies reported in this thesis explored the factors underlying the concept of subjective usability in relation to health information leaflets. Baber (2002) described subjective usability as representing a ‘messy collection’ of disparate concepts. User characteristics such as knowledge, skills, motivation, and involvement are proposed to influence subjective evaluations of usability (Navon 1984), with the concept of usability taking on individual meaning to each individual taking part in the evaluation (Baber 1993).

This thesis was concerned with the study of subjective usability as a function of both leaflet and user characteristics. The thesis adds to current knowledge by studying the concept of usability of health information leaflets as a function of psychological constructs and mood, prior knowledge and prior intentions, frame and objective reading ease. Subjective usability was shown to be influenced by positive mood, prior knowledge, frame and objective reading ease, and perceived usefulness. It was not shown to be influenced by Need for Cognition, Neuroticism, or Social Desirability. However the relationship of each of these concepts to subjective usability was not consistent in all studies. For example the study described in chapter 4 showed no effect of objective reading ease on perceived usability, although this effect was shown in chapters 5 and 6. This reinforces the idea that subjective usability is a complicated interaction between user and leaflet characteristics. The factors influencing perceived usefulness were also studied. Factors influencing

usability did not influence usefulness, with perceived usefulness influenced by past behaviour but not by mood, objective reading ease, frame or prior knowledge. This suggests that despite being closely related, these concepts are distinct. The Technology Acceptance Model (TAM) (Davis 1989) formalises the distinction between these two concepts for evaluations of information technology. The studies in this thesis show that this distinction can be applied to the evaluation of health promotion leaflets. The TAM uses the concepts of usability and usefulness to predict intentions to use technological applications (e.g. Mathieson 1992, Adams et al. 1992, Pavvi 1988, Karahanna and Straub 1999). This thesis tested the ability of subjective usability and usefulness to predict intentions to follow the advice given in health information leaflets.

7.3 Usability and usefulness as predictors of intentions.

This thesis aimed to apply the theory from the TAM to health promotion leaflets. The TAM uses the concepts of usability and usefulness to predict intentions to use a product. The studies in this thesis differed in that the aim was to test the ability of perceptions of the usability and usefulness of a leaflet to predict intentions to follow the advice that was provided in the leaflet. Both usability and usefulness were shown to predict intentions, although these findings were not consistent across all studies, with usefulness predicting intentions in the studies described in chapters 2 and 4 and 6, and subjective usability predicting intentions in the studies described in chapters 2, 3 and 5. These differences are not inconsistent with studies of usability and usefulness using the TAM, for example Subramanian (1994) found only usefulness to predict intentions, with usability having no effect, whereas Mathieson (1992), Adams et al. (1992), and Pavvi (1988) showed the effect of usability on intentions to be mediated by perceptions of usefulness. In the study described in chapter 2, the effect of usability on intentions was shown to be partially

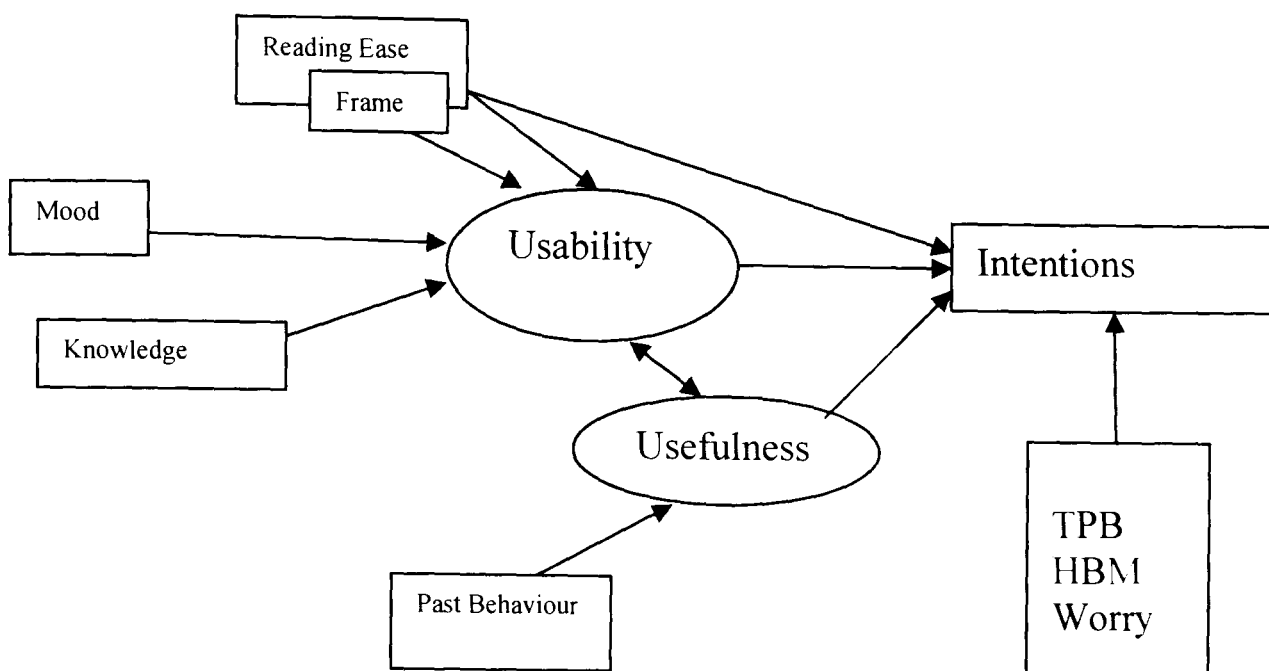
mediated by usefulness. It is possible that the inconsistent results are a result of individual differences of the readers. These may be characteristics such as reading ability, or more transient characteristics such as motivation to process the information.

For health promotion leaflets, formal models that include the antecedents of both perceived usability and usefulness would be beneficial for creating the most persuasive leaflet design. The current thesis explored some of the potential antecedents to subjective usability and usefulness (demographics, past behaviour, prior knowledge, psychological constructs, mood, objective reading ease and frame). There are doubtless many more, and further study is needed to identify what these are and how they influence subjective usability and usefulness. Further exploration into the role of knowledge (via objective measures), skills (i.e. reading ability), and motivation may be of particular interest (Baber 1993).

Measures of usability and usefulness showed incremental validity when tested alongside variables from the Theory of Planned Behaviour (Fishbein & Ajzen 1975), the Health Belief Model (Rosenstock et al. 1966) and worry. Interventions based on these variables have previously been shown to be effective at promoting intentions and behaviour for a range of health behaviours (e.g. Abraham et al. 1992, Conner et al. 2002, Faulkner & Biddle 2001, Kimlin Ashing-Giwas 1999, Lien et al. 2002). Usability and usefulness have not previously been studied alongside these cognitions and emotions. This thesis therefore adds to the understanding of the factors that influence an individual's response to health information by showing that the concepts of usability and usefulness added incremental value when studied alongside cognitive and emotional variables from these health models.

Figure 7.1 presents findings from this thesis diagrammatically.

Figure 7.1 Model to Show Antecedents of Subjective Usability and Influences on Intentions.



As objective reading ease and frame are shown to influence both subjective usability and intentions, the effects of manipulating these factors were tested.

7.4 The effect of manipulating objective usability and frame on recall and intentions

One method of improving the usability of a health promotion leaflet is to manipulate its reading ease level. Previous research has shown that improving the readability of a health promotion leaflet can have beneficial effects on comprehension, knowledge uptake and behaviour (e.g. Calabro et al. 1996, Friedman & Hoffman-Goetz. 2007, Hill & Bird.). The studies in this thesis sought to explore the effects of manipulating reading ease scores of health promotion leaflets on reader's intentions to follow the advice in the leaflets. Based on dual processing theories of persuasion (Elaboration Likelihood Model, Petty & Cacioppo 1986, Heuristic-Systematic Model, Chaiken 1980), it was predicted that reading the easy leaflet would lead to shallow processing and judgements using peripheral cues. Therefore framing effects would be observed. This effect was seen only in the final study.

where pre and post testing was utilised. Negatively framed leaflets were shown to be more persuasive for those reading the easy leaflet. No previous research has looked for an interaction between frame and usability, although one study (Bower & Taylor 2003) tested the effects of Plain English versus technical text alongside frame. Negative frame was best for persuasion, and Plain English was best for persuasion, but there was no interaction between the two. The finding from this final study supports the proposition that easy to read leaflets will lead to shallow processing, with judgements made using peripheral cues such as frame.

The thesis tested the effect of the frame of health information on intentions to follow the advice given in the leaflets. Although it was hypothesised that framing effects would only be observed under conditions of high objective or subjective usability, the direction of this effect was not predicted. Two main conflicting theories of goal framing effects are proposed in the literature. Rothman and Salovey's (1997) framework proposes that gain framed messages will be more persuasive for prevention behaviours, whilst loss framed messages will be more persuasive for detection behaviours. This theory is based on the original Tversky and Kahneman framing studies (1981), which found that individuals are risk-averse when faced with gains (they seek to maximise gains), and risk-seeking when faced with losses (losses loom large – they seek to minimise losses). Prevention behaviours are theorised to be the non-risky – i.e. performing the recommended behaviour will prevent the undesirable outcome. Conversely, detection behaviours are theorised to be risky – i.e. performing the recommended behaviour leads to the risk of something wrong. Levin's framing typology (1998) proposes that for goal frames, a negative frame will be more

persuasive. This is based on the 'negativity bias', a finding that negative information is given more weight in judgements and decision-making.

No specific hypotheses for the direction of framing effects were proposed in this thesis as previous research has provided support for both theories. O'Keefe and Jensen's (2006) meta-analysis of the framing literature suggests that for health prevention behaviours, a positive frame has an overall advantage. The same study, however, showed no loss framed advantage for detection behaviours, as would be expected by the Rothman and Salovey (1997) framework, and a further meta-analysis by O'Keefe and Jensen showed the gain framed advantage for prevention behaviours was only evident for dental flossing behaviours (2007). Results from the series of studies reported in this thesis do not support the Rothman and Salovey (1997) framework. Where framing effects were found, the negatively framed leaflets were more persuasive. These results support predictions from the Levin et al. (1998) framing typology – that negatively framed health messages will be more persuasive due to the negativity bias. The current results also lend support to the O'Keefe and Jensen finding that framing effects for health goals are highly sensitive to the behaviour being studied. However, as gain framed advantages are evident in the framing literature for a number of health goals, neither theory has yet to be proven to be superior.

Frame is one of many potential peripheral cues that may be utilised for decision-making and judgements under conditions of low processing. Other potential cues include, source credibility (Verplanken 1991), source expertise (Horner & Kahle 1990) or use of pictures (Mitchell 1986). It is therefore pertinent to consider other potential peripheral cues that

may influence a leaflet recipient if the leaflet is easy to read as these may influence decision-making and judgements.

In addition to effects on intentions, objective reading ease had a significant effect on recall of the information in the leaflets. Reading the easy leaflet produced greater recall of accurate information. This reflects a higher level of comprehension of the information (van Eye et al. 1989, Kintsch 1994) and supports research that shows that complex text interferes with comprehension (Bradley & Meeds 2002, Johnson 1981). The higher level of recall would also indicate a deeper level of processing of the information (Craik & Lockhart 1972, Craik and Tulving 1975, Rhodes and Armstrong 2000). This was against the prediction that difficult leaflets would produce higher levels of recall due to increased processing. However, evidence suggests that increased text complexity can interfere with text comprehension (Bradley & Meeds 2002, Johnson 1981). This may leave fewer cognitive resources available for processing the actual content of the message, thus resulting in lower comprehension and recall (Bradley & Meeds 2002, Britton et al. 1982, Whittingham et al. 2008). Higher levels of false recall in the study described in chapter 5 was an indicator that reading the easy leaflet had caused shallow processing (Koustaal et al. 1999, McDermott & Watson 2001). However this latter effect is not desirable for education about health risks. Although persuasion is the ultimate goal for health educators, if information has not been comprehended and cannot be remembered accurately then the persuasive effect of the message may not be sustainable. Peripheral processing has been shown to produce only weak and transitory attitude change (Cacioppo et al. 1985, Chaiken 1987, Petty & Cacioppo 1986b). The Elaboration Likelihood Model (Petty & Cacioppo 1986) predicts that attitudes formed by peripheral routes are less stable over time and are less resistant to counter persuasion. Clark et al.

(1999) manipulated levels of processing for messages containing nutrition information and examined the effect on recall. Observed differences in recall lasted less than 30 days after a one time reading. It is therefore unclear whether the effects seen in chapter 6 would still be evident after a time delay. Further study should employ follow-up testing in order to see how sustainable the effects of reading ease and frame are on persuasion for health behaviours. These findings raise the issue of whether easy to read leaflets are beneficial for long term attitude and behavioural change. These issues are discussed below.

7.5 The Usability Paradox

Simple messages often enhance comprehension (Johnson 1981, McKenna and Scott 2007), and increased comprehension is associated with increased persuasion (Chaiken & Eagley 1976, Eagley 1974, Eagley & Warren 1976). However, simple messages are also associated with lower levels of processing (Bradley & Meeds 2002), which may lead to less stable attitudes over time (Cacioppo et al 1985, Chaiken 1987, Petty & Cacioppo 1986b). This represents a dilemma for health educators. Information about health risks must be accessible, attended to and understood in order for acceptance of the message and persuasion to take place (McGuire 1985). Studies show 1 in 5 individuals do not have the literacy skills required to understand basic health information (NCC 2004, 2005). Low literacy levels are associated with poor health outcomes (Pirisi 2004), lower levels of knowledge about chronic health conditions (Kalichman et al. 1999, Schillinger et al. 2002, Williams et al. 1998), and literacy skills have been shown to be the biggest predictor of health status over and above demographic variables such as age and education level (Kellerman 1999). Therefore information about health risks must be presented in a format that is accessible to those with lower literacy skills (easy to read), and yet persuasion

should be stable over time, and resistant to counter argumentation (information processed systematically).

This dilemma has been considered within the field of information technology. Studies have explored how increasing usability can relieve working memory, resulting in an increase in cognitive resources that can be devoted to the task in hand (Nielsen 1994). Designers of information systems manipulate features of the systems so that internalisation of information does not have to take place. For example, 'graying out' of the paste function button if there is no text that has been cut or copied means that the user does not have to remember whether or not information has been cut or copied. The 'graying out' function therefore externalises the information (van Nimwegen et al. 2006). Externalising of information has been shown to relieve working memory so that the purpose of the task can be focused on (Zhang and Norman 1994). This reflects the research around text complexity. Complex text can use up cognitive resources and therefore interferes with the task in hand, i.e. comprehension of the information (e.g. Whittingham et al. 2008). In the domain of information technology, externalisation of information has been shown to have negative consequences. Learning is more effective when information is processed deeply, and is more robust than heuristic/rote learning (van Nimwegen et al. 2006). The implication for health information is that easy to read leaflets may be good for short-term persuasion but that if learning of the information is important (as compared to persuasion) then deeper processing is required for the information to enter long-term memory.

As information needs to be easy to read in order to be accessible to individuals with low levels of health literacy, then additional strategies need to be developed in order to ensure that information enters long-term memory. These strategies may include ensuring repeated

exposure to the message, or providing regular cues to stimulate message-related cognitive activity (Clark et al. 1999, Scammon 1977). Flay et al. (1980) also recommend the presentation and repetition of persuasive information over sustained time periods, via multiple sources and in novel and involving ways. The results reported in this thesis support the persuasive effect of easy to read leaflets. The next challenge is therefore to ensure that the effects achieved through manipulating reading ease are sustainable when applied to a real world situation.

7.6 . External factors that may influence usability effects.

This thesis studied two types of behaviour. Chapters 2 and 3 explored the role of usability in influencing intentions for occupational health behaviours, and chapters 4, 5, and 6 studied alcohol consumption behaviour. These two types of behaviour are fundamentally different. Occupational risks are those that must be faced by a worker in order to carry out his/her job. The usability of a leaflet detailing how to avoid work-related ill health may be a much more important cue in deciding whether to follow safe practice than a leaflet that is trying to convince a young person to curb an enjoyable lifestyle choice. Gerend and Cullen (2008) differentiate between promoting positive behaviours and trying to reduce 'unwanted' behaviours. Difficulties in persuading young people to modify 'addiction' behaviours (although it is not suggested that participants in this study were addicted to alcohol) have been well documented. For smoking behaviour, 'does the 20 year old smoker fully recognise how his/her future self will value health as compared to smoking?' (Viscusi 1992 pp119). Slovic et al. (2007 pp35) highlight how 'utility predicted or expected at the time of decision-making often differs greatly from the quality and intensity of the hedonistic experience that actually occurs'.

The nature of the behaviour studied may influence leaflet reader's level of motivation to process the information. The potential role of motivation in perceptions of usability and usefulness and their subsequent influence on intentions is worthy of further study. Motivation has been shown to influence levels of information processing for health behaviours. There is also evidence for a potential role for level of involvement in the processing of health information. Past behaviour was measured for alcohol behaviours but this may not be an adequate measure of involvement.

7.7. Limitations

7.7.1 Intentions as an outcome measure

The studies reported in this thesis use behavioural intentions as an outcome measure rather than measures of actual behaviour. Ajzen et al. (2009) state that 'a simple, direct measure of intention can account for substantial variance in actual behaviour' (pp. 1356). However, the level of this relationship can vary widely. A recent meta-analysis of 185 Theory of Planned Behaviour studies (Armitage and Conner 2001), found that 27% of the variance in actual behaviour was accounted for by intentions. Ajzen et al. (2004) highlight a tendency to overestimate readiness to perform socially desirable behaviours. Sheeran (2002) also found variations in intention-behaviour relationships for a range of health behaviours (condom use, cancer screening and exercise), with between 26% and 57% of actual behaviour explained by self-reported intentions.

As the studies in this thesis measured only behavioural intentions, it is important to consider factors that may influence the relationship between intentions and behaviour. Changes in intentions seen as a result of the experimental manipulations in these studies may not necessarily be translated into changes in actual behaviour. A number of

factors are suggested to influence the intention-behaviour relationship. Ajzen (2009) showed that strength of commitment towards performing a behaviour is related to the likelihood that the behaviour will be carried out, even where intentions are equally favourable. A stronger commitment resulted in stronger intention-behaviour relationships. Conner et al. (2000) showed that stability of intentions over time increased the intention-behaviour relationship. Individual differences can also moderate the intentions-behaviour relationship. Rhodes et al. (2005) showed that highly conscientious individuals were more likely to translate their intentions to perform exercise behaviour into actual behaviour.

These findings therefore have obvious implications for intervention studies, such as those reported in this thesis, where intentions are the only outcome measure. As the current series of studies only measures intentions, it is acknowledged that there will be no indication of the extent to which an increase in intentions due to the experimental manipulations might be translated into an increase in actual behaviour. However, Webb and Sheeran (2002) provide evidence that behavioural intentions are a reliable indication of actual behaviour. Their meta analysis of 47 experimental studies showed that medium to large increases in intentions leads to a small to medium increase in actual behaviour. This supports the assumption that increases in intentions due to the interventions in the studies reported in this thesis will lead to some extent to increases in actual behaviour.

Research has also shown that it is possible to improve the intention-behaviour relationship. Implementation intentions involve an individual 'specifying the behaviour one will perform in the service of the goal and the situational context in which one will

enact it (i.e. "if situation Y arises, I will initiate goal-directed behaviour Z) (Sheeran et al. 2005 pp.87). Forming implementation intentions have been shown to increase the intention-behaviour relationship (see Gollwitzer 1999 for review). Therefore, interventions that increase intentions by manipulating usability and frame may improve the likelihood that these are translated into increases in actual behaviour by employing implementation intentions.

7.7.2 Low R^2 s

Regression analyses reported throughout this thesis varied in the amount of variance explained. For example, only 15.9% of the total variance in total recall of information contained in the alcohol leaflet was explained by the variables measured. Conversely, 85% of the total variance in intentions to avoid binge drinking was explained by the variables measured in chapter 6. This was largely explained by the measurement of prior intentions in this study, which accounted for 42% of the total variance in intentions. Low R^2 values indicate that other factors were associated with the dependent variables (e.g. intentions, recall, perceptions of usability) that were not accounted for in the model. However, low R^2 values are not unexpected in health behaviour research (see Baronowski et al. 1999 for review). It is likely that for the studies reported in this thesis, prior intentions would have explained a greater amount of the total variance had it been measured in all studies, as was seen in the pre and post study described in chapter 6. Future research could benefit from pre and post testing to incorporate prior intentions in order to explain a larger proportion of total variance in future behavioural intentions.

7.7.3 External Validity

Three of the studies reported in this thesis use student samples to test the relationships between usability and frame and intentions to follow the advice given in health promotion leaflets. Undergraduate students are a convenient target population for many social science researchers. Increasing use of student samples has led to concern that over representation of student populations in experimental social science research may affect the external validity of the results of such experiments (e.g. Lupia 2002, Kam et al. 2007). ‘External validity asks the question of generalisability: to what populations, settings, treatment variables, and measurement variables can this effect be generalised?’ (Campbell and Stanley 1963). Sears (1986) suggests several reasons that students may respond differently to experiments to non-student adults. ‘college students are likely to have less crystallised attitudes, less formulated senses of self, stronger cognitive skills, stronger tendencies to comply with authority and more unstable peer group relationships’ (pp. 515). This may lead them to, for example, exert more cognitive effort than non-students in a reflection of the emphasis in education to ‘get the answer right’. There is some evidence to support these theories. Henrich (2000) and Henrich et al. (2004) demonstrated that in experiments studying dictator and ultimatum games, students responded differently to non-students. In consumer research, effect sizes have been shown to be bigger for students than for non students (Hooge 2010). However, Duckerman and Nelson (2003), and Duckerman (2004) found that students and non-students responded to framed information in a similar manner (for framing of political information).

The studies in the current thesis utilised students as they are a convenient sample who are easily targeted in lectures and who are familiar with taking part in research. Sears (1986) suggests that the generalisability of findings from student populations depends on the issue under investigation. If there is a theoretical reason to believe that the effect of the experimental manipulation would be the same across students/non-students it may be appropriate to use this type of sample. For the issues studied in the current thesis, effects for frame have been found in both student and non-student populations, and, as mentioned previously, students and non-students have been shown to respond in a similar way to framed political information (Duckerman 2004).

It has also been suggested that in some cases, student samples provide a more stringent test of a hypotheses (Sigelman et al. 1991, Kahn and Geer 1994, Funk 1997). This suggestion postulates that, in these situations, the effect of a treatment would be lowest in a group of students, therefore it would be even more likely to be found in a wider population. This may be relevant to the studies reported in this thesis, whereby positive effects for usability on intentions were found. Students would be expected to have higher than average reading skills, therefore these effects may be expected to be more pronounced in the general population.

The primary aim of the studies in this thesis was to examine the relationship between health promotion leaflets and intentions to follow the advice in those leaflets, and to see how this is affected if theoretically relevant conditions i.e. frame and usability are manipulated. Whilst there is no evidence within the framing literature to suggest that students and non-students respond differently to this bias, the issue of usability and students reading skills should be noted. Although there is little evidence to suggest that

the theoretical issues developed in this thesis can not be generalised to other populations, McDermott (2002) cautions that external validity can only be fully established through replication to general populations. Therefore future research in this area should seek to validate these results by testing in wider populations.

7.8 Further Research

The results from this thesis have added to the knowledge of the persuasive effects of health information leaflets by demonstrating the importance of the concepts of usability and usefulness in influencing intentions to follow the recommended advice. Several areas for further study have been identified. These include further exploration of subjective usability as a function of both reader and leaflet characteristics. In the field of ergonomics, subjective usability of a product is suggested to be influenced by the skills of the user (Baber 2002). In relation to readers' characteristics, the concept of skill may be represented by reading ability. Reading ability may have a potential influence on perceptions of the usability of the leaflet. Consequently, usability may be more of an important persuasive influence for individuals with low reading ability as compared to highly able readers. Related concepts include the potential role of IQ, and level of education. Further study into the role of prior knowledge is also suggested. Although the study described in chapter 6 took a measure of perceived knowledge, objective measures may be more reliable.

A large body of research exists that explores the influence of leaflet characteristics on comprehension. These include topical content (Harris 1989), formatting features (Achterberg & Bradley 1991, Adams and Hoffman 1994, Watanabe 1994), paper colour, size, weight and texture (Harvey-Webster 1988), use of pictures (Adams and Hoffman 1994, Michielitte et al. 1992), type size, line spacing (Krass et al. 2002). Leaflet features

that influence comprehension may therefore influence evaluations of usability which in turn may affect intentions.

Formal models to test the objective usability of products are widely used. There are also formal models used for the assessment of usability for written text, for example MIDAS. Scores on these scales could be used to test the influence of objective usability on subjective usability. In the current series of studies, objective usability was only measured through reading ease scores. Objective usability is not simply a function of reading ease score, and therefore a more comprehensive test instrument may yield more consistent results.

Further study should focus on more varied samples. The studies in this thesis used samples from a working population and from student populations. Using a more diverse sample from the general population may facilitate comparisons between user characteristics. On the same note, comparisons between *less* diverse populations may provide useful information for health educators who wish to use tailoring to promote behavioural modification. The studies in this thesis have focused on behavioural intentions. Although intentions are shown to be good predictors of behaviour (Sheeran 2002), further research that studies change in actual behaviour may be more informative for health promoters.

With additional research in these areas, a more comprehensive model of the antecedents of subjective usability and their relative influence on the persuasiveness of health promotion leaflets can be developed.

7.9 Summary of Discussion

The studies in this thesis add considerably to the body of knowledge surrounding the influence of subjective and objective usability and usefulness on intentions to follow advice given in health promotion leaflets. Previous research into the influence of perceived ease of use and usefulness has been conducted within the field of human computer interaction and ergonomics (Davis, 1989, Baber 2002). Perceptions of usability and usefulness in those domains are used to predict use of products and systems. This thesis has extended this knowledge not only by applying the underlying principles of the TAM to the health domain, but also by extending its application beyond predicting use of the information system to predicting intentions to modify health behaviours. The success of usability and usefulness as predictors of health behaviours when studied alongside Health Belief Model and Theory of Planned Behaviour variables also shows that these concepts add incremental validity to models of health behaviour and demonstrate that they are worthy of further study.

The study of usability in the health domain requires a systematic approach in order to take account of the complex interaction between user and leaflet characteristics. Subjective ratings of usability were not consistently related to objective reading ease manipulations. The manipulation of leaflets to reduce their reading level represents a dilemma for health promoters who wish to persuade individuals to modify their behaviour but also ensure that changes in attitudes are robust. This thesis showed that reading easy leaflets can cause framing effects and also increase false recall of health information. This indicates that shallow processing of the information may have occurred. If this is the case then strategies

to improve the retention of the information in long-term memory are needed. A systematic approach to the understanding and application of the concepts of usability and usefulness can provide a solid foundation for the design of effective health promotion materials.

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Appendix 1 manual handling questionnaire used in chapters 2 and 3

Please fill in the following information:
 Age:..... Gender:..... Job
 Title:.....
 Years in NHS:..... Years in current

Please answer the following questions by circling a number using the scale shown below:

1=Not at All—————▶5=Extremely

1. How easy is the leaflet to read?.....1 2 3 4 5
2. How easy is the leaflet to understand?1 2 3 4 5
3. How easy is the information in the leaflet to remember?. ...1 2 3 4 5
4. How informative do you find the leaflet?1 2 3 4 5
5. How relevant do you think the information is for your work?1 2 3 4 5
6. How accurate do you think the information provided is?.... 1 2 3 4 5
7. How helpful do you think the information will be in your work?.....
1 2 3 4 5
8. In what ways could the leaflet be improved? (please write on the lines provided below)

9. To what extent do you feel you are personally likely to suffer injury/ill health as a result of manual handling?.....1 2 3 4 5
10. To what extent do you feel your colleagues are likely to suffer injury/ill health as a result of manual handling?..... 1 2 3 4 5
11. Are you worried about developing back pain through your work?.....
 1...2 3 4 5
12. Do you feel that back pain is a serious health problem?.....1 2 3 4 5
13. How likely is it that you will follow the advice given in the leaflet next time you are handling loads?..... ..1 2 3 4 5
14. How likely is it that you will follow the advice given in the leaflet in the future?.....1 2 3 4 5
15. Have you ever suffered from back pain/other injury that you attribute to manual handling?

Yes No

16. Do you know anyone who has suffered back pain/other injury as a result of manual handling?

Yes No

Thank you for your time

NB Data from question 8 was used for the purposes of work conducted for the HSE and does not form part of the analyses in this thesis

Appendix 2 noise questionnaire used in chapter 2

Please fill in the following information
 Age:Gender:..... Job Title:.....
 Department:.....
 Years in company:..... Years in current job:.....

Please answer the following questions by circling a number using the scale shown below:

- How easy is the leaflet to read?1 2 3 4 5
2. How easy is the leaflet to understand?..... 1 2 3 4 5
3. How easy is the information in the leaflet to remember?1 2 3 4 5
4. How informative to you find the leaflet?1 2 3 4 5
5. How relevant do you think the information is for your work? .1 2 3 4 5
6. How accurate do you think the information provided is?1 2 3 4 5
7. How helpful do you think the information will be in your work?
1 2 3 4 5
8. In what ways could the leaflet be improved? (please write on the lines provided below)

9. How likely do you think you are to suffer from hearing problems as a
 result of loud noise at work?.....1 2 3 4 5
10. How likely do you think your coworkers are to suffer from hearing
 problems as a result of loud noise at work?.....1 2 3 4 5
11. Are you worried about developing hearing difficulties because of your
 work?.....1 2 3 4 5
12. Do you feel hearing difficulties are a serious health problem? 1 2 3 4 5
13. How likely is it that you will follow the advice given in the leaflet next
 time you are exposed to loud noise?.....1 2 3 4 5
14. How likely is it that you will follow the advice given in the leaflet in the
 future?.....1 2 3 4 5
15. Have you ever suffered from hearing problems that you feel were caused by loud noise
 at work?
 Yes No
16. Do you know someone who has suffered from hearing problems that you feel were
 caused by loud noise at work?
 Yes No

NB Data from question 8 was used for the purposes of work conducted for the HSE and does not form part of the analyses in this thesis

Appendix 3 Questionnaire used in chapter 4

Please complete the following information:

Age: _____ Sex (please circle): M/F

Please indicate how many units of alcohol you drink in an average week, using the chart below (1 unit = half pint lager/beer/cider; 25ml spirits; or small glass of wine):

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|--------|--------|---------|-----------|----------|--------|----------|--------|
| Units: | | | | | | | |

A. This section is all about the leaflet that you have just read.

Please read the following questions carefully and indicate your responses to the following items by circling a number from 1-5 using the scale shown below:

| | 1=Not at all | | | | | 5=Extremely | | | | | |
|---|---|---|---|---|---|-------------|--|--|--|--|--|
| 1 | How easy is the leaflet to read? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 2 | How easy is the information in the leaflet to understand? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 3 | How easy is the information in the leaflet to remember? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 4 | How relevant do you think the information is to you personally? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 5 | How helpful do you think the information will be for you? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 6 | How informative do you find the leaflet? | 1 | 2 | 3 | 4 | 5 | | | | | |
| 7 | How accurate do you think the information provided is? | 1 | 2 | 3 | 4 | 5 | | | | | |

**Please answer the following questions by circling a number using the scale given below:
 1 = strongly disagree 2 = moderately disagree 3 = somewhat disagree 4 = neutral
 5 = somewhat agree 6 = moderately agree 7 = strongly agree**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | Reading the leaflet did not require a lot of my mental effort | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | I find the leaflet to be useful in my life | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | | |
|----|--|---|---|---|---|---|---|---|
| 10 | The information in the leaflet was clear and understandable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | Using the information in the leaflet will enable me to keep my alcohol intake within safe limits | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12 | I intend to use the information given in the leaflet | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

B. The following scale consists of a number of words that describe different feelings and emotions. Please read each item and then mark to what extent you generally feel this way, that is, how you feel on average. Please circle your response.

| | 1 Very slightly or not at all | 2 A little | 3 Moderately | 4 Quite a bit | 5 Extremely |
|-----------------|--|---------------|-----------------|------------------|----------------|
| 1) Interested | 1 | 2 | 3 | 4 | 5 |
| 2) Distressed | 1 | 2 | 3 | 4 | 5 |
| 3) Excited | 1 | 2 | 3 | 4 | 5 |
| 4) Upset | 1 | 2 | 3 | 4 | 5 |
| 5) Strong | 1 | 2 | 3 | 4 | 5 |
| 6) Guilty | 1 | 2 | 3 | 4 | 5 |
| 7) Scared | 1 | 2 | 3 | 4 | 5 |
| 8) Hostile | 1 | 2 | 3 | 4 | 5 |
| 9) Enthusiastic | 1 | 2 | 3 | 4 | 5 |
| 10) Proud | 1 | 2 | 3 | 4 | 5 |
| 11) Irritable | 1 | 2 | 3 | 4 | 5 |
| 12) Alert | 1 | 2 | 3 | 4 | 5 |
| 13) Ashamed | 1 | 2 | 3 | 4 | 5 |
| 14) Inspired | 1 | 2 | 3 | 4 | 5 |
| 15) Nervous | 1 | 2 | 3 | 4 | 5 |
| 16) Determined | 1 | 2 | 3 | 4 | 5 |
| 17) Attentive | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|-------------|---|---|---|---|---|
| 18) Jittery | 1 | 2 | 3 | 4 | 5 |
| 19) Active | 1 | 2 | 3 | 4 | 5 |
| 20) Afraid | 1 | 2 | 3 | 4 | 5 |

C. Please answer each of the following questions by putting a circle around the Yes or No. There are no right or wrong answers. Work quickly and do not think too long about the exact meaning of the questions.

| | | |
|--|----|-----|
| 1) Does your mood go up and down? | No | Yes |
| 2) Do you ever feel 'just miserable' for no reason? | No | Yes |
| 3) Are you an irritable person? | No | Yes |
| 4) Are your feelings easily hurt? | No | Yes |
| 5) Do you often feel 'fed up'? | No | Yes |
| 6) Would you call yourself a nervous person? | No | Yes |
| 7) Are you a worrier? | No | Yes |
| 8) Would you call yourself tense or 'highly-strung'? | No | Yes |
| 9) Do you worry too long after an embarrassing incident? | No | Yes |
| 10) Do you suffer from nerves? | No | Yes |
| 11) Do you often feel lonely? | No | Yes |
| 12) Are you often troubled by feelings of guilt? | No | Yes |

D. For each of the statements below, please indicate to what extent the statement is characteristic of you. Please circle the number under the statement that best describes you. There are no right or wrong answers. As you are completing the questionnaire, please keep in mind the following scale as you rate each of the statements below:

- 1= extremely uncharacteristic of me**
- 2= somewhat uncharacteristic of me**
- 3= neither uncharacteristic nor characteristic of me**
- 4= somewhat characteristic of me**
- 5= extremely characteristic of me**

| | Extremely <i>Uncharacteristic</i> of me | | | | Extremely <i>characteristic</i> of me |
|---|--|---|---|---|--|
| 1. I would prefer complex to simple problems. | 1 | 2 | 3 | 4 | 5 |
| 2. I like to have the responsibility of handling a situation that requires a lot of thinking. | 1 | 2 | 3 | 4 | 5 |
| 3. Thinking is not my idea of fun. | 1 | 2 | 3 | 4 | 5 |
| 4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities. | 1 | 2 | 3 | 4 | 5 |
| 5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something. | 1 | 2 | 3 | 4 | 5 |
| 6. I find satisfaction in deliberating hard and for long hours. | 1 | 2 | 3 | 4 | 5 |
| 7. I only think as hard as I have to. | 1 | 2 | 3 | 4 | 5 |
| 8. I prefer to think about small, daily projects to long-term ones. | 1 | 2 | 3 | 4 | 5 |
| 9. I like tasks that require little thought once I have learned them. | 1 | 2 | 3 | 4 | 5 |
| 10. the idea of relying on thought to make my way to the top appeals to me. | 1 | 2 | 3 | 4 | 5 |
| 11. I really enjoy a task that involves coming up with new solutions to problems. | 1 | 2 | 3 | 4 | 5 |
| 12. Learning new ways to think doesn't | 1 | 2 | 3 | 4 | 5 |

excite me very much.

- | | | | | | |
|---|---|---|---|---|---|
| 13. I prefer my life to be filled with puzzles that I must solve. | 1 | 2 | 3 | 4 | 5 |
| 14. The notion of thinking abstractly is appealing to me. | 1 | 2 | 3 | 4 | 5 |
| 15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought. | 1 | 2 | 3 | 4 | 5 |
| 16. I feel relief rather than satisfaction after completing a task that required a lot of mental effort. | 1 | 2 | 3 | 4 | 5 |
| 17. It's enough for me that something gets the job done; I don't care how or why it works. | 1 | 2 | 3 | 4 | 5 |
| 18. I usually end up deliberating about issues even when they do not affect me personally. | 1 | 2 | 3 | 4 | 5 |

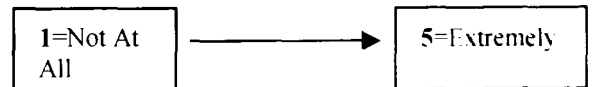
E. Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally. Please circle your response to each statement.

| | | |
|----|--|------------|
| 1 | I never hesitate to go out of my way to help someone in trouble | True/False |
| 2 | I have never intensely disliked anyone. | True/False |
| 3 | There have been times when I was quite jealous of the good fortune of others. | True/False |
| 4 | I would never think of letting someone else be punished for my wrong doings. | True/False |
| 5 | I sometimes feel resentful when I don't get my way. | True/False |
| 6 | There have been times when I felt like rebelling against people in authority even though I knew they were right. | True False |
| 7 | I am always courteous, even to people who are disagreeable. | True/False |
| 8 | When I don't know something I don't mind at all admitting it. | True False |
| 9 | I can remember 'playing sick' to get out of something. | True False |
| 10 | I am sometimes irritated by people who ask favours of me. | True False |

Appendix 4 Questionnaire used in chapter 5

| | | | | | | | |
|---|--------|---------|-----------|----------|--------|----------|--------|
| Please complete the following information: | | | | | | | NE |
| Age: _____ Sex (please circle): M/F | | | | | | | |
| Please indicate how many units of alcohol you drink each day in an average week, using the chart below: | | | | | | | |
| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| Units: | | | | | | | |

Please read the following questions carefully and indicate your responses to the following items by circling a number using the scale shown below:



- | | | | | | |
|---|---|---|---|---|---|
| How easy is the leaflet to read? | 1 | 2 | 3 | 4 | 5 |
| How easy is the information in the leaflet to understand? | 1 | 2 | 3 | 4 | 5 |
| How easy is the information in the leaflet to remember? | 1 | 2 | 3 | 4 | 5 |
| How relevant do you think the information is to you personally? | 1 | 2 | 3 | 4 | 5 |
| How helpful do you think the information will be for you? | 1 | 2 | 3 | 4 | 5 |
| How informative do you find the leaflet? | 1 | 2 | 3 | 4 | 5 |
| How accurate do you think the information provided is? | 1 | 2 | 3 | 4 | 5 |

The next questions refer to the *long-term* consequences associated with excess alcohol consumption:

- | | | | | | |
|---|---|---|---|---|---|
| To what extent do you feel you are personally at risk from the <i>long-term</i> health consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 |
| How worried are you about suffering <i>long-term</i> ill health through alcohol consumption? | 1 | 2 | 3 | 4 | 5 |
| How serious do you think the <i>long-term</i> health risks associated with excess alcohol consumption are? | 1 | 2 | 3 | 4 | 5 |
| To what extent do you feel your friends are at risk from the <i>long-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 |
| To what extent do you intend keeping your daily alcohol consumption to within the limits outlined in the leaflet? | 1 | 2 | 3 | 4 | 5 |

The next questions refer to the *short-term* consequences associated with excess alcohol consumption:

To what extent do you feel you are personally at risk from the *short-term* consequences associated with excess alcohol consumption? 1 2 3 4 5

How worried are you about suffering *short-term* ill health through alcohol consumption? 1 2 3 4 5

How serious do you think the *short-term* health risks associated with excess alcohol consumption are? 1 2 3 4 5

To what extent do you feel your friends are at risk from the *short-term* consequences associated with excess alcohol consumption? 1 2 3 4 5

Please turn over...

To what extent do you intend to avoid 'binge drinking'? 1 2 3 4 5

The following scale consists of a number of words that describe different feelings and emotions. Please read each item and then rate to what extent you feel this way at the moment. Please circle your response.

| | 1 Very slightly or not at all | 2 A little | 3 Moderately | 4 Quite a bit | 5 Extremely |
|-----------------|--|---------------|-----------------|------------------|----------------|
| a) Interested | 1 | 2 | 3 | 4 | 5 |
| b) Distressed | 1 | 2 | 3 | 4 | 5 |
| c) Excited | 1 | 2 | 3 | 4 | 5 |
| d) Upset | 1 | 2 | 3 | 4 | 5 |
| e) Strong | 1 | 2 | 3 | 4 | 5 |
| f) Guilty | 1 | 2 | 3 | 4 | 5 |
| g) Scared | 1 | 2 | 3 | 4 | 5 |
| h) Hostile | 1 | 2 | 3 | 4 | 5 |
| i) Enthusiastic | 1 | 2 | 3 | 4 | 5 |
| j) Proud | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---------------|---|---|---|---|---|
| k) Irritable | 1 | 2 | 3 | 4 | 5 |
| l) Alert | 1 | 2 | 3 | 4 | 5 |
| m) Ashamed | 1 | 2 | 3 | 4 | 5 |
| n) Inspired | 1 | 2 | 3 | 4 | 5 |
| o) Nervous | 1 | 2 | 3 | 4 | 5 |
| p) Determined | 1 | 2 | 3 | 4 | 5 |
| q) Attentive | 1 | 2 | 3 | 4 | 5 |
| r) Jittery | 1 | 2 | 3 | 4 | 5 |
| s) Active | 1 | 2 | 3 | 4 | 5 |
| t) Afraid | 1 | 2 | 3 | 4 | 5 |

Thank you for your time.

Appendix 5 Pre alcohol questionnaire used in chapter 6

Please complete the following information:

PD

Name: _____ Sex (please circle): M/F

Please indicate how many units of alcohol you drink each day in an average week, using the chart below. **1 unit = Half a pint ordinary strength lager/beer/cider; 25ml pub measure of spirits; small glass of wine.**

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|--------|--------|---------|-----------|----------|--------|----------|--------|
| Units: | | | | | | | |

The following questions refer to the *short-term* consequences associated with excess alcohol consumption.

By 'short-term' consequences, we mean those caused by drinking too much in one session ('binge drinking').

For me, avoiding drinking too much alcohol in one session would be:

(Please circle one number on every line below)

| | | | | | | | |
|--------------------|---|---|---|---|---|---|------------------|
| Of no use | 1 | 2 | 3 | 4 | 5 | 6 | Useful |
| Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | Important |
| Unenjoyable | 1 | 2 | 3 | 4 | 5 | 6 | Enjoyable |
| Unpleasant | 1 | 2 | 3 | 4 | 5 | 6 | Pleasant |

For the next questions please use the following scale:

1 = Strongly Disagree 6 = Strongly Agree

Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| Most people who are important to me think that I should avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |
| Whether or not I drink too much alcohol in one session is completely up to me. | 1 | 2 | 3 | 4 | 5 | 6 |
| Most people with whom I am acquainted avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am confident that if I wanted to I could avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |

For the next questions please use the following scale:

1 = Not at all 6 = Extremely

| | | | | | | |
|--|---|---|---|---|---|---|
| To what extent do you feel you are well informed about short-term consequences associated with alcohol intake? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent will you make an effort to avoid binge drinking? | 1 | 2 | 3 | 4 | 5 | 6 |
| How worried are you about suffering <i>short-term</i> ill health through alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you want to avoid binge drinking? | 1 | 2 | 3 | 4 | 5 | 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| To what extent do you feel your friends are at risk from the <i>short-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| How serious do you think the <i>short-term</i> health risks associated with excess alcohol consumption are? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel you are personally at risk from the <i>short-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you intend to avoid 'binge drinking'? | 1 | 2 | 3 | 4 | 5 | 6 |

The next questions refer to the *long-term* consequences associated with excess alcohol consumption. By long-term consequences, we mean those that are caused by drinking too many units of alcohol per week on a regular basis, over a prolonged period. The weekly limit of alcoholic units recommended is 21 for men and 14 for women.

For me, drinking fewer alcoholic drinks than the *weekly recommended limit* would be:

(Please circle one number on every line below)

| | | | | | | | |
|--------------------|---|---|---|---|---|---|------------------|
| Of no use | 1 | 2 | 3 | 4 | 5 | 6 | Useful |
| Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | Important |
| Unenjoyable | 1 | 2 | 3 | 4 | 5 | 6 | Enjoyable |
| Unpleasant | 1 | 2 | 3 | 4 | 5 | 6 | Pleasant |

For the next questions please use the following scale:

1 = Strongly Disagree 6 = Strongly Agree

Agree

| | | | | | | |
|--|---|---|---|---|---|---|
| Most people who are important to me think that I should keep my weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |
| Whether or not I keep my weekly alcohol consumption within safe limits is completely up to me. | 1 | 2 | 3 | 4 | 5 | 6 |
| Most people with whom I am acquainted keep their weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am confident that if I wanted to I could keep my weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |

For the next questions please use the following scale:

1 = Not at all 6 = Extremely

| | | | | | | |
|--|---|---|---|---|---|---|
| To what extent do you feel you are well informed about long-term consequences associated with alcohol intake? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent will you make an effort to keep your weekly alcohol intake within safe limits? | 1 | 2 | 3 | 4 | 5 | 6 |
| How worried are you about suffering <i>long-term</i> ill health through alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you want to avoid drinking more than the recommended weekly limits? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel your friends are at risk from the <i>long-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |

| | | | | | | |
|--|---|---|---|---|---|---|
| How serious do you think the <i>long-term</i> health risks associated with excess alcohol consumption are? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel you are personally at risk from the <i>long-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you intend to keep your weekly alcohol consumption to within safe limits? | 1 | 2 | 3 | 4 | 5 | 6 |

Thank you – now please read the leaflet

Appendix 6 Post Questionnaire used in chapter 6

The following questions are about the leaflet you have just read. Please read the questions carefully and indicate your responses by circling one number on each line using the following scale:

1 = Not at all

6 = Extremely

| | | | | | | |
|---|---|---|---|---|---|---|
| How easy is the leaflet to read? | 1 | 2 | 3 | 4 | 5 | 6 |
| How easy is the information in the leaflet to understand? | 1 | 2 | 3 | 4 | 5 | 6 |
| How easy is the information in the leaflet to remember? | 1 | 2 | 3 | 4 | 5 | 6 |
| How relevant do you think the information is to you personally? | 1 | 2 | 3 | 4 | 5 | 6 |
| How accurate do you think the information provided is? | 1 | 2 | 3 | 4 | 5 | 6 |
| How helpful do you think the information will be for you? | 1 | 2 | 3 | 4 | 5 | 6 |
| How informative do you find the leaflet? | 1 | 2 | 3 | 4 | 5 | 6 |

These questions refer to the *short-term* consequences associated with excess alcohol consumption. By 'short-term' consequences, we mean those caused by drinking too much in one session ('binge drinking').

For me, avoiding drinking too much alcohol in one session would be:

(Please circle one number on every line below)

| | | | | | | | |
|--------------------|---|---|---|---|---|---|------------------|
| Of no use | 1 | 2 | 3 | 4 | 5 | 6 | Useful |
| Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | Important |
| Unenjoyable | 1 | 2 | 3 | 4 | 5 | 6 | Enjoyable |
| Unpleasant | 1 | 2 | 3 | 4 | 5 | 6 | Pleasant |

For the next questions please use the following scale:

1 = Strongly Disagree

6 = Strongly

Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| Most people who are important to me think that I should avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |
| Whether or not I drink too much alcohol in one session is completely up to me. | 1 | 2 | 3 | 4 | 5 | 6 |
| Most people with whom I am acquainted avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am confident that if I wanted to I could avoid drinking too much alcohol in one session. | 1 | 2 | 3 | 4 | 5 | 6 |

For the next questions please use the following scale:

1 = Not at all

6 =

Extremely

| | | | | | | |
|---|---|---|---|---|---|---|
| To what extent do you feel you are well informed about short-term consequences associated with alcohol intake? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent will you make an effort to avoid drinking binge drinking? | 1 | 2 | 3 | 4 | 5 | 6 |
| How worried are you about suffering <i>short-term</i> ill health through alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you want to avoid binge drinking? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel your friends are at risk from the <i>short-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| How serious do you think the <i>short-term</i> health risks associated with excess alcohol consumption are? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel you are personally at risk from the <i>short-term</i> consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you intend to avoid 'binge drinking'? | 1 | 2 | 3 | 4 | 5 | 6 |

The next questions refer to the *long-term* consequences associated with excess alcohol consumption. By long-term consequences, we mean those that are caused by drinking too many units of alcohol per week on a regular basis, over a prolonged period. The weekly limit of alcoholic units recommended is 21 for men and 14 for women.

For me, drinking fewer alcoholic drinks than the weekly recommended limit would be:

(Please circle one number on every line below)

| | | | | | | | |
|--------------------|---|---|---|---|---|---|------------------|
| Of no use | 1 | 2 | 3 | 4 | 5 | 6 | Useful |
| Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | Important |
| Unenjoyable | 1 | 2 | 3 | 4 | 5 | 6 | Enjoyable |
| Unpleasant | 1 | 2 | 3 | 4 | 5 | 6 | Pleasant |

For the next questions please use the following scale:

1 = Strongly Disagree 6 = Strongly Agree

Agree

| | | | | | | |
|--|---|---|---|---|---|---|
| Most people who are important to me think that I should keep my weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |
|--|---|---|---|---|---|---|

| | | | | | | |
|--|---|---|---|---|---|---|
| Whether or not I keep my weekly alcohol consumption within safe limits is completely up to me. | 1 | 2 | 3 | 4 | 5 | 6 |
| Most people with whom I am acquainted keep their weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |
| I am confident that if I wanted to I could keep my weekly drinking to within safe limits. | 1 | 2 | 3 | 4 | 5 | 6 |

For the next questions please use the following scale:

| | 1 = Not at all | | | 6 = Extremely | | |
|---|----------------|---|---|---------------|---|---|
| To what extent do you feel you are well informed about long-term consequences associated with alcohol intake? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent will you make an effort to keep your weekly alcohol intake within safe limits? | 1 | 2 | 3 | 4 | 5 | 6 |
| How worried are you about suffering long-term ill health through alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you want to avoid drinking more than the recommended weekly limits? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel your friends are at risk from the long-term consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| How serious do you think the long-term health risks associated with excess alcohol consumption are? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you feel you are personally at risk from the long-term consequences associated with excess alcohol consumption? | 1 | 2 | 3 | 4 | 5 | 6 |
| To what extent do you intend to keep your weekly alcohol consumption to within safe limits? | 1 | 2 | 3 | 4 | 5 | 6 |

Thank you for your time.