TESTING THE HYPOTHESIS OF ROTHMAN AND SALOVEY (1997) UNDER A CHOICE TASK, A TIME CONSTRAINT AND WHEN DECISION MAKING ON THE BEHALF OF ANOTHER

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ABSTRACT

The presentation of information is central to decisions to engage in a treatment and the uptake of health care behaviours. Hence understanding the processes which are responsible for framing effects within the health domain is crucial to achieving effective and unbiased communication. Within the message framing literature decision making is considered being a function of the valence of the information which is presented. Research has shown that individuals are more likely to attend a screening examination when information is presented as a loss a frame and more likely to engage in preventative behaviour when information is presented as a gain frame. However according to Rothman and Salovey (1997); Rothman, Kelly, Hertel, and Salovey (2003) it is the degree to which performing a health behaviour presents risk to the individual that determines whether a positively or negatively valenced version of information is more likely to be effective in encouraging the behaviour advocated. To date, studies assessing the hypothesis by Rothman and Salovey (1997); Rothman *et al* (2003) have only considered framing effects in the case of decision making for the self, and have not considered how framing of information may influence choice tasks. Additionally emotional reactions to risk information may play a part in determining the influence of framing effects (Lowe and Ferguson, 2003).

The first experiment explored the acceptance of a blood transfusion for the self and on the behalf of a family member and friend within the frameworks of Rothman and Salovey (1997). In relation to this, the risk – as - feelings hypothesis by Lowenstein, Weber, Hsee, and Welch (2001) which postulates a direct effect of feelings onto choice, was examined. In the second chapter a standardised(word study changed to chapter as this not an experiment and so it is correct not to call as such chapter) instrument to measure factors around which people decide to accept blood transfusion products was developed. The final two experiments tested the two hypotheses in relation to a choice task and under a time constraint. Under a time constraint the potential for cognitive processes to play a role in decision making is reduced and the role of hot cognitions (emotions) is heightened. Hence the last experiment aimed to expose the role that affect may contribute to message framing effects by investigating whether the same framing effects could be observed when choosing between two blood transfusion products with and without a time constraint.

When making a decision on the behalf of the self, a family member and a friend to accept a blood transfusion or to choose between two blood transfusion types a gain frame effect was observed.

The framing effect did not alter under a time constraint in the case of decision making on the behalf of any potential recipient. Investigations of affect (trait, anticipated and immediate emotion) and cognitive motivational factors important to decision making as potential mediators produced null results. However, direct effects of immediate emotion were observed when decision making was for the self, family member and a friend in the first experiment and in the case of the self in Experiment 3.

The findings obtained lend support to the increasing call for both cognitive and emotive processes to be incorporated into models of decision making, and to the argument by Rothman and Salovey (1997) that the function of the treatment under consideration moderates framing effects. The blood transfusion service gains valuable information on the importance of psychological factors to aid in planning public information campaigns.

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CONTENTS

LIST OF ABBREVIATIONS

AD	Asian Disease
AIDS	Acquired Immune Deficiency Syndrome
ATF	Appraisal Tendency Framework
BSE	Bovine Spongiform Encephalopathy
	Blood Transfusion Service
CBG	Bovine haemoglobin gain
CBL	Bovine haemoglobin loss
DBG	Donated blood gain
DBL	Donated blood loss
GM	Genetically modified
HBG	Human haemoglobin gain
HBL	Human haemoglobin loss
M	Mean
MHLC	The Multi-Dimensional Health Locus of Control
PFG	Perflurocarbon gain
PFL	Perflurocarbon loss
SD	Standard deviation
TEE	Transfusion environment and emotion

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CHAPTER 1

Introduction to testing the hypothesis of Rothman and Salovey (1997) under a choice task, a time constraint and when decision making on the behalf of another.

1.1 Overview of the Thesis

The development of blood substitutes has been stimulated by reduced blood donations and concerns over the safety of transfusion (Lowe, 2007). With the continual development and testing of blood substitutes, it is inevitable that they will become more widely available for clinical use in the future (Ferguson, Leaviss, Townsend, Fleming, & Lowe, 2005; Klein, 2005; Rinaldi, 2005; Schwarz, Dulchavsky, & Silbergleit, 2003; Wahr, 2003). Once blood substitutes are licensed for clinical use, the question that presents itself is what factors are likely to influence the public's reactions and judgments of risk towards blood substitutes. Moreover, gaining an understanding of the possible reactions from the public towards blood substitutes may then allow the Blood Transfusion Service (BTS) to prepare a suitable response strategy to the public's likely reactions.

Preliminary work on the acceptance of blood substitutes in the United Kingdom (UK), as an alternative to donated blood, has found that both the general public and patients consider blood substitutes to present greater perceived risk, and view them as being significantly less safe than donated blood (Ferguson *et al.,* 2005). In addition, a preference has been found for donated blood (Ferguson, Farrell, James, & Lowe, 2001; Ferguson, Prowse, Townsend, Spence, van Hilton, & Lowe, 2007; Lowe, Farrell, Ferguson, & James, 2001). Beyond the concerns over safety, an avenue worthy of investigation is whether there are additional explanations for the previously observed preference for donated blood. To this end more research is needed on the reasons why blood substitutes will or will not be accepted, be they psychological (emotional disposition), demographic (age) or personal characteristics (blood donation history).

Within the literature on human judgment and decision making, one psychological factor which has been consistently found to be important to risk preference is the framing of information (Rothman & Salovey, 1997). The framing of information refers to a situation where factually equivalent descriptions of the same decision problem are presented in either a positive or negative light (Tversky & Kahneman, 1981). For example, a loss

framed message may read “clinical trials have shown that in receiving a blood transfusion with perflurocarbon blood substitute there is a 3% chance that an individual will experience hypertension. The converse - a gain framed message may read there is a 97% chance that one will not experience hypertension”. Where persons are found to respond differently to such factually equivalent descriptions of the same decision problem framing is said to have occurred (Tversky & Kahneman, 1981, 1984, 1992; Kahneman & Tversky, 1979, 1982).

The framing of information about the same choice outcomes has been associated with variations in preferences within a range of problem domains (consumer choice, responses to social dilemmas, perceptual judgments) and samples (patients, students, managers) (Lauver & Rubin, 1990; Marteau, 1989; Rothman & Salovey, 1997; Wang & Johnston, 1995). Aside from extending our current understanding of the public’s attitudes towards, and potential acceptance rates of blood substitutes, another primary objective of the experiments described in this thesis is to provide a greater understanding of factors which may mediate or moderate the relationship between framing and the acceptance or choice of blood transfusion type. In this pursuit, three theoretical hypotheses will be examined. Firstly, the risk - as - feelings hypothesis by Loewenstein *et al.,* (2001) which postulates a direct and automatic effect of feelings on behavioural choice. Secondly, the appraisal tendency framework (ATF) by Lerner and Keltner (2001) that examines the differential effect of emotions of the same valence upon decision making. Finally an argument from within the health decision making literature that the risk and uncertainty that an individual perceives a health issue may present to them can moderate the framing effect (Rothman and Salovey, 1997).

The following serves as an explanation to the observation by Rothman and Salovey (1997). Detection behaviours, being concerned with the diagnosis of ill health, can be viewed as more risky and uncertain (what will happen to me). For example a gain frame in the case of a detection behaviour may state “there is a 5% chance an abnormality **will** be found during amniocentesis”. Such a statement may be perceived as more risky and uncertain than the converse (loss frame) “there is a 95% chance that an abnormality **will not** be detected”. As such a loss frame advantage is commonly found with detection behaviours (e.g., Meyerowitz & Chaiken, 1987). Preventative behaviours are on the other hand considered safe, and a gain frame in such a case may result in a belief that one is

less likely to become unwell. For example, with the use of donated blood a gain frame may state "for every 2 million units transfused 1,999,999 people **will not** contract HIV" compared to the loss frame "for every 2 million units of blood transfused it estimated that 1 person **will** contract HIV". In the case of a preventative behaviour a gain frame advantage is most commonly observed, and in the case of blood transfusion medicine that is indeed what has been observed (e.g., Farrell, 2005; Farrell, Ferguson, James, & Lowe, 2001).

Before moving on to discuss these three theoretical hypotheses in more detail, for those unfamiliar with the blood transfusion process there follows an outline of transfusion medicine and the status of blood substitutes. It is important to have an understanding of the blood transfusion process to provide the reader with an insight into characteristics of blood transfusion types which may influence choice and acceptance of blood substitutes. To this end the source of different blood transfusion types and the clinical advantages of blood substitutes will be explained.

1.1.1 Transfusion Medicine: a Background

Over the last 40 years artificial cells able to duplicate the oxygen carrying properties of blood have been developed to meet the demand for blood and blood products. Artificial cells are an attempt to mimic some of the biological processes of a real cell to act as a partial substitute for human cells. The emphasis on blood substitutes in their current stage of development is intended for use to replace large volumes of blood loss during surgery, and acute bleeding episodes. There are two major categories of 'artificial blood'. The first category is made from natural products whereby haemoglobin molecules from both human and bovine sources are molecularly modified through the processes of cross linking, conjugation, polymerisation and encapsulation to carry oxygen. The second category, Perflurocarbon substitutes, are synthetic organic fluids.

1.1.2 Attitudes towards Blood Substitutes - the Current State of the Research

The research also aims to provide information to the BTS on the acceptability of blood substitutes, and attitudes to the new biotechnology. For several other reasons it seems important to research the public's responses to receiving blood substitutes. First, there should be a psychological interest in exploring how people react to framed information about new biotechnologies where there is an immediate need for a blood transfusion. Information gathered from within experiments can be used to pre-empt the levels of fear

and stigmatization which may be associated with blood substitutes to enable the BTS to target communication strategies effectively. Such information may enable the BTS to act proactively when informing the public about blood substitutes. Secondly, there should be a distinct medical interest, as the perceptions of the transfusion procedure and psychological reactions which a patient experiences during the transfusion procedure may influence medical outcome (see Johnston & Vogele, 1993). The identification of factors around which concerns are centered could allow effective targeting of cognitive behavioural interventions aimed at reducing stress related to medical procedures. In addition taking the long view, the public's support or non support of the various blood transfusion types would probably affect planning for donor recruitment and supplies of blood substitutes.

While it is recognised that there is a substantial literature examining attitudes towards blood donation (e.g., Armitage & Conner, 2001; Ferguson, 1996; Giles, McClenahan, Cairns, & Mallet, 2004; Le Roux, Elliott, & Winn, 2001; McVittie, Harris, & Tiliopoulos, 2006), the actual transfusion process itself has received little attention. Although in recent years the literature exploring attitudes and perceived risk towards the blood transfusion process and blood products has expanded (Farrell *et al.,* 2001; Ferguson, Farrell, Lowe, & James, 2001; Ferguson, Farrell, James, & Lowe, 2004; Finucane, Slovic, & Mertz, 2000; Ferguson *et al.,* 2005), this is relatively small compared to the research conducted into other medical biotechnologies such as artificial organs (Lowe *et al.,* 2001; Fakhry & Sheldon, 1995). Considering that there are approximately 265 blood transfusions in the UK for every one organ transplantation annually (see Varney & Guest, 2003; UK Transplant, 2007) it could be said that research into attitudes towards biotechnology for use in medicine is disproportionate to applicability. In particular there have only been two published studies investigating preferences between donated blood and blood substitutes (see Lowe *et al.,* 2001; Ferguson *et al.*, 2007). Given that in the future clinicians may have more than one treatment type to offer patients (see Lundin & Widner, 2000), data is required on the public's level of preference for one blood transfusion type over another. Such information is important for three reasons. Firstly it could be drawn upon in clinical practice. With an increasing emphasis on both patient - centered medicine and shared decision making, assumptions about patient preferences and the traditional paternalistic model of medical decision making are outdated (Stevenson, Barry, Britten, Barber, & Bradley, 2002; Royal Pharmaceutical Society of Great Britain, 1997). Secondly with

patient's preferences being poorly understood and usually based on assumptions about their perceived intelligence, age, or quality of life (Fallowfield, 2001), identifying the reasons behind the public's attitude towards blood substitutes would further be available for use in medical education. Finally data on the potential rates of acceptance are required to determine economic allocations. For example if there is a budget of £898 million (which is the estimated annual cost of blood transfusions in the UK (Varney & Guest, 2003)), the proportion spent on blood substitutes would be best estimated based on the expected levels of acceptance, at the same time insuring that the amount left to be invested in donor recruitment would not lead to a supply less than that required for transfusion.

1.1.3 Expected Utility Theory and the Perception of Risk towards the Blood Transfusion Procedure and Biotechnologies

When making decisions expected utility theory (also called von-Neumann Morgenstern utility) predicts that individuals prefer to take the option that is associated with greater gains. In the context of transfusion medicine then, under immediate blood loss, the rational decision would be for individuals to choose the fastest, safest and most efficacious blood transfusion type. All blood substitutes have several advantages over donated blood, namely blood cells can be sterilized so there is no spreading of infections, artificial blood does not contain blood group antigens so there is no need for typing and cross matching and artificial blood can be stored for a long time as a stable, lyophilized powder (Kjellstrom, 2003; National Blood Transfusion Service of the United Kingdom, 2001; Stowell, 2005). Whilst it is recognised that there are several potential risks with blood substitutes such as a rise in blood pressure (hypertension) and potential infection with unknown diseases, blood substitutes have been, and continue to be, the subject of vigorous clinical testing to ensure their safety before approval for use (Nouwairi, 2004; Winslow, 2006; Lowe, 2007). Considering these facts, in a situation where blood loss is severe, the use of an artificial oxygen carrier as a temporary measure before donated blood becomes available would seem to be an acceptable choice.

However, despite the benefits which blood substitutes would bring, due to high profile crises such as Acquired Immune Deficiency Syndrome (AIDS), genetically modified (GM) foods and Bovine Spongiform Encephalopathy (BSE), the use of blood substitutes, as with any technological advance, may still evoke fear in some people (Kitzinger &

Williams, 2005). This means factual knowledge alone may not be the basis for preference of blood transfusion type even in critical care situations. Certainly empirical evidence has shown this to be the case with factual information being unrelated to perceptions of risk with respect to the blood transfusion process (Lowe & Ferguson, 2003). In addition in the case of biotechnologies which in general are objectively safe, data from a large cross national 'Eurobarometer' questionnaire survey by Gaskell, Allumn, Bauer, and Durant *et al.* (2000) found that the general public reported that they perceive biotechnology as risky. This is in line with earlier work by Slovic (1989) who found the American public perceived biotechnology to be high in risk and low in perceived benefit. It is worthy to note, however, that support for biotechnology applied to medicine is higher than that for GM crops (Gaskell *et al,*; Savadori, Savio, Nicotra, & Rumiati *et al.,* 2004).

Attitudes towards biotechnologies then appear to contradict the assumption that human decision making is rational and based on factual information. If factual information does not itself determine preference between biotechnologies and traditional natural treatment types, the question is what factors do influence the acceptance of new technologies? A growing body of evidence is emerging to suggest that one factor which is important when determining acceptance of biotechnologies for medical purposes is whether they derive from biological, chemical materials or synthetic implants (Ferguson *et al.,* 2005; Rios, Conesa, Ramprez, Rudrigvez, & Parrilla, 2004; Sanner, 1998). Aside from perceptions about the naturalness of the source of a blood transfusion product several other factors have also been identified from the literature as being associated with risk preference. For example distrust of doctors (Sanner, 1994), trust of the provider of the information (Lowe & Ferguson, 2003), and belief about the risk of infection (Deschamps, Roux, Gouin, & Sai, 2005). However, apart from examining the role of message framing effects (Ferguson *et al.,* 2005*;* O'Connor, Ferguson, & O'Connor, 2005) and stress appraisals (O'Connor *et al.,* 2005), there is limited published research addressing the role of psychological factors in relation to peoples' preferences for biotechnologies destined for use in medical applications. The only other factors which have been considered within studies investigating individual's acceptance of medical biotechnologies are socio - demographic, such as gender (Sanner, 1998) and education level (Hagelin, 2004; Hagelin, Carlsson, & Hau, 2000; Sanner, 1998).

Although there is an expanding literature which documents an emotional response

towards biotechnologies (Sanner, 2001; Spence 2006), to the knowledge of the author of this current thesis, researchers have failed to further explore the influence of emotion upon the acceptance of biotechnologies as applied to medicine. There are three factors pertinent to the argument that emotionality may be a factor in determining preferences between biotechnologies and natural treatment types. Firstly there is a wealth of literature confirming that medical procedures can be emotive (e.g., Darisi, Thorne, & Iacobelli, 2005; Moene, Begbam, & Skolt, 2006; Salmon, Hall, & Pearbhay, 2001; Smith & Zautra, 2004). Secondly pre surgical anxiety has been related to post procedural outcomes (Johnston & Vogele, 1993). Thirdly empirical evidence by Alhakami and Slovic (1994), suggests that negative feelings about a hazard are linked to the judgment of activities as being high in risk and low in benefit. Hence to exclude measures of emotion from consideration means a potentially important explanatory determinant may therefore be being overlooked. However, before moving on to discussing emotionality in human decision making, the next section will provide a theoretical background to message framing.

1.2 Message Framing: Theoretical Background

Recall from Section 1.1 the term message framing refers to variations in preference which result from a change in the wording of a decision problem from a position where an individual is likely to derive benefit (gain frame) to a position where a loss is likely to happen (loss frame). Gain frames refer to good things that will happen and bad things that will not happen (e.g. lives will be saved or not lost, whereas loss frames refer to bad things that will happen and good things that will not happen (e.g. lives lost or lives that will not be saved) (Rothman *et al.,* 2006). Individuals are said to be risk seeking (prefer to take a gamble) for loss frames and risk averse (prefer the certainty) for gain frames (Tversky & Kahneman, 1979; Tversky and Kahneman, 1981).

A classic example of message framing effects is Tversky and Kahneman's (1981) Asian Disease (AD) problem. People who participated in this research were asked to choose between two alternative programs to deal with the outbreak of the Asian Disease.

The information about the two programs contained factually equivalent information about two alternative options (a certainty and a gamble) framed as gains or losses (Ferguson *et al.,* 2005).

The first program was a gain frame option describing an outcome leading to the

survival of 200 people out of 600 (the certain option) or where there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved (the gamble). Although the outcomes from both options are identical it is found that the majority of people are risk aversive and choose to save 200 lives for certain rather then take the gamble.

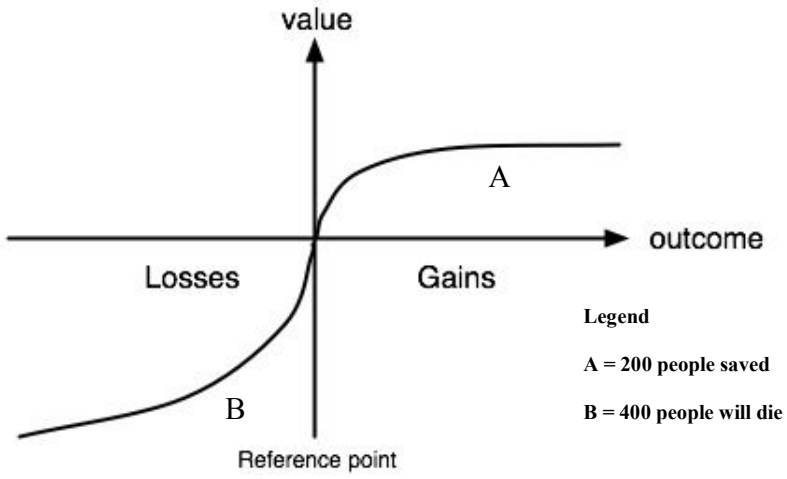
The alternative program, the loss frame option, describes a certain scenario were 400 people are predicted to die and a gamble were there is a 1/3 probability that nobody would die, and a 2/3 probability that 600 people would die. Tversky and Kahneman (1981) found that the majority choice in the second program is risk taking. The certain death of 400 people is less acceptable than the taking the gamble were there is a 2 in 3 chance that 600 people will die. Such a shift in preference from a certain option (risk aversion) to a gamble (risk seeking) is termed preference reversal.

This observation is not in accordance with expected utility theory (see Section and throughout 1.1.3) under which different representation of the same choice problem should yield the same preference (Tversky & Kahneman, 1986). Tverksy and Kahneman, (1981, 1986) and Kahneman and Tversky, (1979) developed Prospect Theory to explain such violations of expected utility and provide the context to message framing effects. Prospect Theory (Tverksy & Kahneman, 1981, 1986) is a model of risky choice designed to explain observed violations of expected utility such as invariance (different representations of the same choice problem should yield the same preference (Tversky & Kahneman, 1986)).

Under Prospect Theory individuals value gains and losses differently with potential losses weighed more heavily than the equivalent gain, meaning that the value function is steeper for losses (convex) than for gains (concave) as is demonstrated in Figure 1 on the next page.

For example in the loss frame option described in the Asian Disease problem above the risk of losing 600 lives is not subjectively more aversive than losing 400, so people will prefer to risk a greater loss with a chance of obtaining no deaths. The converse is true for gains: the value of potentially saving more lives (600) or none is not subjectively greater than the certainty of saving 200 (Ferguson *et al.,* 2005).

Figure 1: Value Function



(Source: Kahneman, D., & Tversky, A. Prospect theory: An analysis of decision making under risk, Econometrica 1979, 47, p 264)

There is a large literature supporting the existence of this so called framing effect which has been subject to both literature reviews (Ferguson, Bibby, & Leaviss, 2003; Levin, Schneider, & Gaeth, 1998), and meta analyses Kuhberger, 1998; Kuhberger, Schulte – Mecklenbeck, & Perner, 1999) the latter on AD like studies.

The mechanism through which framing effects occur is unclear and both within and beyond the health literature there is a growing research effort aimed at identifying potential mediators and moderators of framing effects (McIntosh, 2005; O'Connor *et al.,* 2005; Salovey, Schneider, & Apanovitch, 2002; Steward, Schneider, Pizarro, & Salovey, 2003; Williams, Clarke, & Borland, 2001; Xiao – Fei & Wang, 2003). Tversky and Kahneman (1981) state that the inconsistent responses to the alternative scenarios in the fore mentioned AD problem arise from the conjunction of the framing effect with contradictory attitudes toward risks involving gain and losses. Tversky and Kahneman (1981) further identified that it is the decision maker's conception of three elements (1) Options; (2) Outcomes and, (3) Conditional probabilities (the likelihood that the outcome will happen if the option is pursued) which are associated with a particular choice. An individual's cognitive representation of these three elements is termed the decision frame

(Tversky & Kahneman, 1981).

More recently, and with reference to health behaviours, Rothman and Salovey (1997); Rothman *et al.* (2003) recognize that there will be individual differences in perception, in terms of whether the outcome of a behaviour is perceived as favorable or unfavorable, which will influence the preference for either a safe or risky outcome. The decision frame that the participant adopts is determined by the elements of the problem itself and the norms, habits and personal characteristics of the participant. The latter may be based on variations in trait emotion, cognitive evaluation or immediate emotional reactions to the decision problem. The experiments in this thesis investigate whether any of the fore mentioned factors mediate or directly influence the relationship between frame and acceptance of a blood transfusion. A mediator variable accounts for the relationship between the predictor (in this case message frame) and outcome (in this case acceptance of a blood transfusion and choice of blood transfusion) (Baron & Kenny, 1986). Having described the theoretical aspect of Prospect Theory (Tverksy & Kahneman, 1981, 1986), it is pertinent that the next section details in greater depth the current state of research of message framing within the health domain.

1.2.1 Overview of Message Framing in the Health Domain

Systematic differences in people's preferences to undertake diagnostic tests (Kalichman & Coley, 1995; Maheswaran & Meyers-Levy, 1990; Marteau, 1989) screening tests for the detection of illness (Block & Keller, 1995, Llalor & Hailey, 1990; Meyerowtiz & Chaiken, 1987), treatments (Farrell *et al.,* 2001) and behaviours taken to reduce the risk of ill health or injury (Christpophersen & Gyulay, 1981; Linville, Fischer, & Fischoff, 1993; Rothman, Salovey, Antone, Keough, & Drake Martin, 1993; Treiber, 1986;) have been found within the message framing literature. However the direction of framing effects (whether there is a gain or loss frame advantage) has been found to differ between studies (see Rothman & Salovey, 1997 for reviews). Furthermore some studies have reported no framing effect (e.g., Lauver & Rubin, 1990, Lerman *et al.,* 1992; Rimer, Kedziera, & Levy, 1992; Siminoff & Fetting, 1989).

In order to account for the variations in framing effects within the health domain Rothman and Salovey (1997) conducted a review of the literature. From this review three types of health behaviour were identified: (a) preventative (a behaviour that maintains ones health or prevents the onset of a health problem, for example the application of

sunscreen), (b) recuperative (alleviates a current health problem, for example a blood transfusion to replace low levels of iron in the case of anemia) and (c) detection (tests to confirm or discover a health problem, for example mammography). Preventative and recuperative behaviours, although distinct, are concerned with health behaviours which are considered to reduce the risk of future health problems (where future in the case of preventative corresponds to long term, and recuperative to the short term), and so are considered collectively in the literature. The treatment which is studied in this thesis, the blood transfusion process, is referred to here as a preventative treatment to ensure consistency with previous message framing research within the blood transfusion context (see Ferguson *et al.,* 2005; Farrell, 2005; Farrell *et al.,* 2001).

It is the function of the health behaviour being promoted which determines whether there is a gain or a loss frame advantage i.e. whether it serves as an illness - detecting or a health affirming function (Rothman & Salovey, 1997). Adding to that, recall from Section 1.1, that subsequent research concluded that the differential framing effects observed between preventative and detection behaviours are down to the risk and uncertainty that the behaviour presents (Rothman & Salovey, 1997; Rothman *et al.,* 2003). The hypothesis by Rothman and Salovey (1997) thus has enabled the health framing literature to be organized with some clarity and generates a base from which to investigate inconsistencies in framing effects. The following section discusses the testing of Rothman and Salovey's (1997) typology and its limitations.

1.2.2 Testing of Rothman and Salovey's (1997) Typology

Empirical evidence that the degree of risk and uncertainty presented by the health behaviour moderates the effect of framed appeals has been found from studies which have either manipulated the function of the behaviour (Rothman, Martino, Bedel, Detweiler, & Salovey, 1999) or measured individual perceptions of certainty of outcome (HIV testing (Apanovitch, McCarthy, & Salovey 2003)). More recent evidence suggests that how risky a preventative behaviour is in terms of health outcome efficacies can moderate framing effects. O' Connor *et al.* (2005), examined the intention of participants to use a preventative behaviour with high perceived risk (male hormonal contraceptive). In this study it was found that exposure to a loss frame influenced intention. Empirical evidence then is growing to support the postulate that it is the perceived risk implications of a health behaviour that determines the frame which is most advantageous to promoting

that behaviour. Hence it does appear that not only is it the function of a health behaviour or treatment, be it preventative or detection, that can predict framing effects, but also whether the treatment or behaviour under consideration is perceived by the individual to reflect health benefits or costs.

Ferguson *et al.* (2005) sought to add to the literature by considering the blood transfusion process which was argued by the authors to be a low risk preventative treatment. Suitably there are four different blood transfusion types (donated blood, bovine haemoglobin, perflurocarbon and human haemoglobin) which vary in terms of risk and naturalness, from man - made transfusion type (perflurocarbon) to naturally occurring blood products (human and bovine haemoglobin and donated blood). Moreover, with blood substitutes being a biotechnology, they can arguably be perceived as unfavourable and judged to be low in benefit and higher in risk compared to donated blood (see Alhakami & Slovic, 1994; Slovic, Finucane, Peters, & MacGregor, 2004; Slovic, 1987; Slovic & Peters, 2006). Such variation allows the testing of Rothman and Salovey (1997) without the need for experimental manipulation. According to the hypothesis of Rothman and Salovey (1997); Rothman *et al.* (2003), from the point of view that a health behaviour is not perceived as a safe option, gain framed appeals should be less effective. Hence with respect to the blood transfusion context a loss frame would be expected to be more effective for the riskier option - blood substitutes. However, in this study the framing effect was not moderated by the risk presented by the blood transfusion type. The assessments of safety of the blood transfusion types observed in this study were consistent with the typology by Rothman and Salovey (1997) whereby a gain frame advantage is found in the case of a preventative behaviour, and not what would be expected in the case of a more risky treatment option. However, it is important to note that the frames employed in the study by Ferguson *et al.,* (2005) and indeed throughout this thesis are attribute frames. Recall from Section 1.2 that gain framed messages stress the benefits or negative consequences avoided if one accepts a course of action (e.g. there is a 97% chance that the side effect hypertension will not result from a blood transfusion). Loss framed messages stress either the negative consequences incurred or the benefits forgone if one does not accept a course of treatment (e.g. a 3% chance that one will experience hypertension during a blood transfusion) (Meyers – Levy & Maheswaran, 2004). Levin *et al.,* (1998) proposed a typology to account for the observed inconsistencies within the framing literature. Under this typology three types of framing

are distinguished - risky choice, attribute, and goal framing. A goal frame would emphasise the positive consequences of accepting (e.g. recovery or replacement of loss blood) or declining the blood transfusion (e.g. slower recovery). Risky choice-framing effects occur when willingness to take a risk (e.g., elect a medical procedure with variable potential outcomes) depends on whether the potential outcomes are positively framed (e.g., in terms of success rate) or negatively framed (e.g., in terms of failure rate). Typically, as in Tversky and Kahneman's (1981) "Asian disease task," people are more willing to take risks with negatively framed outcomes than with positively framed outcomes. That is, they are more apt to take risks to avoid a loss than to achieve a gain.

The third type of frame identified under the typology of Levin *et al.,* (1998) being attribute frames are employed in this thesis. Such frames emphasize the positive or negative aspects of a key attribute of a treatment. For example in the case of the Bovine blood substitute the side effect of hypertension can be considered to be a key attribute. Under the typology by Levin *et al.,* (1998) where attribute frames are concerned a gain frame advantage is expected to be observed as they (attribute frames) can generate a positive association and therefore be more attractive than a negative framed option (Krishnamurthy, McCarthy, & Blair, 2001). That is decision making may be influenced by the framing of the side effect (s) as a positive or negative, irrespective of the risk presented by the procedure. This compares to the Rothman and Salovey model where we would expect a loss frame advantage for the higher risk Bovine haemoglobin.

The studies presented in this thesis however are not concerned with testing the two competing hypothesis. That is the Levin *et al.,* (1998) model would not sugest that risk moderates the effects of frame valance – just that attribute frame would show again frame advantage, whereas Rothman and Salovey (1997) suggest a moderating role for risk. The studies reported here just tested the moderating effects of risk with respect to gain and loss frames. One recent paper has tested the competing hypotheses from these two theories and the interested reader is referred to that paper by Ferguson and Gallagher (2007).

Beyond the typology proposed by Levin *et al.,* (1998) there are additional explanations for the lack of support found for the moderation of framing by risk. Firstly in the case of blood substitutes there may not be a sufficient difference in emotional reaction between donated blood and blood substitute to enable a statistically significant difference in

framing effect to be observed. In order to enhance our understanding of choice between medical biotechnologies and traditional treatment types Lowe and Ferguson (2003) suggested that how and what emotional reactions influence people's decision making should be considered within the context of the treatment decisions. This would appear to make sense considering the well documented finding that perceptions of risk are associated with more negative feelings (e.g. Finucane, Alhakami, Slovic, & Johnson, 2000; Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Peters, Slovic, Hibbard, & Tusler, 2006). Indeed recent research within the academic discipline of politics has concluded that framing effects operate through both cognitive and affective channels (Gross, 2008). To date there is limited research assessing emotional arousal in framing effects (Salovey & Wegener, 2003; Williams *et al.,* 2001). Those studies which have assessed emotional reaction to the framing effect have failed to find any differential effect on framing (Meyerowitz & Chaiken, 1987; Rothman *et al.,* 1993). By replicating and extending the work of Ferguson *et al.* (2005) to include the measurement of immediate affect, this may be further clarified. From any significant findings it may be possible to make refinements to the hypothesis of Rothman and Salovey (1997) to account for this apparent lack of consistency, whereby the framing effect was not moderated by the risk presented by the blood transfusion type as expected. The studies conducted in this present thesis will aim to extend upon the work of Ferguson *et al.* (2005) in a number of counts and these are outlined in the following sections.

Firstly with the study by Ferguson *et al.* (2005) having measured both the public's and patient's perception of safety towards blood substitutes, it remains to be seen if the same pattern of framing effects will translate to acceptance and choice of blood transfusion type. Despite the well demonstrated effects that high risk biotechnologies are less accepted (Finucane *et al.,* 2000) little is currently known about the relationships between people's perception of safety and their intention to accept a blood transfusion. It has however been found, with respect to pesticide use, that beliefs about safety are the most powerful predictors of acceptability (Coppin, Eisenhower, & Krannick, 2002). Given this it may be expected that the same framing effects found with respect to perceptions of safety may be found with respect to the acceptance of a blood transfusion. However as necessity for a biotechnology has been found to moderate perceptions of safety (Dunlap & Curtis, 1992), the question then arises, in cases of need for a blood transfusion, will participants ignore beliefs about safety and accept a blood substitute?

The experiments reported in this thesis will report on the acceptance levels of blood substitutes, both when an alternative donated blood is presented, and when only a blood substitute is offered, as both are seen as potential scenarios which could arise in a health setting. In accordance with Rothman and Salovey (1997), because choosing an unknown blood transfusion type (blood substitutes) has relatively uncertain consequences and a greater perceived risk, it is hypothesized that loss - framed messages to motivate acceptance of the blood transfusion will be more advantageous than gain - framed messages in the case of blood substitutes.

1.2.3 Message Framing within the Health Domain and Prospect Theory

Within the health domain framing studies have largely focused on the outcome of a test result or the probability of preventing a disease. In the frames employed in this thesis it is not the success of the blood transfusion which is framed (i.e. success of the transfusion in treating the current ailment) but the probability of being affected by the side effects associated with the respective blood transfusion type. Specifically the positive and negative effects of each particular blood transfusion type will be made differently salient, termed risk manipulation by outcome salience (Kuhberger, 1998). Neither blood transfusion type (donated human blood or a blood substitute) will be a sure option; both will be risky options although varying in their degree of severity around a particular attribute both will be risky options. For example, if one receives donated blood, there is a "1 in 200,000 chance of contracting hepatitis C" versus a "less chance of infection" if bovine hemoglobin is used. The notion of risk then will be similar to that of the original AD problem whereby risk was manipulated by outcome of a possible risky event, outbreak of flu. Here risk will refer to the adverse reactions resulting from the possibility that one may require a blood transfusion (risky event). Stronger framing effects have been found when the decision problem is closer to the AD problem (previously discussed in Section 1.2) (Kuhberger, 1999). This will allow for the first time the assessment of Rothman and Salovey (1997) when applied to treatment decisions in which participants are presented with both the likelihood of risk and a choice, as in the AD problem. Lack of control in specifying probabilities associated with response options has been suggested to undermine systematic testing of Prospect Theory in health (Rothman & Salovey, 1997). Findings in line with Rothman and Salovey (1997) may suggest that the application of the basic assumptions of Prospect Theory (Tversky & Kahneman, 1981) has been successful

in the health framing literature. Besides this theoretical issue it is important to further extend the framing literature to include situations whereby participants are presented with a choice, for several reasons. Firstly as the range of health behaviours studied within a framing context increases current hypotheses may be found to have limited applicability. Secondly due to the advent of biotechnologies there is a proliferation of alternative treatment types which increases the potential opportunity for patients to choose between natural / traditional treatment options and biotechnologies. Thirdly there is only a small body of literature from two decades ago in which message framing was applied to the understanding of preferences between alternative treatment types. Variations in the aims, and confounding factors such as method of administration (Cormier O' Connor *et al.,* 1985) and varying efficacies of the procedures outcome (Eraker, Parker, & Sox, 1981) mean conclusions are hard to draw.

However, there are ethical problems in that differentially framed choice scenarios would undoubtedly compromise informed consent. It is therefore unlikely that information about two different blood transfusion types would be presented to patients as a framed message. This means information gained from framing studies may have limited applicability in the clinical context where patients choose between two treatment options. None the less, it would be ideal if decisions on the choice of blood transfusion type could incorporate the patients' view. Therefore, it is desirable to ascertain which is the most ethical and reassuring manner to present information to help patients make optimal decisions. Hence in this study information about the two blood transfusion types (donated blood and blood substitute) will also be presented congruently as two negative frames and two positive frames. This will provide the BTS with data which is essential to enable to present information about the alternatives in an unbiased fashion.

1.2.4 Message Framing and Decision Making on the Behalf of Another

Within transfusion medicine there lies the possibility that in certain situations (dependent upon an individual's blood group, the supply of blood, policy as to whether patients will be given a choice between blood transfusion types, or state of patient's consciousness) decisions as to whether to use a blood substitute or donated blood could be made for family members and friends. Little is currently known whether decisions made by those acting on the behalf of another are subject to framing effects. Hence an additional aim of this current research is to determine how framed information can

influence decision making on the behalf of another.

In the three experimental studies (Chapters 2, 4 and 5) presented in this thesis the participants will be asked to make decisions to accept a blood transfusion (Experiment 1, Chapter 2) or a choice of blood transfusion type (Experiment 3, Chapter 4), (Experiment 4, Chapter 5), on the behalf of a family member and friend, as well as for oneself. Findings from this investigation may further the application of message framing as a communication strategy to situations whereby consent is required on the behalf of another. Moreover a recent question posed by Rothman, Bartels, Wlaschin, & Salovey (2006) is what determines whether an individual construes a health behaviour as risk averse or risk seeking? Data on the framing effects that are observed when decision making in a choice context is made on the behalf of others may identify a constraint surrounding predictions based on Rothman and Salovey (1997). In addition extending research to include decision making on the behalf of others may provide insight into how decision making made on the behalf of another deviates from that which an individual would make for oneself. Such information may be of interest to those considering or advocating advance directives.

Certainly there is evidence that the intended recipient of a treatment influences individuals decision making. An example of this is a finding by Levin and Chapman (1990) that among patient groups the lives of less stigmatized groups were perceived to be of greater value resulting in risk aversion (i.e. the less risky option was chosen). In addition there is a small body of evidence within the framing literature indicating that the relationship of the recipient to the decision maker also has an influence upon the choice an individual makes. For example, when comparing the decision making about a surgical scenario on the behalf of a family member and a stranger, Wilson, Kaplan, and Schneiderman (1987) found that when the decision involved a stranger's health outcome, the framing effect did not hold.

Wang (1996b) argued that such findings may reflect evolutionary theories such as inclusive fitness (where individuals are predicted to be more helpful towards a relative in order to ensure the passage of genes to the next generation) and Kin Selection theory (KS), (Maynard Smith, 1964), which is widely invoked to account for the preferential treatment of kin - nepotism - in primate societies. In support of evolutionary theories providing an explanation for findings observed when decision making on the behalf of

others, Wang & Johnston, 1995; Wang, 1996a, conducted an in depth range of work testing predictions derived from evolutionary theories on risk preference in human choice within a group context (small family group). Within these studies when small family groups were faced with a situation of losses it was observed that individuals acted in a risk seeking fashion in order to save the whole family or as many members as possible, rather than a risk averse choice that would save only a few.

Considering the evolutionary argument, and the earlier findings of Wilson *et al.* (1987) it is hypothesized that participants will make the same decision to accept a blood transfusion or choice of blood transfusion type (i.e. the same framing effect will be observed, a gain frame advantage under conditions of safety) for their family and friends as for themselves. However, the framing effect is expected to be more pronounced for the self, decreasing progressively along a gradient from the self to a family member and then to a friend. By investigating how the predictions of Rothman and Salovey (1997) apply to decision making on the behalf of another, the work by Wilson *et al.* (1987) is extended.

1.3 Individual Differences in Risk Perception - Perceptions of the Blood Transfusion Procedure

Cognitive factors are also well documented to play a role in acceptance of risky technology (Peters, Burraston, & Mertz, 2004). To date aside from the perception of safety (Finucane *et al.,* 2000) and severity of side effects associated with blood transfusions (Lowe *et al.,* 2001) little is known about an individual's motivation or concerns when accepting a blood transfusion. Kuhberger (2002) is one of a number of theorists who argue that research into decision theory should put more effort into researching how people perceive decision tasks. Arguably there is variation in the degree of risk presented not only between blood substitutes and donated blood, but also within the blood substitutes themselves (bovine haemoglobin, perflurocarbon and human haemoglobin). For example, the blood transfusion types differ on a number of attributes such as the source from which they are derived, the likelihood of side effects and the history of their use. All of these factors may make one or other of the blood transfusion types appear more risky than another. Aside from the perceived risk of a health behaviour it is recognized that additional beliefs and attitudes towards a given health behaviour or treatment may influence choice by acting as a moderator or mediate between frame and choice (Rothman *et al.,* 2006).

According to Rothman and Salovey (1997); Rothman *et al.,* (2003) it is the degree to which performing the recommended health behaviour presents risk to an individual that determines which frame is more likely to be effective in encouraging the behaviour or treatment advocated. For example, even when the information is presented in a positive light a potential recipient may not want to be transfused with a blood transfusion type if they perceive the product to be unnatural. On the other hand in the domain of losses even where there is a chance that a side effect may be experienced from the transfusion an individual may be willing to take a risk. Hence the research presented in this thesis takes a novel approach to increasing our understanding of cognitive process in framing effects. Following the identification of the reasons behind individual's decision making with regard to the blood transfusion process, a psychometric scale will be developed to measure factors important to decision making. Gaining information on how people construe the advocated health behaviour may improve the ability of investigators to specify the set of thoughts and / or feelings elicited by gain and loss framed appeals, which in turn, guide behavioural decisions (Rothman *et al.,* 2003). Given that frames can differentially influence how an individual thinks about a problem it may be the case that factors important to decision making brought to light from framed messages may mediate the relationship between frame and choice of blood transfusion type. Previously Maule (1989) identified from a think aloud protocol analysis of the AD problem that frame influenced whether participants thought about gains or losses (moral principles were also identified in the case of losses) when thinking about the problem. Other than the identification of moral principles (which are arguably specific to the AD problem) the data from Maule (1989) may not inform on what particular beliefs are elicited by gain and loss framed messages in relation to treatment decisions. Within the health framing literature two previous studies have investigated the possibility that attitudinal variables may mediate the effect of frame on behaviour but failed to find a significant effect (Banks, Salovey, Green, Mayer, Beauvais, & Epel, 1995; O 'Connor *et al.,* 2005).

The measurement instrument developed in Chapter 3 of this thesis, using information gained from qualitative data collected from Experiment 1 on reasons for the acceptance of a blood transfusion, is employed to measure the factors around which people decide to accept blood transfusion products. This will facilitate an investigation into (a) whether the way individuals think about the blood transfusion process and types directly influences choice of blood transfusion type (donated blood or blood substitute); and (b) whether

factors important to the choice of a blood transfusion type mediate the relationship between frame and choice of blood transfusion type.

1.4 Individual Difference in Risk Perception - Emotionality in Decision Making

Finally attention is drawn to affect which is speculated to be a factor that may determine whether an individual is receptive to the frame advocated (Ferguson *et al.,* 2005, Ferguson & Lowe, 2003; Rothman & Salovey, 1997; Salovey *et al.,* 2002; Slovic, Peters, Finucane, & MacGregor, 2005). Ideally, in order to study the role of affect upon message framing effects and provide insight into the theoretical questions surrounding the emotion cognition debate, a context which is emotionally charged is required. Decisions in the health context can suit this requirement (Krishnamurthy *et al.,* 2001) and so the blood transfusion example is seen as a suitable vehicle to examine the role affect may play in people's receptivity to framed information.

As previously stated (see Section 1.2.2) any significant influence of affect on framing effects may account for the variation found in framing effects between behaviours of the same function. This could mean for example, that the risk presented by the procedure may only moderate framing where immediate emotions are experienced. Moreover within the wealth of literature examining the role of affect in human judgment and decision making two key issues are debated. Firstly is emotion independent of thought Lazarus (1999), and secondly are specific emotions rather than global (negative - positive) feelings important to risk preference? In addressing the role of affect in message framing effects the experiments conducted in this thesis aims to provide insight into these two key issues. The theoretical background to the emotion cognition debate will now considered.

1.4.1 The Consequentialist Perspective

In common with expected utility theory the consequentialist perspective asserts that under conditions of risk and uncertainty, decision makers weigh up the costs and benefits of the options presented to them and take the action which yields the greatest benefit (Loewenstein *et al.,* 2001). For example, in the case of a decision to accept or decline a blood transfusion, a typical response may be "the risk to me is in my opinion far outweighed by the potential benefit to me". Under the consequentialist perspective any role of emotion is said to be confined to emotions that an individual expects to occur when the outcome of the decision is experienced, and serves as an input to the cognitive decision making process. Such emotions are termed anticipated emotions. In the context

of the experiments conducted in this thesis an example of this would be one expecting the blood transfusion process to be worrying. Such individuals are hypothesized to be more likely to accept the gain framed option and decline the loss framed option. From that view point, feeling cannot arise without cognition, meaning that any role of emotion in the decision making process is indirect.

However, as previously mentioned, message framing effects demonstrate that decision making is not always a rational process. Moreover there is strong evidence supporting the role of immediate emotion which comes from neuroscientific studies where it has been found that emotional deficits can lead to impairments in decision making (see Bechara, 2004). This evidence leads to the conclusion that immediate affect can also contribute an important input both to the decision making process and changes in the willingness of people to take risks (Shiv, Loewenstein, & Bechara, 2005). In consideration of such data, modern cognitive appraisal theories of emotion contend that in making decisions individuals also care about the emotion associated with the situation, and that individual difference factors influence the decision making process (Loewenstein & Lerner, 2002). The referral to positive or negative associations one has with a task when making a decision is termed the affect heuristic (Slovic, Finucane, Peters, & MacGregor, 2002).

Beyond this theory there are a number of hypotheses which contend that current feelings can act as a guide to decision making, the affect as information hypothesis by Schwarz and Clore (1983) being one. Such hypotheses do not however assert that affective reactions are independent of cognitive evaluations. As shown by the marker A in Figure 2 on the next page it is the relationship between cognitive evaluations and feelings which has the impact on behaviour. The risk - as - feelings hypothesis (Loewenstein *et al.,* 2001) is a hypothesis which takes into account feelings both expected and experienced, at the time of decision making and is depicted by marker B in Figure 2. Importantly the risk - as - feelings hypothesis extends upon hypotheses such as the affect as information hypothesis (Schwarz & Clore, 1983) by considering that affective reactions can both arise without cognition and diverge from cognitive evaluations. For example, the thought that the blood transfusion process may be unsafe could be overwhelmed by feelings of joy that the clinical procedure will alleviate the clinical problem. This has been shown to be particularly the case at high levels of emotional intensity (Lerner & Loewenstein, 2002). In Figure 2 the direct relationship between feelings and behaviour is indicated by the

marker B. In the context of the experiments conducted in this thesis, those who may experience negatively valenced feelings are hypothesized to make more risk averse decisions, independent of the frame presented.

In addition to examining the influence of individual differences in trait emotion and immediate emotional reaction, anticipated emotional reactions to the surgical scenarios are explored. The study of anticipated emotion allows parallels to be drawn to prior research on judgment and decision making which has primarily focused on anticipated emotions (Kobbeltved, Brun, Johnsen, & Eid, 2005).

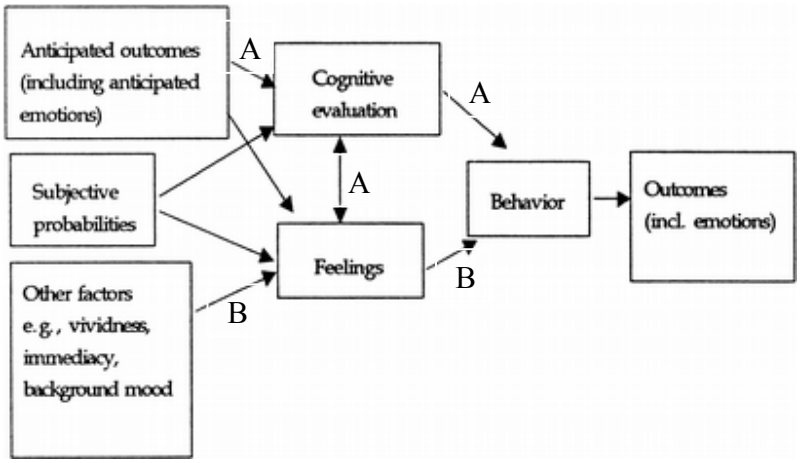


Figure 2: Risk as Feelings Perspective (Source:Loewenstein,G.F.,Weber,E.V.,Hsee,C.K.,Welch,N. Risk as Feelings. Psychological Bulletin, 2001,127 (2), p270)

As hypothesised earlier in this introduction it may well be that the null results obtained in relation to the moderating role of risk by Ferguson *et al.* (2005) may have been due to the lack of emotional reaction. Affect has been found to be created under a time constraint (Maule, Hockey, & Bdzola, 2000; Hockey, Maule, Clough, & Bdzola, 2000). Therefore, in order to further investigate whether immediate emotion can exert a direct effect upon choice of blood transfusion type a time pressure methodology aimed at generating high levels of emotional intensity will be employed in this thesis.

The extent to which feelings are involved in the decision making process seem to be more clearly exposed when peoples opportunity for analytical deliberation is reduced and an efficient mode of judgment is needed (Finucane *et al.,* 2000). Decisions made under a time constraint are therefore argued to be more likely to expose the direct role of emotion. Aside from Svenson and Benson (1993a), Wright and Weitz (1977), within the message framing and decision making literature in health, researchers have typically

allowed the decision maker a relaxed amount of time to perform a task or to make a decision. Previously Svenson and Benson (1993a) found, using Tversky and Kahneman's (1981) AD problem, that when participants had unlimited time under which to make a decision there was a stronger framing effect compared to when the time was short. Similarly Wright and Weitz (1977), in relation to a women's birth control device, found women who made more hasty judgments to be more loss - averse. Thus it would seem that framing effects are not the result of immediate feelings towards the information presented (i.e. are not instantaneous) but occur during the process of cognitive deliberation. However, the results from other studies mean this is far from conclusive.

Firstly, Wright (1974) reported greater weight being placed on negative information under deadlines. Such weighting on negative information may generate negative affect which in turn may increase the perceived risk towards the choice dilemma (Peters, Lipkus, & Diefenbach, 2006). Perceptions of risk in turn are argued to be related to feelings (Alhakami & Slovic, 1994; Loewenstein *et al.,* 2001; Slovic & Peters, 2006). Thus an increase in emotional reaction under a time constraint may account for the differences in risk taking observed between deadline and non deadline conditions. Secondly, Svenson and Benson (1993a) found from their subsequent experiments, that the effects of a time constraint were not so clear, being problem specific in line with research from the general decision making literature. For example Ordonez and Benson (1997) found that a time constraint affected strategies in a rating task but not a pricing task meaning the ratings of responses appear to be more malleable than prices. From those findings, changes in decision making as a result of a time constraint appear to be task specific. This may be because tasks differ regarding the relative affective salience of information (Slovic *et al.,* 2004).

Not all events or situations may generate affect neither does affect appear to influence all types of decision (Lerner & Loewenstein, 2002). With the exception of Maule *et al.* (2000); Hockey *et al*. (2000), studies involving a time constraint have not measured affectivity. In order to address this void in the literature the experiments conducted in this thesis will measure emotional reactions to the surgical scenario during a time constraint. More specifically in Experiment 4, Chapter 5 the choice of blood transfusion made by participants not placed under a time restriction will be compared to the choice participants make under a time constraint. If the imposition of a deadline does not have a

significant effect on choice, with any framing effects remaining under a time constraint, this may lend support to the view that emotion has some influence on observed message framing effects. If decision making is an entirely cognitive activity it would be expected there would be insufficient time for some individuals to make their choice under a time constraint leading to significant differences in choice of blood transfusion between the two conditions (i.e. lack of framing effect or a preference reversal).

The study of decision making in a health context under a time constraint is not only important from a theoretical standpoint but as a means to inform practice. Within day to day life people are increasingly placed under time pressure when making decisions. This is especially the case in the health domain, and time pressure studies which simulate stress may render results from message framing more ecologically valid. Moreover there is evidence that psychological stress exceeding a certain intensity affects the quality of decision making (Keinan, 1987; Maule & Edland, 1989). Poor decision making may lead to anxiety or lack of satisfaction following medical procedures in both patients and clinicians, and taking the long view influence medical outcomes. As such it is important to see if within the health domain quality of decision making is affected under time stress.

Both the risk - as - feelings hypothesis (Loewenstein *et al.,* 2001) and the consequentialist perceptive, although different in their claims about the influence of emotion on decision making, base their predictions on the valence of affect. This model is argued to be too simplistic (Slovic & Peters, 2006; Lerner & Keltner, 2001; Lerner, Gonzalez, Small, & Fischoff, 2003). In order to address the influence of specific emotions on judgment and choice Lerner and Keltner, (2000, 2001) developed the appraisal tendency framework (ATF) to examine whether specific emotions of the same valence differentially influence choice outcomes and judgment. This framework will be further outlined in the next section.

The ATF is based on the findings by Smith and Ellsworth (1985, 1987) who found that different emotions are characterized by different patterns of appraisal, in the case of emotional states actually experienced and on people's' memories of events. Six orthogonal cognitive appraisal dimensions (certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility) which can differentiate emotional experience of an event were identified. The four appraisal dimensions which exert differential effects on the three trait emotions studied in this thesis, namely fear, anger,

and happiness, are shown in Table 1 on the next page. From Table 1 it can be seen that the emotions of anger and fear differ on appraisals of both certainty and control (human and sense of responsibility**)** with individuals with higher levels of trait anger appraising or sensing the environment as high in certainty and control and fear as low in certainty and control. Under the ATF it is assumed that underlying appraisal themes define the influence of different dispositional emotions on decision tasks (Lerner & Keltner, 2000). For example in the case of trait anger the underlying appraisal theme of certainty may be activated directing the appraisal of events. Recall from Section 1.2 on the theoretical background to message framing effect that when a situation is viewed as certain there is a tendency for individuals to behave in a risk averse fashion. Hence Lerner and Keltner (2001) argue that angry individuals are more likely to appraise risk situations as certain and under their control leading to risk seeking. Considering that a number of authors (e.g. Lerner and Keltner, 2000, 2001; Slovic 1987; McDaniels, Aexlrod, Cavanagh, & Slovic, 1997) argue that judgments of risk may be determined by cognitive metafactors which resemble control and certainty, dispositional anger and fear may determine the risk assessment people make. Specifically in contrast to individuals high in trait anger, fearful individuals are expected to be more likely to assess a situation as uncertain leading to pessimistic risk assessments. Theoretically such individuals will behave in risk averse manner and see the situation as out of their control. Lerner and Keltner (2001), using the example of the AD problem, indeed found this to be the case, with the degree to which a person holds chronic disposition to anger or fear being found to shape risk preference. Specific emotion effects have also been observed in potential real world choice tasks such as job selection, and gambling (Rangatham & Pham, 1999; Bodenhausen, Sheppard, & Kramer, 1994; De Steno, Petty, Wegener, & Rucker, 2000, Lerner *et al.,* 2003). Such findings follow a growing body of evidence showing that personality factors predict risk preferences in various domains (health, work finance) (e.g., Baron, 2004, Breslin, Sobell, Cappell, Vakili, & Poulos, 1999; Hockey *et al.,* 2000). In addition a growing number of studies have indeed found that trait emotions of the same valence, such as fear and anger, were shown to exert differential effects on decision making under risk (Lerner & Keltner, 2000, 2001; Lerner, Gonzalez, Small, & Fischoff, 2003).

Table 1. Appraisal Properties of the Emotions Anger, Fear and Happiness

Appraisal Dimensions→ Level of Appraisal↓	**Pleasantness**	**Certainty**	**Human Control**	**Sense of Responsibility and Control**
High perception of the appraisal theme	Happiness	Anger Happiness	Happiness Anger	Happiness Anger
Low perception of the appraisal theme	Anger Fear	Fear	Fear	Fear

Note: The remaining two appraisal dimensions (attentional activity and anticipated effort) do not exert differential effects on anger, fear and happiness and are not shown here.

Thus this thesis will not only aim to decide the role of emotion in decision making in the blood transfusion context but also whether specific emotion influences choice and acceptance of a blood transfusion. The blood transfusion process is a suitable domain for studying the ATF as it can be considered ambiguous in relation to both certainty and control. For example, perceptions of the control a patient may have over the blood transfusion process and any side effects and perceptions of the certainty of outcome may vary between individuals. For events which are ambiguous with respect to the dimension it is expected that the emotional carry over will be strong (Lerner & Keltner, 2001).

1.5 Summary

In summary initial testing of Rothman and Salovey's (1997) hypothesis as an explanation for the inconsistent findings within the health domain has been promising. However Rothman and Salovey's (1997) framework does not address the role of individual differences in perception of the framed information due to emotion or personal beliefs. The experiments conducted within this thesis intend to find further support for Rothman and Salovey's (1997) hypothesis while extending their hypothesis by improving our understanding of factors such as immediate emotion in the decision making process.

There is increasing need to understand, and indeed there should be an interest in, the factors which relate to choice between biotechnology and the traditional treatment type. To improve knowledge of how framing effects occur would improve health promotion campaigns as bodies could then concentrate on the factors which influence message framing effects. If it was found, for example, that it was trait fear rather than the risk presented by the procedure or health behaviour that role in decision making, appropriate action in the form of interventions could be taken to address this.

1.6 Hypotheses to be tested

The hypotheses to be tested in this thesis are:

(1) Based on Rothman and Salovey's (1997) framework it is hypothesized that the individuals who receive a gain framed message will be significantly more likely to act in a risk averse fashion. However, with the more risky blood substitutes it is hypothesized that due to the moderating role of risk there will be a loss frame advantage with individuals more likely to accept the blood transfusion under a loss frame. In the case of decision making on the behalf of others, individuals are expected to be increasingly risk seeking in choice of blood transfusion type with distance from the self. This hypothesised pattern of framing will be expected to extend to a choice task.

(2) Based on Loewenstein *et al.* (2001) risk - as - feelings hypothesis it is predicted that emotional reaction to the surgical scenario will influence choice and acceptance of a blood transfusion independently of message frame. In relation to the influence of anticipated emotions (recall from Section 1.4.1 that anticipated emotions are based on the expected consequences of the decision) on choice of blood transfusion, it is hypothesized that their influence will be mediated by message frame.

(3) Based on Lerner and Keltner (2001) it would be expected that under conditions of greater risk combined with a loss frame, acceptance of a blood transfusion would vary between angry and fearful individuals. Angry individuals being more risk seeking would be expected to be more likely to accept the blood transfusion and fearful individuals to act in a risk averse fashion, being more likely to decline the blood transfusion.

(4) Based on the risk - as - feelings hypothesis Loewenstein *et al.* (2001 it is expected that individuals would make the same choice of blood transfusion type under a time constraint as when there is no time constraint. In terms of the consequentialist perspective

it would be expected that there would be insufficient time for some individuals to make their choice under time pressure leading to differences in choice of blood transfusion type under a time constraint.

CHAPTER 2

Perceived Risk, Trait and Immediate Emotion and their Relationship to Message Framing Effects

2.1 Overview of the Chapter

Faced with blood loss, to receive a blood transfusion is a safe option as the procedure presents few risks and the outcome is almost certainly to be an improvement in ones condition. Hence other than on religious grounds it would make sense for an individual to accept a blood transfusion with any available solution. However the way information is presented has been found to differentially influence patient's and the public's perceptions of safety towards both donated blood and blood substitutes (Ferguson *et al.,* 2005; Farrell *et al.,* 2001). The first aim of the experiment described in this chapter is to explore whether the gain frame advantage observed with respect to perceptions of confidence in the safety of blood transfusion found by Ferguson *et al.* (2005) and Farrell *et al*. (2001) still applies in the case of a clinical outcome variable, namely acceptance of a blood transfusion in the case of the self and on behalf of another. From Rothman and Salovey (1997) it is hypothesized that when individuals are presented with framed information concerning the side effects of the transfusion procedure, in the case of all four blood transfusion types, a greater acceptance of the blood transfusion is expected under a gain frame compared to a loss frame. However the blood transfusion types studied here vary in a number of dimensions which may affect the level of risk one perceives them to present (Ferguson, *et al.,* 2005). It was therefore also hypothesised, based on the moderating effect of risk, that a loss frame advantage would be observed for the more risky blood transfusion type bovine haemoglobin. In the case of decision making on the behalf of a friend it was hypothesised that under conditions of safety participants will be more likely to be risk seeking (loss frame advantage), and risk averse (gain frame advantage) when faced with a potential loss.

Secondly the risk- as - feelings hypothesis (Loewenstein *et al.,* 2001) will be investigated through the measurement of immediate emotional reactions to the surgical scenario. The question being asked is whether any effect of immediate emotion on the decision to accept a blood transfusion is direct, or mediated by frame (indirect). Although support has already been found for the risk – as - feelings hypothesis (Loewenstein *et al.,* 2001) in the domain of transfusion medicine (see Farrell *et al.,* 2001; Ferguson *et al.,*

2005) work needs to be extended from the measurement of stress appraisals to examining more direct emotional reactions, such as fear (Ferguson *et al., 2005*).

Thirdly this experiment investigates whether emotional dispositions of the same valence can differentially moderate the relationship between the risk presented by the blood transfusion and frame. A moderator is a variable that influences the strength and / or direction of the relation between the treatment variable {message frame} and the dependent variable (Muller, Judd, & Yzerbyt, 2005). In order for the findings by Lerner and Keltner (2001) to be shown to extend beyond the AD problem, a richer and more precise understanding of message framing effects in the health domain may result. It is therefore hypothesised that fearful individuals are more likely to behave in a risk averse fashion across frames and angry individuals to be risk seeking. Finally recall from the introduction, Section 1.3, that as well as individual differences in emotional reaction to the situation, individual's beliefs and attitudes towards the blood transfusion process will be examined as a potential mediator of framing effects. The prospect of a blood transfusion gives rise to a range of concerns (for example, are there any side effects, will the procedure hurt), which may vary in importance from person to person. Given this, in order to increase our understanding of concerns potential patients may have about blood substitutes, qualitative data will be collected from participants on their reasons for the decision to accept or decline a blood transfusion. Identifying factors which contribute to the perception of risk towards blood transfusion types is important because these may subsequently lead to the choices people make.

Additionally within this chapter a second Experiment (1A) is included to test the assertion by Slovic *et al.* (2004) that the way risk information is presented may affect perceptions of risk. Slovic and colleagues suggest that risk perception will be influenced by whether information is presented as a probabilistic or as a frequentistic representation. As the scenarios used within the experiments conducted within this thesis are designed to depict the presentation of information within real clinical contexts the framed scenarios vary in the side effects and the way the information is represented. This presents the opportunity to test the question posed by Slovic *et al.,* (2004). A further aim of this chapter then is to examine whether expressing the occurrence of side effects as a probability (1 in 200 thousand will be infected with Hepatitis C) versus a frequentistic presentation of information (there is a small risk of infection with Hepatitis C) has any

influence on framing effects. Not only will the representation of information be different but also the complexity and amount of material will differ between frames. This experiment along with the main experiment presented in this chapter may therefore also add support to the finding by Steward, Schneider, Pizarro, and Salovey (1997) that the complexity of a framing scenario does not alter the framing effect. The hypothesis based on the finding by Steward, *et al.,* (2003) and the proposal by Slovic (2004) is that there will be no difference in the framing effect observed between Experiment 1 A and the main experiment.

2.2 Method

Experiment 1

2.2 1 Design

The experiment was a two way, 2 (message frame: gain or loss frame) by 4 (blood transfusion types: donated blood, perflurocarbon substitute, bovine and human haemoglobin substitute) between subjects design. Participants were randomly assigned to one of the eight conditions. Each participant also completed four measures of emotional disposition (anger, anxiety, fear and happiness). The main outcome measure was acceptance of a blood transfusion.

2.2.2 Participants

368 participants were recruited in person by the author of this thesis from the adult population within cafes and lectures of the University of Nottingham campus. There were three exclusion criteria: those who were unable to read or write English fluently, anyone under the age of 18 years, or anyone who had been exposed to blood substitutes. Of the sample, 53% were female, 46% were male and the gender of 1% of the sample was unknown. Ages of the participants ranged from 18 to 57 years, with a mean age of 21 years and 10 months (SD 4 years and 10 months). 81% of the sample was white and 31% held some religious belief.

2.2.3 Pre Manipulation Measures

Trait emotions

A 12 - item version of the Fear Survey Schedule- II (Geer, 1965) was used to measure trait fear. Original data indicated that the scale is high in internal reliability and construct validity (Geer, 1965). A Cronbach's alpha of 0.79 was obtained in the present experiment.

The Cronbach's alpha coefficient is a measure of the internal reliability of a psychometric instrument. In order that a set of items be internally reliable the items need to be conceptually related to one another such that they measure a single construct. A reliability of 0.70 or higher obtained on a substantial sample is required (Santos, 1999). The trait - anxiety scale (Speilberger, 1983) was used to measure anxiety. The scale consists of 20 items, and from a recent reliability generalization study both internal consistency and re - test reliability have been shown to be acceptable (Barnes, Harp, & Jung, 2002). A Cronbach's alpha coefficient of 0.91 was obtained in the present experiment. Trait anger was measured by both the trait - anger scale (Speilberger, 1996) and an anger scale developed by Lerner and Keltner (2000). Both scales consist of 10 items, and originally demonstrated high levels of reliability and validity. Cronbach's alpha coefficients of 0.84 and 0.78, respectively were obtained in this experiment. The two measures of anger were combined into one composite index of dispositional anger and labeled anger. Pearson's correlations between the two anger measures *(r* = .634, $p <$ 0.001) and the Cronbach's alpha ($\alpha = 0.78$) of the composite scale were in line with Lerner and Keltner (2001, 2000). A six - item version of the Mood Survey (Underwood & Froming, 1980) was used to measure trait happiness. The original scale had shown reliability, construct validity and test re - test reliability. The internal reliability obtained (0.81) in this present experiment was in line with the six item scale previously used by Lerner and Keltner (2001). Ratings for all four measures were on a six point scale ranging from (1) strongly disagree, to (6) strongly agree, with higher scores reflecting a greater tendency to feel the emotion.

2.2.4 Framing Manipulation

To examine the influence of emotion and frame on risk preferences, the same factual information regarding the safety of blood substitutes (bovine haemoglobin (cows), human haemoglobin and perflurocarbon) and donor blood was presented as either a gain or a loss frame. The frames used in this experiment have been employed previously in empirical studies (see Ferguson *et al.,* 2005; Farrell, 2005; Ferguson *et al.,* 2001). It is important to note that although the loss framed condition and the blood substitute conditions contain more information than both the gain frame and donated blood scenarios. Steward *et al.,* (1997) determined that the complexity of a message did not have any influence on the persuasiveness of the message and did not interact with message framing. For one of the

eight framing conditions each participant indicated whether or not they would accept the blood transfusion for themselves and on the behalf of a family member and a friend. The eight framing conditions are presented in Tables 2 to 2.2 on the three subsequent pages.

Table 2. Framing Condition Employed in Experiment 1 - Donated Blood

	Introduction	Gain Frame	Loss Frame
Main Body of Message Donated Blood	**You are about to undergo surgery and your consultant has informed you that during surgery you will require a blood transfusion. Donated blood from the local blood bank will be used.**	**Donated blood** Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.	**Donated blood** Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis-matched blood due to administrative error.

Table 2.1. Framing Conditions Employed in Experiment 1 – Blood Substitutes

Introduction You are about to undergo surgery and your consultant has decided to use a blood substitute to maintain oxygen supply during surgery. This will conserve your own blood that you have pre-donated prior to surgery. The blood substitute is used only as a temporary, intra-operative measure. At the end of surgery your own pre-donated blood will be transferred back into your body, if required.		
	Gain Frame	**Loss Frame**
Main Body of Message Blood Substitutes	**Bovine Haemoglobin** The blood substitute to be used is a haemoglobin-based solution made from cows' blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.	**Bovine Haemoglobin** The blood substitute to be used is a haemoglobin-based solution made from cows' blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin-based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short-term hypersensitivity reaction (flu-like symptoms). There is also an increased chance of auto-immune problems with repeat transfusions
	Human Haemoglobin The blood substitute to be used is a haemoglobin-based solution made from human blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity than with donated blood.	**Human Haemoglobin** The blood substitute to be used is a haemoglobin-based solution made from human blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin-based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of a short-term hypersensitivity reaction (flu-like symptoms).

Table 2.2. Framing Condition Employed in Experiment 1 – Perflurocarbon Blood Substitute

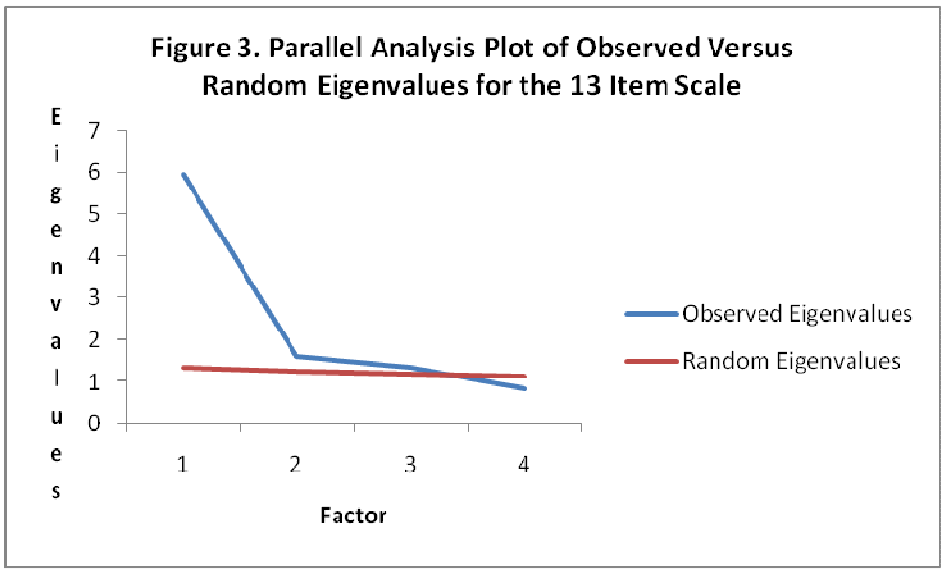
Introduction You are about to undergo surgery and your consultant has decided to use a blood substitute to maintain oxygen supply during surgery. This will conserve your own blood that you have pre-donated prior to surgery. The blood substitute is used only as a temporary, intra-operative measure. At the end of surgery your own pre-donated blood will be transferred back into your body, if required.		
	Gain Frame	**Loss Frame**
Main Body of Message Blood Substitute	**Perflurocarbon Blood Substitute**The blood substitute to be used is a perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. Perflurocarbon solutions eliminate the infectious risks of blood transfusions and provide a ready source of a universally compatible product. Therefore, there is no risk of receiving cross – matched blood. In clinical trials only slight side effects have been observed, such as hypertension (however, 97% of recipients did not experience hypertension), or fever (although 94% of recipients did not experience fever).	**Perflurocarbon Blood Substitute** The blood substitute to be used is a perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. However, perflurocarbon solutions require the use of supplementary oxygen and there are certain risks associated with long-term exposure to high levels of oxygen. Also, as perflurocarbon solutions are only temporary oxygen carriers, repeated exposure to transfusion may be required. Clinical trials have also shown that 3% of recipients experienced hypertension and 6% suffered a short-term hypersensitivity reaction (flu-like symptoms).

2.2.5 Post Manipulation Measures

Affective reactions to the surgical scenario

The immediate emotional impact of the framing manipulation was assessed by a measure comprising 13 emotions. Six of the emotions were those identified by Ekman and Friesen (1971) as showing universality with respect to emotional expression: happiness, surprise, fear, sadness, anger, and disgust. A further four emotions were those which predict health - related responses such as seeking medical care (Cameron, Leventhal, & Leventhal, 1993) namely depression, upset, worry, and anxiety. In addition the emotions of hope, threat, and regret were included. The inclusion of the three latter emotions seemed prudent as they have been previously found to be relevant to decision making within the health context. According to regret theories (Bell, 1982) the motivation to avoid experiencing regret can have a strong influence on decision making, and threat has been found to have an independent effect on the perception of blood safety (Farrell, 2005). Ratings were made on a six point scale ranging from (1) not at all, to (6) very much so. A Principal Components Analysis (PCA) was performed to identify underlying factors that may explain the pattern of correlations within the 13 emotions. A PCA also establishes which linear components exist within the data as opposed to factor analysis which makes estimates of the underlying factors reliant on assumptions (Field, 2000). The dataset's applicability for PCA was examined using the Kaiser - Meyer - Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity.

The resulting Bartlett's test of sphericity (3051.08, $p < 0.001$) and the KMO (0.88) indicated that the data were suitable for the application of PCA. In order to determine the number of factors to be extracted the heuristic applied here was parallel analysis (Horn, 1965). Parallel analysis has been shown to be the most accurate means of deciding the optimum number of factors to extract (Zwick & Velicier, 1986). The observed eigenvalues from an initial PCA were compared to the eigenvalues produced by the analysis of the correlation matrix, based on the same number of variables and participants. The values for the random variables were determined from tables which can be found in Lautenschlager (1989). In this case three factors are to be extracted. The results of this procedure are shown in Figure 3 on the next page.



Following identification of the number of factors to be extracted a second PCA was performed. Varimax rotation was employed and will be used throughout this thesis. Oblique factor structure has been found to be problematic in parallel analysis (Beuducel, 2001). As recommended by Ferguson and Cox (1993) a loading of 0.4 for each variable was used to increase factor saturation.

Following the second PCA a total of nine items were retained comprising three factor scales. The three factors together accounted for 72.53% of the variance. The first factor labeled emotional expression included four of the nine emotions items, surprise, anger, disgust, and regret, and accounted for 40.37 % of the total variance. The second factor labeled concern included three of the nine emotions namely fear, anxiety and worry and accounted for 17.50% of the total variance. The third factor labeled optimism included two of the nine emotions namely hope and happiness and accounted for 14.66% of the total variance. The final factor structure with the values of the factor loadings is shown in Table 2.3 on the next page.

Table 2.3. Principal Components Analysis of the Nine Emotions with Three Factors Extracted

	Concern	Emotional Expression	Optimism
Anxiety	**0.92**	0.19	0.01
Fear	**0.92**	0.21	0.02
Worry	**0.87**	0.28	0.04
Disgust	0.16	**0.85**	0.06
Angry	0.19	**0.80**	0.04
Regretful	0.23	**0.76**	0.07
Surprise	0.12	**0.51**	0.16
Hopeful	0.06	0.20	**0.87**
Happy	0.24	0.17	**0.83**

Previous blood transfusion / donation history

Personal characteristics are known to influence risk perception, (for example blood transfusion history has been found to be related to risk perception (Finucane *et al.,* 2000) and receptivity to information about gain and loss frames (Rothman & Salovey, 1997). In order to control for participants' knowledge and or experience with the blood transfusion process participants were asked to complete five questions about their blood donation and transfusion history. The first three questions required a yes / no response. (1)Whether they had ever received a blood transfusion, (2) known anyone who had required a blood transfusion, (3) or had ever required blood tests. The fourth question required participants to indicate their blood donation history from a choice of four options (I have never donated blood; I am a first time blood donor; I am a regular blood donor or I have

occasionally donated blood). Adding to this, in question five, blood donors were then requested to indicate the length of time that they had been donating blood.

Reasons for decision making

Participants using free text were asked to describe, in the space provided on the questionnaire, their reasons for either accepting or rejecting the blood transfusion.

Certainty and control over decision making

Participants were asked to indicate on a six point scale from (1) not at all certain, to (6) certain beyond any doubt the extent that they agreed that the decision would be the one which they would make in real life. Feelings of certainty are expected to be different between frames with participants who received the loss framed scenario hypothesized to feel greater uncertainty about their decision making. Hence this question served as a manipulation check to ensure that the gain and loss framed messages were indeed perceived differently. In addition participants were asked to indicate on a six point scale from (1) none, to (6) complete control to what extent they felt that they were in control of their emotions during the decision making. Recall from the introduction Section 1.4.1 the ability of immediate emotions to direct the decision making process is more evident at high levels of emotional intensity (Lerner & Loewenstein, 2002). As such this question is included to serve as a measure of the extent of the participants' levels of feeling.

2.2.6 Procedure

Ethical approval was granted by the School of Psychology ethics committee at the University of Nottingham. Participants were informed of the experiment and invited to complete the consent form followed by the questionnaires. Each participant completed all measures individually. A researcher was present to answer any questions and to ensure that the instructions were followed. The complete questionnaire is shown in Appendix 1. The questionnaire was presented in the following order: a 12 - item version of the Fear Schedule - II, (Geer, 1965); a 20 - item trait anxiety scale, (Speilberger, 1983); a 10 - item trait anger scale, (Speilberger, 1996); a 10 - item face valid anger scale, (Lerner & Keltner, 2000); and a six - item happiness scale, (Underwood & Froming, 1980).

Next participants were asked to read a description of one of the eight versions of the

hypothetical situation whereby a blood transfusion was deemed necessary for a surgical procedure. After reading the surgical scenario and using only the information provided participants indicated whether or not they would accept a blood transfusion for themselves, a family member and a friend.

After making their decision the participants were then asked why they had made their decision to accept or decline the blood transfusion, to rate their affective reactions to the scenario, certainty over decision making and control of ones emotions during the decision making process and finally to provide some demographic details. Participants were then thanked for their participation and debriefed if necessary.

Experiment 1A

2.2.7 Design

The experiment was a two way, 2 (message frame: gain or loss frame) by 2 (blood transfusion type: donated blood and bovine haemoglobin substitute) between subjects design. Participants were randomly assigned to one of the four conditions. The main outcome measure was acceptance of a blood transfusion.

2.2.8 Participants

The experiment was undertaken on a group of students (n = 140; mean age 23.3; SD = 4.85; 51% female) recruited in person by the author of this thesis from the adult population within cafes and lectures of the University of Nottingham campus.

2.2.9 Framing Manipulation

To examine the influence of message frame on risk preferences, the same factual information regarding the safety of a bovine haemoglobin blood substitute and donor blood, adapted from Farrell *et al.* (2001), was presented as either a gain or a loss frame. For one of the four framing conditions each participant indicated whether or not they would accept the blood transfusion for themselves. The four framing conditions are presented in Table 2.4 on the next page.

Table 2.4. Framing Condition Employed in Experiment 1A

You are about to undergo surgery and your consultant has informed you that during surgery you will require a blood transfusion. Donated blood from the local blood bank will be used.		
	Gain Frame	**Loss Frame**
Main Body of Message Donated Blood	Being as blood donors are carefully screened donated blood is generally safe with respect to infection with HIV or hepatitis C. Donated blood is also careful checked to avoid the chance of mismatch due to administrative error.	Although blood donors are carefully screened there is a small risk of infection with HIV or hepatitis C. There is also a small chance of mismatch due to administrative error.
Main Body of Message Bovine Haemoglobin	The blood substitute to be used is a haemoglobin – based solution made from cows' (bovine) blood. This blood substitute is very safe with respect to infection, hypertension, and hypersensitivity. Whilst there is a need for repeat transfusion, it is very safe with respect to auto immunity.	The blood substitute to be used is a haemoglobin- based solution made from cows' (bovine) blood. There is a small risk of infection, hypertension and hypersensitivity. There is also a need for repeat treatments which lead to a small risk of auto immune problems.

2.2.10 Procedure

Participants were informed of the experiment and invited to complete the consent form followed by the questionnaire. Each participant completed the experiment individually. A researcher was present to answer any questions and to ensure that the instructions were followed. The complete questionnaire is shown in Appendix 2. The participants were asked to read a description of one of the four versions of the hypothetical situation whereby a blood transfusion was deemed necessary for a surgical procedure. After reading the surgical scenario and using only the information provided participants indicated whether or not they would accept a blood transfusion for themselves. After making their decision participants were then asked to provide some demographic details. Participants were then thanked for their contribution and debriefed if necessary.

2.2.11 Analysis

The data which was obtained from the two experiments conducted in this chapter was analysed in the following manner using the Statistical Package for Social Sciences 15.0 (SPSS). The threshold value of p to be used throughout this thesis unless otherwise stated is 0.05. The first part of the results section presents the results of a number of manipulation checks and preliminary analyses to determine the validity and suitability of the data for analysis. In the second section the first, second and third hypotheses being investigated in this thesis will be tested by logistic regression. Separate analysis is conducted for each of the three recipients (self, family member and friend). The qualitative data was coded by two independent coders (Kappa 0.78) and entered into NVivo 6. Kappas' statistic is an index of the degree of agreement between two raters classifying the same set of items. The score ranges form, ranging from zero when agreement is no better than chance to one when agreement is perfect.

2.3 Results

2.3.1 Section 1 Preliminary Analyses

Before the testing of the hypotheses outlined in the introduction to this chapter it was necessary for five preliminary analyses to be carried out. The details of these are now explained.

Sample equivalence

Moxey, O'Connell, Mc Gettigan, and Henry (2003) recommend that baseline characteristics such as age and gender should be recorded and compared for each framing condition. Chi - square tests and analyses of variance (ANOVA) revealed that there were no statistically significant differences among the eight experimental conditions in terms of participants' age, gender, ethnicity, religion, blood transfusion history and donation history (all *p*s > 0.05, all Fs < 0.84). In addition results of a one – way between subjects multi - variate analysis of variance (MANOVA) revealed that there were no significant differences among the eight experimental conditions and scores on the measures of trait emotion (all *p*s > 0.05, all Fs < 0.34).

Normality of predictor variables

Normality tests of the trait and immediate emotions were not carried out as in logistic regression the predictors do not have to be normally distributed (Tabachnick & Fidell, 2007). The normality of the two variables certainty over decision making and control of ones emotions during the decision making process was investigated as these data points were to be subject to a MANOVA analysis. Both variables were moderately negatively skewed and as recommended by Tabachnick and Fidell (2007) a reflect and square root transformation was carried out on these variables to correct for this. However, the statistical significance of the result did not alter following transformation so the untransformed data was preferred (Winner, 1970).

Correlations between trait and immediate emotions

The relationship between the four trait emotions and the three composite measures of immediate emotions was assessed. As can be seen from Table 2.5 on page 46, consistent with the fact that fear, anxiety and anger share a common valence, a significant positive correlation emerged between the dispositional scales for fear and anger, fear and anxiety and anxiety and anger. In turn consistent with happiness sharing an opposite valence to anger, anxiety and fear, significant negative correlations were obtained between happiness and anxiety, happiness and anger and happiness and fear. These correlations implied that inferential analyses would need to control for the influence of three immediate emotions, to ascertain the independent relationship between the other trait

emotions and acceptance of the blood transfusion.

The correlations observed between the three factors measuring immediate emotion and the four trait emotions were inconsistent. Consistent with concern (comprising worry, anxiety and fear) sharing a common valence with anger and anxiety, significant positive correlations emerged between concern and anger and concern and anxiety. There was however no significant correlation between concern and trait fear or happiness. The negatively valenced trait emotions fear, anxiety and anger, were positively correlated with emotional expression which comprised the negative emotion states of disgust, anger and regret. Emotional expression was not significantly related to trait happiness, and optimism (comprising happiness and hope) was not significantly related to any of the trait emotions. Inconsistent with what would be expected from a valence perspective there was a positive correlation between concern and optimism. On the other hand the positive correlation between concern and emotional expression was as would be expected given that these two factors comprise mainly of negatively valenced emotions. Tests of the effect of immediate emotion upon acceptance of a blood transfusion must therefore, control for the effect of trait emotion. In addition caution must be exercised in making inferences as to the direction of any role played by the immediate emotions.

Table 2.5. Correlations Between the Trait Emotions Fear, Anger, Anxiety and Happiness and the Immediate Emotions Optimism, Emotional Expression and Concern

	Mean (SD)	Anger	Anxiety	Happiness	Fear	Emotional expression	Concern	Optimism
Anger	2.84 (0.67)	1						
Anxiety	3.0 (0.72)	0.42***	1					
Happiness	4.3 (0.79)	-0.32**	-0.70**	1				
Fear	3.0 (0.73)	0.34**	0.62***	-.43**	1			
Emotional expression	3.18 (1.39)	0.11*	0.20**	-0.08	0.30**	1		
Concern	1.87 (0.80)	0.14**	0.12*	-0.02	0.10	0.44**	1	
Optimism	2.72 (1.19)	0.03	-0.02	0.08	-0.04	0.03	0.15*	1

Note. N's range from 351 to 360.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Certainty about decision making

A two - way between subjects MANOVA was conducted to establish whether the feelings of certainty about the decision made on the behalf of the self and feelings of emotional control over the decision making process, differed between frame and blood transfusion type. The statistic used to test significance of effects was Pillai's trace, as where groups differ along more than one variate Pillai's trace is the most powerful (Field, 2000). In addition it is considered more robust (Olson, 1976). The multivariate F tests indicated a significant main effect for both frame (Pillai's trace = 0.02 (2, 35), $p < 0.01$) and blood transfusion type (Pillai's trace = 0.07 (6, 702), $p < 0.001$). The interaction between frame and blood transfusion type was not significant, F (2,109) = 1.01, $p > 0.05$.

As can be seen from Table 2.6 on the next page participants who received the loss frame responded with less certainty about their decision than participants who received the gain frame [F 1,358) = 5.05, $p < 0.01$]. Between blood transfusion types there was a significant [F 3,358) = 6.25, $p < 0.01$] difference in ratings for certainty over decision making. To ascertain between which blood transfusion types this difference in feelings of certainty lay, post hoc tests were conducted. Because the specific hypothesis was made that perceptions of risk towards the blood transfusion types should differ between the blood substitutes and donated blood a Dunnett's *post - hoc* test was used (see Field, 2000).

The Dunnett's *post - hoc* test showed that participants who received the donated blood responded with greater certainty about their decision than participants who received the bovine haemoglobin. There was no significant difference in feelings of certainty between donated blood and either human haemoglobin and perflurocarbon or between human haemoglobin and both perflurocarbon and bovine haemoglobin. The univariate statistic showed there was no significant main effect for control over ones emotional reaction with respect to frame or blood transfusion type (all ps > 0.05, all Fs < 0.87). The means and standard deviations of certainty and control over ones emotions are presented in Table 2.6 on the next page.

Table 2.6. Means, Standard Deviation of Certainty and Control Over Ones' Emotions by Frame and Blood Transfusion Type

Frame	**Certainty** (n = 47)	**Control** (n = 47)
Gain Frame	4.65 (1.24)	4.33 (1.31)
Loss Frame	4.52 (1.34)	4.62 (1.23)
Blood Transfusion Type	**Certainty** (n = 92)	**Control** (n = 92)
Donated Blood	5.12 (0.99)	4.49 (1.35)
Human Haemoglobin	4.52 (1.30)	4.58 (1.37)
Perflurocarbon	4.44 (1.20)	4.64 (1.27)
Bovine Haemoglobin	4.41 (1.30)	4.59 (1.30)

Note: The maximum number of respondents (n) for each blood transfusion type and framing condition are given in parentheses. The possible scale range was 1 - 7.

The data presented in Table 2.6 above allows one to have some confidence that the gain and loss frames were perceived differently by the participants in terms of certainty. However the framing of the information did not lead to an intense emotional response.

Descriptive statistics: preference for donated blood or blood substitute

Acceptance rates of the respective blood transfusion types by framing condition are shown in Table 2.7 on the next page. The percentage of respondents who accepted the blood transfusion ranged from a high of 96% in the case of donated blood presented as a gain frame to a low of 45% in the case of bovine haemoglobin presented as a loss frame. In the case of all four blood transfusion types there were lower levels of acceptance of the blood transfusion under the loss framed condition. The next section of the results examines a) whether the difference in acceptance between the gain and loss frames is statistically significant and b) if so is this the case for all blood transfusion types.

Table 2.7. Acceptance Rates of Donated Blood and Blood Substitutes in the Case of the Self, Family Member and Friend

	Donated Blood (n=92)	**Human Haemoglobin (n=95)**	**Perflurocarbon (n=92)**	**Bovine Haemoglobin (n=88)**
Self				
Gain	**44 (96%)**	41 (87%)	42 (93%)	36 (82%)
Loss	41 (89%)	36 (75%)	35 (74%)	24 (54%)
Family Member				
Gain	43 (93%)	40 (85%)	38 (84%)	32 (73%)
Loss	38 (83%)	34 (71%)	33 (70%)	21 (48%)
Friend				
Gain	42 (91%)	39 (83%)	36 (77%)	29 (66%)
Loss	39 (85%)	34 (71%)	36 (80%)	**20 (45%)**

Note. The maximum number of respondents (n) for each blood transfusion type are given in parentheses.

2.3.2 Section 2 Logistic Regression Analyses

The contributions of frame, (gain or loss), trait emotion (fear, anger, anxiety, happiness), blood transfusion type (blood substitute or donated blood), and immediate emotion to the acceptance of a blood transfusion, were examined for each of the three recipients (self, family and friend) using logistic regression.

The three aims of the analyses presented in this section were to (a) determine the influence of message frame on the decision to accept a blood transfusion, (b) investigate if the influence of frame could be moderated by either blood transfusion type or trait emotion and (c) determine the influence of the immediate emotions on the decision to accept a blood transfusion. To conclude that the pattern of acceptance of a blood

transfusion across the eight conditions is moderated by blood transfusion type or trait emotion (i.e. that there is a significant two way interaction), the interaction term must make a significant contribution to the logistic regression model. Prior to the main analysis preliminary logistical regression, correlation and MANOVA analysis established which if any of the demographic variables were significantly related to acceptance in the case of each recipient.

A logistic regression analysis was conducted because it is a valid means of testing a dichotomous dependent variable (Clearly & Angel, 1984). Individuals who accepted the blood transfusion were assigned the value one, and individuals who declined the blood transfusion were assigned the value of zero.

Hierarchical logistic regression analysis of message frame, blood transfusion type, immediate and trait emotion as predictors of the acceptance of a blood transfusion for the self

The data obtained from 352 participants was available for analysis: 293 participants accepted the blood transfusion and 59 participants declined the transfusion. The variables were entered into a hierarchical logistical regression model in three blocks using the enter method. In accordance with Cohen and Cohen (1983), trait emotion being a personality variable which is likely to vary between individuals was entered at step one. Each trait emotion was entered separately into the logistic regression model and only retained in the model if it was a significant predictor or interacted significantly with frame. In this instance none of the trait emotions were found to be significant predictors of the acceptance of a blood transfusion and there were no significant interactions between any of the trait emotions and frame (all *p*s > 0.05, all $\chi^2 < 1.85$). The remaining three variables were entered into the equation using the enter method: (i) frame (ii) blood transfusion type and (iii) immediate emotion followed by the interaction terms at step four. The addition of frame produced a significant improvement to the constant - only model ($\chi^2 = 16.99$ (1), $p < 0.001$). At the second step the addition of blood transfusion type made a further improvement to the model ($\chi^2 = 26.25$ (3), $p < 0$ .001). At the third step the addition of the immediate emotions made a further improvement to the model ($\chi^2 = 59.32$ (3), $p < 0.001$). The separate addition of the interaction between frame and blood

transfusion type, did not lead to a significant improvement to the model ($\chi^2 = 5.42$ (3), $p > 0.05$). The result of the analysis at the end of the third step is presented in Table 2.8 on the next page.

The results presented in Table 2.8 on the next page show, that in the case of the self participants were 3.34 times more likely to accept a blood transfusion when information about the procedure was presented as a gain frame than when it was presented as a loss frame. Participants were 12.21 times more likely to accept the blood transfusion with donated blood, 2.02 times more likely to accept the blood transfusion with human haemoglobin and 1.73 times more likely to accept the blood transfusion with perflurocarbon when compared with bovine haemoglobin. The odds of accepting a blood transfusion diminish by a factor 0.75 and 0.40 respectively for a one point increase in feelings of emotional expression and concern controlling for other variables in the model. On the other hand the odds of accepting a blood transfusion increase by a factor of 2.26 for every one point increase in feelings of optimism.

Table 2.8. Hierarchical Logistic Regression Analysis of Immediate Emotion, Message Frame, and Blood Transfusion Type as a Predictor of the Acceptance of a Blood Transfusion on Behalf of the Self

Predictor Variables	β	Wald	d.f.	SE	Odds ratio	95% CI
Frame Gain Frame Compared to Loss Frame	1.20	10.44	1	0.37	**3.34****	1.61 – 6.93
Blood Transfusion		15.89	3			
Donated Blood Compared to Bovine Haemoglobin	2.50	15.63		0.63	**12.21*****	3.53- 42.20
Human Haemoglobin Compared to Bovine Haemoglobin	0.70	2.60		0.43	**2.02***	0.86 – 4.75
Perflurocarbon Compared to Bovine Haemoglobin	0.54	1.56		0.43	**1.73***	0.73 – 4.08
Concern	0.29	4.49	3	0.13	**0.74****	0.57 - 0.98
Emotional expression	0.92	15.95		0.23	**0.40*****	0.25 - 0.62
Optimism	0.96	27.12		0.18	**2.62*****	1.82 - 3.76

Note. The indicator coding scheme was used in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame and one to a gain frame. In the case of blood transfusion type the last contrast was taken the reference group being bovine haemoglobin. The analysis include those who have received a blood transfusion in the past (being 4.3% of the sample). The results of the analysis did not alter when these participants were removed from consideration. Although both age and ethnicity varied as a function of acceptance of the blood transfusion due to the homogeneity of the age range and the large white population in the study population these were not controlled for in the logistic regression equation

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Hierarchical logistic regression analysis of message frame, blood transfusion type and trait and immediate emotion as predictors of the acceptance of a blood transfusion on the behalf family member

The data obtained from 353 participants was available for analysis: 274 participants accepted the blood transfusion and 79 declined the transfusion. Each trait emotion was entered separately into the logistic regression model and only retained in the model if it was a significant predictor or significantly interacted with frame. In this instance none of the trait emotions were found to be significant predictors of the acceptance of a blood transfusion and there were no interactions between any of the trait emotions and frame (all *ps* > 0.05, all $\chi^2 < 0.08$). The remaining three variables were entered into the equation using the enter method: (i) frame (ii) blood transfusion type and (iii) immediate emotion followed by the interaction term at step four. The addition of frame produced a significant improvement to the constant - only model ($\chi^2 = 11.81$ (1), $p < 0.001$). At the second step the addition of blood transfusion type made a further improvement to the model ($\chi^2 = 25.82$ (3), $p < 0.001$). At the third step the addition of the immediate emotions made a further improvement to the model ($\chi^2 = 22.85$ (3), $p < 0.001$). The separate addition of interaction term between frame and blood transfusion type, did not lead to a significant improvement to the model in any case ($\chi^2 = 0.98$ (3), $p > 0.05$). The result of the analysis at the third step is presented in Table 2.9 on the next page. The results presented in Table 2.9 show, that in the case of a family member participants were 2.14 times more likely to accept a blood transfusion when information about the procedure was presented as a gain frame than when it was presented as a loss frame. Participants were 6.94 times more likely to accept the blood transfusion with donated blood, 2.41 times more likely to accept the blood transfusion with human haemoglobin and 2.07 times more likely to accept the blood transfusion with perflurocarbon when compared with bovine haemoglobin. The odds of accepting a blood transfusion diminish by a factor 0.68 and 0.76 respectively for a one point increase in feelings of emotional expression and concern controlling for the other variables in the model. On the other hand the odds of accepting a blood transfusion increase by a factor of 1.41 for every one point increase in feelings of optimism.

Table 2.9. Hierarchical Logistic Regression Analysis of Immediate Emotion, Message Frame, and Blood Transfusion Type as a Predictor of the Acceptance of a Blood Transfusion on Behalf of a Family Member

Predictor Variables	β	Wald	d.f.	SE	Odds ratio	95% CI
Frame Gain Frame Compared to Loss Frame	0.76	6.86	1	0.29	**2.14****	1.21 - 3.79
Blood Transfusion Type		19.08	3			
Donated Blood Compared to Bovine Haemoglobin	1.94	18.06		0.45	**6.94** ***	2.84 -16.97
Human Haemoglobin Compared to Bovine Haemoglobin	0.88	5.78		0.36	**2.41***	1.18 - 4.96
Perflurocarbon Haemoglobin Compared to Bovine Haemoglobin	0.73	4.00		0.36	**2.07***	1.02 - 4.20
Concern	-0.27	5.80	3	0.11	**0.76****	0.61 - 0.95
Emotional Expression	-0.38	4.27		0.18	**0.68***	0.48 - 0.98
Optimism	0.35	7.3		0.12	**1.41****	1.01 - 1.81

Note. Indictor coding scheme was employed in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame, one to a gain frame. In the case of blood transfusion type the last contrast was taken the reference group being bovine haemoglobin. The analysis include those who have received a blood transfusion in the past (being 4.3% of the sample). The results of the analysis did not alter when these participants were removed from consideration. Although ethnicity varied as a function of acceptance of the blood transfusion the large white population in the study population these were not controlled for in the logistic regression equation.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Hierarchical logistic regression analysis of immediate and trait emotion, message frame, blood transfusion type as predictors of the acceptance of a blood transfusion on the behalf of a friend

The data obtained from 353 participants was available for the analysis: 270 participants accepted the blood transfusion and 83 declined the transfusion. Each trait emotion was

entered separately into the logistic regression model and only retained in the model if it was a significant predictor or significantly interacted with frame. In this instance none of the trait emotions were found to be significant predictors of the acceptance of a blood transfusion and there were no significant interactions between the trait emotions and frame (all *p*s > 0.05, all $\chi^2 < 0.09$).

The remaining three variables were entered into the equation using the enter method: (i) frame (ii) blood transfusion type and (iii) immediate emotion followed by the interaction term at step four. The addition of frame produced a significant improvement to the constant - only model ($\chi^2 = 4.85$ (1), $p < 0.05$). At the second step the addition of blood transfusion type made a significant improvement to the model ($\chi^2 = 32.09$ (3), $p < 0.001$). At the third step the addition of the immediate emotions made a further improvement to the model ($\chi^2 = 13.07$ (3), $p < 0.01$).The separate addition of interaction terms between frame and blood transfusion type, did not lead to a significant improvement to the model ($\chi^2 = 3.74$ (3), $p = 0.29$).

The results presented in Table 2.10 on the next page show, that in the case of a friend participants were 1.54 times more likely to accept a blood transfusion when information about the procedure was presented as a gain frame than when it was presented as a loss frame. Additionally, participants were 8.04 times more likely to accept the blood transfusion with donated blood, 2.72 times more likely to accept the blood transfusion with human haemoglobin and 2.58 times more likely to accept the blood transfusion with perflurocarbon when compared with bovine haemoglobin. The odds of accepting the blood transfusion increase by a factor of 1.33 for every one point increase in feelings of optimism.

Table 2.10. Hierarchical Logistic Regression Analysis of Immediate Emotion, Message Frame, and Blood Transfusion Type as a Predictor of the Acceptance of a Blood Transfusion on Behalf of a Friend

Predictor Variables	β	Wald	d.f.	SE	Odds ratio	95% CI
Frame Gain Frame Compared to a Loss Frame	0.43	2.47	1	0.28	**1.54***	0.89 - 2.64
Blood Transfusion		24.47	3			
Donated Blood Compared to Bovine Haemoglobin	2.1	22.09		0.44	**8.04*****	3.37 - 19.18
Human Haemoglobin Compared to Bovine Haemoglobin	1.0	8.24		0.35	**2.72****	1.37 - 5.39
Perflurocarbon Hemoglobin Compared to Bovine Haemoglobin	0.95	7.34		0.35	**2.58 ****	1.30 - 5.11
Concern	-0.20	3.18	3	0.11	0.82	0.66 - 1.02
Emotional Expression	-0.25	1.97		0.18	0.77	0.55 - 1.10
Optimism	0.28	5.44		0.12	**1.35***	1.04 -1.68

Note. Indictor coding scheme was employed in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame, one to a gain frame. In the case of blood transfusion type the last contrast was taken the reference group being bovine haemoglobin. The analysis include those who have received a blood transfusion in the past (being 4.3% of the sample). The results of the analysis did not alter when these participants were removed from consideration. Although both age and ethnicity varied as a function of acceptance of the blood transfusion due to the homogeneity of the age range and the large white population in the study population these were not controlled for in the logistic regression equation.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.3.3 Section 3 Immediate Emotion as a Mediator of the Framing Effect

The next hypothesis to be investigated in this chapter is whether immediate emotion reaction can have a direct influence on the decision to accept a blood transfusion as hypothesised by the risk – as - feelings hypothesis (Loewenstein *et al.,* 2001). The next analysis presented was therefore carried out to examine whether emotional reaction to a

surgical scenario can have a direct or an indirect effect by emotional reaction mediating the effect of message frame on the acceptance of a blood transfusion.

To demonstrate mediation, the following must be shown: both the potential mediating variable (immediate emotion) and frame must be associated with acceptance of the blood transfusion and there must be an association between frame and the potential mediator (immediate emotion). Once this is established for mediation to be shown the association between frame and acceptance of the blood transfusion type must be weakened when immediate emotion is entered into the logistic regression equation. It has already been established from the analysis presented in Tables 2.8 to 2.10 that frame and some of the composite immediate emotions are significant predictors of the decision to accept a blood transfusion in the case of the self, family member and a friend. To complete the meditational analysis a two - way between subjects MANOVA was conducted to determine if message frame had an effect on scores of immediate emotional reaction. Preliminary correlational and MANOVA analysis revealed that the demographic variables were largely unrelated to the emotional reactions (all *p*s > 0.05, all Fs < 3.78) with the exception of gender, which was related to optimism. In addition from the correlational analysis trait emotions were found to be related to the composite scores of immediate emotion. As such gender and the trait emotions were entered as covariates in the analysis. However, as their addition did not alter the significance of the subsequent analysis the results reported are exclusive of these variables. The statistic used to test significance of effects was Pillai's trace, (see Section 2.3.1). The multivariate F tests indicated a significant effect for frame (Pillai's trace = 0.09, (3, 349), $p < 0.001$). Between frames there was a significant ($p < 0.001$) difference in ratings for the factor labelled concern which comprised the emotions fear, anxiety and worry. Participants who received the loss frame responded with greater concern mean score (3.53) to the surgical scenario than participants who received the gain frame (2.84), [F (1, 358) = 23.17, $p <$ 0.001]. However there were no main effects in the case of the other two factors: emotional expression or optimism (all *p*s > 0.05, all Fs < 3.22). Finally in order to establish whether concern mediates the relationship between frame and acceptance of a blood transfusion a logistic regression analysis was conducted for both the self and a family member (further meditational analysis was not conducted in the case of a friend as

the only immediate emotion (optimism) which was related to decision making did not differ by the frame the participant received. The results of this analysis are presented in Tables 2.11 and 2.12 on the two subsequent pages.

In both logistic regression equations message frame was entered into the logistic regression model at the first step. The addition of message frame produced a significant improvement to the constant - only model in the case of both the self ($\chi^2 = 13.01$ (1), $p <$ 0. 001) and a family member ($\chi^2 = 11.81$ (1), $p < 0.001$). At the second step concern (anxiety, fear and worry) was entered in into the equation using the enter method. This again resulted in a significant improvement to the model in the case of both the self and a family member ($\chi^2 = 11.63$ (1), $p < 0.001$); ($\chi^2 = 10.86$ (1), $p < 0.001$) respectively. As a result of the entry of concern into the logistic regression equation the significance of the effect of message frame reduced from 0.001 to 0.05 in the case of both the self and a family member. That is, in the case of both a family member and the self, conditions for partial mediation were met. This reduction in significance of frame between step one and step two is demonstrated in Tables 2.11 and 2.12.

Table 2.11. Hierarchical Logistic Regression Analysis of Message Frame and Concern as Predictors of the Acceptance of a Blood Transfusion on Behalf of the Self

Predictor Variables	**β**	**Wald**	**SE**	**d.f**	**Odds ratio**	**Confidence intervals**
Step one Frame	1.22	15.21	0.313	1	3.40***	1.84 - 6.27
Step two Frame	1.01	9.84	0.322	1	2.75*	1.46 - 5.16
Concern	-0.39	12.22	0.112	1	0.67***	0.54 - 0.84

Note. Indicator coding was employed in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame, one to a gain frame. *p< 0.05, ** p < 0.01, *** p < 0.001

Table 2.12. Hierarchical Logistic Regression Analysis of Message Frame and Concern as Predictors of the Acceptance of a Blood Transfusion on Behalf of a Family Member

Predictor Variables	β	Wald	SE	d.f	Odds ratio	Confidence intervals
Step one						
Frame	0.89	11.26	0.27	1	2.43***	1.45 - 4.09
Step two						
Frame	0.71	6.68	0.27	1	2.03*	1.19 – 3.46
Concern	-0.32	10.49	0.09	1	0.73**	0.60 -0.09

Note. Indicator coding was employed in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame, one to a gain frame.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.3.4 Experiment 1 A Results

A logistic regression analysis was conducted to determine the influence of message frame on the decision to accept a blood transfusion. Prior to the main analysis a preliminary logistic regression analysis established that the gender and age of the participants was not significantly related to acceptance of the blood transfusion (all *p*s > 0.05, all $\chi^2 < 0.99$).

The data from 140 participants was available for analysis: 113 participants decided to accept the blood transfusion and 27 participants declined the transfusion. The predictor variables were entered in two blocks using the enter method: (i) frame, (ii) blood transfusion type followed by the interaction term at step three. The addition of frame at step one made a significant improvement to the constant - only model ($\chi^2 = 4.93$, (1), $p < 0.05$). The addition of blood transfusion type at step two also produced a significant improvement to the model ($\chi^2 = 29.40$, (1), $p < 0.001$). The addition of the interaction term between frame and blood transfusion type at step three did not lead to a significant improvement to the model ($\chi^2 = 1.17$, (1), $p = 0.41$). The results of this procedure are

presented in Table 2.13 on below.

Table 2.13. Hierarchical Logistic Regression Analysis of Message Frame, and Blood Transfusion Type as a Predictor of the Acceptance of a Blood Transfusion for the Self

Predictor Variables	β	Wald	SE	d.f	Odds ratio	95% CI
Frame: Gain Compared to Loss	1.16	5.24	0.51	1	**3.20***	1.18 - 8.64
Blood Transfusion Type: Donated Blood Compared to Bovine Haemoglobin	3.06	15.84	0.77	1	**21.40*****	4.73 – 96.46

Note. Indicator coding scheme was employed in the analysis. In the case of frame the first contrast was taken where 0 corresponded to a loss frame, one to a gain frame. In the case of blood transfusion type the last contrast was taken the reference group being bovine haemoglobin.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results presented in Table 2.13 above show, that in the case of the self, participants were 3.2 times more likely to accept a blood transfusion when gain framed information was presented than when loss framed information was presented. Participants were 21.40 times more likely to accept the blood transfusion with donated blood compared to bovine haemoglobin.

2.3.5 Examination of the Qualitative Data

Participants were then asked to describe using free text what factors, if any, motivated their decision to accept a blood transfusion. The responses were content analyzed by the author of this thesis. Content analysis is a research tool used to determine the presence of words or concept in a text. 324 statements (88% response rate) provided by the participants were broken down into 560 units representing one of 18 themes. The 18 themes identified by the author of this thesis using NVivo software were examined using conceptual analysis. A Chi - square test was conducted to determine whether the participant's motivations between transfusion types was a function of their perception of the information provided. Recall from the introduction to this chapter the qualitative data

is to be used towards the development of a measurement scale in the next chapter. To provide an indication of whether there is variation among the frames in individual's motivation for decision making a Chi square analysis is conducted. Significant findings can act as a guide to the worth of the development of an instrument around these themes. The results of the Chi square test reveled significant associations between reasons for the acceptance of a blood transfusion by frame ($\chi^{2=}$ 34.78 (1, 22) p = 0.041), blood transfusion type (χ^2 = 110.55, (1, 66); $p < 0.001$). Significant association's were also obtained in the acceptance of the blood transfusion in the case of all recipients. Self ($\chi^{2=}$ 108.17 (1, 22); $p < 0.001$), family ($\chi^{2=}$ 50.59 (1, 22); $p < 0.001$) and friend ($\chi^{2=}$ 60.21 (1, 22); $p < 0.001$). Details of the themes associated with acceptance of a blood transfusion which accounted for more than 1% of the response are provided in Table 2.14 on the next page Kappa 0.87) being 89 % of the words. A miscellaneous category accounted for less than 15 of the total responses.

Table 2.14. Themes Emerging From the Qualitative Data

	Theme	Frequency	Percentage
1.	Risk	85	15
2.	Consequences	70	12.5
3.	Beliefs About Health Professionals and Standard of Care	71	12.7
4.	Cost Benefit	49	8.8
5.	Medical Need and Health Status	61	10.9
6.	Information Seeking	21	3.7
7.	Personal Beliefs	18	3.2
8.	Safety	32	5.7
9.	Alternative	19	3.4
10	Beliefs About Technology / Testing Trust Efficacy Compatibility	22	3.9
11	Altruism	10	1.8
12	Timeline	15	2.7
13	Personal Experience	9	1.6
14	Interdependence Between Blood Transfusion and Surgery	35	6.2
15	Resulting Emotions	10	1.8
16	Attitudes towards Blood Substitutes	11	1.9
17	Resources Available	7	1.2
18	Miscellaneous	15	2.7

2.4 Discussion

This experiment explored the influence of message framing on acceptance of both donated blood and an artificial counterpart "blood substitute" in the case of both the self and another. The findings from this experiment lend support to the hypothesis by Rothman and Salovey (1997) that the function of a health treatment determines the direction of the framing effect. A gain frame advantage was found in the case of both donated blood and all three blood substitutes when decision making was for the self, a

family member and a friend.

The argument from the ATF (Lerner & Keltner, 2001) that specific emotions states can influence decision making was not supported. However, evidence was found for both an indirect and direct influence of immediate emotion when decision making for the self and family member. Where decision making on the behalf of a friend is concerned a direct effect of the composite immediate emotion variable optimism was observed. The latter finding is in line with the work of Farrell (2005) where a mixture of feelings states, both indirect and direct effects, have been observed to play a role in risk perception in the blood transfusion domain.

Qualitative data on the reasons for individual's acceptance of a blood transfusion was identified. This data was then used in the next chapter to develop the psychometric scale intended to measure cognitive motivational factors involved in the decision making process.

2.4.1 Theoretical Implications - Message Framing

From the data obtained from the two experiments presented in this chapter it is concluded that within this study population, and in relation to transfusion medicine, the evidence suggests it is the function of the health treatment (Rothman & Salovey, 1997) rather than differential levels of perceived risk which determine the frame of dominance (Rothman *et al.,* 2003). Such a gain frame advantage is also in line with the hypothesis by Levin *et al*. (1989) which suggests a gain frame advantage for attribute frames, of which the frames employed here are an example of.

In relation to the failure to find a preference reversal under conditions of risk, (in this case where the example of blood substitutes has been used), this is asserted to be due to the low perceived risk of the blood transfusion procedure itself. The results of at least two studies assessing the relative risk about the blood transfusion procedure comparative to other hazards suggest that individuals may perceive the procedure itself as safe (see Ferguson *et al.,* 2001; Slovic, 1989). It has previously been concluded that the level of perceived procedural risk associated with transfusion (donor and blood substitute) is not sufficiently large to alter the pattern of framing (Ferguson *et al.,* 2005). As societal practices play a prominent role in shaping how health behaviours are perceived (Kasl &

Cobb, 1966; Leventhal *et al.,* 1984) it may thus be that irrespective of the type of transfusion, perceptions of safety of the procedure rather than transfusion type dominate an individuals' consideration when making the decision to accept a blood transfusion. This is partial supportive of the view by Rothman and Salovey (1997) that pre - existing perceptions of the health issue influence the behavioural response. An additional point to consider is that the negative emotional response was to the loss frame and not the blood transfusion types. Indeed Peters *et al.* (2004) argued that perceived risk is a function of negative emotion. The observation of a gain framed advantage in Experiment 1A provides us with confidence that the variations in the length and complexity of the framed information and data on natural frequencies are unlikely to be factors which are responsible for the observed "framing effects". This is in line with the prediction from Steward *et al.,* (1997) that the complexity of a framing scenario does not alter the framing effect. As such, despite the variation between blood transfusion types in both the severity and probability of a given side effect occurring, the findings from Experiment 1 can be considered robust. In addition, although the wording of the frames in Experiment 1A may be interpreted as a given blood transfusion type having no risk, this is factually correct and the framing effects observed support predictions from Prospect Theory.

2.4.2 Individual Differences and Emotionality in Relation to Message Framing

In relation to the influence of the trait emotions anger, fear, anxiety and happiness upon the acceptance of a blood transfusion the findings were inconclusive. In addition the prediction from the ATF (Lerner & Keltner, 2001) that emotions of the same valence can exert differential effects on risk preference was not able to be confirmed. However, the cognitive awareness hypothesis asserts that appraisal tendencies will be deactivated when individuals become aware of their own judgment process. The amount and detail of the qualitative data suggests that participants put considerable thought into the study. Therefore the ability of specific emotions to differentially influence risk preference will be investigated under a time constraint, whereby the opportunity for cognitive deliberation is argued to be reduced (Finucane *et al.,* 2000).

With respect to the hypothesis that emotional reactions to the surgical scenario may influence acceptance of a blood transfusion independent of frame, as hypothesized by

Loewenstein *et al.* (2001) results were also inconsistent. There was evidence that the factors emotional expression (surprise, anger, regret and disgust) and optimism (hope and happiness) exerted a direct influence on acceptance of a blood transfusion in the case of the self and a family member. In addition feelings of optimism were observed to exert a direct effect on the acceptance of a blood transfusion in the case of a friend. In the case of each recipient the direction of the effect of immediate emotion was as would be expected. For example, in line with the mood maintenance hypothesis (Isen & Patrick, 1983) individuals feeling positively or optimistic about the transfusion were more likely to accept the transfusion and those feeling negatively were more likely to act in a risk averse fashion (declining the transfusion). The reduced effect of the immediate emotion factors to influence decision making on the behalf of a friend is in some support of the hypothesis by Lowenstein and Lerner (2002) whereby with distance from the self the role of cognitive influence is thought to be greater.

On the other hand concern (fear, anxiety and worry) were found to exert an indirect effect in the case of the self and a family member partially mediating the influence of frame on the acceptance of a blood transfusion. Interestingly direct effects were found for the composite emotion factor optimism which comprises happiness and anger, and indirect effects found for concern comprising fear, worry and anxiety which suggests that to further explore the role of specific rather than global emotions may be of value Encouragingly it was found that variations in the participant's motivations between transfusion types may be a function of participants' perception of the information provided, for example transfusion type or side effect. The themes identified around which participant's based their decision are in line with previous studies investigating individual's motivations for decision making in various clinical populations and situations (including framing studies for example, Mc Neil *et al.,* 1982). The themes are also consistent with the dimensions contained within health cognition models such as the dimensions of health cognition models (timeline, Leventhals' self regulatory model for example) and principles such as unrealistic optimism (Weinstein, 1983).

In consideration of these facts it is reasonable to conclude that the themes identified from the study here accurately reflect the participants perception of the decision making process. Despite the overlap between the themes identified here and both previous

research and health cognition models it is expected that a scale measuring the representation of the decision making space with respect to blood transfusions would have important applications as it has been demonstrated from the work on illness representation that cognitions do differ between illnesses (Weinman, Petrie, Moss Morris, & Horne, 1996). It is also clear that the motivations involved with decision making within health do differ by domain. For example, this is demonstrated where the motivations for decisions over the use of contraception, (Nimmons & Folkman, 1999) and choice of medical insurer (Farley Short *et al*., 2002) differ from those identified as important to the decision to accept a blood transfusion. Furthermore some studies have lacked a theoretical framework from which to consider the decision making process (e.g., Ritvo, Irvine, Katz, Matthew, Sacamano, & Shaw, 1999).

2.4.3 Acceptance of Donated Blood and Blood Substitutes

Blood substitutes were found to be less likely to be accepted than donor blood. Bovine haemoglobin was in this experiment the least accepted, with there being no significant difference in acceptance between human hemoglobin and perflurocarbon. This is contrary to the findings of Ferguson *et al.* (2005) where both human haemoglobin and bovine haemoglobin were considered to be the most risky. Further data is needed to understand the inconsistency observed between this work and the study by Ferguson *et al.* (2005). In particular participants' perceptions of donated blood and human haemoglobin needs to be clarified as in the current experiment some participants considered human haemoglobin to be the same as donated blood. Given that the three blood substitutes presented identical risk from side effects, all of which are of a short term nature, it may be concluded that preference is related to the type of transfusion rather than the occurrence of side effect or their severity.

Despite the preference for donated blood over all three blood substitutes there is still an encouraging level of acceptance for the use of biotechnologies in the blood transfusion process (45 % minimum see Table 2.7). These findings are generally in support of the findings by Gaskell *et al.* (2000) where in the UK and most of Europe there is evidence to suggest strong support for biotechnology applied to medicine. Although the results with regard to preference are higher and as such not in line with the work of Lowe *et al.*

(2001) in the experiment reported here participants were presented with only one type of blood transfusion and asked to decline or accept. This situation can be considered unrealistic and does have limited value to inform as it would be expected that patients, or at least health professionals, may have the choice between a blood substitute and donated blood rather than given one type to accept or reject. As such an experiment whereby participants are presented with a choice between a blood substitute and donated blood is one line of future enquiry.

2.5 Next Chapter

The motivations identified in this experiment as being related to acceptance will be compiled into a psychometric instrument to measure the role that factors around which people decide to accept blood transfusion products may play in the choice of blood transfusion type.

CHAPTER 3

Scale Development - Measuring Factors around which People Decide to Accept Blood Transfusion Products

3.1 Overview of the Chapter

It has been suggested that variability in how people think about a health behaviour, may alter the impact of gain and loss framed appeals (Rothman *et al*., 2006; Rothman & Salovey, 1997). Recently it has been postulated that perceived risk reflects not only the probability of a particular outcome, but also concerns about a health issue and reasoning strategies (Rothman *et al.,* 2006). In addition O'Connor *et al.* (2005) have argued that attitude towards a health behaviour needs to be considered as a potential mediator of the relationship between frame and intention to perform a behaviour. The qualitative data from the previous chapter demonstrated that the reasons behind individual's acceptance of a blood transfusion do vary, see Section 2.3.4, Chapter 2. Importantly, this variation was found to be significantly associated with both blood transfusion type and frame.

Given this then, it is reasonable to investigate if there is any mediating role of attitudes towards the blood transfusion process on message framing effects. This is important both theoretically and practically. Firstly, in order to design better communication materials for both patients and the publics' understanding, risk perception is a prerequisite (Burley & Inman, 1988). Secondly, if factors can be identified that (a) reliably predict the persuasiveness of framed appeals or (b) are subject to change as a result of framed information, this information could be used to provide a more encompassing organisation of the health framing literature. This will become increasingly important as the range of health behaviours which are promoted through framing extends. Thirdly, with respect to the blood transfusion process it has been argued that more research is needed to explore the factors that influence judgments of transfusion risk (Lowe & Ferguson, 2003). It is the intention that the scale developed in this chapter to measure factors around which people decide to accept blood transfusion products will facilitate this investigation. The reliability and validity of the scale is evaluated. In the development of any measurement instrument it is necessary to corroborate that the scale is measuring the construct of interest. One way to establish this is to investigate whether constructs that theoretically

should be related to each other are, in fact, observed to be related to each other**.** Two factors which are related to assessments of risk are neuroticism and feelings of control. The locus of control refers to the degree to which an individual believes the occurrence of experiences and reinforcements is contingent on his or her own behaviour (Rotter, 1954). In the transfusion context participants with stronger beliefs in the necessity of the blood transfusion and beliefs about the control held by the health professional would be less likely to believe that they can have control over their health. Thus scores on items reflecting medical need and trust in health professionals are expected to be negatively correlated with internal control, positively correlated to external control, powerful others and chance.

Neuroticism refers to the general emotional over - responsiveness, and ability to neurotic breakdown under stress (Eysenck & Eysenck, 1968). In relation to the blood transfusion context individuals with higher neurotic tendency may be more likely to have stronger concerns about the side effects and negative consequences of the blood transfusion procedure. Thus it was hypothesized that the neuroticism scale would be positively correlated with the importance of side effects, consequences and feelings of anger about a transfusion.

3.2 Method

3.2.1 Design

A cross - sectional survey

3.2.2 Participants

An opportunity sample of 317 adults was selected from the adult population within cafes and lectures on the University of Nottingham campus. People were ineligible for participation in this study: if they had English as a second language, were under the age of 18, or had participated in Experiment 1. Of the sample 54 % were female, 44% were male and the gender of 2% of the sample was unknown. The ages of participants ranged from 18 years and 7 months to 80 years, with a mean age of 24 years and 9 months (SD = 8 years and 1 month). 41% of the sample held some religious beliefs and most of the sample were white (67%).

3.2.3 Measures

Development of items to be included in a scale to measure factors around which people decide to accept blood transfusion products

A pool of 47 items was generated from two sources: (1) 565 free text responses representing 18 themes identified from study, Chapter 2; (2) several factors identified from the decision making literature were also included (for example, whether a patient wishes to share their preferences (Stevenson *et al.,* 2000). The full scale is presented in Table 3 on the two following pages.

Procedures for item selection

Each of the 18 themes identified from the qualitative data in Experiment 1 was represented within the scale. The representation of each theme within the scale was in proportion to the responses obtained from the qualitative data in Chapter 2. For example, in the case of themes such as risk and consequences, which represented a greater proportion of the responses, additional items were constructed to represent these themes. For example the theme risk was comprised of items concerning the size of the risk, and the severity of the risk hence both severity and size of the risk were represented in the scale. Items were then constructed from the reasons given, as for example, item 35, "the size of the risk associated with the transfusion" was derived from the statement" because the risks are so low." Each side effect associated with the blood transfusion types, namely infections, hypertension, hypersensitivity, cross matching, allergies and flu, was represented in the scale. Redundant items were deleted after consultation with a Professor of Health Psychology. Additionally, in Experiment 1, four emotions, namely scared, anger, disgust, and comfortable, were used by participants in making their decision to accept or decline the blood transfusion. As emotion is being studied here as a factor in the decision making process these emotions indicated by participants' as being anticipated when making a decision with respect to blood transfusions were included.

Each item on the measure under development was worded as a personal opinion statement and accompanied by a seven point Likert scale response frame ranging from -3 (not at all important) to, +3 (of utmost importance). All of the 47 items and the reasons from which they were derived are provided in Appendix 3.

Table 3. Measure of the Factors Around which People decide to Accept Blood Transfusion Products

You are required to indicate on the 7 point scale from **- 3 (not at all important) to +3 (of utmost importance**) how important each item would be to you in reaching a decision to accept a blood transfusion. **Please answer all questions** by placing a tick in the appropriate box to the right hand side of each statement.	
Statements Within the Questionnaire	
1. The length of time that the transfusion has been used in medical treatments.	25. The position of the person providing the advice about the transfusion.
2. The risk of contracting a life threatening illness (e.g. HIV or BSE) from the transfusion.	26. The importance of the treatment for which the transfusion is required.
3. An increased chance of survival / recovery with the transfusion.	27. The acceptability of the transfusion to my significant others (e.g. family, friends or partner).
4. The speed at which I am able to receive the transfusion.	28. Any immediate complications caused by the transfusion.
5. An increased chance of good health in the long term.	29. Feeling that I have control over the transfusion.
6. The influence of the side effects associated with the transfusion on my future life plans.	30. Being able to cope with any side effects associated with the transfusion.
7. The current supplies of blood stocks (donated and blood substitute) available for the transfusion.	31. Feeling angry towards the transfusion.
8. Feeling scared about a transfusion.	32. Whether the side effects associated with the transfusion are treatable.
9. Feeling disgusted about a transfusion.	33. Confidence in the tests that have been conducted to ensure the safety of the transfusion.
10. Feeling comfortable about a transfusion.	34. Feeling able to share my preferences with the medical team.

Table 3. continued

11.	The risk of receiving the wrong blood type.	35.	The size of the risk associated with the transfusion.
12.	The willingness of the health professionals to involve me in the decision making process	36.	The way in which information about the transfusion is provided to me (e.g. booklet, in person).
13.	Whether a health professional is available to answer my questions about the transfusion.	37.	Confidentiality about my decision.
14.	The nature / personality of the health professionals.	38.	The reliability of the source from which the information about the transfusion came.
15.	Being able to understand the medical information / data.	39.	Believing that I can pull through any of the side effects associated with the transfusion.
16.	My current state of health.	40.	Being provided with all of the information I want to know.
17.	The quantity of blood received.	41.	The potential need for repeat transfusions.
18.	The source of the blood solution which is to be transfused (e.g. human, bovine or synthetic).	42.	Whether the transfusion carries unknown risks to my health.
19.	Whether an alternative to the transfusion is available.	43.	The time at which the side effects associated with the transfusion pronounce.
20.	The risk of allergic reaction from the transfusion	44.	The risk of contracting hepatitis from the transfusion.
21.	The risk of flu from the transfusion.	45.	How well I am monitored by the health professionals.
22.	An increased quality of life following the transfusion.	46.	The risk of hypersensitivity from the transfusion.
23.	How susceptible I feel towards suffering from the side effects associated with the transfusion	47.	How satisfied I am with my medical treatment in the hospital prior to the transfusion.
24.	The risk of hypertension from the transfusion.		

Construct validity

To ensure that the instrument being developed is measuring the intended concepts, construct validity was assessed by the five measures detailed below.

History of side effects

As the framing conditions comprised several side effects from the blood transfusion procedure it was considered desirable to control for participants' experience of side effects from medical procedures. Participants completed a single question measured on a four point scale from 1 (none) to, 4 (yes severe) as to whether they have experienced any side effects from medical procedures or treatments.

Current health status

To ensure homogeneity participants completed a single question measured on a four point scale from 1 (poor) to, 4 (excellent) as to how they rate their current state of health.

The Multi - Dimensional Health Locus of Control (MHLC)

This scale, developed by Wallston, Wallston, & de Vellis (1978), comprising 18 items rated on a six point likert type scale ranging from 1 (strongly disagree) to, 6 (strongly agree) was employed. The MHLC scale contains three subscales assessing whether the health related behaviour is primarily 'internal', a matter of 'chance' or under the control of 'powerful others'. Each sub scale is composed of six items and scales are summed, with scores for each subscale ranging from 6 - 36. Higher scores reflect greater internal control beliefs and beliefs in chance and powerful others. The MHLC instrument has been found to be a psychometrically valid and reliable instrument, (Hewson & Charlton, 2005; Wallston *et al.,* 1978).

Social desirability

As recommended by Ferguson and Cox (1993), to ensure that the measure under development does not overlap with standard measures of social desirability the 20 item true / false inventory of social desirability scale (Crowne & Marlowe, 1960) was employed. Internal scoring reliability estimates have ranged from the low 0.70s to the high 0.80s and temporal stability has been reported at 0.89 (Barger, 2002; Crowne & Marlowe, 1960).

Neuroticism

A measure of neurotic disposition, a 12 - item EPQ neuroticism scale (Eysenck, Eysenck, & Barrett, 1985), was employed. This measure employs a dichotomous scale and requires participants to give the answer that best reflects their own character (e.g., "Do you consider yourself a worrier?"). The range of this scale is 0 - 12, with higher score reflecting greater neurotic tendency. The mean, standard deviation and internal reliabilities observed in this study are shown in Table 3.1 below and are in line with findings from recent studies validating the instruments (Hewson & Charlton, 2005; Leite & Beretvas, 2005).

Table 3.1. Means, Standard Deviation and Internal Reliabilities of the MHLC Subscales Neuroticism and Social Desirability

	Mean (M)	**(SD)**	**Cronbach's alpha**
Internal	25.19	4.15	0.66
Powerful others	19.95	5.10	0.75
Chance	19.28	4.78	0.73
Social desirability	10.06	3.41	0.67
Neuroticism	5.58	3.17	0.79

Note. The possible scale ranges are MHLC 6-36, Social desirability 1-20, and neuroticism 1-12. In the case of powerful others item seven was deleted to improve the Cronbach's alpha from 0.58 to 0.75.

Demographics

Information on participant's age, gender, religious beliefs and, ethnicity was collected.

Blood donation and transfusion history

This variable was assessed as in Chapter 2 of this thesis.

Reasons for decision making

Participants using free text were asked to describe, in the space provided on the questionnaire, if there were any additional reasons they could think of for accepting or declining a blood transfusion.

3.2.4 Procedure

Ethical approval was granted by the School of Psychology ethics committee at the University of Nottingham. Participants were provided with an information sheet (Appendix 4) and those who volunteered were asked to provide their written consent. A researcher was present to answer any questions. A booklet of questionnaires containing 105 items was presented to those who agreed to participant. The questions were presented in the following order: 47 items to measure factors important in people's decision to accept a blood transfusion, 18 items measuring MHLC (Wallston *et al., 1978*), 12 items measuring neuroticism (Eysenck *et al.,* 1985) and a 20 item social desirability scale (Crowne & Marlowe, 1960). Finally participants completed eight demographic questions. The full questionnaire can be found in Appendix 4.

Participants were then asked to complete the questionnaire individually, by reading the materials and answering the questions. Following completion of the questionnaire participants were fully debriefed as to the aims of the study. Participants were also provided with a sheet containing the contact phone numbers of the University of Nottingham counseling and nightline service.

3.2.5 Analysis

In order to establish the number of factors that result from the 47 items intended to measure the importance to blood transfusion acceptance Principal Components Analysis (PCA) was carried out. The first PCA was conducted to establish the scales ability to measure factors around which people decide to accept blood transfusion products is presented. This is followed by an assessment of the validity and reliability of the instrument. The latter will be assessed by linear regression and MANOVA intended to test the relationship between the instrument under development and the measures of MHLC, neuroticism and social desirability. A summary of the qualitative data is then presented.

3.3 Results

3.3.1 Stage One: Preliminary Analysis

Before conducting the PCA to achieve the aims outlined in the introduction to this chapter it was necessary for two preliminary analyses to be carried out. The details of

these are now explained.

Tests of normality

Items which deviated from normality according to tests of skewness and kurtosis were removed. The criteria for removal of the items was based on Tabachnick and Fidell (2007). Where the absolute value of the skewness and kurtosis statistic was greater than two times the standard error of the skewness a variable was removed. Seven items which were removed on this criteria are presented in Table 3.2 below.

Table 3.2. Items Which Deviated from Normality

	Statement	Skewness	Kurtosis
2	The risk of contracting a life threatening illness (e.g. HIV or BSE) from the transfusion	-2.59	7.53
5	An increased chance of good health in the long term	-1.61	3.15
20	The risk of allergic reaction from the transfusion	14.66	244.32
22	An increased quality of life following the transfusion	-1.55	3.16
32	Whether the side effects associated with the transfusion are treatable	-1.18	2.78
39	Believing that I can pull through any of the side effects associated with the transfusion	-1.21	2.26
40	Being provided with all of the information I want to know	-1.34	3.14

Relation to social desirability

Additionally as recommended by Ferguson and Cox (1993) any item showing a significant correlation with the measure of social desirability was removed to reduce the possibility of the resultant factors structures being a product of social desirability responding. This is because in some instances participants respond to a question as they think that society would want them to hence the inclusion of such items can lead to basis in a questionnaire. Pearson's product moment correlations revealed that six items correlated with social desirability at a significance level of $p < 0.05$ and were removed. These are shown in Table 3.3 on the next page.

Table 3.3. Significant Correlations Between Six Items Contained within the Scale and Social Desirability

Statements		Social desirability
13	Whether a health professional is available to answer my questions about the transfusion	0.14*
15	Being able to understand the medical information / data	0.17**
18	The source of the blood solution which is to be transfused (e.g. human, bovine or synthetic)	0.15**
27	The acceptably of the transfusion to my significant others (e.g. family, friends or partner)	0.12*
42	Whether the transfusion carries unknown risks to my health	0.13*
45	How well I am monitored by the health professionals	0.13*

Note. N's range from 292 to 310.

*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Suitability of the data for principal components analysis

Following this 34 items were left for analysis. Before conducting the analysis several assumptions about the data were tested. Firstly the dataset's applicability for PCA was examined using the Kaiser - Meyer - Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO for this dataset was 0.90 and the Bartlett test of sphericity was ($F(528) = 3610.48$, $p < 0.001$). These two tests results indicate that this data set was suitable for the application of PCA. Secondly the subject to variable ratio was assessed. For the 34 item scale this was found to be 7.76:1 and this is acceptable within the limits provided by Gorsuch (1983) for the PCA.

3.3.2 Stage Two: Principal Components Analysis

Initial factor extraction

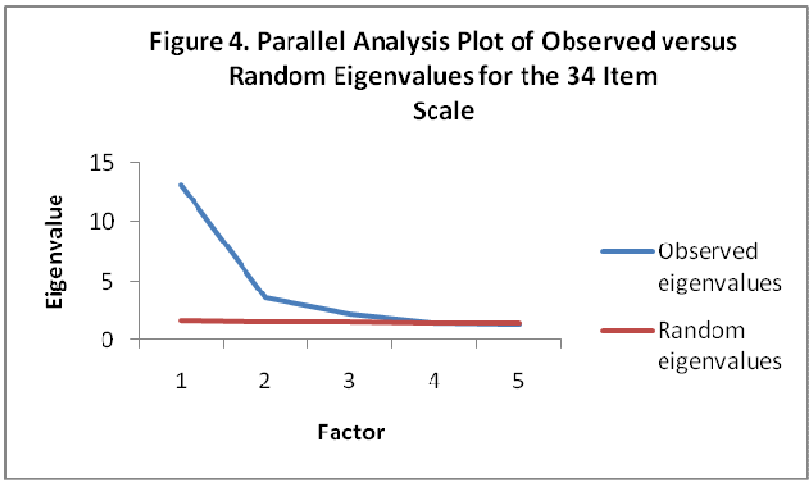
Following the confirmation that the data was suitable for PCA as recommended by Ferguson and Cox (1993) a PCA was performed. Varimax rotation was employed and

will be use throughout this thesis. Oblique factor structure has been found to be problematic in parallel analysis (Beuducel, 2001). As recommended by Ferguson and Cox (1993) a loading of 0.40 for each variable will be used to increase factor saturation. In this first analysis all of the remaining 34 items were entered into the PCA.

Parallel analysis

In order to determine the number of factors to be extracted the heuristic applied here was parallel analysis (Horn, 1965). Parallel analysis has been shown to be the most accurate means of deciding the optimum number of factors to extract (Zwick & Velicier, 1986). Following the initial extraction the next step was to compare the observed eigenvalues from that PCA to the eigenvalues produced by the analysis of the correlation matrix, based on the same number of variables and participants. The values for the random variables were determined from tables which can be found in Lautenschlager (1989). These values are plotted in Figure 4 below. The number of factors to be extracted is given by the value immediately prior to the crossing point of the two plots. In this case three factors are to be extracted.

Figure 4. Parallel Analysis Plot of Observed versus Random Eigenvalues for the 34 Item Scale



Based on the parallel analysis plot in the second analysis, the 34 items were entered into the PCA and three factors were extracted. As recommended by Ferguson and Cox (1993) where cross loadings in the rotated structure were apparent if the difference between loadings was small (< 0.20) then the variable was removed. 13 items were removed, according to this criterion and these items are shown in Table 3.4 below.

Table 3.4. Items Which Cross Loaded

8	Feeling scared about a transfusion.
9	Feeling disgusted about a transfusion.
17	The quantity of blood received.
28	Any immediate complications caused by the transfusion.
34	Feeling able to share my preferences with the medical team.
12	The willingness of the health professionals to involve me in the decision making process.
30	Being able to cope with any side effects associated with the transfusion.
31	Feeling angry towards the transfusion.
38	The reliability of the source from which the information about the transfusion came.
23	How susceptible I feel towards suffering from the side effects associated with the
43	The time at which the side effect associated with transfusion procedure pronounce
44	The risk of contracting hepatitis from the transfusion
41	The potential need for repeat transfusions

In addition three items which did not appear to load on any of the factors were also deleted from the scale. These three items are shown in Table 3.5 below**.**

Table 3.5. Items Which Failed to Load on to any Factor

1	The length of time that the transfusion has been used in medical treatments
11	The risk of receiving the wrong blood type
19	Whether an alternative to the transfusion is available

The processes of extraction and rotation were re run with these 16 items removed. The remaining 18 items were then entered into a third PCA.

All of the remaining items loaded exclusively on to one factor and the factor loadings for the individual items and their factors are presented in Table 3.6 on the two subsequent pages. A total of 18 items were retained comprising three factors together accounting for 48.22 % of the variance. Inspection of the items indicated that factor one taps aspects of the hospital environment and emotion and was labeled transfusion environment and emotion (TEE). This first factor, (TEE), accounted for 28.50 % of the total variance and included 9 of the 18 items. Factor two pertained to side effects which can be experienced from the blood transfusion procedure and was labeled side effects. This second factor, side effects, included 4 of the 18 items and accounted for 11.25 % of the total variance. The third factor primarily taps medical need and risks accordingly and was labeled the clinical risk. This final factor, labeled clinical risk included 5 of the 18 items and accounted for 8.48 % of the total variance. Parallel analysis was conducted with the final factor structure to ensure that a three factor structure still resulted. The result of this procedure is presented below in Figure 5.

Figure 5. Parallel Analysis Plot of Observed Versus Random Eigenvalues for the 18 Item Scale

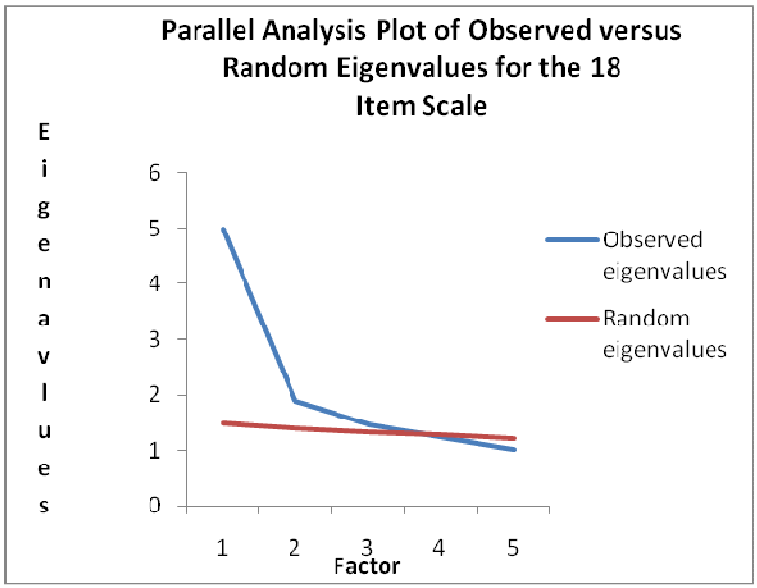


Table 3.6. Principal Components Analysis of the 18 Items

Item	Factors and items	TEE	Clinical risk	Side Effects
	The blood transfusion environment and emotion (TEE)			
36	The way in which the information about the transfusion is provided to me (e.g. Booklet, in person).	**0.73**	0.21	0.11
4	The speed at which I am able to receive the transfusion.	**0.59**	0.10	<0.10
37	Confidentiality about my decision.	**0.59**	0.33	<0.10
7	The current supplies of blood stocks (donated and blood substitute available for the transfusion).	**0.58**	<0.10	0.14
25	The position of the person providing the advice about the transfusion.	**0.58**	0.14	0.12
14	The nature / personality of the health professionals.	**0.57**	0.35	<0.10
47	How satisfied I am with my medical treatment in the hospital prior to the transfusion.	**0.57**	0.15	0.28
29	Feeling that I have control over the transfusion.	**0.55**	0.37	<0.10
10	Feeling comfortable about a transfusion.	**0.55**	-0.10	-0.10
	Side effects			
24	The risk of hypertension from the transfusion	0.19	**0.85**	<0.10
46	The risk of hypersensitivity from the transfusion	0.11	**0.77**	0.27

Table 3.6. continued

21	The risk of flu from the transfusion	0.32	**0.76**	-0.15
6	The influence of the side effects associated with the transfusion on my future life plans.	<0.10	**0.56**	0.28
	Clinical risk			
3	An increased chance of survival / recovery from the transfusion.	-0.16	-0.18	**0.69**
26	The importance of the treatment for which the transfusion is required.	<0.10	0.10	**0.64**
35	The size of the risk associated with the transfusion.	<0.10	0.28	**0.62**
33	Confidence in the tests that have been conducted to ensure the safety of the transfusion.	0.30	0.10	**0.59**
16	My current state of health	0.17	<0.10	**0.56**

3.3.3 Stage Three: Psychometric Properties of the Scale

To be useful a measure must be valid (measure what it intends to), and reliable. The next section presents preliminary data on the internal reliability of the instrument.

Internal reliability

All of the three subscales demonstrated good internal reliability. These ranged from 0.81 for TEE, 0.79 for side effects to 0.64 for the clinical risk dimension higher than Cronbach's (1951) suggested accepted value of 0.50. In addition there were no items that would have increased the scale reliability if they were deleted. Cronbach's alpha for the overall scale was high (alpha = 0.84).

Construct validity of the scale intended to measure factors important to the choice of blood transfusion type

Both convergent and discriminant validity are needed to establish construct validity (Bowling, 2001). The following analysis was carried out to establish that the scale a) does not correlate with dissimilar variables discriminant validity) and b) there is a correspondence between the scale and similar constructs. Firstly it is expected that the measure would not correlate with neuroticism. This is important as if this was the case the measure would simply be another measure of neuroticism. On the other hand it is important that subscales correlate with various dimension of MHLC as they are items which are theoretically related to perceptions of risk.

Divergent validity between sub scales

To ensure that the three subscales do not come from the same conceptual domain inter - correlations between the identified factor structures (TEE, side effects and clinical risk) were assessed. Pearson's product moment correlations coefficients were computed to investigate the inter - relationships between the identified factor structures. The inter correlations between the factors are shown in Table 3.7 on the next page and apart from the relation between side effects and TEE (0.51) are not indicative of conceptual overlap (a coefficient of over 0.50 indicates conceptual overlap (Bowling, 2001)). This suggests that subscales are measuring a single variable rather than a multi dimensional concept. All three dimensions were related to each other in a positive direction. Participants who attributed a greater importance TEE also attributed a greater importance to the importance of side effects and clinical risk factors involved with the blood transfusion process. Placing high importance on clinical risk factors was related to the concerns about the occurrence of side effects. Further examination of the scales divergent validity and the establishment of convergent validity was carried out by linear regression analysis.

Table 3.7. Correlation Matrix of the Three Factor Structures (TEE, Side Effects and Clinical Status)

	Mean (SD)	Side effects	TEE	Clinical Risk
Side effects	5.00 (1.10)	1		
TEE	4.56 (0.97)	0.510**	1	
Clinical Risk	6.00 (0.66)	0.275**	0.267**	1

Note. The possible scale range was 1 - 7.
* $p < 0.05$, ** $p < 0.01$ ***$p < 0.001$.

Hierarchical regression

The three constructs identified from the factor analysis need to be psychologically distinguished from neuroticism and MHLC to ensure confidence that the three constructs are not simply measuring such traits. Three separate hierarchical regressions HMLRs were conducted to investigate the relationship. In accordance with Cohen and Cohen (1983), stable background variables (e.g. demographics) were entered at step one, and the personality variables neuroticism and MHLC which are likely to vary between individuals were entered at step two. A summary of the results is shown in Table 3.8 on the next page.

As shown in Table 3.8 gender, neuroticism, internal control and powerful others were significant independent predictors of TEE. The model was statically significant (F (7, 274) = 6.71, $p < 0.001$), and explained 12.7 % of the variance in TEE (Adjusted R2 = 0.13). Gender emerged as the strongest predictor (0.55, $p < 0.001$), followed by powerful others (0.21, $p < 0.01$), internal control (0.19, $p < 0.05$) and neuroticism (0.04, $p < 0.05$).

In the case of clinical risk, neuroticism, internal control and powerful others were significant independent predictors. The model was statically significant (F (7, 273) = 7.26, $p < 0.001$), and explained 7.8 % of the variance in clinical risk (Adjusted R2 = 0.08). Gender emerged as the strongest predictor (0.29, $p < 0.001$), followed by religion (-0.05, $p < 0.05$) powerful others (-0.01, $p < 0.01$), chance (-0.04, $p < 0.05$) blood donation (0.03, $p < 0.05$) and neuroticism (0.02, $p < 0.05$).

Finally gender and neuroticism were significant independent predictors of side effects. The model was statically significant (F (7,272) = 8.86, $p < 0.001$), and explained 10.8 % of the variance in TEE (Adjusted R2 = 0.11). Gender emerged as the strongest predictor (0.4, $p < 0.001$), followed by neuroticism (0.04, $p < 0.05$).

In the case of all three factors gender emerged as the most significant predictor. This indicates that females are more likely to consider the respective factors as important in their decision making. The personality variables contributed only 7.7 % of the variance in TEE, 2.8 % of the variance in side effects and 4.3% of the variance on clinical risk.

Table 3.8. Hierarchical Multiple Regression Analysis of the Demographics, Neuroticism and MHLC Variables on the Factor Structures TEE, Clinical Risks and Side Effects

	TEE		**Clinical Risk**		**Side Effects**	
Variables	**ΔR2**	**β**	**ΔR2**	**β**	**ΔR2**	**B**
Step 1	0.09***		0.07***		0.09***	
Gender		0.55***		0.29***		0.43**
Blood Donation History		0.01		0.03*		-0.04
Religion		0.15		-0.05*		0.02
Step 2	0.08***		0.03		0.04*	
Neuroticism		0.04*		0.02*		0.04
Internal control		0.19*		0.14		0.18
Powerful Others		0.21**		-0.04*		0.05
Chance		-0.09		-0.04*		-0.05
d.f.		4, 269		4, 273		4,272

Note. *$p < 0.05$, **$p < 0.01$ ***$p < 0.001$. Age and ethnicity were not entered into the equation due to the homogeneity of these indicators within the sample.

3.3.4 Qualitative data

The free response question which followed completion of the scale under development had a response rate of 19 %. 80 reasons for the acceptance of a blood transfusion were yielded. Reasons identified from Experiment 1 were reiterated including alternative, consequences, medical need, health professionals' information, safety, personal experience, resources. Four new themes were identified namely source of the blood transfusion (6) external information (4), aspects of the procedure (7), individual differences (6). The themes and the frequency of their occurrence are presented in Table 3.9 on the next page. Given the overlap with the existing qualitative data obtained in Chapter 2 we can be confident about the face validity of the items contained within the scale measuring the factors around which people decide to accept blood transfusion products.

Table 3.9. Themes Emerging From the Qualitative Data

	Theme	Frequency	Percentage
1	Risk	1	<1
2	Consequences	6	7.5
3	Beliefs About Health Professionals and Standard of Care	6	7.5
5	Medical Need and Health Status	27	33.8
6	Information Seeking	4	5
8	Safety	4	5
9	Alternative	5	6.3
13	Personal Experience	3	3.8
17	Resources Available	1	<1
19	Source of the Blood Transfusion Type	6	7.5
20	External Information	4	5
21	Aspects of the Procedure	7	8.8
22	Individual Differences	6	7.5

Note. Numbers up to 22 are shown as 22 themes have now been identified, but only 12 out of 22 were mentioned by participants in this study .

3.5 *Discussion*

In this chapter the development and structure of a new questionnaire has been outlined. Specifically constructed to allow the quantitative measurement of the factors around which people decide to accept blood transfusion products.

Reliability analysis showed that the internal consistency of the identified factor structures contained within the scale is encouraging. The significant intercorrelations between the subscales measuring factors around which people decide to accept blood transfusion products indicate that these factors appear to represent a multidimensional construct, with factor analysis suggesting that the item variance can be best accounted for by a three factor solution. Additionally, the high level of internal consistency for the entire scale indicates that computing a total score maybe appropriate for research activities. For example, it might be possible to identify individuals going for elective surgery who have particularly high levels of concerns about the blood transfusion process and provide them with a structured anxiety reduction intervention.

In addition the data on the construct validity of the subscales is also encouraging. Expected relations were obtained between the factor structures, and established measures of health locus of control and neuroticism. However the size and significance of the relationships indicate that the factor structures are distinct from the demographic variables, MHLC and neuroticism lending support to the divergent validity of the scale.

Having said this, the small amounts of variance predicted by the regression equations are of theoretical importance. Believing TEE to be important to the decision to accept a blood transfusion was predicted by internal control beliefs i.e. the extent to which individuals believe their health is the result of their own action. This is a logical relationship as people who believe that their health is within their own control seek more health - related information than people who believe their health is influenced by external factors (Wallston, Wallston, Kaplan, & Maides, 1976). Importantly as neuroticism has been documented to be related to perceptions of risk (e.g. O'Johnson, 1999) the sparcity of relations between neuroticism and the factors around which people decide to accept a blood transfusion indicates that this instrument is not simply measuring risk perception.

The individual subscale scores open up an avenue from which there is a possibility to

identify specific aspects of the blood transfusion process that maybe important to choice behaviour. The provision of such information could then be useful for health information campaigns, to assist in the development of patient information materials and for use in one to one interventions. It has for example been argued by Lowe and Ferguson (2003) that challenging peoples' beliefs about their knowledge may be effective in reducing perception of risk. However, in order to do this it is necessary to know which areas to challenge. A major purpose of the scale developed in this chapter is to identify what factors may predispose individuals to refuse a blood substitute. It was anticipated the scores for each of the subscales would give an indication of which specific beliefs are most important to an individual in terms of making a decision. As a result this research may then help to identify how specific beliefs and perceptions of risk about the blood transfusion process influence choice of blood transfusion type. Beliefs about health threats are potentially modifiable (Grace *et al.,* 2005) and as such if an investigator finds that side effects from blood transfusion are the important factor determining decision making then this could be the avenue to focus on. Such interventions may be important in encouraging the use of blood substitutes in the care of people who refuse donated blood but are hesitant about biotechnologies such as Jehovah's witnesses.

Practically valuable information could be provided to clinicians and medical educators about what aspect of the blood transfusion process are important to patients' decision making. Indeed the three factors identified here may also be important to the acceptance of medical biotechnologies in general.

The scale is a straight-forward and feasible method for assessing factors around which people decide to accept blood transfusion products. A questionnaire method using a psychometrically sound instrument for eliciting the importance of factors around which people decide to accept blood transfusion products may possibly also be applied to a wide range of biotechnologies. Users may be able to amend the scale to include items which are specific to particular procedures, in particular the side effects subscale. In addition a reliable and valid measure such as this could serve an important role as a sensitive and predictive measure of choice behaviour. Further work is however needed to establish the psychometric status of the scale, in particular to provide predictive validity, known group validity, (the scale may differ in applicability between different patient groups and

procedures), re – test reliability, discriminant validity, and replication of the reliability and validity, and expansion to patient populations. The present conclusions should therefore be treated with caution. Validity of the scale was complicated by the absence of a reference standard. The predominance of young adults in this study, may limit the generalisability of the findings. Additional studies should be performed in men and women of other age groups and socio economic backgrounds to verify the factor structure.

In conclusion, remove that there is scope for further developing the assessment questionnaires and the scale could have considerable scope in health psychology research.

3.6 Next Chapter

In the next chapter Rothman and Salovey's (1997) hypothesis is explored in relation to the presentation of framed information about two types of blood transfusion type i.e. a choice is given between two distinct options. In addition, the moderating role of anticipated emotions, together with the potential of factors around which people decide to accept blood transfusion product to mediate the relation between frame and choice will be considered.

CHAPTER 4

Using Message Framing to Determine the Acceptance Rates of Blood Substitutes when Presented with Donated Blood as an Alternative

4.1 Overview of the Chapter

Previously in this thesis message framing has been found to be effective in raising the acceptance levels of blood substitutes, with positively framed information being attributed with the highest rates of acceptance of a blood transfusion.

This penultimate experimental chapter aims to explore Rothman and Salovey's (1997) hypothesis regarding the moderating role of risk in relation to a framed scenario where a choice is given between two distinct options. Specifically participants are provided with information about two types of blood transfusion products, donated blood and one of three blood substitutes (human haemoglobin, perflurocarbon and bovine haemoglobin). As was the case in Experiment 1, Chapter 2, participants will be asked to make a decision on the behalf of a family member and friend, as well as for themselves. Finally the factors' around which people decide to accept a blood transfusion products, and anticipated emotions towards the blood transfusion process, are both investigated as potential mediators between frame and choice of blood transfusion.

4.1.2 Acceptance Rates of Blood Substitutes - Methodological Refinements

In Experiment 1 presented in Chapter 2 of this thesis the lowest acceptance rate of a blood transfusion was found to be 45% in the case of the blood substitute bovine haemoglobin presented as a loss frame (see Table 2.7, Section 2.3.1 Chapter 2). This compares to a maximum acceptance of 26% in an earlier experiment examining preferences for blood substitutes compared to donated blood within a lay population in the absence of message framing (Lowe *et al.,* 2001). The provision of information about the side effects and properties of the blood substitutes in the present experiment is one possible explanation for this difference in preference between the two studies. A second explanation is that the participants in Experiment 1 of this thesis were, albeit hypothetically, in a state of immediate clinical need (blood loss during surgery). Certainly from the qualitative data it was apparent there was a belief, at least amongst some participants, that the only hope to alleviate the health problem (blood loss) was the blood

transfusion that was offered. This is shown, for example, in the response "Because it might be detrimental to me, as if I don't I might die". Furthermore, the qualitative data revealed that beliefs that one needed the transfusion or surgery accounted for 10.9 % of the stated reasons for accepting or declining the blood transfusion (see Section 2.3.5, Chapter 2). Hence necessity of treatment is a factor which needs to be considered as a factor which may account for the inconsistency of acceptance rates between studies. In consideration of this, it is important to validate the findings from Experiment 1 by determining acceptance rates of blood substitutes in the same surgical scenario when participants are presented with an alternative option in the form of donated blood. This should then give a more accurate representation of the potential acceptance rates of blood substitutes. Such information is necessary for the blood transfusion service to gain an understanding of the degree of opposition which might be faced towards blood substitutes. This is an important consideration when determining resource allocation.

4.1.3 Theoretical Issues: Extending the Theory by Rothman and Salovey (1997)

Presenting participants with a choice between blood transfusion types will not only provide the BTS with a more accurate indication of possible acceptance rates of blood substitutes within the UK population but also extend current theories. Rothman and Salovey's (1997) hypothesis was derived from a narrow range of health behaviours (Rothman *et al.,* 2006) and in which participants in the majority of studies were asked to accept or decline a treatment or choose whether to engage in a health protective behaviour. As discussed in Section 1.2.3 of the introduction to this thesis there is an increasing need to understand the factors which determine individual preference between two treatment options. In addition whilst the distinction between preventative and detection behaviours has provided clarity to the message framing literature, extending knowledge of the antecedent conditions under which framing influences choice behaviour may provide insight into inconsistencies. The present study aims to do this by using choice problems that share the same probability structure but which differ in the risk presented by the blood transfusion. Hence this experiment will for the first time test the prediction of Rothman and Salovey (1997) in relation to a choice scenario. In accordance with the results obtained in experiment one, and Rothman and Salovey (1997) it is predicted that individuals will prefer the blood transfusion type which is presented as a

gain frame over that presented as a loss frame. However, the preference for the gain frame is expected to be moderated by the risk presented by the blood substitute offered as the alternative. For example, where the gain framed option presents a greater risk, as in the case of bovine haemoglobin, a loss framed advantage or preference for donated blood is expected.

Although the findings from an experiment involving a choice scenario will be of theoretical interest, in a clinical context participants would either be presented with a situation where they would be asked to accept or decline a blood transfusion as in Experiment 1, or presented with congruent information about both transfusion types. Given this the current experiment also aims to ascertain the acceptance rates of blood substitutes when valence congruent information about both blood transfusion types (donated blood and blood substitute) is presented. Recall from the introduction, (Section 1.1.3), utility theories predict that individuals weigh up the cost and benefits of each alternative and take the option which is associated with the greatest gain, with a random 50 : 50 split expected. It is therefore, predicted that when individuals are presented with valence congruent information there will be no observed preference for either blood transfusion type.

4.1.4 Mediators of Message Framing Effects

Anticipated emotion

Recall from Section 1.4.1 of the introduction that, according to the consequentialist perspective, any role of emotion in judgment and decision making is said to be through anticipated emotions (Loewenstein *et al.,* 2001). Consequentialists argue that in thinking about choice outcomes individuals anticipate what their feelings may be at a later date, and that such feelings can be considered by the decision maker when making a choice.
For example, people could choose an option because they want to avoid the worry about future unknown consequences that may result from choosing a blood substitute. It is important to study the effect of anticipated emotion for two reasons. Firstly, evidence exists within the literature that decisions made with the influence of anticipated emotions are not always accurate. This has been shown for example in requests made in documents such as living wills. The choices made when writing such documents are argued to be

influenced by anticipated emotions, have been found to be incongruent with wishes at the time (Copplao *et al.,* 1999). Another important point is that work demonstrating the role of anticipated emotions upon the decision making process has focused mainly on negative anticipated emotions (see Bagozzi, Dholakia, & Basuroy, 2003). By ensuring that the contributions of both positive and negative emotions are examined a richer understanding of anticipated affect may be obtained.

In consideration of the two above factors this current experiment examines whether anticipated emotion plays a role in decision making in relation to the blood transfusion process. Finding a role for anticipated emotion upon choice of blood transfusion may have implications for any advance directives on which type of blood transfusion an individual prefers to receive. Anticipated emotions are argued to be used as information to inform choice (Loewenstein *et al.,* 2001). Given this the role played by frame is predicted to be reduced when anticipated emotions are taken into account i.e. anticipated emotion may mediate the frame - choice relation.

Cognitive factors in the choice of blood transfusion type

Analysis of the qualitative data from Experiment 1 demonstrated that there were differences in the reasons for acceptance of a blood transfusion between framing conditions, (see Section 2.3.5, Chapter 2). This is in line with the speculation that message framing influences aspects of health risk perceptions other than perceived susceptibility (Williams, *et al.,* 2001). Currently the interplay between framing and how this changes how a health behaviour is construed or perceived remains untested (Rothman *et al.,* 2003). The scale developed in Chapter 3 of this thesis is therefore to be used to examine whether factors around which people decide to accept blood transfusion products exert any statistically significant effect upon choice of blood transfusion type, or mediate framing effects. Specifically it was predicted in this experiment that the addition of side effects, clinical status, and TEE would result in the contribution of frame becoming less significant, meaning that beliefs would mediate the effect of frame upon choice.

4.2 Method

4.2.1 Design

The experiment was a two way, 3 (type of blood substitute: perflurocarbon, bovine and human haemoglobin) by 4 (choice task: congruent gain, congruent loss, blood substitute gain paired with donated blood loss and donated blood gain paired with blood substitute loss) between subjects design. Participants were randomly assigned to one of the 12 experimental conditions. The order of presentation of blood transfusion types was counterbalanced across all four choice tasks (i.e. whether information about the donated blood or blood substitute was presented first or last). In addition the order of presentation of the valence of information about the blood transfusion types was counterbalanced across the two incongruent conditions (i.e. whether gain or loss framed information was presented first or last).

4.2.2 Participants

An opportunity sample of 717 adults was recruited by the author of this thesis from the adult population within cafes and lectures on the Nottingham University campus. People were ineligible for participation in this study if they were unable to read and write English fluently; were under the age of 18, had been exposed to blood substitutes or had participated in one of the two previous studies described in this thesis (being Chapter 2 and 3). Of the 717 participants 56% were female, 43% were male and in the case of 1% the gender was not given). The ages of participants ranged from 17 to 78 years, with a mean age of 23 years and 2 months (SD = 7 years and 6 months). Most of the sample were white (67 %) and held some religious beliefs (65 %).

4.2.3 Pre Manipulation Measures

Anticipated emotions towards the blood transfusion procedure

Participants completed a nine - item measure about how they felt towards the prospect of receiving a blood transfusion in the future. The measure comprised the three composite emotion subscales identified in Experiment 1 (emotional expression, concern and optimism). The reliability coefficients obtained in this experiment for these constructs were in line with the reliabilities observed in Chapter 2 of this thesis being concern 0.76,

optimism 0.72 and emotional expression 0.83. Ratings were made on a six point scale ranging from 1 (not at all) to, 6 (very much so).

4.2.4 Framing Manipulation

The same factual information regarding the safety of blood substitutes (bovine, human haemoglobin and perflurocarbon) and donated blood was presented in one of four choice formats. 1: A gain frame describing donated blood and a loss frame describing each of the three blood substitutes; 2: A loss frame describing donated blood and a gain frame describing each of the three blood substitutes, 3: Gain framed information about both blood transfusion types 4: Loss framed information about both blood transfusion types. The information about the blood transfusion types contained within the frames was the same as that in the first experiment, Chapter 2. For one of the 12 conditions each participant indicted which type of blood transfusion type they would choose.

4.2.5 Post Manipulation Measures

Factors around which people decide to accept blood transfusion products

The scale developed in Chapter 3 of this thesis to measure factors around which people decide to accept blood transfusion products was employed. The questionnaire consists of 18 individual items based around three constructs identified from a PCA. The three factor structures identified were TEE (consisting of nine items), clinical risk (consisting of five items), and side effects (consisting of four items). The instrument had previously shown good validity and reliability.

The reliability coefficients obtained in this study for these constructs were in line with the reliabilities observed in Chapter 3 of this thesis being 0.77 side effects, 0.76 clinical risk and 0.63 TEE. The internal reliability of the subscale TEE could not improved by the deletion of items. Participants were required to rate the level of importance they would attribute to each item in making a choice between blood transfusion types on a seven point scale from -3 (not at all important) to, +3 (of utmost importance).

Reasons for choice of blood transfusion type

To ensure that the act of choosing between two blood transfusion types did not evoke any further motivations beyond those identified in Chapter 2. Hence participants using

free text, were asked to describe in the space provided their reasons for choice of blood transfusion type.

Perceptions of the similarity of the two blood transfusion types

To ensure the two blood transfusion types were perceived as being different participants were asked to indicate on a scale of 1- 10 **(**where 1 = completely different to, 10 = identical) the extent to which they perceive the two blood products as being similar.

Previous blood transfusion and donation history

These factors were assessed as in Chapter 2.

History of side effects

This factor was assessed as previously in Chapter 3.

Current health status

This factor was assessed as previously in Chapter 3.

Demographics

Information on participants' age, gender, religious beliefs and ethnicity was collected

4.2.6 Procedure

Ethical approval was granted by the School of Psychology ethics committee at the University of Nottingham. Participants were provided with an information sheet (Appendix 5). People who volunteered were asked to provide their written consent, and were then asked to complete the questionnaire individually, by reading the materials and answering the questions. A researcher was present to answer any questions they may have. A booklet of questionnaires containing 39 items was presented in the following order: firstly the measure of anticipated emotions was presented, followed by one of the 12 choice task conditions. Following the experimental manipulation the measure of factors around which people decided to accept blood transfusion products was presented. Finally participants were presented with questions relating to their history of blood donation or blood transfusion, any side effects experienced, their current health status, confidence in choice of blood transfusion type, and a series of demographic questions. Following completion of the questionnaire participants were fully debriefed as to the

aims of the experiment. Participants were also be provided with a sheet containing the contact phone numbers of the University of Nottingham counseling and nightline service as well as a website providing information about blood transfusions (Appendix 5).

4.2.7 Analysis Plan

The data obtained from the experiment were analysed in the following manner. The first part of the results section presents the results of a number of manipulation checks and preliminary analyses to determine the validity and suitability of the data for analysis.

In the second section, to answer the first hypothesis tested in this thesis, being that individuals will be more likely to prefer the transfusion option presented as a gain frame, the contribution of frame (gain or loss) to the acceptance of blood transfusion type was examined for each of the three recipients (self, family and friend) using a Z - test of two proportions. A Z-Test for two proportions calculator produced by Dimension Research, Inc. was used for this purpose. The Z-Test allows us to confirm whether the proportion of people choosing the gain framed option of a given blood transfusion type differs from the proportion of people choosing the same blood transfusion type when presented with a loss framed version of that blood transfusion type. A binomial test was used to assess the preferred blood transfusion type when presented with congruent information. The binomial test is an exact test of the statistical significance of any deviation of the data from the expected pattern of preference (50% being the reference point). Following this in the third section a logistic regression analysis was used to examine the potential role of anticipated emotions to act as a mediator of the framing effect. Finally a logistic regression and a MANOVA analysis was used to investigate whether factors around which people decided to accept a blood transfusion product acted as a mediating variable. Individuals who chose the blood substitute were assigned a value of one, and individuals who chose donated blood were assigned the value of zero. The qualitative data was coded by two independent raters with the initial Kappa being 0.77 there being a 79% agreement between coders.

4.3 Results

4.3.1 Section 1: Preliminary Analysis

Before the testing of the hypotheses outlined in the introduction to this chapter it was necessary for several lines of preliminary analyses to be carried out. The details of these are now explained.

Normality tests of the independent variables

Normality tests of the continuous variables anticipated emotions and factors around which people decide to accept blood transfusion were not carried out as in logistic regression the predictors do not have to be normally distributed (Tabachnick & Fidell, 2007).

Sample equivalence

Moxey *et al.* (2003) recommend that baseline characteristics such as age and gender should be recorded and compared for each choice task condition. Chi - square tests and analyses of variance revealed that there were no differences among the 12 experimental conditions in participants', gender, religion, blood transfusion history and donation history (all *p*s > 0.05, all $\chi^2 < 1.17$). There was however a significant difference between the conditions in terms of age, ethnicity and whether participants were health professionals. Subsequent logistic regression and Chi - square tests revealed that these variables were not related to participants' choice of blood transfusion type and so accordingly these did not need to be controlled for in the main analysis (all *p*s > 0.05, all $\chi^2 < 0.02$).

Order of presentation of frame and blood transfusion type

In this experiment to ensure that the order that the framed information was presented did not alter participants choice of blood transfusion each condition was counterbalanced for order of both frame (gain or loss) and blood transfusion type (donated blood or blood substitute). Logistic regression analysis confirmed that neither the order of presentation of the blood transfusion type nor order of presentation of the message frame affected choice of blood transfusion type made by any of the recipients (all *p*s > 0.05, all $\chi^2 <$ 2.65). Order of presentation of framed information is an important factor to have

considered as Moxey *et al.* (2003) suggests that patients may prefer information which is presented first.

Variations in preference by type of blood substitute

A logistic regression analysis was conducted to determine whether within each of the choice task conditions preference for the donated blood differed by the type of blood substitute which was offered. From this analysis it was found that the level of preference for donated blood differed between bovine haemoglobin and both perflurocarbon and human haemoglobin in three of the choice task conditions. Hence in those three cases when determining the effect the type of choice task played in ones choice of blood transfusion type separate analysis was conducted for the conditions involving the bovine haemoglobin. The data from the conditions pertaining to perflurocarbon and human haemoglobin were considered collectively.

4.3.2 Section 2: Framing Effect

A *Z* - test of two proportions was used to establish whether there was a preference for the gain framed option among the two incongruent choice task conditions (condition one where donated blood was presented as a gain frame and blood substitute as a loss frame, and condition two were donated blood was presented as a loss frame and the blood substitute as a gain frame). The results from this analysis are presented in Table 4 and 4.1.on the following pages.

Table 4. Percentage of Sample Preferring the Gain Framed Option when Presented with a Choice between Bovine Haemoglobin and Donated Blood

Recipient	**Self**		**Family Member**		**Friend**	
	Proportion of Participants Choosing Donated Blood	**Proportion of Participants Choosing Bovine Blood Substitute**	**Proportion of Participants Choosing Donated Blood**	**Proportion of Participants Choosing Bovine Blood Substitute**	**Proportion of Participants Choosing Donated Blood**	**Proportion of Participants Choosing Bovine Blood Substitute**
Choice Task						
Donated Gain Bovine Loss	**95%**	5%	**95%**	5%	**95%**	5%
Donated Loss Bovine Gain	47%	**53%**	44%	**56%**	44%	**56%**
Z SCORE	Z = - 5.99, $p <$ 0.001	Z = 5.99, $p <$ 0.001	Z = - 6.23 , $p <$ 0.001	Z = 6.23 , $p <$ 0.001	Z = - 5.99. $p <$ 0.001	Z = 5.82, $p <$ 0.001

Note. The percentage of the sample preferring the gain framed option of a given transfusion type is compared to the percentage preferring the loss framed option e.g. 95% is compared to 47%. All Z scores are significant at the 99% level. The Chi Square statistic is not required due to the high significance of the Z score.

Table 4.1. Percentage of Sample Preferring the Risk Averse Option when Presented with a Choice Between Human Haemoglobin and Perflurocarbon Blood Substitute and Donated Blood

Recipient	**Self**		**Family Member**		**Friend**	
	Proportion of Participants Choosing Donated Blood	**Proportion of Participants Choosing Blood Substitute**	**Proportion of Participants Choosing Donated Blood**	**Proportion of Participants Choosing Blood Substitute**	**Proportion of Participants Choosing Donated Blood**	**Proportion of Participants Choosing Blood Substitute**
Choice task						
Donated Gain and Blood Substitute Loss	**96%**	4%	**94%**	6%	**92%**	8%
Donated Loss and Blood Substitute Gain	23%	**77%**	26%	**74%**	23%	**77%**
Z SCORE	Z = -11.26 , $p <$ 0.001	Z = 11.26 , $p <$ 0.001	Z = -10.37 , $p <$ 0.001	Z = 10.37 , $p <$ 0.001	Z = -10.50 , $p <$ 0.001	Z = 15.23 , $p <$ 0.001

Note. The percentage of the sample preferring the gain framed option of a given transfusion type is compared to the percentage preferring the loss framed option e.g. 96% is compared to 23%. All Z scores are significant at the 99% level. The Chi Square statistic is not required due to the high significance of the Z score.

As can be seen from the Z - test scores presented in Tables 4 and 4.1 a gain frame effect was observed in the case of all four blood transfusion types and in the case of all recipients. Consistent with the preference levels obtained in the Experiment 1 the donated blood is preferred to all blood substitutes and the human haemoglobin and perflurocarbon are preferred to bovine haemoglobin. The presentation of positive information about the blood substitutes together with negative information about donated blood leads to a situation where at least 50% of the sample considered a blood substitute as an option. This compares to as little as 4% of the sample considering a blood substitute where negative information about the blood substitute was presented.

4.3.3 Participants Preference for Donated Blood when Presented with Congruently Framed Information

Under expected utility theory preference for blood transfusion types within a congruent choice task is hypothesized to be equally divided (50:50) between blood substitute and donated blood. Whether preference for the donated blood or blood substitute deviates from the 50 % is investigated by the use of a binomial test. The results are shown in Table 4.2 and 4.3 on the subsequent pages.

The results presented in Tables 4.2 and 4.3 on the following pages show that in the congruent gain frame condition there was no preference for either blood transfusion type in the case of any recipient. Under the congruent loss frame condition there a significant preference for donated blood in the case of all recipients was observed with this effect being the most significant when the donated blood was compared with bovine haemoglobin.

Table 4.2. Participants Preference for Blood Transfusion Types Within the Congruent Gain Conditions in the Context of Potential Blood Loss

Comparison of Expected Values of safe and risky Choices	Condition	Recipient	Total Number of Respondents	Proportion of Participant Selecting Donated Blood	Assymp. Sig 2 tailored
Safe = risky	Condition Three Donated Blood and Blood Substitute Gain	Self	177	**0.50**	ns
		Family	176	**0.50**	ns
		Friend	177	**0.49**	ns

Note. Based on Z Approximation $p < 0.05$ that observed proportions differ from 0.50 by chance data for all three blood substitutes types were combined as preliminary analysis had identified that preference of blood transfusion type did not differ within these conditions.

Table 4.3. Participants Preference for Blood Transfusion Types Within the Congruent Loss Conditions in the Context of Potential Blood Loss

Comparison of Expected Values of safe and risky Choices	**Condition**	**Recipient**	**Total Number of Respondents**	**Proportion of Participant Selecting Donated Blood**	***Assymp. Sig 2 tailored***
Safe = risky	Condition Four Donated blood Human Haemoglobin and Perflurocarbon Loss	Self	108	**0.76**	$p < 0.001$
		Family	107	**0.74**	$p < 0.001$
		Friend	106	**0.73**	$p < 0.001$
Safe = risky	Condition Four Bovine Haemoglobin and Donated Loss	Self	69	**0.91**	$p < 0.001$
		Family	69	**0.93**	$p< 0.001$
		Friend	69	**0.93**	$p < 0.001$

Note. Based on Z Approximation $p < 0$ .05 that observed proportions differ from 0.50 by chance.

4.3.4 Section 3: Anticipated Emotion and Factors Important to the Blood transfusion Process as Mediators of the Framing Effect

Anticipated emotion as a mediator of the framing effect

To demonstrate mediation, the following must be shown: both the potential mediating variable and frame must be associated with choice of blood transfusion and there must be an association between frame and the potential mediator. Once this is established for mediation to be shown the association between frame and choice of blood transfusion type must be weakened when the potential mediator is entered into the regression equation. A series of logistic regression analyses were conducted to explore if anticipated emotion towards the blood transfusion procedure influenced choice within the incongruent conditions. Results showed that anticipated emotions failed to influence participants' choice of blood transfusion (all *p*s > 0.05, all $\chi^2 < 3.84$). This analysis revealed that in the case of all recipients the conditions for mediation were not met (Baron & Kenny, 1986).

Factors around which people decide to accept a blood transfusion as a mediator of the framing effect

The final aim of this chapter is to investigate whether factors around which people decide to accept a blood transfusion can have a direct influence on the choice of blood transfusion type. The next analysis presented was therefore carried out to examine whether factors around which people decide to accept a blood transfusion have a direct effect, or an indirect effect whereby they mediate the effect of message frame on the choice of blood transfusion.

To facilitate this investigation a four way between subjects MANOVA and a logistic regression analysis was performed.

With respect to the logistic regression analyses, there was no significant effect observed in the choice of a blood transfusion type in the case of all potential recipients within the incongruent conditions (all *p*s >.05, all $\chi^2 < 7.29$). As the first condition for mediation being that the potential mediating variable (factors important to the choice of blood transfusion).

must be associated with choice of blood transfusion type, was not met (Baron & Kenny, 1986), the MANOVA analysis was not conducted.

4.4 Qualitative data

The free response question which followed the experiment had a response rate of 34%. The 245 statements provided by the participants were broken down into 327 units representing one of 22 themes. The themes identified from Experiment 1, Chapter 2 and the psychometric study in Chapter 3 were reiterated including alternative, consequences, medical need, health professionals' information, safety, personal experience, resources, source of the blood transfusion type, and individual differences. Two new themes were identified being naturalness (2) and familiarity (7). The correspondence between the themes identified in this experiment together with the minimal amount of new material elicited suggests that a point of data saturation has been reached**.** Differences in the assignment of the motivations to the themes by the two coders were discussed until the assignment of phrase to themes was agreed 100%. A summary of the qualitative is data is presented in Table 4.4 on the next page.

Table 4.4. Themes Emerging from the Qualitative Data

	Theme	Frequency	Percentage
1.	Risk	30	9
2.	Consequences	26	8
3.	Beliefs about Health Professionals and Standard of Care	4	1
4.	Cost Benefit	27	8
5.	Medical Need and Health Status	33	10
6.	Information Seeking	13	4
7.	Personal Beliefs	19	5.8
8.	Safety	7	2
9.	Alternative	7	2
10	Beliefs About Technology / Testing Trust Efficacy Compatibility	14	4
11	Altruism	6	1.8
12	Timeline	22	6.7
13	Personal Experience	28	8.5
14	Interdependence between Blood Transfusion and Surgery	10	3
15	Resulting Emotions	23	7
17	Resources Available	4	1
18	Miscellaneous	3	<1
19	Source of the Transfusion Type	22	6.7
20	External Information	13	4
21	Aspects of the Procedure	7	2
23	Naturalness	2	<1
24	Familiarity / Length of the use of the Procedure	7	2

Note. Numbers up to 24 are shown as there were 24 themes identified throughout this thesis, but only 22 out of 24 were mentioned by participants in this experiment.

Additional data

Participants in this experiment were asked to state the extent to which they perceived the two blood transfusion types as being the same. Participants rated donated blood and blood substitutes as being quite different (4.40 on a 10 point scale where 10 = identical). A one - way between subjects analysis of variance was conducted to evaluate the perceptions of the similarity between blood transfusion types (donated blood or blood substitute) and choice task condition. The ANOVA was not significant [F (1, 23) =1.28, p = 0.23]. The choice task condition which one received therefore did not alter the participant's perception of the difference between blood transfusion types.

4.5 *Discussion*

It was hypothesized that the way in which a message about a blood transfusion type is framed whether emphasizing gains (benefits of the blood transfusion types) or losses (risk of side effects from the blood transfusion types) affects the blood transfusion type an individual will choose. Specifically, in line with Rothman and Salovey, (1997) it was predicted that participants would be more likely to choose the transfusion type presented as the safe option (gain frame) rather than the blood transfusion type presented as a risky option (loss frame).

Indeed a gain frame advantage was observed in the case of all four blood transfusion types. The hypothesis derived by Rothman and Salovey (1997) then extends to a choice scenario akin to the AD problem and as such suggests the generalisabilty of the basic foundations of their typology.

Factors around which people decide to accept blood transfusion products and anticipated emotions were examined as potential mediators of the frame behaviour relationship. With respect to anticipated emotions no statistically significant relationships betweenen frame and blood transfusion choice was found. It can therefore be concluded that in this particular study anticipated emotions are not related to intended choice of blood transfusion type. Having said this, to the young population in the study the prospect of a blood transfusion may have seemed a distant event, making the anticipation of emotion difficult.

The factors around which people decide to accept blood transfusion products also did

not exert any statistically significant effect upon choice of blood transfusion. This finding does not mean that such factors do not exert any influence on choice. The time of measurement and the use of a student sample are two factors which may have contributed to the failure to find support for the instruments predictive validity. For example the experimental conditions may not have had an immediate impact on the factors around which people decide to accept blood transfusion products, but had a delayed impact by way of cognitive processing after the participants' had been made their choice.

This experiment benefited from the inclusion of two conditions which presented congruent information to participants. The data obtained from this experiment provides the BTS with insight as to the most effective way of presenting information about the new technology, namely that gain frames seem the most effective way to raise acceptance levels of blood substitutes. Positive framing has also been found to enhance people's understanding of information (Armstrong, Schwartz, Fitzgerald, Putt, & Ubel, 2002). However, given that focus on only positive information has been found to lead people to make choices they later regret (Edwards, Elwyn, Covey, Mathews, & Pill, 2001) it is questionable whether this would be the most ethical method of the presentation of information. On the other hand the acceptance rates of blood substitutes when loss framed information is provided is only 18%. This means that unless positive framed information is provided those administering the blood transfusions would need to engage in a campaign targeting the reduction of the concerns about blood substitutes. The qualitative data collected throughout this thesis provides valuable data in this regard.

In summary the results of this experiment provides both theoretical and practically important information. Firstly the likelihood of acceptance of any product for blood transfusion can be increased by supplying recipients with positive framed information about both donated blood and blood substitutes. Secondly, the hypothesis by Rothman and Salovey (1997) relating to the function of a health behaviour extends to a choice scenario.

4.6 Next chapter:

The experiments reported so far in this thesis have provided evidence that message framing can increase the acceptance of blood substitutes. The processes by which framing

occurs is however still unresolved. The final experimental chapter in this thesis will test the risk - as - feelings hypothesis (Loewenstein *et al.,* 2001) through the implementation of a time constraint methodology and the concurrent measurement of anticipated emotions, trait emotions and immediate emotions.

CHAPTER 5

Message Framing Effects under a Time Constraint

5.1 *Overview of the Chapter*

Recall from the introduction (Chapter 1) that the implementation of a time constraint has been shown to have the potential to expose the role of emotion in the decision making process (Finucane *et al*., 2000; Maule & Svenson, 1993). Thus studying message framing effects under a time constraint within health decision making may have a twofold benefit. Firstly the use of a time constraint has the potential to extend both our theoretical knowledge and understanding of the role of emotive and cognitive processes involved in message framing effects. Secondly any findings can be related back to a health setting and applied to inform practice. For example patients, significant others, and healthcare professionals may in an emergency context be under stress when faced with the need to receive or undertake a blood transfusion. Under conditions of stress message framing effects are likely to be unstable (Kuhberger, 1998). Hence in this experiment a time constraint is employed to establish whether message framing effects within the domain of transfusion medicine are the same under affective experience. As has been the case throughout this thesis, decision making made on the behalf of a family member and a friend will also be investigated. In addition potential moderators and mediators of the framing effect continue to be explored.

5.1.1 Perceived Risk as a Moderator of Framing Effects

Despite the perceived risk towards bovine blood substitutes arguably being higher than that of donated blood the two experiments reported in Chapters 2 and 4 of this thesis failed to find support for the moderating role of risk (Rothman & Salovey, 1997). However, the point was raised that unless affect of a high enough intensity is generated there may not be a statistically significant difference in framing effect between the blood transfusion types. Under a time constraint it is expected that loss frames may be more heavily weighted (Wright, 1974). In view of this the perception of risk towards the blood transfusion products may be greater than under control conditions. Consequently, if under the time constraint greater affectivity is generated in response to the more risky blood transfusion type being presented, a loss frame advantage may be observed in the case of

both donated blood and bovine haemoglobin.

5.1.2 The Direct Role of Emotion and the ATF

A comparison of the framing effects between the time constraint and control condition may help to clarify any possible role played by emotion. For example, when participants have an unlimited amount of time under which to make a decision, a finding that the framing effect is the same as under a time constraint may be suggestive of an emotive influence on message framing effects. On the other hand if a variation in framing effects is observed this may provide insight into the influence of cognitive evaluation and perceived risk on framing effects.

The evidence that different emotions of the same valence can have a differential effect on decision making was discussed previously in Section 1.4.3 of the introduction to this thesis. Although in Experiment 1, Chapter 2 there was no evidence to support the ATF, where people become aware of their own judgment and choice processes the appraisal tendency may be deactivated (Lerner *et al.,* 1998). Under a time constraint pressure people's opportunity for analytical deliberation is reduced (Finucane *et al*., 2000; Maule & Edland, 1993; Lerner *et al.,* 2003). Consequently the appraisal tendencies may be activated. Under the ATF specific emotions give rise to specific cognitive and motivational properties, expressed at the behavioural level (Lerner & Tiedens, 2006). Of particular importance to the understanding of framing effects, trait anger has been associated with a sense of certainty, and trait fear with feelings of uncertainty. It would be expected then that the choice of blood transfusion type would vary between angry and fearful individuals. Recall from the introduction Section 1.2 individuals are said to be risk seeking (prefer taking a risk over safety) for loss framed messages and risk averse (prefer safety to taking a risk) for gain framed messages. Due to the sense of certainty associated with trait anger and to the uncertainty associated with trait fear differential effects of frame are predicted. Specifically it would be expected angry individuals would be more risk seeking and more likely to choose the blood transfusion presented as a loss frame independent of blood transfusion types. On the other hand while fearful individuals would be expected to act in a risk averse fashion and be more likely to choose the blood transfusion presented as a gain frame independent of blood transfusion type.

Moreover emotions and appraisals are said to have a recursive relationship, each making the other more likely (Lerner & Tiedens, 2006). Indeed Lerner and Keltner (2001) found that appraisals of control mediated the relationship between emotion and risk perception. Hence it is investigated here whether emotional response to the framed scenarios gives rise to appraisal tendencies which shape choice of blood transfusion type. Or, alternatively, is it the appraisal of the blood transfusion process which contributes towards the emotional response to the surgical scenarios? Two additional appraisal dimensions identified by Smith and Ellsworth (1985) which differ in terms of anger and fear (see Table 1, Chapter 1) namely pleasantness, and attributions of personal responsibility were assessed along with appraisals of certainty of outcome and control.

5.1.3 Perceptions of Naturalness and Preference of Biotechnologies

Ferguson *et al.* (2005) found that the more natural blood substitutes' bovine and human haemoglobin were preferred to the perflurocarbon. This was in line with an earlier assertion from Sanner (2001) who proposed that perceptions of naturalness towards a biotechnology influences acceptance. In the studies conducted in this thesis to date bovine haemoglobin has been the least accepted blood substitute type, questioning the degree to which the perceived naturalness of a blood transfusion type influences acceptance.

The preferences observed between blood substitutes in experiments one and three of this thesis are in line with research outlined in the Chapter 1, Section 1.1.3 suggesting that one important factor when determining acceptance of biotechnologies for medical purposes is whether they derive from biological, chemical materials or synthetic implants (i.e. the source from which the biotechnology is obtained). Specifically biotechnologies obtained from animal sources and in particular bovine sources are documented to be least preferred (Rios *et al*., 2004; Sanner, 1998; Deschamps *et al*., 2005). In order to provide further insight into this inconsistency participants' in this experiment will therefore also be asked to rate how natural they perceive the bovine blood substitute and donated blood to be. Recall from the introduction Section 1.3 that beliefs about the blood transfusion procedure are in this thesis being investigated as a mediator of the framing effect. Given this it is predicted that beliefs about the naturalness of the blood substitute would mediate

the frame choice relationship. Specifically individuals who consider the blood substitute bovine haemoglobin to be more unnatural would be less likely to accept the blood substitute.

Participants will be asked to rate perceptions of naturalness of a further 19 biotechnologies and to rank the biotechnologies in order of preference. The 19 biotechnologies were selected to gain the most comprehensive understanding of attitudes towards blood substitutes amongst the population studied. Comparisons will also be able to be made with previous attitudinal research work on acceptance of biotechnologies and the resulting data may be useful for choosing a likely candidate which may alter the pattern of framing in any further studies.

5.2 *Method*

5.2.1 Design

The experiment was a 2 (choice task: gain frame bovine blood substitute and loss frame donated blood versus gain frame donated blood and loss frame bovine blood substitute) by 2 (time pressure: control condition being where there was an unlimited time to make a choice of blood transfusion type versus deadline condition where there was a time constraint under which to make a choice of blood transfusion type). Participants were assigned to one of the four conditions.

5.2.2 Participants

81 participants were recruited from the adult population of the University of Nottingham campus via a poster advertising the study. Participants were paid £5.00 when they had completed the study. Of the study sample 63% were female, and 37% were male. The ages of participants ranged from 18 to 45 years, with a mean age of 22 years and 8 months (SD = 4 years and 3 months). Just over half of the sample were white (54%) and held some religious beliefs (52 %).

5.2.3 Pre Manipulation Measures

Trait emotions

Three measures of trait emotions (fear, anger and happiness) were employed in this experiment. The scales had been used previously in Experiment 1 of this thesis, see

Section 2.2.3, Chapter 2. Here trait anger was measured only by the trait - anger scale (Speilberger, 1996). More recent assessments have validated the psychometric properties of this scale (del Barrio, Aluja, & Speilberger, 2004). In this experiment the internal reliabilities of the three trait emotion measures were 0.72, 0.84, and 0.88 respectively and in line with the Cronbach's alphas obtained in Experiment 1 of this thesis.

There were seven items intended to measure the four appraisal tendencies which were outlined in Table 1 of the introduction. These were: Certainty: (1) I am certain that a blood transfusion would resolve the medical problem for which I was being treated; (2) I am certain that I would not suffer any long term side effects following transfusion; (3) I am certain that I would suffer immediate side effects during a blood transfusion; Pleasantness: (4) I am certain that undergoing blood transfusion would be an unpleasant procedure; Attribution of Personal Responsibility: (5) If I take care of myself, I can reduce my chances of requiring a blood transfusion; Control: (6) Needing a blood transfusion is down to the luck of the draw; (7) Health professionals control most of the factors which determine whether or not I will require a blood transfusion. The last three items were taken from the Multi - Dimensional Health Locus of Control (MHLC) scale developed by Wallston *et al.* (1978). Items were scored on a seven point scale from -3 (strongly disagree) to, +3 (strongly agree) with higher scores reflecting a greater appraisal tendency. Items one, two and five above were reverse scored. The three certainty items and two control items were combined into a two single variables as they were significantly correlated (smallest r = - 0.25, $p < 0.05$).

Anticipated emotions towards the blood transfusion procedure

Participants indicated the extent to which the nine emotions which had been included in the two prior experiments presented in Chapter 2 and 4 represented how they felt towards the prospect of receiving a blood transfusion in the future. Ratings for all nine items were on a six point scale ranging from (1) strongly disagree to, (6) strongly agree with higher scores reflecting a greater emotional experience

5.2.4 Framing Manipulation

Factual information regarding the safety of both bovine haemoglobin and human donated blood was presented as a deterministic or risky outcome. If a time constraint is to

alter any framing effect this will be most likely to occur in a situation where the framing effect is weak (Kuhberger, 2002). In view of this bovine blood substitute was selected as in the previous two experiments conducted in this thesis a weaker gain frame advantage was observed for this blood transfusion type compared to that for the other two blood substitutes. The framing conditions used are the same as those presented previously in Section 2.2.4, Chapter 2.

5.2.5 Post Manipulation Measures

This part of the experiment contained five sets of measures. The first measure served to ensure that the control and deadline conditions differed with respect to feelings of time pressure, and that the two choice task conditions did not differ in terms of involvement, interest, realism, amount learned and personal relevance. The remaining three sets of variables were measured with the intention of identifying mediators (factors important to the blood transfusion process, immediate emotion, and perceived naturalness) of a potential framing effect.

Evaluation of the hypothetical surgical scenarios

Using a six point - scale, from 1 (strongly disagree) to, 6 (strongly agree) five questions asked whether the hypothetical scenario was interesting, whether the participant had learnt a lot from the scenario, whether the scenario was involving, realistic, personally relevant to the participant and whether the participant was satisfied with the decision that they made. To assess whether participants felt under time pressure the following three questions were asked: Whilst reading the scenario and making my subsequent decision I had plenty of time to think; I experience feelings of time pressure; the exposure to the decision problem was too short. The first statement was reverse scored with higher scores reflecting a greater degree of feelings of time pressure. A further four questions assessed the degree of certainty participants felt about the choice of blood transfusion type made for themselves, family member and a friend. Higher scores reflected greater feelings of certainty with the choice of blood transfusion type.

Immediate emotions

The same nine emotions which were used to assess anticipated emotions in this experiment were employed to measure participants' immediate emotional reactions to the

hypothetical surgical scenarios.

Factors around which people decide to accept blood transfusion products

The scale developed in Chapter 3 was used to measure the importance of a number of factors to participants' choice of blood transfusion type, see Section 4.2.5, Chapter 4 for full details of this measure. The internal reliabilities of the three factors were 0.75 side effects, 0.76 clinical risk and 0.74 TEE and in line with the Cronbach's alphas obtained in Chapters 2 and 3.

Perceptions of naturalness towards biotechnologies

Participants completed a 19 item questionnaire intended to gain their opinions towards biotechnologies. Participants were asked to indicate, on a six point likert scale, the extent to which they felt a given biotechnology is natural or unnatural from 1 (natural) to, 6 (unnatural) and to rank the 19 biotechnologies in order of preference.

Recall of the surgical scenario

Participants were asked to recall as much about the framed scenario as possible. This would allow the determination of whether there is any difference between the time constraint and no deadline conditions in terms of the content remembered, and provide potential explanations for the findings. This question also serves as a second manipulation check to ensure that participants in the time constraint condition felt stressed. That is it would be expected that less detail would be remembered by those who had completed the choice task under a time constraint.

Reasons for choice of blood transfusion type

Participants using free text were asked to describe in the space provided their reasons for their choice of blood transfusion. This question also served as a manipulation check to provide insight into the amount of thought which had gone into the decision between the deadline and control conditions.

Demographics

Information on participant's age, gender, religious beliefs, blood donation and blood transfusion history, occupation or academic discipline (previous attitudinal work within biotechnology has found variations by discipline (Hagelin, 2004) and ethnicity were

collected.

Blood donation and transfusion history were assessed as previously in this thesis.

5.2.6 Procedure

Ethical approval was granted by the School of Psychology ethics committee at the University of Nottingham. Participants were recruited from the University of Nottingham campus via posters advertising the study and were provided with an information sheet (Appendix 7). Those who volunteered were asked to provide their written consent, and were paid £5 when they had completed the study. The questions were presented to participants on a computer screen and participants were instructed to use the keyboard to indicate their answers. Previous research has found that framing effects do not differ by medium of presentation (e.g., Cormier O' Connor *et al.,* 1985).

The experiemnt was divided into three sections. In Section 1 the participants completed three (fear, anger and happiness) measures of trait emotions, followed by measures of appraisals of the blood transfusion process and anticipated emotions.

In Section 2 participants made their choice of blood transfusion type under one of the two conditions being (1) control condition (2) deadline condition. In the first condition (the control condition) participants were allowed as much time as they desired to make their choice of blood transfusion type. Following the running of the control condition, the deadline condition was operationalised by requiring participants to make their decision within a time limit. This time limit was determined from the median amount of time taken by participants in the control condition to make their choice. E prime, produced by Psychology Software Tools Inc. is a suite of applications for designing and running experiments and for managing data, and was used to regulate the time intervals. The median was used as the standard deviations were too large to take the time from two deviations from the mean. Even removal of outliers did not improve this position. The participants in the deadline condition were allowed only 43 seconds to read the first choice task (bovine blood substitute gain and donated blood loss) and 53 seconds to read the second choice task (bovine blood substitute loss and donated blood gain). As the participants are provided with more time to read the longer scenario the choice task being of different length should not influence the results. In terms of time to make a choice

participants had 21 and 16 seconds respectively to make their choice of blood transfusion type for the self, between P (donated blood) or Q (bovine blood substitute) on screen. If participants failed to make their choice within the time allowed a further screen showing just the two blood transfusion choices instructed them to choose immediately.

Participants were then asked to make the same choice on behalf of a family member and a friend. The times allowed to make the choice of blood transfusion type were 11 and 7 seconds for a family member and 7 and 12 seconds for a friend. Again if participants failed to make their choice within the time a further screen showing just the two blood transfusion choices instructed them to choose immediately.

After the participants had made their choice of blood transfusion type they were required to press any key to continue to the next set of questions.

Following the choice task, in Section 3, participants completed five questions measuring the degree of difference in perceived uncertainty and desirability between the two blood transfusion types. This was followed by a measure of immediate emotions, and three questions assessing how time pressured they felt while completing the choice making task in section two. A further 37 questions assessing factors around which people decide to accept blood transfusion products were then presented. Finally there were 19 questions relating to biotechnology and participants were asked to write or draw anything they could remember about the decision making task presented to them on the computer screen in Section 2. They were also asked to explain the reason (s) for choice of blood transfusion type. To conclude the questionnaire participants were asked to provide some demographic details.

Participants completed the experiment individually in an experimental room with a researcher nearby to answer any questions. Following completion of the questionnaire participants were fully debriefed as to the aims of the study. Participants were also provided with a sheet containing the contact phone numbers of the University of Nottingham counselling service and nightline service as well as website providing information about blood transfusion (Appendix 7).

5.2.7 Statistical Analysis

The data obtained from the experiment is analysed in the following manner. The

following section presents the results of a number of manipulation checks and preliminary analyses to determine the validity and suitability of the data for analysis. In the second section the effect of a time constraint upon message framing is examined by logistic regression. Further to this to answer the first hypothesis tested in this thesis, being that a gain framed advantage will be observed, the contribution of frame (gain or loss) in the case of both donated blood and bovine haemoglobin is examined by Z test of two proportions. Finally tests of moderation (trait, and pre manipulation appraisal of the blood transfusion process) and mediation (immediate emotion, anticipated emotion, cognitive factors important to the choice of blood transfusion type, perceived naturalness, are then examined using logistic regression analysis and MANOVA analysis. As throughout this thesis analysis was conducted separately for each of the three recipients (self, family member and friend). The qualitative data was coded by two independent coders (Kappa 0.78).

5.3 *Results*

5.3.1 Section 1: Preliminary Analysis and Manipulation Checks

The following section describes the results of a series of preliminary analyses which were conducted before the testing of the hypotheses.

Sample equivalence

Participants in the four conditions (control: donated blood presented as both a gain and loss frame against the bovine haemoglobin as a loss and gain frame respectively; deadline: donated blood presented as both a gain and loss frame against the bovine haemoglobin as a gain and loss frame respectively) were compared on demographic characteristics, and the pre manipulation measures of trait emotion, anticipated emotion and appraisals of the blood transfusion process..

Chi - square tests revealed that there were no differences among the four experimental conditions in terms of participants', gender, religion, blood transfusion history, ethnicity and blood donation history (all *ps* > 0.05, > χ^2 = 3.86). The results from an ANOVA analysis did however show there was a significant difference between the choice task conditions in terms of age. However, as a subsequent logistic regression revealed that age was not related to participants' choice of blood transfusion type, age was not entered in

the main analysis (χ^2 = 3.30 (1), p = 0.07). In addition a two – way between subjects MANOVA analysis revealed that the levels of trait emotions, pre - manipulation appraisals of the blood transfusion process and anticipated emotions did not differ between the four experimental conditions (all ps > 0.05, F = 2.23).

Correlations between trait emotions

In order to ascertain the independent relationships between trait emotions and choice of blood transfusion type the relationship between the three trait emotions themselves was assessed. As can be seen from Table 5, consistent with the fact that fear and anger share a common valence, a significant positive correlation emerged between the dispositional scales for fear and anger. In turn consistent with happiness sharing an opposite valence to anger and fear, significant negative correlations were obtained between happiness and anger and happiness and fear. These correlations implied that inferential analyses would need to control for the influence of three emotions, to ascertain the independent relationship between the other trait emotions and acceptance of the blood transfusion.

Table 5. Correlations between the Trait Emotions Fear, Anger and Happiness

	Mean (SD)	**Fear**	**Anger**	**Happiness**
Fear	4.32 (0.80)	1		
Anger	2.81 (0.67)	0.32**	1	
Happiness	3.09 (0.67)	-0.49**	-0.30**	1

Note. N's range from 80 to 105.

*p < 0.05, ** p < 0.01, *** p < 0.001

A time constraint

In order to establish whether participants in the time constraint condition did in fact experience feelings of time pressure, a two - way between subjects MANOVA analysis was conducted. The three questions intended to measure if participants did experience time stress during the time constraint condition (''exposure time to the choice task was

too short," "Whilst reading the scenario and making my subsequent decision I had plenty of time to think", and "whether the individual experienced feelings of time pressure") were analysed independently given their non - significant relation with the largest correlation coefficient being (r = - 0.138, p = 0.135).

The multivariate tests indicated a significant main effect for time constraint (Pillai's trace = 0.39 (3, 75), $p < 0.001$), but not choice task. In the case of the two questions ''exposure time to the choice task was too short", and "whether the individual experienced feelings of time pressure" there was a significant difference in ratings [F (1, 77) = 47.18; $p < 0.001$], [F (1, 77) = 6.57; $p < 0.05$] respectively. However, in the case of the third question assessing time pressure, "Whilst reading the scenario and making my subsequent decision I had plenty of time to think" there was no significant difference between condition [F (1, 77) =.001; p= 0.97]. No interactions between time constraint and choice task condition were observed (ps > 0.05, F = 1.30). The means and standard deviations for the three questions in both the time constraint and control condition are presented in Table 5.1 on the next page.

Immediate emotional reaction

A two - way between subjects MANOVA test was undertaken to establish whether there was a difference between the emotions experienced by participants in the control condition versus the time constraint condition. The multivariate F tests did not indicate a significant main effect for time constraint or choice task. Nor were any interactions observed (ps > 0.05, F = 2.56). Hence neither the imposition of a time constraint nor choice task differentially evoked emotional reaction. The means for both the time constraint and control condition are presented in Table 5.1 on the next page**.**

Table 5.1. Means and Standard Deviation for the Immediate Emotional Reactions and Experience of Time Pressure

Statements	Time Constraint Mean (M) and (SD)	Control Mean (M) and (SD)
Exposure time to the choice task was too short	**4.56 (1.19)**	**2.70 (1.22)**
Whilst reading the scenario and making my subsequent decision I had plenty of time to think	2.56 (1.23)	2.58 (1.30)
I experienced feelings of time pressure	**4.49 (1)**	**3.83 (1.28)**
Emotional Reaction		
Concern (fear, anxiety and worry)	2.43 (0.80)	2.46 (0.80)
Emotional Expression (disgust, angry, regretful and surprise)	1.68 (0.80)	1.65 (0.75)
Optimistic (hopeful and happy)	1.73 (0.87)	1.73 (1)

Note. N = 40 in each condition. The measurement scale was from (1) strongly disagree, to (6) strongly agree.

Recall of the surgical scenario

Details from the surgical scenario recalled by the participants were coded into 1 of 15 categories of the information contained within the framed scenarios. Inter - rater agreement on categorizing the content of the information recalled was high (Kappa = 0.96) and disagreement were discussed until agreement was 100%. Examples of the

categories were naming a side effect, naming the blood transfusion types, what the task was, the probability of given side effects and who a decision was to be made for. A Chi square test indicated that the number of items recalled by participants were not associated with the time constraint conditions ($\chi^{2\ =}$ 3.33 (1, 10), p = 0.66) or by choice task ($\chi^{2\ =}$ 9.02 (1, 10), p = 0.53). Table 5.2 on the next page shows the items recalled by time condition.

The mean number of items recalled, was 5.7 out of a possible 15 facts contained within the frames. Given that a number of facts overlapped considerably, for example stating that there were two blood transfusion options or naming the two transfusion types, the mean suggests moderate levels of cognitive integration of the material, consistent with systematic processing. This fact needs to be considered in evaluating the role of cognitive and emotive processes in the choice of a blood transfusion in that it suggests that both in the time constraint and control condition there was sufficient time to integrate the information.

Evaluations of the surgical scenarios

From a two - way between subjects MANOVA analysis the multivariate F tests indicated a significant main effect for choice task condition. From the univariate tests the participants in all four conditions evaluated the surgical scenario as comparable in terms of interest, information learnt, satisfaction, involvement and realism (all *p*s > 0.05, > F = 1.94). However, in terms of personal relevance there was a difference between the choice task conditions. Participants in the choice task condition where donated blood was presented as a gain frame considered the scenario to be of more relevance to them than did the participants who received the donated blood as a loss frame [F (1,77) = 4.24; p = 0.04]. As can be seen from the means and standard deviations presented in Table 5.3 on page 126 overall participants reported low levels of satisfaction with their decision making and moderate levels of learning. The extent to which the participants rated the scenario as realistic, having personal relevance, being interesting and informative, and involving, was also moderate.

Table 5.2. Recall of the Surgical Scenario by Time Condition

Content Recalled	**Control**		**Time Constraint**	
Details of the Surgical Scenario Recalled	Percentage	Frequency	Percentage	Frequency
Size of the Risk of a Given Side Effect	11%	33	7%	22
Two Transfusion Options	3%	9	3%	10
Naming a Side Effect	27%	78	24%	72
Donated Blood	16%	46	14%	42
Stating a Misunderstanding	4%	12	7%	22
Consultant Doctor	<1%	2	1%	1
Operation	1%	4	2%	7
Family, Friend	2%	7	4%	12
Need the Blood Transfusion	4%	12	5%	15
Situation Requiring the Blood Transfusion Immediate	<1%	1	2%	7
An Un-named Side Effect	1%	4	15%	44
Bovine Blood Substitute	16%	45	9%	26
Specified Required to Make a Choice	7%	21	3%	10
Less Risk for one Transfusion Option Compared to the Other	2%	7	1%	3
Characteristics of Transfusion Types	1%	3	1%	4

Note. N = 40 in each condition

Table 5.3. Mean and Standard Deviations of the Items Evaluating the Surgical Scenario

Evaluative Statement	M	SD
I found the information, which was presented about the blood transfusion types interesting	3.46	(1.44)
I feel that I learned a lot about the blood transfusion process and types form the paragraph, which I read	3.66	(1.47)
I feel satisfied with the decision that I made	2.81	(1.38)
The scenario was involving	4.10	(0.98)
The scenario was personally relevant to me	4.27	(1.33)
The scenario was realistic	4.78	(0.81)

Note. N = 81. The measurement scale was from (1) strongly disagree, to (7) strongly agree.

Certainty of choice of blood transfusion type

From a two – way between subjects MANOVA analysis the multivariate F tests indicated a significant main effect for choice task (Pillai's trace = 0.18 (4, 74), $p < 0.05$). Between choice task conditions there was a significant ($p < 0.05$) difference in ratings for certainty about choice for the self [F (1, 77) = 12.70, $p < 0.001$]. From Table 5.4 on the neat page it can be seen that participants who read the information about the bovine blood substitute presented as a gain frame condition were significantly more certain (self 3.71) about their choice of blood transfusion type than those who read information about the bovine haemoglobin presented as a loss frame (self 2.79). There was no difference in certainty about decision making by time condition nor was there any interaction between choice task and time condition (all ps > 0.05, F = 1.32).

Table 5.4. Mean and Standard Deviation of Certainty of Decision Making by Choice Task Condition

Frame	**Certainty** (n = 42)	
	Mean	**SD**
Self		
Gain Frame Bovine	3.71	0.83
Loss Frame Bovine	2.79	0.59

Note: The maximum number of respondents (n) for each choice task condition are given in parentheses. The possible scale range was 1 - 6.

Perceived naturalness towards a range of biotechnologies

Preliminary correlation and MANOVA analysis indicated that perceptions of naturalness were not related to trait emotion, immediate emotion or choice task condition (all *p*s > 0.05, F = 2.90); r = 0.23, $p = 0.07$). As such the measure asking the participants to rate their perceptions of naturalness towards biotechnologies shows some discriminant validity. It was suggested in the discussion section of Chapter 2 that the biotechnology under study (blood substitute) may not evoke a high enough perception of risk to facilitate the moderation of framing effects. The data presented in Table 5.5 on the next page shows that the bovine blood substitute was perceived as being low in naturalness, with synthetic blood substitute being perceived as moderately so, and donated blood rated highly, as would be expected. A paired – samples t test was conducted to evaluate whether participants considered bovine or donated blood more natural, synthetic or donated blood more natural, and bovine or synthetic more natural. The results indicated that the mean for bovine 2.90 (SD = 1.12) was significantly greater than the mean for donated blood 5 (SD = 1.02), t (14.15) = 98, $p < 0.001$) and synthetic 3.28 (SD = 1.19), t (11.20) = 98, $p < 0.001$). In addition the mean for donated was significantly greater than for synthetic 5 (SD = 1.102), t (3.89) = 104, $p < 0.001$).

This data presented in Table 5.5 provides us with some confidence that the bovine blood substitute does differ from the synthetic and donated blood on at least one postulated dimension of risk (see Sjoberg, 2000).

Table 5.5. Ratings of Perceived Naturalness for 19 Biotechnologies

	Biotechnology	Mean SD
13.	Donated blood for a blood transfusion	5.00 (1.02)
9.	Insulin for the treatment of diabetes	4.78 (1.03)
6.	Transplantation of a kidney from a human	4.75 (1.16)
15.	Transplantation of cells/ tissues from a human for Parkinson's disease.	4.46 (1.24)
19.	Injection of a purified hormone from human sources to treat anaemia	4.38 (1.19)
10.	Implantation of a synthetic heart valve.	4.00 (1.29)
17.	A synthetic hormone used as a blood clotting agent.	3.97 (1.17)
18.	A blood transfusion using genetically modified (GM) blood	3.49 (1.25)
16.	A drug made from genes from human liver and hamster kidney to clot blood.	3.43 (1.22)
7.	Transplantation of cells tissues from a monkey for diabetes	3.31 (1.15)
11.	Implantation of a heart valve from a pig.	3.30 (1.20)
3.	A blood transfusion using synthetic blood.	3.28 (1.19)
5.	Use of GM crops in food	3.27 (1.27)
14.	Transplantation of cells / tissues from a cow for Parkinson disease.	3.05 (1.07)
8.	Pig islet transplantation for diabetes	2.94 (1.14)
4.	A blood transfusion using a blood substitute obtained from a cow.	2.90 (1.12)
2.	Transplantation of a heart from a cow	2.74 (1.21)
12.	Transplantation of a heart from a pig	2.64 (1.20)
14.	Transplantation of cells / tissues from a cow for Parkinson disease.	3.05 (1.07)

Note. Ns ranged from 98-105 all participants were included

5.3.2 Section Summary

In summary then, although there are two indicators which suggest that participants felt time pressured when under a time constraint, the lack of difference in the emotional reactions to the surgical scenario and amount of information recalled between the time constraint and control condition suggests that the results of the study must be interpreted with caution. On a positive note the variations in feelings of certainty about the decision making between choice task allows one to have some confidence that the risk participants perceived differed between choice tasks. Moreover, the perception of bovine haemoglobin as unnatural and donated blood as more natural, along with the moderate feelings of involvement, realism, personal relevance, informational value and interest towards the scenario provide a level of external validity to the experiment.

5.3.3 Section 2: A Time Constraint and its Influence on Framing Effects

A logistic regression analysis was undertaken to determine whether a time constraint differentially influenced the framing effect and in turn choice of blood transfusion. Consistent with the two previous experiments presented in Chapters 2 and 4, analysis was conducted separately for the self, family member and friend. The analysis included both those who completed the task in time and those who failed to compete within the deadline as a) preliminary logistic regression analysis showed that there was no difference in choice of blood transfusion type between the two groups and b) perceptions of time pressure were also present those who did not complete on time. There was no observed difference in the framing effect between the time constraint and control condition in the case of any recipient (all *ps* > 0.05, χ^2 = 3.53). Hence the two conditions time constraint and control were combined for consideration of the hypotheses outlined in the introduction to this chapter.

Framing effect

The first analysis presented in this section examines the first hypothesis to be investigated in this thesis, that based on Rothman and Salovey's (1997) framework that individuals' who receive a gain framed message will be significantly more likely to act in a risk averse fashion. A Z test of two proportions was used to establish whether there was a preference for the risk averse choice (or gain frame) in the case of the two blood

transfusion types bovine haemoglobin and donated blood. The results from this analysis are presented in Tables 5.6 - 5.8 on the two subsequent pages.

Table 5.6. Percentage of Sample Preferring the Gain Framed Option Across Blood Transfusion Types for the Self

	Proportion of Participants Choosing Donated Blood	**Proportion of Participants Choosing Bovine Blood Substitute**
Choice Task		
Donated Gain Bovine Loss	**92%**	8%
Donated Loss Bovine Gain	41%	**59%**
Z Score	$Z = 2.01$, $p < 0$ .001	$Z = -2.10$, $p < 0.001$

Note. The percentage of the sample preferring the gain framed option of a given transfusion type is compared to the percentage preferring the loss framed option e.g. 92% is compared to 41%. All Z scores are significant at the 99% level.

Table 5.7. Percentage of Sample Preferring the Gain Framed Option Across Blood Transfusion Types on the Behalf of a Family Member

	Proportion of Participants Choosing Donated Blood	**Proportion of Participants Choosing Bovine Blood Substitute**
Choice Task		
Donated Gain Bovine Loss	**72%**	28%
Donated Loss Bovine Gain	41%	**59%**
Z Score	$Z = 3.32$, $p < 0.001$	$Z = 3.01$, $p < 0.001$

Note. The percentage of the sample preferring the gain framed option of a given transfusion type is compared to the percentage preferring the loss framed option e.g. 72% is compared to 41%. All Z scores are significant at the 99% level.

Table 5.8. Percentage of Sample Preferring the Gain Framed Option Across Blood Transfusion Types on the Behalf of a Friend

	Proportion of Participants Choosing Donated Blood	**Proportion of Participants Choosing Bovine Blood substitute**
Choice Task		
Donated Gain Bovine Loss	**77%**	33%
Donated Loss Bovine Gain	40%	**60%**
Z Score	$Z = 3.96$, $p < 0.001$	$Z = 2.77$, $p < 0.001$

Note. The percentage of the sample preferring the gain framed option of a given transfusion type is compared to the percentage preferring the loss framed option e.g. 77% is compared to 40%. All Z scores are significant at the 99% level.

As can be seen from the percentage of respondents choosing the risk averse option (minimum 59%) and the Z - test scores presented in Tables 5.6.- 5.8 a significant gain frame advantage was observed in the case of both blood transfusion products and also in the case of all potential recipients. Donated blood was preferred to bovine haemoglobin by a significant majority (self 92% - 59%, family member 72 % - 59%, friend 77% - 60%).

5.3.4 Section 3: Moderators and Mediators of the Framing Effect

A recurring theme throughout this thesis has been to identify the role of emotive and cognitive processes in framing effects. The next analysis presented was carried out to examine potential moderating and mediating variables measured in this experiment.

Appraisals of the blood transfusion process and trait emotion as a moderators, anticipated emotion as a mediator of framing effect

A series of logistic regression analyses were conducted to explore whether appraisals of the blood transfusion process, trait emotion, and anticipated emotion towards the blood transfusion procedure influenced choice. Because of the correlations identified between the three variables in preliminary analysis all variables were entered into the same equation. Due to the small sample size, (maximum 80), and the number of variables to be entered into the equation, only statistically significant effects at $p < 0.001$ were reported. The analysis showed that appraisals of the blood transfusion process, trait emotions and anticipated emotions all failed to influence choice of blood transfusion. In addition in the case of the variables measuring appraisal of the blood transfusion process and trait emotions no interactions were observed i.e. the conditions for moderation were not met (all ps > 0.05, $\chi^2 = 3.50$).

Perceived naturalness, factors around which people decide to accept blood transfusion products and immediate emotions as mediators of the framing effect

The final aim of this chapter is to investigate whether perceived naturalness, factors important to the blood transfusion process, immediate emotions, can act as mediators of the framing effect. The set of next analyses presented was carried out to examine whether any of these factors have a direct effect or an indirect effect.

In all cases preliminary correlational, logistic regression and one – way between subjects MANOVA analysis revealed that the demographic variables were unrelated to the choice of blood transfusion and the potential mediating variable (all *p*s > 0.05, χ^2 = 4.29 ; r = 0.16, *p* = 0.16).

To demonstrate mediation, the following must be shown both the potential mediating variables and choice task must be associated with choice of blood transfusion and there must be an association between choice task and the potential mediator. Once this is established for mediation to be shown the association between choice task and choice of blood transfusion type must be weakened when the potential mediator is entered into the logistic regression equation. To facilitate this investigation a MANOVA and logistic regression were performed in the case of each factor. Each factor will now be considered in turn.

Immediate emotion

A two - way between subjects MANOVA was performed to establish whether participants' immediate emotional reactions to the surgical scenario was related to the choice task which the participant had been presented with. Preliminary correlational analysis had revealed that both trait, anticipated and immediate emotions were significantly related to each other. In view of this, in investigating the interaction between frame and whether immediate emotion could mediate the frame - choice relation, trait emotion and anticipated emotion was entered as covariates. The multivariate F tests indicated no significant effect for frame or time constraint (Pillai's trace *p* > 0.05,> F = 2.59). This analysis revealed that in the case of all recipients the conditions for mediation could not be met (Baron & Kenny, 1986). In addition a logistic regression analysis showed no significant effect of immediate emotion on choice of blood transfusion type when decision making on the behalf of a family member and a friend (*p* > 0.05, χ^2 = 8.93). The data from 80 participants was available for analysis: 53 participants chose the donated blood and 27 participants chose the blood substitute. The immediate emotions were entered in one block using the enter method. The addition of immediate emotion made a significant contribution to the constant - only model (χ^2 = 9.23, (3), *p* < 0.05). The results of this procedure are presented in Table 5.9 on the next page.

Table 5.9. Hierarchical Logistic Regression Analysis of Immediate Emotion as a Predictor of the Choice of Blood Transfusion Type for the Self

Predictor Variables	β	Wald	SE	d.f	Odds ratio	Confidence Intervals
Optimism	0.93	4.52	0.44	1	**2.54***	1.07 – 5.98
Emotional Expression	-0.39	.61	0.50	1	0.67	0.25- 1.80
Concern	-0.53	2.20	0.36	1	0.59	0.29- 1.20

Note. *$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The results presented in Table 5.9 show, that in the case of the self participants were 2.5 times more likely to choose the donated blood independent of the choice task scenario they were presented with.

Factors around which people decide to accept blood transfusion products

A two - way between subjects MANOVA was performed to establish whether the factors important to the choice of blood transfusion were related to the choice task which the participant had been presented with. The multivariate F tests indicated a non significant effect for choice task condition and time constraint (Pillai's trace $p > 0.05$, F = 1.50). In addition a logistic regression analysis showed no significant effect of the immediate emotions on choice of blood transfusion type ($p > 0.05$, $\chi^2 = 4.10$).

Perceived naturalness

A two - way between subjects MANOVA was performed to establish whether perceptions of naturalness were related to the choice task which the participant had been presented with. The multivariate F tests indicated a non significant effect for choice task and time constraint (Pillai's trace $p > 0.05$, F = 2.07). In addition a logistic regression analysis showed no significant effect of the perceptions of naturalness towards the blood transfusion products on choice of blood transfusion type ($p > 0.05$, $\chi^2 = 25.80$).

5.3.5 Examination of the Qualitative Data

Participants were then asked to describe using free text what factors, if any, motivated their choice of blood transfusion type. The responses were content analyzed by the author of this thesis. 118 statements (99% response rate) provided by the participants were broken down into 240 units representing one of 18 themes. Reasons identified from the three previous studies presented in Chapters 2, 3 and 4 of this thesis were reiterated with no new themes identified. Details of the themes associated with choice of blood transfusion type are provided in Table 5.10 on the next page (Kappa 0.82).

Table 5.10. Themes Emerging from the Qualitative Data

Theme	Frequency	Percentage
1. Risk	56	23
2. Consequences	30	12.5
4. Cost Benefit	3	1
5. Medical Need and Health Status	11	4.5
6. Information Seeking	7	3
7. Personal Beliefs	1	<1
8. Safety	22	9
10. Beliefs about Technology	8	3
12. Timeline	12	5
13. Personal Experience	2	<1
15. Resulting Emotions	26	11
17. Resources Available	3	1
18. Miscellaneous	15	6
19. Source of the Transfusion Product	26	11
20. External Information	1	<1
21. Aspects of the Procedure	3	1
23. Perceptions of Naturalness	11	4.5
24. Familiarity with the Transfusion Type	3	1

Note. Numbers up to 24 are shown as there were 24 themes identified throughout this thesis, but only 18 out of 24 were mentioned by participants in this experiment.

5.4 Discussion

This experiment investigated message framing effects under a time constraint in relation to choice of blood transfusion type, with the results showing that the framing effect was not affected by a time constraint. Participants in both the time constraint and control condition were significantly more likely to choose both donated blood and bovine haemoglobin when information about the risks of a blood transfusion was presented as a gain frame. Consistent with the previous studies reported in Chapters 2 and 4 of this thesis, the gain frame advantage was observed when decision making on the behalf of a family member and friend as well as the self.

5.4.1 Time Constraint and Message Framing Effects in the Health Domain

Contrary to expectations greater levels of affectivity were not generated under a time constraint. As a result the hypothesis that increased risk taking would be observed under greater affectivity (i.e. a loss frame advantage would be observed), was not able to be confirmed. Whilst the lack of emotional reaction under a time constraint is a limitation of the experiment which must be borne in mind, the results presented in this experiment suggest that in the context of a blood transfusion a time constraint may not alter ones preference of treatment type. This is in accordance with earlier findings within the health domain in relation to a heart operation problem (Svenson & Benson, 1992). Further studies involving a wider range of treatment options conducted within the same study are required to confirm whether this assertion holds over different decision domains. Indeed, Svenson and Benson (1992) in different treatment domains (AIDS deaths, tumour removal, Cancer surgery, food poisoning, and the AD problem) did find a change in strength of the framing effect under a time constraint. When considering the blood transfusion context and Svenson and Benson's (1992) problems there are no consistent distinguishable differences between the problems, as for example, the heart problem was concerned with lives lost as were the other problems investigated by Svenson and Benson (1992). In consideration of these facts it is concluded that to date the effects of a time constraint on treatment decisions within the health domain are inconsistent.

However this current experiment has extended the literature by the concurrent measure of immediate affect. Recall from the introduction that Wright (1974) suggested that

greater weighting on negative information under a time constraint may generate negative affect, in turn increasing perceived risk towards the choice dilemma. In order that this assertion is examined future studies investigating the role of a time constraint as a mediator of framing effects need to continue to measure affect. This would enable comparisons to be made between studies where inconsistencies in the direction of framing effects are observed to ascertain if there is a common role played by immediate affect.

5.4.2 Theoretical Implications

Recall from the introduction to this chapter Section 5.1.2 a lack of time is argued to expose the role of emotion in decision making through the reduction of available time for cognitive deliberation (Finucane *et al*., 2000). The observation in this experiment that the framing effect is the same under a time constraint as when participants have an unlimited amount of time under which to make a decision may be suggestive of an emotive influence on framing effects. In support in the case of the self immediate feelings of optimism during the decision making task was directly related to the choice of blood transfusion. Taken together these two results suggest the influence of affect is consistent with the theories suggesting that individuals use affect to make decisions (Zajonc, 1980; Loewenstein *et al*., 2001). Additionally whilst a gain frame advantage was observed when decision making was made on the behalf of another it was weaker than for the self (92% self compared to 63% friend). Lerner and Loewenstein (2002) argue that it is more difficult to experience feelings for others. Thus the weakened framing effect together with the lack of a significant relation between immediate emotion and choice may suggest a reduced role of emotion when decision making on the behalf of another.

Future research investigating the under - explored areas of a time constraint, affect and decision making on the behalf of another is required to clarify our understanding of the role played by affect in message framing. In relation to this, in this current study trait emotion was not found to exert any effect on choice of blood transfusion. Given this and the fact that the effects of immediate emotion were in line with valence reasoning no evidence has been found to support the ATF. Lerner and Keltner (2001) argue that where a situation is clearly un / controllable or un / certain appraisal tendencies should not shape

judgment. In this study scores on both pre and post measures of certainty and control towards the blood transfusion process were moderate. This suggests that in this sample the blood transfusion process may have not been perceived by the participants to present the ambiguity required with respect to control and certainty of outcome for the appraisal tendency hypothesis to work.

In support of the external validity of the study the participants thought the scenario was realistic, had personal relevance, was interesting and informative, and felt moderate levels of involvement with the scenarios.

5.4.3 Limitations

There were several limitations of the study which must be noted. Despite there being a limited amount of time available for the participants to read the framed surgical scenario in the deadline condition, it is questionable whether there was sufficient time stress in order to reduce cognitive processes. High levels of immediate emotion were not generated nor did participants' feelings of anticipated emotion differ between the time constraint and control conditions suggesting that the task was not significantly worrying for the individuals. In addition the detail with which the scenarios were recalled further suggests that the deadline imposed was too lenient. Decision making is said to shift to the performance of two simultaneous cognitive tasks: decision making and time estimation (Zakay & Woods, 1984). The more resources are allocated for the time estimation process, the fewer resources are left for the decision process. However as participants were not provided with the actual time they had to complete this task and did not have a time counter their cognitive resource may not have been sufficiently taxed.

A further limitation may also be that participants were not motivated enough to complete the task within time as they would be in a reward task experiment (40% didn't make their choice of blood transfusion in time in the case of the self). This may be reflective of the student sample. Students are well used to being time pressured with exams and compared to an exam situation the decision making task may not have been significant to them. Finally, there may be an order effect, because the control condition was run before the experimental condition.

The findings from this experiment are considered more fully, in relation to the overall

findings from the experiments conducted in this thesis, in Chapter 6 which follows.

CHAPTER 6

Final Discussion

6.1 Introduction

This thesis investigated the potential role of emotion and cognitive beliefs in message framing effects. In addition, message framing effects were investigated in relation to decision making on the behalf of another and under a time constraint. The discussion presented is centered on the four hypotheses posed in the introduction to this thesis. Finally, the limitations and practical applications of the research are discussed.

Based on Rothman and Salovey's (1997) framework it was hypothesized that individuals who received a gain framed message about a particular blood transfusion type would be significantly more likely to act in a risk averse fashion. The results of the three experimental studies conducted in this thesis add to the wealth of research supporting the notion that in the case of a preventative health behaviour individuals are more likely to be influenced by information presented as a gain frame. Specifically, a gain frame advantage was obtained within the studies conducted in this thesis in line with previous findings with respect to confidence and safety of the blood transfusion products (Ferguson, *et al.,* 2005; Farrell, *et al*., 2001).

The fact that the four blood transfusion types studied in this thesis differed in perceived risk (Ferguson *et al.,* 2005) allowed for the examination of the later prediction by Rothman and Salovey (1997) that perceptions of risk can determine whether a gain or loss frame is preferred. With the more risky blood substitutes it was hypothesized that a loss frame to motivate the acceptance of a blood transfusion would be more advantageous than gain framed messages. This hypothesis was not supported, with a gain frame advantage being observed irrespective of blood transfusion type, which is in accordance with the findings by Ferguson *et al.* (2005). From data collected in this thesis there can be some confidence in the assertion that the blood transfusion types were perceived differently in terms of risk. The blood transfusion types were differentially related to perceived naturalness which is a dimension of risk (see Sjoberg, 2000) and participants rated donated blood and blood substitutes as being quite different (4.40 on a 10 point scale where 10 = identical).

However this is not to say that a gain frame advantage will always be found in the blood transfusion context. It might be that extrogenous factors such as health status may be a determinant of whether a gain or a loss frame advantage is found. The scenarios presented in this thesis differ in an important way from treatments and health behaviours where a loss framed advantage been demonstrated. Take for example two studies on health issues in which a loss frame advantage has been observed, male hormone contraceptive examined by O'Connor *et al.* (2005) and mammography screening (e.g., Meyerowtiz & Chaiken, 1987). In both cases the participants are arguably in good health and the agreement to undertake testing or use of medication that carries risk may be seen as risky. In the surgical scenario presented in this thesis the participants are, albeit hypothetically, undergoing surgery and possibly willing to accept any treatment which may improve their health status.

Alternatively it may therefore be more useful to examine a behaviour, treatment or product which is not considered safe, where emotional response is higher, and supply of the natural product is abundant (donated blood is a known scarce commodity a factor which may have influenced choice). With respect to perceived naturalness and in terms of supply GM crops are suggested from the data as a biotechnology which may meet this requirement and hence in a framing context may show a loss framed advantage. Furthermore the future measurement of perceived risk towards health behaviours and treatments may lead to a greater understanding of the process of message framing effects. For example Ferguson *et al*. (2001) found that individuals who perceived the blood transfusion process as risky were more likely to choose the blood substitute i.e. the risk seeking option. Finally the concurrent study of both a preventative behavior and a detection behaviour varying in risk would enable a deeper understanding of the hypothesis by Rothmans and Salovey in relation to the moderating role of risk. The example of collateral screening (which varies by age in the likelihood of detection) and sunscreen (use at a young age has greater effect on preventing skin cancer the use in late adulthood) can be employed by manipulating age as the risk factor.

In the majority of message framing studies participants have commonly been asked to accept or decline a treatment or choose whether to engage in a health protective behaviour (Rothman & Salovey, 1997). This research for the first time assessed Rothman

and Salovey (1997) typology when applied to a treatment decision in which participants were presented with both the likelihood of risk and a choice, as in the AD problem. The observance of the gain frame advantage across conditions of both choice and acceptance suggests the assessment of Prospect Theory (Tversky & Kahneman, 1980) has been successful in the health framing literature.

Although a number of message framing studies conducted in the early 1980s did assess message framing in relation to choice between alternative treatment types (e.g., Mc Neil *et al.,* 1982; Cormier O'Connor *et al*., 1985; Marteau, 1989), the scenarios presented within this thesis represent a potentially realistic choice task. Indeed the participants in the final experiment rated the scenarios presented to them as moderate to high in relation to perceptions of realism. The two experiments presented in this thesis which provided participants with a choice scenario compare favourably to earlier studies on a number of counts. Consider for example the study by Earker and Sox (1981) who presented information about alternative drug types as (a) and (b). This would rarely be the case in a clinical context as alternative treatments would be given a name, as has been the case here with alternative blood substitutes. In addition the studies from the earlier 1980s presented participants with framed scenarios where there was a choice between two treatments which differed on a range of levels of the percentage outcome of side effects (e.g., Cormier O'Connor *et al.,* 1985), compared to the standard clinical side effects presented in the scenarios employed in the experiments in this thesis. However framed messages would possibly compromise informed consent and it is therefore unlikely that information about blood transfusion types would be presented to patients as a framed message. This thesis had the additional benefit of obtaining data on choice behaviour where participants are provided with valence congruent information about two blood transfusion products**.** Hence this research has filled a number of voids left by earlier research. The results showed that where congruent gain information was presented there was no preference observed between blood transfusion types. Where congruent loss information was presented a preference was observed for donated blood although this was more significant with bovine haemoglobin than when perflurocarbon and human haemoglobin were offered as the alternatives. Thus where negative information was presented it was found that acceptance of blood substitutes did vary by type of blood

substitute and by whether the blood transfusion type was a biotechnology or not. This is in line with findings that in general biotechnology is seen to be less accepted if there is risk and an alternative is offered (Deschamps *et al.,* 2005). The preference of donated blood to blood substitute when both were presented as loss frames compared to acceptance levels found in earlier studies in relation to xenotransplantation with human sources being preferred to artificial (Sanner, 1998; Verte, Lambrecht, & Ponjaert – Kristoffersen, 2001). In addition the findings that blood substitutes from bovine sources are the least preferred is consistent with the finding of Deschamps *et al.* (2005). The preference for human haemoglobin and perflurocarbon over bovine haemoglobin and preference for donated blood over blood substitutes was also found in the choice task experiment presented in Chapter 4. There can be some confidence in the validity of the preference levels obtained here despite the information about the side effects from the Perflurocarbon blood substitute being presented in a percentage form compared to the natural frequency format in the case of the other three transfusion options. Firstly the pattern of preference levels obtained remained the same when both the perflurocarbon and human haemologlobin were compared to donated blood. Secondly preference levels for the blood transfusion products differ from that found by Ferguson *et al*., (2005) who used the same frames which were employed within the experiments conducted in this thesis. Hence the manner in which the numerical data is presented although shown to be a factor in patient understanding and choice (see Thomson *et al*., 2005) does not account alone for the variations in preference between the blood substitutes.

The data from this thesis may thus be used as a guide by bodies interested in acceptance rates of blood substitutes. For example the data from this research suggest that negative framing of information will lead to very low acceptance rates of blood substitutes. This is an important area to address when it is considered that negative framing of information is commonly used in clinical practice (Thomson *et al.,* 2005). However interested parties should be aware that it is possible that acceptance levels of substitutes might be higher in a sick population as this has been found to be the case with xenotransplantation (Deschamps, Chaillous, & Gouin *et al.,* 2000). Furthermore one fact stated by participants as being important to their decision was the history of the procedure. With increasing use the acceptance levels of blood substitutes would therefore be expected to

increase. Certainly Hagelin (2004) has reported that over time a lower proportion of study populations oppose xenotransplantation.

The results from the last two experiments which involved a choice scenario are a useful base for researchers to continue work on patient preference in the message framing context, and provide information which can be drawn on by both clinicians to best inform patients and educators to utilise when teaching within the medical curriculum

In addition this research has extended the small body of research which has explored decision making on the behalf of another in a framing context. In the experiments presented in Chapters, 4 and 5 where participants were asked to make a choice between donated blood and blood substitutes, a gain frame advantage was observed in the case of all recipients. This was also the case in Experiment 1 when participants were presented with the option to accept or decline treatment where no explicit alternative was presented. Thus it is concluded that individuals act in what they see as the best interests for another. To follow up this explanation participants in subsequent studies could be asked to state their reasons for the decision made on the behalf of another. This is not to suggest as in the assertion by Wilson *et al*. (1987) that personal involvement is not of importance when decision making on the behalf of another. Indeed lower involvement with a potential recipient of any treatment may render the decision maker more inclined to act in their best interests. The results are contrary to conclusions by Wang (1995) who explained risk preference in relation to the AD problem in evolutionary terms where decisions made were based on the number of family members who would be saved. However the problem tested by Wang (1995) was a life / death situation compared to the blood transfusion process where the survival of the race is not necessarily a factor for concern. Although it might be argued that the participants in this study may have been affected by demand characteristics, in a real clinical context it would be unlikely that there would be a different effect as the decision maker would inevitably be answerable to ones significant other or the patient. Such results and conclusions however may not be able to be generalized to all treatment decisions as within the biotechnology literature, there is inconsistency in patterns of acceptance when making a decision for the self and loved ones (for example Bona, Canova, & Rumiati *et al.,* 2004).

It would be interesting to compare the results obtained in this thesis with choices made about public health issues in the context of framed information. Are choices made reflective of the populations' best interests or economic considerations? Finally this thesis sought to examine potential mediators of the framing effect.

6.2 Emotion as a Mediator of the Framing Effect

Based on Loewenstein *et al.* (2001) risk - as - feelings hypothesis it was predicted that emotional reactions to the surgical scenario would influence choice and acceptance of a blood transfusion independently of message frame. That is affect would exert a direct effect on choice and acceptance of a blood transfusion without cognitive mediation. The findings from the experiments conducted in this thesis in part support this assertion.

In the first experiment the positive emotions happiness and hope (termed optimism) and emotions termed expressive emotions such as, surprise, disgust, regret, and anger were observed to have a direct effect on the acceptance of a blood transfusion in the case of the self and a family member. Additionally optimism was shown to have a direct effect on decision making on the behalf of a friend. In the last experiment support was found for these results with optimism being related directly to choice of blood transfusion type in the case of the self.

The emotional responses were not associated with individual differences in trait emotion, anticipated emotion, or appraisal of the blood transfusion process supporting the assertion that influences of affect are direct and not due to any predisposing factor measured here. In addition a time constraint was employed in this thesis to provide support for the assertion that emotionality can drive decision making in a message framing context. It was hypothesized that consistency of choice under time a time constraint compared to a control condition is suggestive of a role for emotion in framing effects (see Svenson & Benson, 1993). Consistency in choice of blood transfusion was observed across both control and time constraint conditions in the case of all potential recipients. When taken together the finding of direct effects of emotion on choice and acceptance and the lack of difference observed in the framing effect between time pressure conditions these facts support the idea that affect can drive decision making.

However other conclusions could be drawn. For example Edland and Svenson (1993)

conclude that effects of a time constraint on decision making may also vary by the ethical or moral aspects to the decision. In addition the consistency of choice under a time constraint is not sufficient on its own to conclude a role for emotion on decision making. Svenson and Edland (1989); Maule and Edland (1993) for example conducted a review of the empirical studies involving a time constraint, judgment and decision making, and to that point the literature showed that there are systematic changes of cognitive processing, when decisions have to be made under time restrictions. Thus even consistent findings in the direction of choice of blood transfusion under a time constraint may not necessarily mean the decision has been affectively driven as it may be that the there has been cognitive adaption in terms of strategy (Maule & Mackie, 1990). Some people may have the ability to process categories of information more quickly than others, and less increased input selection is likely to follow (a process termed filtration). Thus an experiment comparing affect generated under situational (a time constraint) affect to any affect evoked by the surgical scenario is required. From such an experiment any variation in the role of affect between time pressure and the control condition may allow greater insight into whether, emotion exerts a direct or indirect effect. In addition a measure of time at the millisecond level would increase validity. Further work is therefore required across a wide range of decision problems to clarify the role of affect in decision making in relation to biotechnologies.

Recall from the discussion section of Chapter 2 it was hypothesised that the failure to observe a loss framed advantage in the case of the more riskier blood substitute bovine haemoglobin may have been due to a lack of emotional arousal. The time constraint methodology was also employed to attenuate affect and in turn heighten perceived risk. However as the time constraint did not generate high levels of affect conclusions in this regard could not be drawn. Furthermore with the lack of affect generated under the time constraint the question posed as to whether emotive processes occur before cognitive was not able to be considered here. One line of further enquiry would be the measurement of physiological responses which are increasingly called for in order to support assertions made in self reports (Loewenstein *et al*., 2001). Inconsistent with the argument by Wright (1974) participants did not weight the loss frames more heavily under a time constraint (measured by self reported affective reaction). In relation to this there was also no

difference in the strength of the importance of factors to decision making under a time constraint.

The lack of affectivity generated under a time constraint in this thesis means that in generalising the results to the clinical context caution must be taken. The processes which determine message framing effects may differ in a real emergency context as in this thesis the true effect of a time constraint may not have been simulated. One modification which could be made in future research is to include two time constraint conditions as variation has been found between degrees of time constraint and decision making (Svenson, Edland & Slovic 1990; Ben Zur & Breznitz, 1981). Finally, it is suggested that any future study randomize participants to the control and experimental conditions. This would eliminate any suggestion that findings may be due to an order effect which was a limitation of the time pressure experiment conducted within this thesis. Beyond whether emotion exerts a direct or indirect influence on choice the more recent and less researched debate surrounding whether specific emotions of the same valence differentially influence choice outcomes and judgment was investigated. The research presented in this thesis addressed this issue by an examination of the ATF (Lerner & Keltner, 2001). Based on Lerner and Keltner (2001) it was expected that independent of frame, angry individuals being more risk seeking, would be more likely to decline the blood transfusion. Fearful individuals being more likely to act in a risk averse fashion, were expected to be more likely to accept the blood transfusion.

No evidence was found to support the notion that trait emotions (or indeed immediate or anticipated emotions) of the same valence can exert different effects of choice behaviour. Following the lack of a significant effect in experiment one with regard to support for the ATF it was hypothesised those appraisal tendencies may have been deactivated whilst participants were considering the options presented to them. The investigation of the ATF under a time constraint where the opportunity for cognitive deliberation is argued to be reduced (Finucane *et al.,* 2000) was predicted to yield a significant effect. However even under a time constraint in relation to the blood transfusion process specific emotions did not influence decision making. In support of the validity of the findings the distribution of the trait emotion scores was in the normal range and in line with the sample used by Lerner and Keltner (2001). It could be that some

experiences may be evaluated by people high in anger and fear in the same way. A decision such as whether to accept a blood transfusion is most likely, other than on religious ground, to be accepted. Hence the need for a blood transfusion may be evaluated in the same way by all individuals irrespective of trait disposition. In contrast the AD problem studied by Lerner and Keltner (2001) places participants in a public health decision making context and an earlier study by Bodenhausen *et al.* (1994) studied a social perception tasks and persuasion situation, all problems which may be viewed differently by people high in anger and fear. That specific emotion effect may vary by domain is supported by an assertion by Peters *et al*. (2004). Specifically Peters *et al*. (2004) found that individuals had mixed emotions to technological risks which cancelled each other out. This would mean appraisal would have little impact on emotion felt hence accounting for the non significant findings here. This proposition needs to be followed up in subsequent studies evaluating the ATF in decision making with respect to biotechnologies. Finally in the last experiment the a lack of significant effects specific emotions were suggested to be due to participants considering the blood transfusion to be unambiguous with respect to certainty and control. This assertion was able to be supported by the inclusion of measures of appraisal of the blood transfusion which showed moderate levels of feelings of certainty and control. However these indicators were not measured in the first experiment and lack of psychometric validity of the items means this assumption must be interpreted with caution.

6.3 Cognitive Beliefs as Mediators of the Framing Effect

The research presented within this thesis also explored the role of factors around which people decide to accept a blood transfusion and their potential to act as a mediator of the framing effect. Initial exploratory work was presented which assessed the contested role of the beliefs about the health issue under study in determining message framing effects. The three subscales identified were not related to choice of blood transfusion. Further research is required to confirm the role of the three subscales in the decision making process.

Several factors may have hampered the ability of this scale to predict choice. Firstly the mean scores for the subscales and items within were in the medium to high range. This

may be because the sample used was a not a clinical population and participants may not have a clear idea about factors that are important in a real clinical context thus masking the predictability of the scale. Certainly within the studies conducted within this thesis only 5 % of participants had received a blood transfusion. Although the qualitative data collected through the experiments suggest that the items contained within the scale developed are show face validity research has shown a marked incongruity between healthy women's perceptions and actual patients' experiences of disease and its treatment (Buick & Petrie, 2002). Additionally in relation Lee, Mehta, and James (2003) have found that laypeople and physicians perceive risk differently for blood transfusion. This is supported by the general agreement that content validity should be judged by members of the target population (Patrick, 2003). A worthwhile endeavour for future assessment of the scale would be to include those actually facing the prospect of a blood transfusion. Assessment within a clinical population may provide more accurate information about what aspect of the blood transfusion process is most important as a focus for the clinician and for informing medical educators. For example, if additional studies where to find that cognitive beliefs are an important factor which determine decision making, then this could be the avenue to focus on when presenting information about blood transfusion products to blood transfusion recipients. Indeed any findings may be applicable to interventions to encourage greater uptake of preventative and detection behaviours. Despite the findings in this thesis that emotion can direct decision making the psychological mechanisms which underlie framing remain unclear. McCaul, Johnson, and Rothman (2002) proposed that framed messages are most likely to exert their effect by changing beliefs and attitude. Given this it would be interesting to compare the importance attributed to side effects, TEE, and clinical risks in the choice of blood transfusion type in a patient sample in receipt of regular transfusions. If investigators do hope to predict how peoples representation of a health problem changes, the factors that shape these representation need to be specified (Rothman, *et al.,* 2003). At least in relation to the blood transfusion context and treatment decisions these may have been identified. From a technical viewpoint the scale may comprise items which are redundant and additionally, as recommend be De Villis (2003) the inclusion of negative and positive statements may improve the predictive validity for the scale.

6.4 Practical Applications

Although this current research was predominantly aimed at investigating recent theoretical decision models such as the appraisal tendency theory (Lerner & Keltner, 2001), risk – as - feelings hypothesis (Loewenstein *et al.,* 2001) and the hypothesis based on Rothman and Salovey (1997), the quantitative and qualitative data reported are of considerable importance for providing information to the BTS, for clinicians, and as discussed in Section 6.2.1 to add to academic applied biology. Few articles have previously focussed exclusively on public opinion towards blood substitutes. Certainly those that have (e.g., Lowe *et al.,* 2001) did not include in their investigation the four blood transfusion types or obtain qualitative data on reasons for decision making.

From the data obtained clinicians can be provided with valuable information about what aspects of the blood transfusion process and transfusion types are most important to the recipient when making a decision. These factors can then be the focused on by the clinician when informing patients about transfusion options and to inform medical educators. For example, participants in Experiment 1, cited advice from a health professional as being a significant factor in influencing their decision. However, when participants were presented with a choice between a blood substitute and donated blood the importance of the health professionals in their decision making was reduced. This may provide some confidence to health professionals who desire to increase the participation of the patient in decision making.

The qualitative data obtained from the experiments conducted within this thesis has highlighted some interesting beliefs about transfusion medicine. Whist there are similarities between all biotechnologies which may influence their acceptance, such as specific moral objections, physiological concerns and psychological worry about biotechnologies, there are characteristics both positive and negative which are specific to blood substitutes. As an example the, need for repeat transfusions was a factor which put participants off blood substitutes. Although repeat transfusions may be required when using a blood substitute this maybe better than a transfusion with donated blood as dependent on blood loss this maybe a long process. Thus an attribute of blood substitutes maybe perceived as a negative when it need not be and information to potential patients

can be presented with this factor bourne in mind. Interestingly in contrast to what has been found in the xenotransplantation literature (Hagelin, 1997) participants in this research were not concerned about the value or cost saving from the use of the technology. The data on reasons for decision making with regard to blood transfusion has filled a definite void when it is considered that in the UK there are 170,0000 transfusions a year compared to 6400 transplantations, (Varney & Guest, 2003) of which there is attitudinal work on biotechnological alternatives (xenotransplantation) going back 20 years (Deschamps *et al.,* 2005). The data on blood substitutes also serves to validate the findings on attitudes from biotechnology studies conducted within other cultures and patients to a young lay population.

Blood substitutes could provide a definite solution to the shortage in supply of donated blood for transfusion. Given this it is important information is targeted correctly to the public. Considering that when targeting information about blood substitutes to the public, scientific information may be seen as too complicated, this research has identified useful areas to target campaigns. Specific points to be addressed (such as concerns about side effect) during clinical consultations and potentially taught in medical education may be too distressing for public information campaigns have been identified. In introducing blood substitutes to the public the first factor to be considered will be the type of blood substitute which is to be introduced. Beyond this are the areas of misunderstandings (for example, that the blood substitute transfused is not actual cows blood but a modified haemoglobin molecule to carry oxygen) revealed in this thesis which maybe useful when targeting information to the public and enabling a suitable response strategy. Such clarification of misunderstandings may lead to more willingness to accept and is a strategy to build on before addressing more detailed reasons within the clinic setting. This is important as changing people's attitude about one point can influence ratings on other attributes. For instance decreasing the public's perception of risk about the product which may potentially be used for transfusion might increase beliefs about benefits (see Finucane *et al.,* 2000). The provision of information about the source and advantages in terms of availability and cost in the public domain would provide information beyond that about the potential side effects which would inevitably be discussed before any transfusion.

6.5 Limitations

The sample used in the present study was homogenous with respect to age. It has been widely documented that there is a heightened propensity for risk - taking among younger persons (Eshel, Nelson, Blair, Pine & Ernst, 2007). Given this the acceptance levels of blood substitutes observed might be argued to differ to those in an older population who may be less likely to take risks. However, to counter this, in the transfusion context an older population more likely to be affected by blood transfusion may not be concerned with the future as much and so, in fact, may be more inclined to take a risk and a higher rate of acceptance of blood substitutes may be observed. Furthermore the literature with respect to the young being at high propensity is inconsistent (e.g., Fischoff *et al.,* 2000; Quaderll, Fischooff, & Davis, 1993). With the participants being a student population it could also be argued that their education level may have influenced the results. In previous research there have been findings of greater acceptance of biotechnologies among the better educated (Hagelin, 2004), and furthermore with increasing diversity of the population different sub groups having different opinions**.** On the other hand the sample was quite heterogeneous with respect to gender, and blood donation history, which should increase confidence in the external validity of these findings.

Participants in the studies presented in this thesis were not in a real life situation and it could be argued that their responses may have been different if that were the case. However, it has previously been found that many hypothetical framing studies do compare favorably in terms of outcomes with real life studies (Kuhberger, 2002). Importantly in relation to this study, this has previously been found in relation to transfusion medicine (Ferguson *et al*., 2005).

6.6 Summary and General Significance of the Research

The three experimental studies reported in thus thesis provide empirical evidence to suggest that the choice and / or acceptance of blood transfusion type is determined by message frame, in that differential acceptance levels of the blood transfusion effects are observed for loss and gain frames, irrespective of the risk presented by the blood transfusion type offered. Additionally emotion can direct decision making. In consideration of the two facts above decision making in the transfusion context is

suggested to be based on situational variables (immediate emotion and frame) rather than dispositional (trait emotion). Uniquely, the framing effect was investigated in relation to decision making on the behalf of another and under a time constraint. The evidence presented in this thesis suggests that choice behaviour does not vary between whether the recipient is the self or another. Secondly a time constraint was not found to alter choice behaviour in the context of transfusion medicine.

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APPENDICES

Appendix 1: Information sheet, consent form questionnaire and debriefing document from Experiment 1

Information Sheet

You are being invited to take part in a research study exploring peoples' decision making with respect to blood transfusions.

The study involves completing a questionnaire. The questionnaire will take about 10 minutes to complete. The questionnaire you will complete asks you to rate your feelings towards everyday situations.

You will then be asked to read a scenario describing a hypothetical situation in which you are about to undergo surgery whereby a blood transfusion is deemed necessary. After reading this scenario you will be asked to make a decision. You will then be asked to complete a further questionnaire comprising, some questions relating to the decision that you will make, and provide some demographic details. The information from the research will be used to provide an understanding towards decision making with respect to blood transfusions.

If you do decide to take part all the information given by you will remain confidential and anonymous, and used for the purpose of the research only. The consent form will be kept separate from the questionnaires in order to ensure anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the study, you are free to withdraw. If you are happy to participate in the study please sign and date the consent form provided. Please retain this information sheet for your reference.

Thank you for volunteering

Researcher

Susan Tomlinson

Room 228

School of Psychology

Supervisors

Dr Ken Lowe (Life Science) and

Dr Eamonn Ferguson, Psychology

The University of Nottingham

Consent Form

I freely and voluntarily consent to take part in a research study exploring peoples' decision making with respect to blood transfusions.

I understand that the experiment will take about 10-15 minutes to complete.

The nature and purpose of the research has been explained to me and any questions I asked have been answered to my satisfaction.

I understand that there will be no personal identifying information written on the questionnaire and that all the information that I give will remain confidential, and be used for the purposes of the research only. The consent form will be kept separate from the questionnaire in order to ensure anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the study, you are free to withdraw.

If you are happy to continue with the study, then please sign below.

Signed:

Date:

Countersigned:

Date:

Please read the instructions below

Specific instructions are provided for each questionnaire. Please complete the question in the order presented. There are no right or wrong answers. There is no need to deliberate for long periods over your answers and please answer honestly. If you are happy to continue please turn to the first page of the booklet and begin to answer the questions.

Thank you for agreeing to volunteer.

Researcher: Susan Tomlinson

Supervisors: Dr Ken Lowe and Dr Eamonn Ferguson

The University of Nottingham

Section 1

Please complete the following 4 – item demographic questionnaire.

1. Please indicate your age, **years** **months**

2. Please state your gender by circling one of the options below

Male **Female**

3. Please describe in your own words the ethnic group to which you feel you belong.

4. Please state by circling yes or no whether or not you hold or practice (visit a place of worship, pray) any religious beliefs

Yes **No**

PLEASE CONTINUE ON THE NEXT PAGE

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Section 1 Continued

5. For each of the ten statements below you are asked to indicate the extent to which the description is "true of you". Please circle the number to the right hand side of each statement which is the best description of how you usually feel using the following scale:

1. I rarely get angry at my friends	**1**	**2**	**3**	**4**	**5**	**6**	6. I am often mad at someone or something	**1**	**2**	**3**	**4**	**5**	**6**
2. I am rarely frustrated by other people	**1**	**2**	**3**	**4**	**5**	**6**	7. Other drivers on the road infuriate me	**1**	**2**	**3**	**4**	**5**	**6**
3. I often find myself feeling angry	**1**	**2**	**3**	**4**	**5**	**6**	8. I often blame others before blaming myself	**1**	**2**	**3**	**4**	**5**	**6**
4. I get mad easily	**1**	**2**	**3**	**4**	**5**	**6**	9. A lot of people annoy me.	**1**	**2**	**3**	**4**	**5**	**6**
5. It's rare for me to get enraged	**1**	**2**	**3**	**4**	**5**	**6**	10. I'd like to tell people how much they anger me.	**1**	**2**	**3**	**4**	**5**	**6**

PLEASE CONTINUE ON THE NEXT PAGE

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Section 2: DIRECTIONS: A number of statements which people have used to describe themselves appear below. Read each statement then use the scale below to fill in the value to the left of each statement that best indicates how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer, which seems to describe how you generally feel. In the example the respondent has told us he/she is always sad.

For example**: 6** 1. I feel sad.

1 = never 2 = almost never 3 = sometimes 4 = often 5 = almost always 6 = always.

----- 1. I fear being criticised
----- 2. I feel anxious that I might make mistakes
----- 3. Being teased / made self-conscious
----- 4. I feel uneasy around people in authority.
----- 5. Spiders scare me
----- 6. When I'm in enclosed places, I feel scared
----- 7. I'm afraid of not being a success
----- 8. I'm afraid of snakes
----- 9. I'm uneasy speaking before a group
----- 10. I'm fearful / anxious in hospitals
----- 11. Tough looking people scare me
----- 12. I feel uneasy when I'm with someone I find physically attractive.
----- 13. I feel pleasant
----- 14. I feel nervous and restless
----- 15. I feel satisfied with myself
----- 16. I wish I could be as happy as others seem to
----- 17. I feel like a failure.
----- 18. I feel rested.
----- 19. I am "calm, cool, and collected".
----- 20. I feel that difficulties are piling up so that I cannot overcome them
----- 21. I worry too much over something that really doesn't matter
----- 22. I am happy

PLEASE CONTINUE ON THE NEXT PAGE

Section 2 continued

Read each statement then use the scale below to fill in the value to the left of each statement that best indicates how you generally feel. There are no right or wrong answers.

1 = never 2 = almost never 3 = sometimes 4 = often 5 = almost always 6 = always

----- 23. I have disturbing thoughts
----- 24. I lack self-confidence
----- 25. I feel secure.
----- 26. I make decisions easily
----- 27. I feel inadequate
----- 28. I am content.
----- 29. Some unimportant thought runs through my mind and bothers me.
----- 30. I take disappointments so keenly that can't put them out of my mind.
----- 31. I am a steady person.
----- 32. I get in a state of tension or turmoil as I think over my recent concerns and interests.
---- 33. I feel quite cheerful.
----- 34. I look at the sunny side of life.
----- 35. My friends seem to feel I'm unhappy.
----- 36. I consider myself a happy person.
----- 37. Compared to my friends, I think less positively about life in general.
----- 38. I laugh joyfully.
----- 39. I am quick tempered.
----- 40. I have a fiery temper.
----- 41. I am a hotheaded person.
----- 42. I get angry when I'm, slowed down by others' mistakes.
----- 43. I feel annoyed when I am not given recognition for doing good work.
----- 44. I fly off the handle.
----- 45. When I get mad, I say nasty things.
----- 46. It makes me furious when I am criticised in front of others.
----- 47. When I get frustrated, I feel like hitting someone.
----- 48. I feel infuriated when I do a good job and get a poor evaluation.

PLEASE CONTINUE ON THE NEXT PAGE

Section 3

DIRECTIONS: Firstly please read the hypothetical situation below. And then after reading the scenario can you please indicate the option that you would choose. The choice you have to make is whether or not you will be willing to accept a blood transfusion. You are required to answer Yes or No by circling one of the options presented to you after reading the scenario. Please do not deliberate about the decision; there are no wrong or right answers.

You are about to undergo surgery and your consultant has informed you that during surgery you will require a blood transfusion. Donated blood from the local blood bank will be used.

Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are now extremely small. It is estimated that for every 2 million units transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Yes, I would accept the blood transfusion

No, I would not accept the blood transfusion

PLEASE CONTINUE ON THE NEXT PAGE

Section 4

The following questions relate to your decision that you have just made on the preceding page over whether or not to accept the blood transfusion.

1. Please tell us as much about the reason (s) why you chose to accept or decline the blood transfusion on the last page (**page three**).

2. Using a six point scale **(where 1 = not at all, to 6 = very much so)** please rate by circling the number to the right of each emotion the extent to which the scenario just described on page three evoked each of the 13 emotions listed below.

Fear	**1**	**2**	**3**	**4**	**5**	**6**	Disgust	**1**	**2**	**3**	**4**	**5**	**6**
Anxiety	**1**	**2**	**3**	**4**	**5**	**6**	Happiness	**1**	**2**	**3**	**4**	**5**	**6**
Hope	**1**	**2**	**3**	**4**	**5**	**6**	Sadness	**1**	**2**	**3**	**4**	**5**	**6**
Surprise	**1**	**2**	**3**	**4**	**5**	**6**	Upset/Distress	**1**	**2**	**3**	**4**	**5**	**6**
Depression	**1**	**2**	**3**	**4**	**5**	**6**	Threatened	**1**	**2**	**3**	**4**	**5**	**6**
Anger	**1**	**2**	**3**	**4**	**5**	**6**							
Worry	**1**	**2**	**3**	**4**	**5**	**6**							

3. How much control do you think you had over your emotions when you made the decision on **page three** to accept or decline the blood transfusion? Please respond by placing a circle around one of the numbers on the scale below where **1 = none, to 6 complete control.**

1 2 3 4 5 6

4. How certain are you that the decision you made on **page three** to accept or decline the blood transfusion is the one that you would make in a real life situation? Please respond by placing a circle around one of the numbers on the scale below where **1 = not at all certain, to 6 = certain beyond any doubt**.

1 2 3 4 5 6

PLEASE CONTINUE ON THE NEXT PAGE

Section 4 continued

5. Imagine having to make the same decision for each of the following a member of your family or a friend. Please indicate whether you would make the same choice or a different choice to the choice you made for yourself on **page three** by circling one of the options for questions a and b.

a) family member same choice as for myself different

b) friend same choice as for myself different

6. Please indicate your status as a blood donor by circling one of the options below.

I have never donated blood
I am a first time blood donor
I am a regular blood donor
I have occasionally donated blood

7. If you are a regular blood donor please specify how long you have been donating blood

Years **Months**

8. Have you ever given blood for any other reason e.g. drug trials, diagnostic tests?

Yes **No**

9. Have you ever had a blood transfusion**?**

Yes **No**

10. Do you know anyone who has had a blood transfusion*?*

Yes **No**

THANK YOU FOR PARTICIPATING IN THE STUDY.

The University of Nottingham

Information for debrief

The aim of the study that you have participated in is to determine whether there is any evidence to suggest that emotional disposition (namely trait fear, anger or happiness) can influence the decisions people make, in this case the decision to accept a blood transfusion.

The results of this study will be used to design future work studying risk perception and decision making in patients undergoing surgery.

Blood substitutes

The development of artificial cells is an attempt to mimic some of the biological processes of a real cell. Pharmaceutical companies are developing artificial cells from Human Haemoglobin, Bovine Haemoglobin and Perflurocarbons to be used as blood substitutes.

Stage of development

At this stage in the UK phase III clinical trails are being conducted in patients undergoing surgery (company Hemosol).

In South Africa Biopure's bovine Polyhemoglobin has been approved for routine clinical uses for anaemia in patients as of April, 2001.

Human and bovine haemoglobin has been used in clinical trials in patients undergoing surgery in the United States and Canada.

You can find out more information about blood substitutes on http:www.medicine.mcgill.ca/artcell/

For further information on the background to this study refer to Lerner, J. S. & Keltner, D. (2001). Fear, Anger and Risk. Journal of Personality and Social Psychology. 81, 146-159.

Appendix 2: Questionnaire used in Experiment 1 A

Instructions

Please read the hypothetical situation below. After reading the scenario can you please indicate the option that you would choose. The choice you have to make is whether or not you will be willing to accept a blood transfusion. You are required to **answer yes or no by circling one of the options** presented to you after reading the scenario. Please do not deliberate about the decision; there are no wrong or right answers.

You are about to undergo surgery and your consultant has decided to use a blood substitute to maintain oxygen supply during surgery.

The blood substitute to be used is a haemoglobin - based solution made from cows' (bovine) blood. There is a small risk of infection, hypertension and hypersensitivity. There is also a need for repeat treatments which lead to a small risk of autoimmune problems.

Yes, I would accept the blood transfusion using the blood substitute made from the Bovine Haemoglobin.

No, I would not accept the blood transfusion using the blood substitute made from the Bovine Haemoglobin.

Please now complete the two demographic questions below.

1. What is your date of birth? -- -- / -- -- / - - - -

2. Please state your gender by circling one of the options **Male** **Female**

THANK YOU FOR PARTICIPATING IN THE STUDY

The University of Nottingham

Appendix 3: Items from which the items used in the scale intended to measure factors important to the choice of blood transfusion type were derived.

Statement on questionnaire	Reason and participant's number
1. The length of time that the transfusion has been used in medical treatments.	**19. Never heard of blood substitute procedure i.e. the familiarity of the transfusion.**
2. The risk of contracting a life threatening illness (e.g. HIV or BSE) from the transfusion.	**2. The risk of infection from HIV is too high.** **99. Worried about infection BSE**
3. An increased chance of survival / recovery with the transfusion.	**183. It will help to make the operation a success to aid in my recovery.**
4. The speed at which I am able to receive the transfusion.	**Efficiency refers to one of the advantages of blood substitutes whereby there is no risk of cross matched blood.**
5. An increased chance of good health in the long term	**188. I would like a good life for as long as possible.**
6. The influence of the side effects associated with the transfusion on my future life plans.	**131. The potential risks I feel are incompatible with my life plans.**
7. The current supplies of blood stocks (donated and blood substitute) available for the transfusion.	**46. Conserves blood stocks.**
8. Feeling scared about the transfusion.	**230. The risk of 1 in 2 million is scary.**
9. Feeling disgusted with the transfusion.	**Question one, page four study one.** **300. I do not think it is disgusting.**
10. Feeling comfortable about the transfusion.	**367. The passage makes me feel secure about blood substitutes.**
11. The risk of receiving the wrong blood type.	**113. Worried about receiving the wrong blood type.**

Statement on questionnaire	**Reason and participant's number**
12. The willingness of the health professional to involve me in the decision making process.	**Stevenson *et al.* (2000) found that patients appeared reluctant to share their preferences.**
13. Whether a health professional is available to answer my questions about the transfusion.	**73. So long a she / he explain everything clearly to me and answer my questions.**
14. The nature/ personality of the health professionals.	**235. If trustworthy professional thinks its ok.**
15. Being able to understand the medical information / data.	**209. If my blood is pre donated, does it mean one doesn't need to use a substitute in the first place?**
16. My current state of health.	**322. If I needed surgery I would be in poor health anyway**
17. The quantity of blood received.	
18. The source of the blood solution which is to be transfused.	**132. comes from a cow**
19. Whether an alternative to the transfusion is available.	**362. If there is an alternative means I'll go for it.**
20. The risk of allergic reaction from the transfusion.	**A possible side effect from blood transfusions.**
21. The risk of flu from the transfusion.	**32. Minor ill effects flu.**
22. An increased quality of life following the transfusion.	**5. To lead a happier and healthier life.**

Statement on the questionnaire	**Reason and participant's number**
23. How susceptible I feel towards suffering from the side effects associated with the transfusion.	**225. I feel that I am more likely to suffer from adverse reactions.**
24. The risk of hypertension from the transfusion.	**86. High blood pressure isn't going to stop me.**
25. The position of the person providing the advice about the transfusion.	**176. I trust in someone who knows more than me.**
26. The importance of the treatment for which the transfusion is required.	**284. Because I presumed I needed surgery.**
27. The acceptability of the transfusion to my significant others (e.g. family friends partner).	**Subjective norm from the theory of planned behavior Azjen & Fishbein (1970).** **61. My father would disagree on religious grounds.** **328. It would be stupid to reject surgery that I need.**
28. Any immediate complications caused by the transfusion.	**166. Extra risks of complications.**
29. Feeling that I have control over the transfusion.	**Perceived behavioral control from the theory of planned behavior (Azjen & Fishbein, 1970).**
30. Being able to cope with any side effects associated with the transfusion	**301. If the doctor says it is ok. Then I suppose I could cope with being mildly grossed out.**
31. Feeling angry towards the transfusion.	**Question one page four study one.**
32. Whether the side effects associated with the transfusion are treatable.	**Subjective norm theory of planned behaviour (Azjen & Fishbein, 1970).**
33. Confidence in the tests that have been conducted to ensure the safety of the transfusion.	**174. Screening in place for donated blood components.** **46. If blood substitutes are on the market they will have been tested.**
34. Feeling able to share my preferences with the medical team.	**Stevenson *et al.,* (2000) found that patients appeared reluctant to share their preferences.**

Statement on questionnaire	Reason and participant's number
35. The size of the risk associated with the transfusion.	**123. 1 in 2 million is a very small risk to take**
36. The way in which information about the transfusion is provided to me e.g. booklet, in person.	**Characteristics of information provider.**
37. Confidentiality about my decision	**Factor in trust – a major factor stated by participants in their decision study one.**
38. The reliability of the source from which the information about the transfusion came.	**Factor associated with risk perception, Slovic (2000).** **174. The consultant knows what he is talking about that is what he is trained to do.**
39. Believing that I can pull through any of the side effects associated with the transfusion.	**279. I am in good health I think would be able to pull through anyway.**
40. Being provided with all of the information that I want to know.	**232. Need more information to make a decision.**
41. The potential need for repeated transfusions.	**69. Don't like the sound of repeat transfusion perhaps being necessary.**
42. Whether the transfusion carries unknown risks to my health.	**209. The fear of unknown diseases that science still hasn't discovered**.
43. The time at which the side effects associated with the transfusion pronounce.	**272. Side effects only during surgery whilst under lots of observation.**
44. The risk of contracting hepatitis from the transfusion.	**2. The risk of infection from hepatitis is too high.**
45. How well I am monitored by the health professionals.	**272. Side effects only during surgery whilst under lots of observation.**
46. The risk of hypersensitivity from the transfusion.	**141. Risk of suffering from hypertension.**
47. How satisfied I am with the information I received during the consultation about the transfusion	**232. Need more information to make a decision.** **Patient satisfaction with consultation is a major differentiating factor between patients and is related to compliance e.g. Ley (1988).**

Note. Numbers in the left hand column correspond to the participant's number from Experiment 1.

Appendix 4: **Questionnaire, information sheet and consent form used in study 2**

WELCOME TO THE STUDY

Please read the instructions below

Specific instructions are provided within the questionnaire. Please complete the questions in the order presented. There are no wrong or right answers, **please do not deliberate for long periods** over your answers and **please answer honestly**. If you have any problems with any questions please do not hesitate to ask the researcher. If you are happy to continue please turn to the first page of the booklet and begin to answer the questions.

Researcher
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Supervisors
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The University of Nottingham

Information Sheet From Study 2

You are being invited to take part in a research study, exploring peoples' decision making with respect to blood transfusions

The study involves completing a questionnaire. The questionnaire will take about 15 - 20 minutes to complete. The questionnaire you will complete asks you to rate your beliefs about the blood transfusion process your feelings about everyday situations and your health. Finally you will be asked to provide some demographic details.

If you do decide to take part all the information given by you will remain confidential and anonymous, and used for the purposes of the research only. The consent form will be kept separate from the questionnaires in order to ensure your anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the study, you are free to withdraw. If you are happy to participate in the study please sign and date the consent form provided. Please retain this information sheet for your reference.

Thank you for volunteering

Researcher

Susan Tomlinson
Room 228 School of Psychology
Email:lpxst@psychology.nottingham.ac.uk
Ph: 0115 84 67281

Supervisors

Dr Ken Lowe

Professor Eamonn Ferguson

The University of Nottingham

Consent Form

I freely and voluntarily consent to take part in a research study exploring peoples' decision making with respect to blood transfusions.

I understand that experiment will take about 20 minutes to complete.

The nature and purpose of the research has been explained to me and any questions I asked have been answered to my satisfaction.

I understand that there will be no personal identifying information written on the questionnaire and that all the information that I give will remain confidential, and be used for the purposes of the research only. The consent form will be kept separate from the questionnaire in order to ensure anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the study, you are free to withdraw.

If you are happy to continue with the study, then please sign below.

Signed:

Date:

Countersigned:

Date:

1. Consider that you require a blood transfusion. You are asked to rate how important each of the items would be to you in a decision to accept a blood transfusion.

You are required to indicate on the seven point scale from **-3 (not at all important), to +3 (of utmost importance)** how important each item would be to you in reaching a decision to accept a blood transfusion. Please answer all of the questions by circling the appropriate number to the right hand side of each statement. Please consider each item independently.

The following is an example

For example

1a). Any feelings I hold towards blood transfusions.

-3	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
Not at all Important			**Neutral**			**Of utmost importance**

In the example the respondent has rated this factor **+2** on the seven point scale.

Please now turn over the page and start the questionnaire.

1. You are required to indicate on the seven point scale from **- 3 (not at all important) to, +3 of (utmost importance)** how important each item would be to you in reaching a decision to accept a blood transfusion. **Please answer all of the questions** by circling the appropriate number to the right hand side of each statement.

	Statement	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
1	The length of time that the transfusion has been used in medical treatments	1	2	3	4	5	6	7
2	The risk of contracting a life threatening illness (e.g. HIV or BSE) from the transfusion.	1	2	3	4	5	6	7
3	An increased chance of survival / recovery with the transfusion.	1	2	3	4	5	6	7
4	The speed at which I am able to receive the transfusion.	1	2	3	4	5	6	7
5	An increased chance of good health in the long term.	1	2	3	4	5	6	7
6	The influence of the side effects associated with the transfusion on my future life plans.	1	2	3	4	5	6	7
7	The current supplies of blood stocks (donated and blood substitute) available for the transfusion.	1	2	3	4	5	6	7
8	Feeling scared about a transfusion.	1	2	3	4	5	6	7
9	Feeling disgusted about a transfusion	1	2	3	4	5	6	7
10	Feeling comfortable about a transfusion.	1	2	3	4	5	6	7
11	The risk of receiving the wrong blood type.	1	2	3	4	5	6	7

PLEASE CONTINUE ON THE NEXT PAGE

You are required to indicate on the seven point scale from **- 3 (not at all important) to, +3 of (utmost importance)** how important each item would be to you in reaching a decision to accept a blood transfusion. **Please answer all of the questions** by circling the appropriate number to the right hand side of each statement.

	Statement	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
12	The willingness of the health professionals to involve me in the decision making process.	1	2	3	4	5	6	7
13	Whether a health professional is available to answer my questions about the transfusion.	1	2	3	4	5	6	7
14	The nature/ personality of the health professionals.	1	2	3	4	5	6	7
15	Being able to understand the medical information/data.	1	2	3	4	5	6	7
16	My current state of health.	1	2	3	4	5	6	7
17	The quantity of blood received.	1	2	3	4	5	6	7
18	The source of the blood solution which is to be transfused (e.g. human, bovine or synthetic).	1	2	3	4	5	6	7
19	Whether an alternative to the transfusion is available.	1	2	3	4	5	6	7
20	The risk of allergic reaction from the transfusion	1	2	3	4	5	6	7
21	The risk of flu from the transfusion.	1	2	3	4	5	6	7
22	An increased quality of life following the transfusion	1	2	3	4	5	6	7
23	How susceptible I feel towards suffering from the side effects associated with the transfusion	1	2	3	4	5	6	7
24	The risk of hypertension from the transfusion	1	2	3	4	5	6	7
25	The position of the person providing the advice about the transfusion	1	2	3	4	5	6	7
26	The importance of the treatment for which the transfusion is required.	1	2	3	4	5	6	7
27	The acceptability of the transfusion to my significant others (e.g. family, friends or partner).	1	2	3	4	5	6	7
28								

PLEASE CONTINUE ON THE NEXT PAGE

You are required to indicate on the seven point scale from **- 3 (not at all important) to, +3 of (utmost importance)** how important each item would be to you in reaching a decision to accept a blood transfusion. **Please answer all of the questions** by placing a tick in the appropriate box to the right hand side of each statement.

	Statement	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
29	Feeling that I have control over the transfusion	1	2	3	4	5	6	7
30	Being able to cope with any side effects associated with the transfusion	1	2	3	4	5	6	7
31	Feeling angry towards the transfusion.	1	2	3	4	5	6	7
32	Whether the side effects associated with the transfusion are treatable	1	2	3	4	5	6	7
33	Confidence in the tests that have been conducted to ensure the safety of the transfusion	1	2	3	4	5	6	7
34	Feeling able to share my preferences with the medical team	1	2	3	4	5	6	7
35	The size of the risk associated with the transfusion	1	2	3	4	5	6	7
36	The way in which information about the transfusion is provided to me (e.g. booklet, in person)	1	2	3	4	5	6	7
37	Being able to cope with any side effects associated with the transfusion	1	2	3	4	5	6	7
38	Feeling angry towards the transfusion	1	2	3	4	5	6	7
39	Believing that I can pull through any of the side effects associated with the transfusion	1	2	3	4	5	6	7
40	Being provided with all of the information I want to know	1	2	3	4	5	6	7
41	The potential need for repeat transfusions	1	2	3	4	5	6	7
42	Whether the side effects associated with the transfusion are treatable	1	2	3	4	5	6	7
43	The time at which the side effects associated with the transfusion pronounce	1	2	3	4	5	6	7
44	The risk of contracting hepatitis from the transfusion	1	2	3	4	5	6	7
45	How well I am monitored by the health professionals	1	2	3	4	5	6	7
46	The risk of hypersensitivity from the transfusion	1	2	3	4	5	6	7
47	How satisfied I am with my medical treatment in the hospital prior to the transfusion	1	2	3	4	5	6	7

PLEASE CONTINUE ON THE NEXT PAGE

2. Please lists any additional factors not listed in the questionnaire which you think would influence your decision to accept a blood transfusion.

A) ----------

B) ----------

C) ----------

3. Please answer each question 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**

PLEASE CONTINUE ON THE NEXT PAGE

4. 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 indicate your answer by ticking T – True or F – False.**

1. I never hesitate to go out of my way to help someone in trouble. T [ ] F [ ]

2. I have never intensely disliked anyone. T [ ] F [ ]

3. I sometimes get resentful when I do not get my way. T [ ] F [ ]

4. I like to gossip at times. T [ ] F [ ]

5. There have been times when I felt like rebelling against people in authority even though I knew they were right. T [ ] F [ ]

6. I can remember "playing sick" to get out of something. T [ ] F [ ]

7. There have been occasions when I took advantage of someone. T [ ] F [ ]

8. I'm always willing to admit it when I make a mistake. T [ ] F [ ]

9. I always try to practice what I preach. T [ ] F [ ]

10. I sometimes try to get even rather than forgive and forget. T [ ] F [ ]

11. When I don't know something I don't at all mind admitting it. T [ ] F [ ]

12. I am always courteous, even to people who are disagreeable. T [ ] F [ ]

13. At times I have really insisted on having my own way. T [ ] F [ ]

14. There have been occasions when I felt like smashing things. T [ ] F [ ]

15. I would never think of letting someone else be punished for my wrong doings. T [ ] F [ ]

16. I never resent being asked to return a favour. T [ ] F [ ]

17. I have never been irked when people expressed ideas very different from my own. T [ ] F [ ]

18. There have been times when I was quite jealous of the good fortune of others. T [ ] F [ ]

19. I am sometimes irritated by people who ask favours of me. T [ ] F [ ]

20. I have never deliberately said something that hurt someone's feelings. T [ ] F [ ]

PLEASE CONTINUE ON THE NEXT PAGE

5. Listed below are a number of statements concerning your personal beliefs about your health. Please read each item and decide the extent to which you agree or disagree with the item on the six point scale from **6 (strongly agree) to, 1(strongly disagree).** Please circle your answer.

1	If I become sick, I have the power to make myself well again.	**1**	**2**	**3**	**4**	**5**	**6**
2	Often I feel that no matter what I do, if I am going to get sick, I will get sick.	**1**	**2**	**3**	**4**	**5**	**6**
3	If I see an excellent doctor regularly, I am less likely to have health problems.	**1**	**2**	**3**	**4**	**5**	**6**
4	It seems that my health is greatly influenced by accidental happenings.	**1**	**2**	**3**	**4**	**5**	**6**
5	I can maintain my health by consulting health professionals.	**1**	**2**	**3**	**4**	**5**	**6**
6	I am directly responsible for my health.	**1**	**2**	**3**	**4**	**5**	**6**
7	Other people play a big part in whether I stay healthy or become sick.	**1**	**2**	**3**	**4**	**5**	**6**
8	Whatever goes wrong with my health is my own fault.	**1**	**2**	**3**	**4**	**5**	**6**
9	When I am sick, I just have to let nature run its course.	**1**	**2**	**3**	**4**	**5**	**6**
10	Health professionals keep me healthy.	**1**	**2**	**3**	**4**	**5**	**6**
11	When I stay healthy, I'm just plain lucky.	**1**	**2**	**3**	**4**	**5**	**6**
12	My physical well- being depends on how well I take care of myself.	**1**	**2**	**3**	**4**	**5**	**6**
13	When I feel ill, I know it is because I have not been taking care of myself properly.	**1**	**2**	**3**	**4**	**5**	**6**
14	Even when I take care of myself, its easy to get sick	**1**	**2**	**3**	**4**	**5**	**6**
15	The type of care I receive from other people is what is responsible for how well I recover from an illness.	**1**	**2**	**3**	**4**	**5**	**6**
16	When I become ill, it's a matter of fate.	**1**	**2**	**3**	**4**	**5**	**6**
17	I can pretty much stay healthy by taking good care of myself.	**1**	**2**	**3**	**4**	**5**	**6**
18	Following doctor's orders to the letter is the best way for me to stay healthy.	**1**	**2**	**3**	**4**	**5**	**6**

PLEASE CONTNUE ON THE NEXT PAGE

Appendix 5: Information Sheet, consent form and questionnaire from Experiment 2

You are being invited to take part in a research study involving the completion of a questionnaire which will take about 10 - 15 minutes. The questionnaire you will complete asks you to rate your beliefs about blood transfusions, read a hypothetical surgical scenario and choose between two blood transfusion types. You will also be asked to provide some demographic details.

If you do decide to take part all the information given by you will remain confidential and anonymous, and used for the purpose of the research only. The consent form will be kept separate from the questionnaires in order to ensure anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the study, you are free to withdraw. If you are happy to participate in the study please sign and date the consent form provided. Please retain this information sheet for your reference.

Thank you for volunteering

Researcher

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Supervisors

Dr Ken Lowe

Professor Eamonn Ferguson

The University of Nottingham

Consent Form

I freely and voluntarily consent to take part in a research experiment exploring peoples' decision making with respect to blood transfusions.

I understand that experiment will take about 10 - 15 minutes to complete.

The nature and purpose of the research has been explained to me and any questions I asked have been answered to my satisfaction.

I understand that there will be no personal identifying information written on the questionnaire and that all the information that I give will remain confidential, and be used for the purposes of the research only. The consent form will be kept separate from the questionnaire in order to ensure anonymity. Participation is voluntary and if at any time you decide that you do not want to continue to take part in the expereiment, you are free to withdraw.

If you are happy to continue with the study, then please sign below.

Signed:

Date:

Countersigned:

Date:

The University of Nottingham

WELCOME TO THE EXPERIMENT

Please read the instructions below

The questionnaire is presented in four sections.

Section 1: Consists of 9 questions enquiring about your general opinion and feelings towards the blood transfusion process.
Section 2: Consists of a choice task relating to a hypothetical surgical scenario.
Section 3: Consists of 18 questions relating to the choice task in section two.
Section 4: Consists of 10 demographic questions.

Specific instructions for each section are provided within the questionnaire. Please complete the sections in the order presented. If you have any problems with any of the questions please do not hesitate to ask the researcher. If you are happy to continue please turn to the first page of the booklet and begin to answer the questions.

Researcher

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Supervisors

Professor Eamonn Ferguson (Psychology) and Dr Ken Lowe (Biology)

The University of Nottingham

Section 1: Opinions and Feelings towards the Blood Transfusion Process.

This section comprises one part. You are asked to answer nine statements about your feelings towards blood transfusions.

1. Feelings towards blood transfusions.

Using a six - point scale **(where 1= not at all to, 6 very much so)** please rate the extent to which each emotion listed below represents how you feel at this current moment in time towards the prospect of receiving a blood transfusion in the future by circling the appropriate answer (if completing on line delete the inappropriate responses).

Fear	**1**	**2**	**3**	**4**	**5**	**6**	Disgust	**1**	**2**	**3**	**4**	**5**	**6**
Anxiety	**1**	**2**	**3**	**4**	**5**	**6**	Happiness	**1**	**2**	**3**	**4**	**5**	**6**
Hope	**1**	**2**	**3**	**4**	**5**	**6**	Worry	**1**	**2**	**3**	**4**	**5**	**6**
Surprise	**1**	**2**	**3**	**4**	**5**	**6**	Regret	**1**	**2**	**3**	**4**	**5**	**6**
Anger	**1**	**2**	**3**	**4**	**5**	**6**		**1**	**2**	**3**	**4**	**5**	**6**

PLEASE CONTINUE ON THE NEXT PAGE

Section 2: Choice task

Instructions

Firstly please read the hypothetical situation below. After reading the scenario can you please choose between the two options which are presented to you on the next page and answer the subsequent questions. Please do not deliberate about the decision; there are no wrong or right answers.

Scenario

You are about to undergo surgery and your consultant has informed you that during surgery you will require a blood transfusion. Your consultant has given you the opportunity to choose between two blood products - a blood substitute or donated blood. Descriptions of the two options are presented to you on the next page. After reading the descriptions of the two blood products please make your choice.

PLEASE CONTINUE ON THE NEXT PAGE

Donated Blood Gain (DBG) Human Haemoglobin Gain (HBG)

Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks are extremely small. It is estimated that for every 2 million units blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin-based solution made from human. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity than with donated blood.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the human haemoglobin solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1	2	3	4	5	6	7	8	9	10
Completely different									**Identical**

PLEASE CONTINUE ON THE NEXT PAGE

Section 3: **Motivations behind your choice.**

I am interested in **your** reasons for the choice that **you** made in section two. Over the next three pages you will be presented with a series of 18 statements. You are required to indicate on the 7 point scale from **- 3 (not at all important) to, +3 of (utmost importance)** how important each item was to **you** in making your choice between the donated blood and the blood substitute. **Please answer all of the questions** by placing a tick/cross in the appropriate box.

WITH RESPECT TO MY CHOICE IN SECTION 2 THE FOLLOWING WERE IMPORTANT

	Statement	-3	-2	-1	0	+1	+2	+3
1	An increased chance of survival / recovery with the transfusion.	1	2	3	4	5	6	7
2	The speed at which I am able to receive the transfusion.	1	2	3	4	5	6	7
3	The influence of the side effects associated with the transfusion on my future life plans.	1	2	3	4	5	6	7
4	The current supplies of blood stocks (donated and blood substitute) available for the transfusion.	1	2	3	4	5	6	7
5	Feeling comfortable about a transfusion.	1	2	3	4	5	6	7
6	The nature/ personality of the health professionals.	1	2	3	4	5	6	7
7	My current state of health.	1	2	3	4	5	6	7
8	The risk of flu from the transfusion.	1	2	3	4	5	6	7
9	The risk of hypertension from the transfusion	1	2	3	4	5	6	7
10	The position of the person providing the advice about the transfusion	1	2	3	4	5	6	7
11	The importance of the treatment for which the transfusion is required.	1	2	3	4	5	6	7
12	Feeling that I have control over the transfusion	1	2	3	4	5	6	7
13	Confidence in the tests that have been conducted to ensure the safety of the transfusion	1	2	3	4	5	6	7
	The size of the risk associated with the transfusion	1	2	3	4	5	6	7
15	The way in which information about the transfusion is provided to me (e.g. booklet, in person)	1	2	3	4	5	6	7
16	Confidentiality about my decision	1	2	3	4	5	6	7
17	The risk of hypersensitivity from the transfusion	1	2	3	4	5	6	7
18	How satisfied I am with my medical treatment in the hospital prior to the transfusion	1	2	3	4	5	6	7

PLEASE CONTINUE ON THE NEXT PAGE

Section 3 Continued

3. Please lists any additional factors not listed in the questionnaire which you think would influence your decision to accept a blood transfusion.

A) ----------

B) ----------

4. Imagine that you have been asked to choose between a blood substitute and donated blood for a family member, friend and a stranger. Please indicate whether you would make the same or a different choice to the one that you made for yourself in section two by circling the appropriate option below.

Family member	**same**	**different**
Friend	**same**	**different**

Section 4: Demographic details.

1. Have you ever had a blood transfusion or known anyone who has had a blood transfusion? Please circle the appropriate answer below.

No **Yes myself** **Yes someone else**

2. Please indicate your date of birth below.

---------- ----------

PLEASE CONTINUE ON THE NEXT PAGE

Section 4 continued

3. Please state your gender by circling one of the options below.

Male **Female**

4. Please describe below in your own words the ethnic group to which you feel you belong.

5. Please state by circling yes or no below whether or not you hold or practice (visit a place of worship, pray) any religious beliefs.

Yes **No**

6. Please indicate your status as a blood donor by circling one of the options below.

a) **I have never donated blood**

b) I am a first time blood donor

c) I have donated blood once

d) I am a regular blood donor

e) **I have occasionally donated blood**

f) I am unable to donate blood

7. Do you have any personal experience with side effects from medical procedures / treatments? Please circle one of the options below.

Yes **Yes** **Yes** **None**

Severe **Moderately** **Minor**

PLEASE CONTINUE ON THE NEXT PAGE

8. How do you rate your health? Please circle one of the options below.

Excellent Good Fair Poor

9. Please state by circling yes or no below whether or not you are a health professional.

Yes No

THE END

THANK YOU FOR PARTICIPATING

Appendix 6: ADDITIONAL FRAMING CONDITIONS used in Experiment 2

Donated Blood Loss (DBL) Human Haemoglobin Loss (HBL)

Option one

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis-matched blood due to administrative error.

Option two

2**. You will be offered a blood substitute for the transfusion.** The blood substitute to be used is a haemoglobin – based solution made from human blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypetension. Also, as haemoglobin – based blood substitute are only temporary oxygen carriers with a life of 6 -12 hours, repeat transfusions maybe necessary.

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the human haemoglobin solution to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10

Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

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DBG HBL
Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from human blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin - based blood substitutes are only temporary oxygen carriers with a life of 6 – 12 hours, repeat transfusions maybe necessary.

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the human haemoglobin solution to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Completely different									**Identical**

PLEASE CONTINUE ON THE NEXT PAGE

The University of Nottingham

HBL DBL

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from human blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin - based blood substitutes are only temporary oxygen carriers with a life of 6 – 12 hours, repeat transfusions maybe necessary.

Option two

2. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error**.**

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from human haemoglobin to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10

Completely different **Identical**

PLEASE CONTINUE ON THE NEXT PAGE

The University of Nottingham

DBL and HBG

Option one

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from human blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity than with donated blood.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) **I would give my consent for the donated blood to be used.**

2) I would give my consent for the blood substitute from the human haemoglobin solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical)** the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

The University of Nottingham

HBG and DBL

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin- based solution made from human blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity than with donated blood.

Option two

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the haemoglobin solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

The University of Nottingham

HBL DBG

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from human blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin - based blood substitutes are only temporary oxygen carriers with a life of 6 – 12 hours, repeat transfusions maybe necessary.

Option two

2. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the haemoglobin solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

HBG and DBG

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from human blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity than with donated blood.

Option two

2. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the human haemoglobin solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different **Identical**

PLEASE CONTINUE ON THE NEXT PAGE

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Perflurocarbon Loss (PFL) and DBG
Option 1

1**. You will be offered a blood substitute for the transfusion.** The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. However, Perflurocarbon solutions require the use of supplementary oxygen and there are certain risks associated with long-term exposure to high levels of oxygen. Also, as perflurocarbon solutions are only temporary oxygen carriers, repeated exposure to transfusion may be required. Clinical trials have also shown that 3% of recipients experienced hypertension and 6% suffered a short - term hypersensitivity reaction (flu - like symptoms).

Option 2

2. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Perflurocarbon solution to be used

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Completely different									**Identical**

PLEASE CONTINUE ON THE NEXT PAGE

Bovine Blood Loss (CBL) and DBG

Option one

1. **You will be offered a blood substitute for the transfusion.** The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin-based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short - term hypersensitivity reaction (flu - like symptoms). There is also an increased chance of auto - immune problems with repeat transfusions.

Option two

2**. You will be offered donated blood for the transfusion.** Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the bovine haemoglobin to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

DBG and CBL

Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from bovine blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin-based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short-term hypersensitivity reaction (flu - like symptoms). There is also an increased chance of auto-immune problems with repeat

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the bovine haemoglobin to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

DBG PFL

Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. However, Perflurocarbon solutions require the use of supplementary oxygen and there are certain risks associated with long - term exposure to high levels of oxygen. Also, as Perflurocarbon solutions are only temporary oxygen carriers, repeated exposure to transfusion may be required. Clinical trials have also shown that 3% of recipients experienced hypertension and 6% suffered a short - term hypersensitivity reaction (flu - like symptoms).

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different **Identical**

PLEASE CONTINUE ON THE NEXT PAGE

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Perflurocarbon Gain (PFG) and DBL

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. Perflurocarbon solutions eliminate the infectious risks of blood transfusion and provide a ready source of a universally compatible product. Therefore, there is no risk of receiving cross-matched blood. In clinical trials only slight side effects have been observed, such as hypertension (however, 97% of recipients did not experience hypertension), or fever (although 94% of recipients did not experience fever).

Option two

2. You will be offered donated blood for the transfusion. Donated blood from the local blood bank. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1	2	3	4	5	6	7	8	9	10
Completely different									**Identical**

PLEASE CONTINUE ON THE NEXT PAGE

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DBL and PFG

Option one

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. Perflurocarbon solutions eliminate the infectious risks of blood transfusion and provide a ready source of a universally compatible product. Therefore, there is no risk of receiving cross - matched blood. In clinical trials only slight side effects have been observed, such as hypertension (however, 97% of recipients did not experience hypertension), or fever (although 94% of recipients did not experience fever).

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

DBL and CBL

Option One

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin - based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short - term hypersensitivity reaction (flu - like symptoms). There is also an increased chance of auto-immune problems with repeat

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

The University of Nottingham

CBL and DBL

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin - based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short-term hypersensitivity reaction (flu - like symptoms). There is also an increased chance of auto - immune problems with repeat transfusions.

Option two

2. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1	2	3	4	5	6	7	8	9	10
Completely different									**Identical**

PLEASE CONTINUE ON THE NEXT PAGE

CBG (Bovine Blood Gain) and DBL

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.

Option two

2. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis-matched blood due to administrative error.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

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DBL and CBG

Option one

1. You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Option two

2. You will be offered a blood substitute for the transfusion The blood substitute to be used is a haemoglobin - based solution made from bovine blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

DBG and CBG

Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

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CBG and DBG

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.

Option two

2. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Bovine Haemoglobin to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

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DBG and PFG

Option one

1. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. Perflurocarbon solutions eliminate the infectious risks of blood transfusion and provide a ready source of a universally compatible product. Therefore, there is no risk of receiving cross - matched blood. In clinical trials only slight side effects have been observed, such as hypertension (however, 97% of recipients did not experience hypertension), or fever (although 94% of recipients did not experience fever).

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

PFG and DBG

Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. Perflurocarbon solutions eliminate the infectious risks of blood transfusion and provide a ready source of a universally compatible product. Therefore, there is no risk of receiving cross - matched blood. In clinical trials only slight side effects have been observed, such as hypertension (however, 97% of recipients did not experience hypertension), or fever (although 94% of recipients did not experience fever).

Option two

2. You will be offered donated blood for the transfusion. Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1 - 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different **Identical**

PLEASE CONTINUE ON THE NEXT PAGE

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PFL and DBL
Option one

1. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. However, Perflurocarbon solutions require the use of supplementary oxygen and there are certain risks associated with long - term exposure to high levels of oxygen. Also, as Perflurocarbon solutions are only temporary oxygen carriers, repeated exposure to transfusion may be required. Clinical trials have also shown that 3% of recipients experienced hypertension and 6% suffered a short - term hypersensitivity reaction (flu - like symptoms).

Option two

2. **You will be offered donated blood for the transfusion.** Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

2) I would give my consent for the donated blood to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different **Identical**

PLEASE CONTINUE ON THE NEXT PAGE

DBL and PFL

Option one

1. **You will be offered donated blood for the transfusion.** Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Option two

2. You will be offered a blood substitute for the transfusion. The blood substitute to be used is a Perflurocarbon solution which is a synthetic material designed to carry out the oxygen carrying function of blood. However, Perflurocarbon solutions require the use of supplementary oxygen and there are certain risks associated with long - term exposure to high levels of oxygen. Also, as Perflurocarbon solutions are only temporary oxygen carriers, repeated exposure to transfusion may be required. Clinical trials have also shown that 3% of recipients experienced hypertension and 6% suffered a short - term hypersensitivity reaction (flu - like symptoms).

PLEASE NOW MAKE YOUR CHOICE

A) CHOOSE ONE OPTION ONLY by circling option 1 or 2

1) I would give my consent for the donated blood to be used.

2) I would give my consent for the blood substitute from the Perflurocarbon solution to be used.

Please now complete the question below

B) Please indicate by circling 1- 10 (**where 1 = completely different to, 10 = identical**) the extent to which you see the two blood products as being similar.

1 2 3 4 5 6 7 8 9 10
Completely different Identical

PLEASE CONTINUE ON THE NEXT PAGE

Appendix 7: Questionnaire, information sheet and consent form used in Experiment 3, Chapter 5

Cover sheet for the control condition

Welcome to the experiment

Please read the instructions below

This experiment is presented in four sections

Section 1: Consists of 44 questions relating to how you feel about everyday situations, how you feel towards the prospect of taking part in the experiment, and your attitude towards the blood transfusion process.

Section 2: Consists of a decision making task relating to a hypothetical scenario.

Section 3: Consists of 52 questions relating to the decision that you made in section two and your attitudes towards blood transfusions.

Section 4: Consists of three further questions relating to the decision that you made in section two followed by seven demographic questions

Please press any key to begin the experiment.

Cover sheet time constraint condition

Welcome to the experiment

Please read the instructions below

This experiment is presented in four sections

Section 1: Consists of 44 questions relating to how you feel about everyday situations, how you feel towards the prospect of taking part in the experiment, and your attitude towards the blood transfusion process.

Section 2: Consists of a decision making task relating to a hypothetical scenario. You will have a limited amount of **TIME** to complete this section.

Section 3: Consists of 52 questions relating to the decision that you made in section two and your attitudes towards blood transfusions.

Section 4: Consists of three further questions relating to the decision that you made in section two followed by seven demographic questions

Please press any key to begin the experiment.

Specific instructions are provided within the experiment. There are no right or wrong answers, please do not deliberate for long periods over your answers and please answer honestly. If you have any problems with nay of the questions please do not hesitate to ask the researcher. Sections 1-3 are presented on the computer and section four is a short pen and paper exercise. If you are happy to continue please press any key to begin the experiment.

Section 1 This section consists of three parts. You are asked to rate your agreement with 28 statements which people have used to describe themselves followed by 7 statements about your opinions towards blood transfusions and your views on the likelihood that you may need a blood transfusion. Finally you are asked to answer 9 statements about your feelings towards the prospect of one day receiving a blood transfusion.

If you are still happy to participate in the experiment please press any key to begin answering the questions.

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Section 1 question 1:

DIRECTIONS: A number of statements which people have used to describe themselves appear below. Read each statement then use the scale below to fill in the value to the left of each statement that best indicates how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer, which seems to describe how you generally feel. In the example the respondent has told us he/she is always sad.

For example**: 6** 1. I feel sad.

1 = never 2 = almost never 3 = sometimes 4 = often 5 = almost always 6 = always.

----- 1. I fear being criticised.
----- 2. I feel anxious that I might make mistakes
----- 3. Being teased / made self - conscious
----- 4. I feel uneasy around people in authority.
----- 5. Spiders scare me.
----- 6. When I'm in enclosed places, I feel scared.
----- 7. I'm afraid of not being a success.
----- 8. I'm afraid of snakes.
----- 9. I'm uneasy speaking before a group.
----- 10. I'm fearful / anxious in hospitals.
----- 11. Tough looking people scare me.
----- 12. I feel uneasy when I'm with someone I find physically attractive.
----- 13. I feel quite cheerful.
----- 14. I look at the sunny side of life.
----- 15. My friends seem to feel I'm unhappy.
----- 16. I consider myself a happy person.
----- 17. Compared to my friends, I think less positively about life in general.
----- 18. I laugh joyfully.
----- 19. I am quick tempered.
----- 20. I have a fiery temper.
----- 21. I am a hotheaded person.
----- 22. I get angry when I'm, slowed down by others' mistakes.
----- 23. I feel annoyed when I am not given recognition for doing good work.

PLEASE CONTINUE ON THE NEXT PAGE

Section 1 continued

1 = never 2 = almost never 3 = sometimes 4 = often 5 = almost always 6 = always

----- 24. I fly off the handle.

----- 25. When I get mad, I say nasty things.

----- 26. It makes me furious when I am criticised in front of others.

----- 27. When I get frustrated, I feel like hitting someone.

----- 28. I feel infuriated when I do a good job and get a poor evaluation.

PLEASE CONTINUE ON THE NEXT PAGE

Section 1 question 2: Opinions towards the blood transfusion process

The blood transfusion is a process undertaken to replace lost blood and/ or to correct imbalances of the components of blood. You will be presented with seven statements about blood transfusions. Please indicate on a seven point scale from 1 (strongly disagree) to, 7 (strongly agree) how much you agree or disagree with each statement by pressing the appropriate number key. Press any key to continue.

----- 1. I am certain that a blood transfusion would resolve the medical problem for which I was being treated.
----- 2. I am certain that I would not suffer any long term side effects following transfusion.
----- 3. I am certain that undergoing blood transfusion would be an unpleasant procedure.
----- 4. I am certain that I would suffer immediate side effects during a blood transfusion.
----- 5. If I take care of myself, I can reduce my chances of requiring a blood transfusion.
----- 6. Needing a blood transfusion is down to the luck of the draw.
----- 7. Health professionals control most of the factors which determine whether or not I will require a blood transfusion

Please respond to the question by pressing the appropriate number on the keyboard.

PLEASE CONTINUE ON THE NEXT PAGE

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Section 1 question 3: Anticipated emotions

In this question you are asked to rate the extent to which a series of emotions represent how you feel at this current moment in time towards the prospect of receiving a blood transfusion in the future. Please answer every question, even if you find it difficult. Answer, as honestly as you can, what is true for you. Please do not choose a reply just because it seems like the right thing to say. You should try and work quite quickly: there is no need to think very hard about the answers. The first answer you think of is usually the best. For each emotion, please select the appropriate number from 1 - 6 (where 1 = not at all to, 6 definitely). Please press any key to continue.

Fear	**1**	**2**	**3**	**4**	**5**	**6**	Anxious	**1**	**2**	**3**	**4**	**5**	**6**
Surprise	**1**	**2**	**3**	**4**	**5**	**6**	Happy	**1**	**2**	**3**	**4**	**5**	**6**
Regret	**1**	**2**	**3**	**4**	**5**	**6**	Disgusted	**1**	**2**	**3**	**4**	**5**	**6**
Worried	**1**	**2**	**3**	**4**	**5**	**6**	Angry	**1**	**2**	**3**	**4**	**5**	**6**
Hopeful	**1**	**2**	**3**	**4**	**5**	**6**							

Please respond to the question by pressing the appropriate number on the keyboard.

PLEASE CONTINUE ON THE NEXT PAGE

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Section 2: question 1, control condition - no time constraint

In this section you are required to read a hypothetical scenario, in

which you are about to undergo surgery. Your consultant has informed you that during the surgery you will require a blood transfusion. You are required to read the descriptions of the two blood transfusion types. After reading the descriptions

you will be prompted to answer each of the four questions which followed.

You will be presented with the two descriptions on the following screen. Press any key to begin reading.

Section 2 question 1, Time constraint condition

In this section you are required to read a hypothetical scenario, in which you are about to undergo surgery. Your consultant has informed you that during the surgery you will require a blood transfusion. You are required to read the descriptions of two blood transfusion types and answer three questions. **YOU WILL HAVE A LIMITED AMOUNT OF TIME TO COMPLETE THIS SECTION.** IF you do not make your choice within the time limit you will be automatically redirected to a choice screen where you will be asked to make your choice immediately. You will be presented with the two descriptions on the following screen. Press any key to begin reading.

FRAMING MANIPULATION DBL CBG

You are about to undergo surgery and your consultant has informed you that during the surgery you will require a blood transfusion. You are required to choose which blood transfusion type you would prefer to receive.

The two options presented to you are P) and Q) below.

P) You will be offered donated blood for the transfusion. Although all units of blood are carefully screened it is recognised that some risk of infection remains. For every 2 million units of blood transfused it is estimated that 1 person will contract HIV and for every 200,000 units transfused 1 person will be infected with the hepatitis C virus. There is also a slight risk of mis - matched blood due to administrative error.

Q) You will be offered a blood substitute for the transfusion. The blood substitute to be used is a haemoglobin - based solution made from cows' (bovine) blood. Whilst there is a small potential risk of infection this is considerably less than for donated blood. There is also less likelihood of cross reactivity.

Please now make your choice (**CHOOSE ONE OPTION ONLY** by pressing number P (red button) or Q (green button) which corresponds to your choice)

P) I would give my consent for the donated blood to be used.

Q) I would give my consent for the blood substitute made from cows' (bovine) blood to be used.

If you did not have time to respond to the last question please make your choice now.

P) I would give my consent for the bovine blood substitute to be used

Q) I would give my consent for the donated blood to be used

Otherwise please press any key to continue

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CBL DBG

You are about to undergo surgery and your consultant has informed you that during the surgery you will require a blood transfusion. You are required to choose which blood transfusion type you would prefer to receive.

The two options presented to you are P) and Q) below.

P) **You will be offered donated blood for the transfusion.** Blood donors and donated blood are well screened to prevent the transmission of infection by transfusion. Blood transfusion has a long history of safe use. The risks of infection are extremely small. It is estimated that for every 2 million units of blood transfused 1,999,999 people will not develop HIV, and for every 200,000 units transfused 199,999 will not be infected with the hepatitis C virus.

Q)**You will be offered a blood substitute for the transfusion.** The blood substitute to be used is a haemoglobin-based solution made from bovine blood. Therefore, there is a small potential risk of infection and cross reactivity. There is also a risk of hypertension. Also, as haemoglobin-based blood substitutes are only temporary oxygen carriers with a life of 6 to 12 hours, repeat transfusions may be necessary. There is also an increased chance of short-term hypersensitivity reaction (flu-like symptoms). There is also an increased chance of auto-immune problems with repeat transfusions.

Please now make your choice (CHOOSE ONE OPTION ONLY by pressing number **P** (red button) or **Q** (green button) which corresponds to your choice).

P) I would give my consent for the donated blood to be used.

Q) I would give my consent for the blood substitute made from cows' (bovine) blood to be used.

PLEASE CONTINUE ON THE NEXT PAGE

Section 2, question 2

Please now make the same choice for a family member again by pressing number P or Q which corresponds to your choice.

P) I would give my consent for the donated blood to be used.

Q) I would give my consent for the blood substitute from bovine blood to be used.

If you did not have time to respond to the last question please make your choice now.

P = I would give my consent for the bovine blood substitute to be used

Q= I would give my consent for the donated blood to be used

Otherwise please press any key to continue

Section 2, question 3

Please now make the same choice for a friend again by pressing key P or Q which corresponds to your choice.

P) I would give my consent for the donated blood to be used.

Q) I would give my consent for the blood substitute from bovine blood to be used.

If you did not have time to respond to the last question please make your choice now.

P = I would give my consent for the bovine blood substitute to be used

Q= I would give my consent for the donated blood to be used

Otherwise please press any key to continue

Section 3

This section consists of three sets of questions. In the first question you are asked to answer 12 items concerning your thoughts about the surgical scenario, followed by 9 items about your current feelings and finally by 38 items concerning your present attitudes towards blood transfusions and biotechnology

If you are still happy to participate in the study please press any key to continue.

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Section 3 question 1: Immediate emotions

This section of the questionnaire is concerned with how you felt about making your choice between the two blood transfusion types for yourself. Please indicate how well each word describes how you felt whilst making your decision. For each word, please select the appropriate number to indicate from 1 - 6 (where 1 = not at all to, 6 definitely).

Fear	**1**	**2**	**3**	**4**	**5**	**6**	Anxious	**1**	**2**	**3**	**4**	**5**	**6**
Surprise	**1**	**2**	**3**	**4**	**5**	**6**	Happy	**1**	**2**	**3**	**4**	**5**	**6**
Regret	**1**	**2**	**3**	**4**	**5**	**6**	Disgusted	**1**	**2**	**3**	**4**	**5**	**6**
Worried	**1**	**2**	**3**	**4**	**5**	**6**	Angry	**1**	**2**	**3**	**4**	**5**	**6**
Hopeful	**1**	**2**	**3**	**4**	**5**	**6**							

Please respond to the question by pressing the appropriate number on the keyboard

PLEASE CONTINUE ON THE NEXT PAGE

Section 3 question 2: Evaluation of the scenario

You will be presented with a series of nine statements related to your experience of the decision – making task in section two (where you made a choice between two blood transfusion types). Please respond to each statement by selecting the appropriate number key which best corresponds to your answer where 1 = strongly disagree and 6 = strongly agree. Press any key to continue.

Statement	Strongly Agree	Agree	Agree Slightly	Disagree Slightly	Disagree	Strongly Disagree
I found the information, which was presented about the blood transfusion types interesting	6	5	4	3	2	1
I feel that I learned a lot about the blood transfusion process and types form the paragraph, which I read	6	5	4	3	2	1
The exposure time to the decision problem was too short	6	5	4	3	2	1
Whilst reading the scenario and making my subsequent decision I had plenty of time to think	6	5	4	3	2	1
I experienced feelings of time pressure	6	5	4	3	2	1
I feel satisfied with the decision that I made	6	5	4	3	2	1
The scenario was involving	6	5	4	3	2	1
The scenario was personally relevant to me	6	5	4	3	2	1
The scenario was realistic	6	5	4	3	2	1
I am certain that the choice I made for myself is the one that I would make if I was confronted with that situation in real life	6	5	4	3	2	1
I am certain that the choice I made for myself is the one that I would make if I was confronted with that situation in real life	6	5	4	3	2	1
I am certain that the choice I made for myself is the one that I would make if I was confronted with that situation in real life	6	5	4	3	2	1

PLEASE CONTINUE ON THE NEXT PAGE

Section 3, question 3: Motivations to accept a blood transfusion

3. I am interested in **your** reasons for the choice that **you** made for yourself in section two. You will be presented with a series of 18 statements. You are required to indicate on the seven **point scale (from 1 not at all important to, 7 of utmost importance**) how important each item was to you in making your choice between the donated blood and the blood substitute. Please answer all of the questions by selecting the appropriate number key which best indicates your answer. Press any key to continue.

WITH RESPECT TO MY CHOICE IN SECTION 2 THE FOLLOWING WERE IMPORTANT

	Statement	**-3**	**-2**	**-1**	**0**	**+1**	**+2**	**+3**
1	An increased chance of survival / recovery with the transfusion	1	2	3	4	5	6	7
2	The speed at which I am able to receive the transfusion	1	2	3	4	5	6	7
3	The influence of the side effects associated with the transfusion on my future life plans	1	2	3	4	5	6	7
4	The current supplies of blood stocks (donated and blood substitute) available for the transfusion	1	2	3	4	5	6	7
5	Feeling comfortable about a transfusion	1	2	3	4	5	6	7
6	The nature/ personality of the health professionals	1	2	3	4	5	6	7
7	My current state of health	1	2	3	4	5	6	7
8	The risk of flu from the transfusion	1	2	3	4	5	6	7
9	The risk of hypertension from the transfusion	1	2	3	4	5	6	7
10	The position of the person providing the advice about the transfusion	1	2	3	4	5	6	7
11	The importance of the treatment for which the transfusion is required	1	2	3	4	5	6	7
12	Feeling that I have control over the transfusion	1	2	3	4	5	6	7
13	Confidence in the tests that have been conducted to ensure the safety of the transfusion	1	2	3	4	5	6	7
14	The size of the risk associated with the transfusion	1	2	3	4	5	6	7
15	The way in which information about the transfusion is provided to me (e.g. booklet, in person)	1	2	3	4	5	6	7
16	Confidentiality about my decision	1	2	3	4	5	6	7
17	The risk of hypersensitivity from the transfusion	1	2	3	4	5	6	7
18	How satisfied I am with my medical treatment in the hospital prior to the transfusion	1	2	3	4	5	6	7

PLEASE CONTINUE ON THE NEXT PAGE

Section 3 continued

2. Please lists any additional factors not listed in the questionnaire which you think would influence your decision to accept a blood transfusion.

A) ----------

B) ----------

C) ----------

PLEASE CONTINUE ON THE NEXT PAGE

Section 3 question 5

You will be presented with a series of 19 biotechnologies. Your task is to rate the extent to which you perceive the biotechnologies as being natural where **1 = unnatural - 6 = very natural**. Please answer all of the questions. Press any key to continue.

Please indicate the degree to which you perceive the procedures listed below as being natural where **1 = unnatural – 6 = very natural**. Please answer all of the questions. Press any key to continue

Transplantation of a kidney from a pig.	1	2	3	4	5	6	A blood transfusion from GM blood.	1	2	3	4	5	6
Transplantation of a heart from a cow	1	2	3	4	5	6	A synthetic hormone to clot blood.	1	2	3	4	5	6
A blood transfusion using synthetic blood.	1	2	3	4	5	6	A synthetic hormone to clot blood.	1	2	3	4	5	6
A blood transfusion using a blood substitute from a cow.	1	2	3	4	5	6	Novonseven a drug made from genes from human liver and hamster kidney.	1	2	3	4	5	6
Use of genetically modified (GM) crops in food.	1	2	3	4	5	6	Transplantation of cells/ tissues from a human for Parkinson's disease.	1	2	3	4	5	6
Transplantation of a kidney from a human	1	2	3	4	5	6	Implantation of a heart valve from a pig.	1	2	3	4	5	6

Section 3 question 5 continued

Transplantation of cells tissues from a monkey for diabetes	1	2	3	4	5	6	Implantation of a synthetic heart valve	1	2	3	4	5	6
Pig islet transplantation for diabetes	1	2	3	4	5	6	Transplantation of a heart from a pig	1	2	3	4	5	6
Insulin for the treatment of diabetes	1	2	3	4	5	6	Donated blood for a blood transfusion	1	2	3	4	5	6
Transplantation of cells / tissues from a cow for Parkinson disease	1	2	3	4	5	6							

Thank you for completing the computer based section of the experiment.

Please now turn to the question sheet on the desk and answer the 10 remaining questions.

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Section 4 question 1

Please us this page to tell us as much as you can remember about the scenario, which was presented to you on the computer screen in section two. Feel free to use words, diagrams, colours or symbols in your description.

Section 4 question 2

Please tell us why you made the choice that you did i.e. why did you chose the blood transfusion type that you did? Specifically why did you or did you not choose the donated blood or blood substitute?

PLEASE CONTINUE ON THE NEXT PAGE

Section 4 question 3: Attitudes towards biotechnologies

Please read each of the 19 statements listed below. You are required to rank the 19 items in terms of acceptance to you. Please place the number of the item in the respective position in the table on the next page which best represents your opinion. You may only place one item into each box. Please position/ rank each item in the table provided on the next page from **1 = I would not accept – 19 I would accept** in your order of preference or acceptance.

1. Transplantation of a kidney from a pig.
2. Transplantation of a heart from a cow
3. A blood transfusion using synthetic blood.
4. A blood transfusion using a blood substitute from a cow.
5. Use of GM crops in food
6. Transplantation of a kidney from a human
7. Transplantation of cells tissues from a monkey for diabetes.
8. Pig islet transplantation for diabetes.
9. Insulin for the treatment of diabetes.
10. Implantation of a synthetic heart valve.
11. Implantation of a heart valve from a pig.
12. Transplantation of a heart from a pig
13. Donated blood for a blood transfusion
14. Transplantation of cells / tissues from a cow for Parkinson disease.
15. Transplantation of cells / tissues from a human for Parkinson's disease.
16. A drug made from genes from human liver and hamster kidney to clot blood.
17. A synthetic hormone used as a blood clotting agent.
18. A blood transfusion using genetically modified (GM) blood.
19. Injection of a purified hormone from human sources to treat anaemia.

PLEASE CONTINUE ON THE NEXT PAGE

1= I would not accept
2
3
4
5
6
7
8
9
10 Neutral
11
12
13
14
15
16
17
18
19 I would accept

Section 4 question 4: Demographics

1. Please indicate your status as a blood donor by circling one of the options below.

I have never donated blood

I have donated blood once

I am a regular blood donor

I have occasionally donated blood

2. Please indicate by circling the appropriate option below whether you have received a blood transfusion or known someone who has

No yes myself no yes someone else

3. Please indicate your date of birth below

Day------ month------ year---------

4. Please state your gender by circling one of the options below.

Male Female

5. Please describe below in your own words the ethnic group to which you feel you belong.

Section 4 question 4: Demographics cont.

6. Please state by circling yes or no below whether or not you hold or practice (visit a place of worship, pray) any religious beliefs.

Yes **No**

7. If you are a student what is your discipline of study

_____

If not what is your occupation

_____

THANK YOU FOR PARTICIPATING IN THE EXPERIMENT

The University of Nottingham

Information for debrief

The aim of the study that you have just participated in is to investigate whether the imposition of deadline influences people's decision making. You will have received in either the deadline or no deadline conditions. Potential mechanism for any effects such as mood and perception of the scenario / blood transfusions were also measured.

Further information about blood transfusion can be from http://www.aabb.org

Here you will find information about the blood transfusion procedure and safety as well as links to the National Blood Service.

If you have that you have become distressed by any of the questions support can be found through Nightline 0115 951 4985 (term time) or the University counselling service 0115 951 3695.

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