

The relative influence of feelings and cognitive
evaluations on risk based behavioural decision
making.

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Abstract

This research investigates the hypothesis posited in the ‘Risk as Feelings model’ (Loewenstein 2001) that feelings in risk related decisions can diverge from cognitive evaluation of the same risk.. Participants received 2 vignettes describing either a low risk or high risk scenario which requires a behavioural decision. Each participant was encouraged to attend to the scenario according to their feelings or cognitive evaluations via a set of instructions and 12 items. A further 20 items were used to measure behavioural intention, subjective decision quality, assessments of subjective norms and perceived behavioural intention along with additional scales investigating the characteristics of participants decisions. It was found that participants in the feelings focused condition expressed a stronger intention to perform the risky behaviour as well as take subjective norms into account. They also rated their decision as more impulsive. Conversely participants rated themselves as being more consciously aware of their decisions in the cognitive evaluation focused condition and had a greater perception of control. Effects for both control and subjective norm ratings were found to interact with risk type. The findings support Loewenstein’s hypothesis and also suggest a possible reframing of subjective norm assessments as gut feelings rather than analytical evaluations.

Introduction

Relative to cognition, the role of affect has been under researched in human mental processing. The reason for this appears to stem from an assumption made by many early theorists that only processes susceptible to conscious modification and control can be studied empirically. While it is generally perceived that we have control over our cognitions, the same cannot be said for our affective states. However the expanding body of research that has developed in recent years on the role of emotion in behavioural decision making suggests it is too important to ignore. There is a strong implication made by many theorists that, in certain situations, affect may guide decision making and exert a dominant influence over behaviour. (Clarke 1992, Damasio 1994, Zajonc 1984, Lowenstein 2001, Slovic 2003)

Classic cognitive models of behavioural planning, such as the ‘theory of reasoned action’ (Fishbein and Azjen 1980) and the ‘theory of planned behaviour’ (Azjen 1985) suggest beliefs about self-efficacy and behavioural control determine our intention to act. Affect is not included as a relevant antecedent to behavioural intention. In expected utility theories of decision making affect is considered only as an anticipated outcome of a given decision. For example someone may anticipate feeling regret after starting an argument with a friend or family member. Such theories appear to ignore the actual expression of emotion in anticipation of making a decision and

performing subsequent behaviours. For example feeling anxiety at the prospect of confronting a friend. In the literature this is generally referred to as 'anticipatory emotion'. Unlike the typical expression of emotions however, these represent 'faint, fleeting, twinges of affect' which are largely unconscious (Clarke 1992).

One of the earliest formal references to anticipatory emotion in a theoretical context comes from Damasio's (1994) 'somatic marker hypothesis'. Damasio posited that emotions represent brain and body state changes caused by our perceptual experience of a specific event or object. Body state changes include modifications of heart rate, facial expression, muscle contraction, fight, flight or freeze responses etc. (Bechera 2005). These are referred to as 'somatic states'. Brain state changes are responsible for the phenomenological aspect of emotions i.e. how they feel. When paired together the end result is a somatic state triggered by a particular stimulus, which either feels pleasurable or unpleasant. This is referred to as a 'somatic marker' which, generally speaking, exists below a person's threshold of conscious awareness. There are two types of stimuli that can induce the creation of a somatic marker. The first are 'primary inducers' which are either innate or learned. A typical example would be a fear object like a snake or spider. (Bechera 2005). However a somatic marker can also be created through imagining a hypothetical stimulus or remembering one from past experience. These are called 'secondary inducers' (Damasio 1995).

Damasio proposes that these 'somatic markers' guide and bias human decision making, particularly when we are faced with decisions that overwork our cognitive resources due to their complexity or the incompatibility of choice options. A response option is associated with a certain stimulus that is either perceived, imagined or recalled. This response option is then marked by either a pleasant or unpleasant 'gut feeling' which signals for the decision maker to choose or not avoid that option. (Damasio 1994)

One key question that emerges from the anticipatory emotion literature is whether these 'gut feelings' have a more potent influence on our behavioural decision making than factors such as perceived self efficacy and behavioural control seen in classic cognitive models. A significant portion of research has been devoted to defining the influence emotions have over decision making and behaviour relative to cognitive processing (Simon 1967, Bargh 1984, Zajonc 1984, Lazarus 1984).

For many researchers, the relative influence of either affect or cognition in decision making is determined by its temporal location within a sequential chain. The process that occurs first has the more potent effect on our decision making and subsequent behaviours. Zajonc (1984) was the first to suggest that affect may occur before any form of cognitive activity. Empirical support for

this hypothesis was drawn from a number of sources including earlier work on the '*mere exposure effect*'. Zajonc (1968) found that the more participants were exposed to a set of arbitrary Chinese symbols, the more aesthetically pleasing they were rated. In such cases, no processes that we would generally associate with cognitive decision making, could allow for one symbol to be favoured over the other. Certainly participants are not consciously aware of applying any rational criteria in order to make their judgments, as none are available. There is no outcome from this judgement, and therefore no expected utility or probability of cost and benefit.

The theory has been criticised for assuming that cognitive processing is always conscious or even always rational. Cognitive appraisal theories claim that affective responses towards a stimulus can only occur after we have determined whether our well being, be it our genetic fitness or personal goals, are affected for better or worse. (Fridja 1987, Ellsworth and Smith 1985, Lazarus 1984). Lazarus (1984) argues that such appraisal actually occurs most frequently at an unconscious level. In the case of preferential judgements, it is claimed that Zajonc is far too ambiguous. While preferences may represent genuine affective responses they can also merely be indicators of a social obligation to make a judgement or take a stance (C.f. Lazarus 1984)

In more recent research, it has been suggested that the primacy debate may actually represent a false dichotomy. Assuming that behavioural decision making always occurs in this linear fashion does not provide a strong explanation of why individual differences or differing environmental conditions can result in variable decision making. From an anecdotal perspective there are many scenarios in which affect appears to produce a dominant influence over behavioural decisions, while others in which it takes more of a back seat role. The most compelling illustrations of this come from decision making under risk and extreme time pressure. In such circumstances we seem much more likely to '*get carried away with our emotions*'. In terms of accounts such as the cognitive appraisal theory however, this variation makes little sense.

An alternative approach, which can potentially explain such real world observations, is to regard emotion and cognition as working in tandem as part of larger processing systems during behavioural decision making. (Lowenstein 2001, Reyna 2004, Slovic 2003). This is generally referred to as a '*dual processing approach*'. Dual processing theory can be traced back to the work of William James in the early 20th century, with his distinction between '*associative*' and '*true reasoning*'. In the 'CEST' model, Epstein (1994) proposes that people function on the basis of two information processing systems. The first is the '*rational system*' through which we make inferences based on logical analysis of rules and evidence. The system is deliberate, conscious and drains cognitive capacity. The second is the '*experiential system*' through which we adapt to our

environment via associative learning of past experience. In contrast it is unconscious, fast and intuitive. While the experiential system is cognitive by nature, it is inherently driven by affect. We learn through association, to avoid experiencing negative affect and encourage positive affect. The CEST model therefore represents one of the early accounts of affect and cognition working in tandem, as opposed to one sequentially preceding the other. (Epstein 1994).

The theoretical framework described by Epstein, may not map directly on to decision making, without some minor adjustments. Slovic (2004) notes that the label of a 'rational system' is misleading as both systems actually contain substantial amounts rationality. The notion that emotion in some way disrupts reasoning is a fallacy. Intuition, not probability analysis, guided us through the early stages of our evolution allowing us to make decisions which would achieve an optimal outcome. The rational system is renamed the '*the analytic system*'. (Slovic 2004).

Several theories have utilised the dual processing approach as a means of describing how and when affect can provide a dominating influence over decision making. One example is the 'Affect Heuristic' (Slovic et al 2002). The affect heuristic represents a reliance on the affective experiential system when making a decision, in order to gain a quicker and easier assessment of the situation than would be achieved by evaluating the expected outcomes or utility. All mental representations in the human mind are labelled with some degree of affect. Much like the somatic marker hypothesis, affect in this sense refers to a negative or positive feeling which may or may not be conscious. Affectively marked representations enter an 'affect pool' which can then be referenced by the decision maker (Slovic 2002). The extent to which the pool is referenced and the heuristic is implemented varies according to the individual and the decision in question. (Slovic 2002). Again it is when we must make decisions and judgement under risk, that the affect heuristic has greatest impact. Humans fundamentally comprehend '*risk as feelings*' and '*risk as analysis*'. (Slovic 2004)

The theory that is key to this research focuses centrally on the 'risk as feelings' processing system, and gives a potential account for why it is risk specifically, that seems to encourage an overriding affective influence. Loewenstein (2001), like Slovic, proposes two parallel processing systems. These are '*feelings*' and '*cognitive evaluation*' which share many of the key characteristics of Epstein's 'experiential' and 'rational' systems respectively. During everyday processing they both function in parallel, interacting in a reciprocal fashion, leading to decision making and behavioural output as in the majority of other dual processing theories. However crucially when faced with decisions involving an element of risk, feelings diverge from cognitive evaluations, and can result in decisions and behaviours which contradict our cognitive evaluations. This is for two

primary reasons. Firstly risk related feelings (anticipatory emotions) have separate determinants, which do not influence cognitive evaluations of the same risk. Such determinants include; how vividly we can imagine or how strongly we associate an outcome occurring after the decision, the time delay between making the decision and the outcome, and evolutionary preparedness (Loewenstein 2001). Secondly, while these anticipatory emotions still receive input from probability and outcome information, they do not react to it the same manner as cognitive evaluations. (Loewenstein 2001). This explains why our anticipatory emotions appear largely insensitive to any variation in probability, a phenomenon found throughout decision making research. (Deane 1969, Damasio 1994, Weber and Hsee 1998). The more emotionally rich and vivid an outcome is imagined to be, the greater the probability insensitivity to it. (Rottenstreich and Hsee 1999)

The general conclusion that can be drawn from the work of Lowenstein, Slovic and other dual processing theorists, is that while affective and cognitive systems do interact during decision making, we often rely more heavily on one system over the other when making a decision. The extent to which this is the case appears largely to be a product of the situational conditions under which the decision is made and what information is available and accessible to the decision maker at the time. The most obvious question that follows from this is which form of decision making leads to better decisions? Until recently, there has been an element of disconnect between real world phenomena and scientific research in this area. Everyday language is littered with phrases like ‘*go with your gut*’, the implication being that intuitive, experiential and therefore affectively driven decisions are favourable. However the suggestion within most psychological and economic models of decision making is that we use the deliberative, analytical system to maximise utility and therefore make superior decisions i.e. rational choice and expected utility theory.

Janis and Mann (1977) propose that the impulsive decision making processes which occur under time pressure are more susceptible to panic and stress leading to ‘hyper vigilant’ decisions. In the majority of situations this is maladaptive in contrast to ‘*vigilant*’ decision making in which we objectively assess the costs and benefits of an option, and identify any potential alternatives. Furthermore the experiential system has been slated as a source of many biases and short cuts in decision making, such as the availability, representativeness and anchoring heuristics, which lead to errors in judgment. (Kahneman and Tversky 1973). Gilovich (2002) posits that our automatic and immediate assessments of a situation provide us with information on the ease of retrieval or similarity with a prototype, before deliberative analysis has occurred. Heuristics are therefore primarily caused by our ‘natural assessments’, while the fact that we are ‘*cognitive misers*’ is a secondary influence. (Gilovich 2002)

In more recent research however there has been an emphasis on both the advantages of relying on our intuitive feelings, as well as the disadvantages of deliberation. Wilson and Schooler (1991) found university students required to state preferences for psychology modules after evaluating the qualities of all the available options deviated further away from expert opinion than controls. As mentioned earlier, Slovic et al (2003) advocate an affect based heuristic which is more efficient and effective, under certain circumstances, than assessing outcome probabilities. Reyna (2004) posits that '*gist representations*' are more potent in identifying the meaning of experiences, including those marked with emotion. Alternatively, processing of '*verbatim representations*' is more vulnerable to interference. (Reyna 2004).

What remains one of the more challenging aspects of experimentation in this area, is how to manipulate participants into forming an unbalanced reliance on either their intuitive feelings or their analytical cognitions. The method utilised by the majority of researchers is to use instructions and questions in order to 'focus' participants on one 'decision strategy' over the other. (Carstensen et al 2004, Lockenhoff and Carstensen 2007, Mikels 2010, Maglio 2011). Maglio (2011) presented participants with positive and negative attributes of 4 hypothetical cars, each attribute presented sequentially for 4 seconds at a time. In the 'affective decision strategy condition' participants were instructed to focus and respond to questions on their feelings towards each. In the deliberative decision strategy condition they were instructed to focus and respond to questions on their memory for the details of each car. One of these cars had 75% positive attributes, 2 had 50% and 1 had 25%. This provided the researchers with an objectively superior decision i.e. the car with 75% positive attributes. An assessment of the subjective quality of each decision could also be obtained by measuring how important participants rated each attribute. The results showed that affective decision strategies lead to both subjectively and objectively better decisions. Furthermore this effect was stronger when the number of attributes for each car was increased, making the decision more complicated.

The present research takes a similar approach to that of Maglio by conducting a comparison between these two types of decision strategy. However it is noted that there is a lack of studies which make such comparisons for decisions under risk. This is despite the fact that a significant portion of the theoretical basis for affective decision making specifies that it is in situations of risk when emotion is most likely to exert a dominant influence. In response to this, the current research will test participant's decision making when faced with risk of varying type and degree. The manipulation used is based on Lowenstein's distinction between 'cognitive evaluation' and 'feelings' in the 'risk as feelings model'. The model specifies that feelings can diverge from cognitive evaluations leading to contrasting decisions and behavioural responses. For this reason the

scenarios facing participants will be focusing specifically on risky behaviours. Rather than stating preferences for a particular choice option, participants must state their behavioural intention in the given situation. In line with Loewenstein's hypothesis it is predicted that using cognitive evaluation focused decision strategies will have differing behavioural intentions to those using feelings focused decision strategies.

Several additional scales will be used in an attempt to answer some of the central questions posed in the previous literature. Are feelings focused decision strategies of a higher subjective quality? Do the characteristics of cognitive evaluations and feelings match those of the analytic and experiential systems respectively in dual processing models? Are we more likely to assess subjective norms and perceived behavioural control in cognitive evaluation focused strategies and therefore perceive ourselves as having greater control over the subsequent decisions?

Method

Overview

Each participant received 2 vignettes describing either a low risk or high risk scenario in which one would be required to make a behavioural decision. In the first scenario participants were to imagine themselves faced with the decision over whether or not to engage in unprotected sex, while in the second this decision was with regards to having major back surgery. They were encouraged, via a set of instructions and 12 statements, to assess the scenario and provide a behavioural decision according to either their feelings or cognitive evaluations. The behavioural intention of the participants was assessed through ratings of one statement (e.g. 'I would have sex in this situation') on a 7 point scale (i.e. 1 = strongly disagree / 7 = strongly agree). Several additional scales were used to examine the central characteristics of these decisions; subjective decision quality, speed, verbalisation, impulsiveness, intuitiveness, conscious awareness, effort, control, assessment of subjective norms and perceived behavioural control.

Participants

88 undergraduate students (57 females and 31 males with a mean age of 20.5) from the University of Nottingham were recruited to take part in the experiment. A power analysis was conducted on the sample size suggesting that 80 participants (20 in each treatment condition) would be appropriate to obtain a medium effect size.

Materials

Participants were presented with a questionnaire containing an information sheet, consent form and 64 statements split evenly between 2 vignettes of approximately 90 words in length. Each vignette was headed with its own set of instructions informing participants how to assess the information and rate the statements below. After completing the questionnaire participants were given a de brief sheet outlining the rationale and hypothesis of the study.

Design and Procedure

The experiment was carried out using a three – way (2X2X2) mixed groups design, with two between subject's variables and one repeated measures variable.

Participants were required to fill out a questionnaire taking approximately 10 – 15 minutes to complete. The questionnaire contained 2 vignettes taken from Kobbeltvedt and Wolff (2008), which present differing types of risk. The vignette labelled '*unprotected sex*' described a scenario in which the participant meets someone on a night out, goes home with them and begins to get intimate but does not have a condom. The vignette labelled '*back surgery*' described a situation in which the participant hurts their back in a fall and is faced with major surgery. (See appendix 2) In terms of underlying constructs '*unprotected sex*' refers to a 'positive hedonic experience with potential negative consequences'. (Kobbeltvedt and Wolff 2008) While the act of sexual intercourse is pleasurable, not using protection leaves one vulnerable to catching a sexually transmitted disease for example. In contrast '*back surgery*' is a 'negative hedonic experience with potential positive consequences'. (Kobbeltvedt and Wolff 2008) The actual surgery itself and immediate aftermath will be painful, but there could be major health benefits in the long term. This manipulation represented the repeated measures variable of the study, labelled 'risk type'.

Each vignette was preceded with instructions which encouraged participants to focus on either to their feelings or cognitive evaluations of the situation when reading the vignette. This was the first manipulation of the between subjects variable labelled 'decision strategy'. In the 'feelings focused' condition participants were told to '*read the following scenario relative to how you would feel and what emotions you might experience*'. In the 'cognitive evaluation focused' condition participants were told to '*read the following scenario relative to your own personal attitudes and assessment of the outcomes that might derive from this situation*'. These instructional manipulations were loosely based on those used by Carstensen et al (2004) and Mikels (2010).

Both vignettes were also manipulated to vary according to ‘risk level’, representing the second between subjects variable of the study. The original Kobbeldt and Wolff vignettes form the basis of the ‘low risk’ condition while several modifications are made to create the ‘high risk’ condition. In the case of ‘safe sex’ the participant is no longer familiar with the potential sexual partner, lacking the same connection but finds them very ‘*physically attractive*’. The unfamiliarity and lack of connection were used to increase uncertainty about the person’s promiscuity and reliability, while the attraction was intended to raise levels of temptation. In the case of the back surgery the participant is in ‘*severe pain*’ after the fall and the surgery carries with it the possibility of ‘paralyses. The increased level of pain made the option of not having the surgery more costly while the potential paralyses raised the stakes with regards to having the surgery.

The order in which participants receive these vignettes was counterbalanced. Half were randomly allocated to receive the safe sex vignette first and the other half receives the back surgery vignette first. This is to avoid the possibility of order effects i.e. answers given in relation to the first vignette influencing those provided for the second.

For each vignette participants are required to read a total of 32 statements and rate the extent to which they agree on a 7 point scale ranging from strongly disagree (1) to strongly agree (7). The first 12 of these statements represent a further manipulation of the ‘decision strategy’ variable. In the feelings focused condition participants rated statements on their anticipatory emotions, vividness of imagined outcomes and strength of associations. For example ‘*thinking about having sex in this situation makes me feel anxious*’. In the cognitive evaluation based condition participants rate statements about subjective probabilities, beliefs and cognition specific attitudes. For example ‘*it is probable having this surgery will lead to being forced to take time of university / work*’. These statements are adapted from questions used by Kobbeldt and Wolff (2008), which were specifically designed to tap into the constructs of the ‘risk as feelings’ model, and demonstrated to be significant predictors of behavioural intention (Kobbeldt and Wolff 2008).

The next 20 statements represented the dependant variables of the experiment. While ratings of each statement were analysed separately in the research, they can loosely be categorised as tapping into around 10 different constructs. The first statement was a measure of participant’s behavioural intention in the scenario i.e. ‘*I would have sex / have the back surgery in this situation*’. The subsequent nineteen variables measured various characteristics of the decision implied within participant’s behavioural intention ratings. Participants rated their confidence and satisfaction with the decision giving an indication of subjective decision quality. Likewise they also rated the speed,

verbalisation, impulsiveness, intuitiveness, conscious awareness, control and effort they would expend in making the decision. Finally statements on the willingness to consider the opinions of friends and family were used to determine assessment of subjective norms. For example ‘I would take my families opinion into account’. Statements on the willingness to consider potential obstacles were used to determine perceive behavioural control.

Results

Measures of skew and kurtosis were used to assess the normality of the data with all values falling within the acceptable limits of (+-) 3.6 and (+-) 14.9 respectively. The data was also tested for homogeneity of variance using Levene’s Test. Dependent variables 2, 3 and 7 violated the homogeneity of variance assumption for conducting an ANOVA. However when the same dependant variables were assessed using Hartley’s Fmax (a less conservative test), all were found to have homogenous data sets.

A two way (2X2) between subjects ANOVA was conducted on each of the dependent variables for the ‘risk level’ and ‘decision strategy’ variables. In this analysis the ratings from the 2 separate vignettes were combined and averaged to form an overall score. 7 out of the 20 dependent variables were found to have significant main effects for ‘decision strategy’, but none reached a level of significance for the variable of risk, or for an interaction effect.

Table 1: Table showing the means and standard deviations for the decision strategy variable

	Decision strategy	
	Feelings	Cognitive evaluation
DV 1: <i>I would have sex / the surgery in this situation</i>	4.14 (0.96)	3.58 (1.13)
DV7: <i>I would be consciously aware of making this decision</i>	5.67 (1.43)	6.18 (0.79)
DV8: <i>This decision would be impulsive</i>	3.24 (1.30)	2.67 (0.98)
DV14: <i>I would have control over this decision</i>	5.81 (0.95)	6.28 (0.74)
DV15: <i>My friends would approve of this decision</i>	5.64 (0.92)	5.08 (1.32)
DV16: <i>I would take their (friends) opinion into account</i>	5.38 (1.04)	4.51 (1.40)
DV 18: <i>I would take their (family’s) opinion into account</i>	5.50 (1.08)	4.96 (1.43)

In terms of decision strategy participants expressed a stronger intention to perform the risky behaviour (i.e. either unprotected sex or back surgery) in the feelings focused condition ($f_{1,84}=6.236, p<0.05$). Using the same strategy participants also rated their decisions as more impulsive ($f_{1,84}=4.71, p<0.05$) and demonstrated a greater willingness to take the opinions of their friends ($f_{1,84}=8.378, p<0.05$) and family ($f_{1,84}=4.02, p<0.05$) into account. Finally these decisions were more likely to gain the approval of the participants friends ($f_{1,84}=6.59, p<0.05$). In contrast those using a cognitive evaluation focused strategy rated themselves as having more conscious awareness of the decision making process ($f_{1,84}=4.35, p<0.05$) and more control over their subsequent decisions ($f_{1,84}=4.23, p<0.05$).

A three way (2X2X2) mixed ANOVA was then conducted on these 7 dependent variables, adding the variable of 'risk type'. In this case participant's scores from the two vignettes were analysed separately. Significant main effects for risk type were found for 5 of the variables

Table 2: Table showing the mean scores and standard deviations for the risk type variable

	Risk Type	
	Back Surgery	Unprotected Sex
DV 1: <i>I would have sex / the surgery in this situation</i>	5.55 (1.41)	2.26 (1.70)
DV7: <i>I would be consciously aware of making this decision</i>	6.28 (0.98)	5.77 (1.54)
DV8: <i>This decision would be impulsive</i>	2.67 (1.39)	3.87 (1.93)
DV14: <i>I would have control over this decision</i>	5.88 (1.18)	6.216 (0.89)
DV16: <i>I would take their (friends) opinion into account</i>	5.47 (1.39)	4.42 (2.00)
DV 18: <i>I would take their (family's) opinion into account</i>	6.17 (1.03)	4.30 (2.05)

For the risk type variable participants expressed a much stronger intention to have the back surgery than engage in unprotected sex ($f_{1,84}=189, p<0.001$). They also rated that they would be more consciously aware of making this decision ($f_{1,84}=7.64, p<0.01$), and more willing to take account of their friend's ($f_{1,84}=5.06, p<0.05$) and family's ($f_{1,84}=65.6, p<0.001$) opinions. Finally, participants perceived themselves to have greater control over their decision ($F_{1,84}=6.51, p<0.05$). In the case of having unprotected sex however, these decisions were viewed as more impulsive ($f_{1,84}= 65.59, p<0.001$).

A significant interaction between risk level and decision strategy was found for participants' perception of control ($f(1,84)=4.17, p<0.005$). This is illustrated in the graph below;

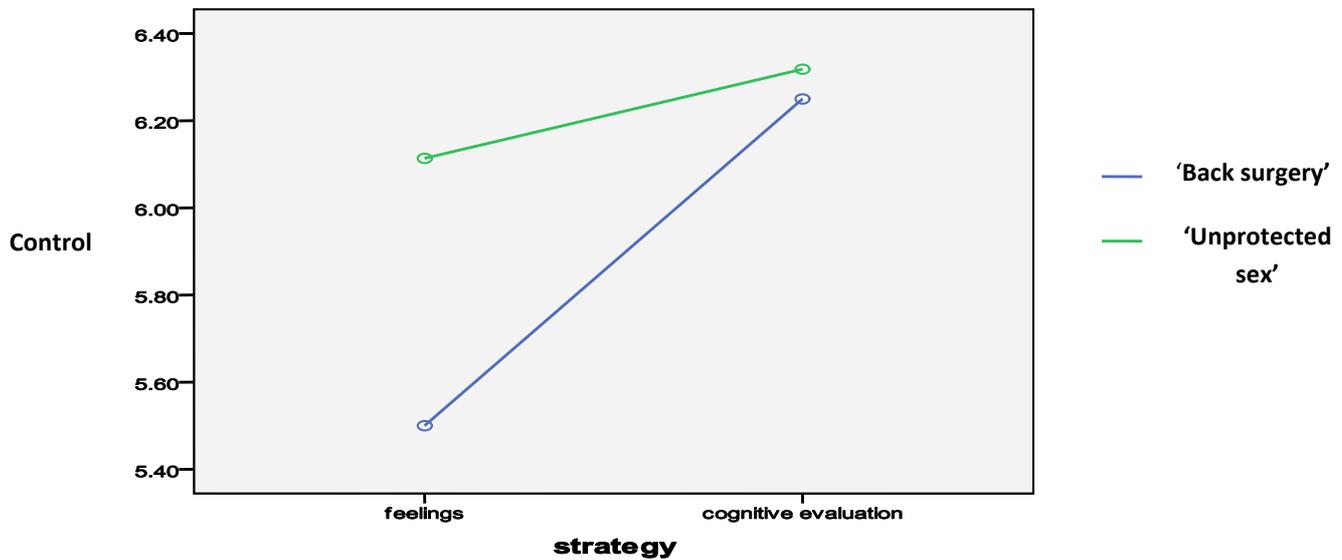


Figure 0: Graph to show interaction between decision strategy and participants control over their decision

The graph appears to demonstrate an interaction at 2 main points, the difference between feelings and cognitive evaluations in the back surgery condition, and the difference between back surgery and safe sex in the feelings condition. This interpretation was backed up by a post hoc simple main effects analysis. A simple main effect of decision strategy was found for the back surgery condition ($f(1,84)=10.7, p<0.005$). This meant that participants rated themselves as having significantly more control over their decision in the back surgery scenario than the safe sex scenario when they were focusing on their cognitive evaluations. A simple main effect of risk type was also found for the feelings based condition ($f(1,84)=10.5, p<0.005$). This meant that participants also rated themselves as having significantly less control over their decision when focusing on their feelings than focusing on their cognitive evaluations in the back surgery scenario.

A significant interaction between decision strategy and risk type was also found for participant's willingness to take their friend's opinion into account. ($f(1,84)=5.06, p<0.05$). This is illustrated in the graph below.

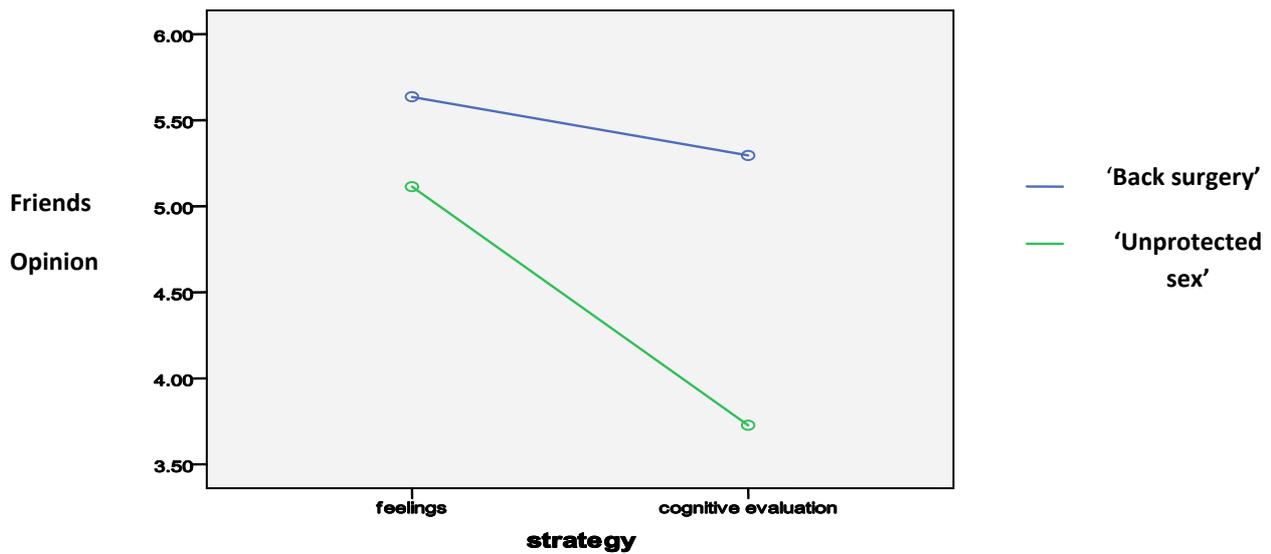


Figure 2: Graph to show interaction between decision strategy and participants willingness to take friend's opinions into account

Again the graph shows an interaction at 2 points, the difference between back surgery and unprotected sex in the cognitive evaluation condition, and the difference between feelings and cognitive evaluations in the unprotected sex condition. This was confirmed in the simple main effects analysis. A simple main effect of decision strategy was found for the safe sex condition ($f_{1,84}=11.8$, $p<0.005$). This meant that participants were significantly more likely to take their friends opinion into account in the safe sex scenario when they were focusing on their feelings. A simple main effect of risk type was also found for the cognitive evaluation condition ($f_{1,84}=2.530$, $p<0.001$). This meant that participants were significantly more likely to take their friends opinion into account when focusing on their cognitive evaluations in the back surgery scenario.

Discussion

The rationale for conducting this research was to investigate whether focusing on ones 'feelings' during decision making under risk can result in contrasting behaviours to a focus on 'cognitive evaluation'. In combination with this was an assessment of whether these decision strategies might also differ in subjective quality and on the characteristics which differentiate 'experiential' and 'analytic' systems in dual processing models.

Significant main effects for decision strategy were found for 7 out of the 20 dependant variables; however there were no significant main effects of risk and no interaction effects. Participants expressed a stronger intention to 'have sex' and 'have the surgery' (DV1) in the feelings based condition compared to those encouraged to focus on cognitive evaluations. This supports Loewenstein's 'Risk as Feelings' model which posits that due to having separate

determinants, cognitive evaluations and feelings diverge under risk, leading to potentially contrasting decisions and behaviours. However, the fact that no significant interaction was found between decision strategy and risk level cannot provide any further indication of whether this divergence may be exaggerated for high or varying types of risk. .

The second, third and fourth dependant variables were all measures of subjective decision quality. No significant main effects of decision strategy were found for any of these variables, suggesting the results cannot provide support for the notion that feelings based decisions are of a higher quality (Maglio et al 2011). Participants did not demonstrate any greater satisfaction (DV2) or confidence (DV3) with these decisions, and did not rate them as more rational (DV4). Interestingly though participants in the feelings condition did rate that their friends would be significantly more approving of the decisions (DV1) than those in the cognitive evaluation condition.

It was hypothesised that the characteristics of cognitive evaluation based decision strategies would map onto those of the ‘analytic’ system posited in dual processing models like the ‘CEST’ (Epstein 1994) or the ‘affect heuristic’ (Slovic 2003). By this logic these participants would rate their decisions as being more effortful, deliberative, conscious as well as expressing a greater intention to verbalise the decision making process. However participants in the cognitive evaluation condition did not perceive making their decisions as requiring any more effort (DV6) or deliberation (DV9). Furthermore there was no significant difference found for verbalisation. Participants did not express any greater intention to discuss this decision with another person (DV11) or desire to have someone discuss it with them (DV12). An effect was found however for conscious awareness (DV7). Participants in the cognitive evaluation condition stated that they would be significantly more conscious of the decision making process than those in the feelings condition.

In terms of the feelings based decision strategies it was predicted that characteristics of these decisions would map on to those of the ‘experiential’ systems in the same dual processing models. Participants would therefore rate their decisions as quicker, more impulsive and intuitive. While no significant difference was found for dependant variables measuring speed (DV5) or intuition (DV10), an effect was found for ratings of impulsivity (DV8). Participants in the ‘feelings’ condition stated that their decisions were more impulsive than those in the ‘cognitive evaluation’ condition.

Likewise participants rated themselves as having significantly more control over their decision (DV14) in the cognitive evaluation based condition. This finding makes theoretical sense.

Control strongly ties in with perception of changeability. If we are able to modify and manipulate something, then we can claim to have control over it. While cognitions are susceptible to change, affective states are much less malleable. This is why such effective results are found for treatments like cognitive behavioural therapy (Beck 1967). Maladaptive cognitions can be identified, challenged and substituted in a way that is simply not possible for maladaptive emotions. In everyday language we see expressions like ‘getting carried away with your emotions’, which demonstrate a curious perception expressed by many lay people that while we have control over our cognitions, our emotions control us. This can be explained by Clarke’s (1987) hierarchical model of control, in which emotions form the unconscious top level of a three tiered control hierarchy. It is superordinate to the conscious cognitive level and has a greater scope of influence over our action planning (Clarke 1987). Essentially therefore we do not feel we have control over our emotions within behavioural decision making because we are not consciously aware of their influence.

The significant interaction found between decision strategy and risk type at DV14 suggests this effect may be mediated by the nature of the risky behaviour upon which we are making our decision. Only in the back surgery scenario did focusing on cognitive evaluations appear to significantly increase participant’s perception of control relative to feelings. This may be because in situations where we are faced with an initial negative hedonic experience, we make a greater effort to block our conscious awareness of the associated unpleasant anticipatory emotions. Instead it is favourable to focus on our cognitive evaluations of the potential positive outcomes. By the same logic the safe sex scenario, a positive hedonic experience with potential negative outcomes, should be the reverse. We may attempt to bring our pleasant anticipatory emotions about having sex to conscious awareness, while avoiding cognitive evaluations on the negative consequences of doing so unsafely. In the case of back surgery therefore, being less consciously aware of our anticipatory emotions may enhance our perception of control.

Significant findings were also found for dependant variables measuring assessment of subjective norms. In the feelings based condition participants stated a greater intention to take the opinions of both their family (DV18) and their friends (DV16) into account. This is contradictory to a significant portion of the previous literature. Subjective norms make up a central component in many of the classic cognitive theories of behavioural decision making such as the ‘theory of planned behaviour’ (Ajzen 1985) or the ‘theory of reasoned action’ (Fishbein and Ajzen 1980). However the suggestion from this finding is that consideration of subjective norms may represent more of a gut feeling, than an analytical assessment.

From an anecdotal perspective this makes sense. Cultural norms, for the most part, become ingrained when we have lived in the same cultural environment for an extended period of time. It is a product of our learning, but also of our genetics. This is why it can be very difficult for foreigners to avoid making social faux pas when visiting a distant country. The same can be the case for the opinions of our friends and family. Through spending a large percentage of our time with these people we intuitively consider what they may think of any given decision and its subsequent behaviour. Possibly, like in the case of Damasio's 'somatic markers', these opinions become associated with the emotions and the bodily states we experience when they are first expressed. For example if a mother expresses disapproval at what her daughter is wearing, this may cause the daughter to experience anger and maybe an increased heart rate. After repeated association she experiences an unpleasant gut feeling when next deciding what to wear which biases her decision in one direction or the other. This occurs without any actual conscious deliberation or analysis of what her mother's opinion would be.

An interesting area for future research may be to assess this effect in relation to subjective norms at the other end of the spectrum, namely the opinions of complete strangers. By the same logic it might be expected that these considerations would be analytical in nature, because no such association has built up.

A significant interaction was also found at DV 16 between risk type and decision strategy. In the safe sex scenario a focus on feelings appeared to lead to a greater willingness to take friends opinions into account during the decision. As already mentioned the safe sex scenario represents a positive hedonic experience with potential negative outcomes. This finding might be explained by the fact that such types of risk are discussed more frequently among friends; hence these opinions are likely to have formed a strong association with emotional responses. This could also account for why the same effect was not found for the opinion of one's family. For example in the case of safe sex, having sex without a condom is probably a topic that we would feel more comfortable talking about with friends than parents. Therefore a friend's opinion expressing disapproval in such behaviour could conceivably result in the creation of a somatic marker and an unpleasant gut feeling when faced with such a decision. In the case of back surgery i.e. a negative hedonic experience with potential positive outcomes, such risk is probably discussed much less frequently with friends and therefore their opinion on the matter would not manifest in a gut feeling. This would explain the finding that focusing on cognitive evaluations in the back surgery scenario also resulted in stronger willingness to take friends opinions into account. When such opinions are limited and lacking an emotional association, we may have to consider them through conscious deliberation as opposed to intuition.

A few limitations of the research must be taken into consideration before drawing any conclusions from the findings. Firstly by using a vignette methodology this naturally decreased the generalisability of the study to a real life setting. For example imagining a situation in which you are choosing whether or not to have major surgery is never going to recreate actually being faced with that prospect. However one of the plus sides of vignettes is that, if constructed properly, it is possible to cut out many of the factors which may affect such a decision in the real world but are irrelevant to the research. The vignettes used in this study provided a short and concise description of the relevant details. The use of undergraduate students as participants presents another potential flaw in the design of the experiment. People in their late teens and early twenties are much less likely to have experience of major back surgery than for example someone in the 50+ age bracket. This could hinder their ability to imagine the consequences of having such surgery as well as the associated emotions.

In terms of statistical issues, when conducting multiple individual tests, as in this research, the chance of incorrectly rejecting the null hypothesis will always be elevated. This increased family wise error rate therefore decreases the overall power of the study and must be taken into consideration by the reader when interpreting these results.

In conclusion the research does appear to support the notion presented by Loewenstein (2001) that situations with inherent risk can cause a divergence between feelings and cognitive evaluations which has the potential to lead to contrasting behaviours. However the findings cannot shed any more light on the possibility that this divergence is mediated by risk level or type. Neither was the research able to demonstrate a replication of Maglio's (2011) finding that feelings focused decision strategies were of a higher subjective quality to cognitive evaluation focused strategies. From an external perspective however it may be that friends of the decision maker show stronger approval for feelings focused decisions.

With respect to feelings and cognitive evaluations in the context dual processing models, there was a suggestion that feelings focused decisions were more impulsive and cognitive evaluation focused decisions were more conscious. These characteristics match those of the 'rational' and 'experiential' systems respectively in Epstein's (1994) model. For the most part however the results did not show significant differences on this basis. Feelings focused decisions were not rated as any more intuitive, verbalised or rapid and neither were cognitive evaluation focused decisions rated as any more deliberate or effortful.

Participant's perception of having greater control over the cognitive evaluation focused decisions may be explained by the fact that, unlike emotions, cognitions are susceptible to

conscious modification. Again this appears to be mediated by risk type. It is suggested within this research that risk with an initial negative hedonic experience may cause people to block the associated negative anticipatory emotions from reaching conscious awareness. The end result is a heightened sense of control over the decision.

Contradictory to many classic models of behavioural decision making, assessments of subjective norms appeared more likely to take place in feelings focused decision strategies. It is posited within this research that such assessments may actually represent gut feelings, particularly when considering the opinions of friends and family. Such opinions form stronger associations with emotional responses leading to the creation of somatic markers which guide decision making. This effect was found to depend on the type of risk the decision maker is faced with, possibly because certain types of risk are discussed more frequently among friends and family. These risks are therefore more likely to form such associations.

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Appendices

Appendix 1: Cover Sheet

Information Sheet

Research Project on Decision Making

Researchers: *Alex Mott and David Clarke (supervisor)*

Contact Details: lypdam@nottingham.ac.uk

University of Nottingham

This is an invitation to take part in a research study on decision making. Before you decide if you wish to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

If you participate, you will be required to read about two brief written scenarios in which one would be required to make a decision. Then you will be presented with a series of statements and asked to rate the extent to which you agree (1= strongly disagree / 7 = strongly agree). The whole procedure will last approximately 10 - 15 minutes

Participation in this study is totally voluntary and you are under no obligation to take part. You are free to withdraw at any point before or during the study. All data collected will be kept confidential and used for research purposes only. Furthermore the results you provide will be completely anonymous.

If you have any questions or concerns please don't hesitate to ask now. We can also be contacted after your participation at the above address.

Appendix 2: Debrief Sheet

Thank you for taking in this study. Below is an abstract giving a rough outline of the aim and rationale for conducting the research

Abstract

This research investigates the hypothesis posited in the ‘Risk as Feelings model’ (Loewenstein 2001) that feelings in risk related decisions can diverge from cognitive evaluation of the same risk.. Participants received 2 vignettes describing either a low risk or high risk scenario which requires a behavioural decision. Each participant was encouraged to attend to the scenario according to their feelings or cognitive evaluations via a set of instructions and 12 items. A further 20 items were used to measure behavioural intention, subjective decision quality, assessments of subjective norms and perceived behavioural intention along with additional scales investigating the characteristics of participants decisions.

In addition to this I have included some key references below, which may be of interest if you wish to do further reading into the area.

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Appendix 3: Instructions

Cognitive evaluation

Please read the following scenario relative to your own personal attitudes and assessment of the outcomes that might derive from this situation. Then answer the extent to which you agree with the written statements below (1 = strongly disagree / 7 = strongly agree)

Feelings

Please read the following scenario relative to how you would feel and what emotions you might experience in this situation. Then answer the extent to which you agree with the written statements below (1 = strongly disagree / 7 = strongly agree)

Appendix 4: Vignettes

Low Risk

Safe Sex

'Imagine you are having a night out and you meet someone you have noticed before. You are happy when this person shows an interest in you, and you connect immediately. The rest of the evening the two of you stay together. You realise that you like this person really well. When the clubs and bars are closing, you do not want to split up, so you go home to your place. You start to get intimate. But, you do not have a condom...'

Back Surgery

'Imagine you are in the emergency unit at the hospital after having hurt your back in a fall. You are in moderate pain. The surgeon informs you that if an operation may be of help it must be carried out immediately. The operation will probably lead to severe pain for around 6 months, but in the long run, it may reduce the pain considerably. If you choose not to undergo surgery, the pain will be stabilising at the present level, probably for the rest of your life. '

High Risk

Safe Sex

Imagine you are having a night out and you meet someone you have never seen before. You are happy when this person shows an interest in you as you find them very physically attractive; however upon getting to know them better you realise you have little in common. The rest of the evening the two of you stay together. When the clubs and bars are closing, you do not want to split up, so you go home to their place. You start to get intimate but you do not have a condom....'

Back Surgery

'Imagine you are in the emergency unit at the hospital after having hurt your back in a fall. You are in severe pain. The surgeon informs you that if an operation may be of help it must be carried out immediately. If successful the operation will probably reduce the pain considerably but there is a chance of it rendering you with paralysis. If you choose not to undergo surgery, the pain will be stabilising at the present level, probably for the rest of your life.'

Appendix 5: Items (decision strategy manipulation)

Back surgery / cognitive evaluation

- 1.) It is probable this surgery will lead to pain reduction**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 2.) It is probable that after this surgery there will be setbacks in recovery.**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 3.) It is probable this surgery will lead to improved sleep**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 4.) It is probable this surgery will lead to being forced to take time off university / work.**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 5.) It is probable this surgery will lead to improved physical condition**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 6.) It is probable this surgery will lead to feelings of frustration due to slow or nonexistent recovery**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 7.) Undergoing back surgery in this situation is wise**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 8.) Undergoing back surgery in this situation is responsible**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7
- 9.) Undergoing back surgery in this situation is unnecessary**
Strongly disagree Strongly agree
- 1 2 3 4 5 6 7

10.) Undergoing back surgery in this situation is health promoting

Strongly disagree Strongly agree

1 2 3 4 5 6 7

11.) Undergoing back surgery in this situation is dangerous

Strongly disagree Strongly agree

1 2 3 4 5 6 7

12.) Undergoing back surgery in this situation is reckless

Strongly disagree Strongly agree

1 2 3 4 5 6 7

Unprotected sex / cognitive evaluation**1.) It is probable that sex in this situation will lead to unplanned pregnancy.**

Strongly disagree Strongly agree

1 2 3 4 5 6 7

2.) It is probable that sex in this situation will lead to feelings of pride

Strongly disagree Strongly agree

1 2 3 4 5 6 7

3.) It is probable that sex in this situation will lead to the contraction of a sexually transmitted disease.

Strongly disagree Strongly agree

1 2 3 4 5 6 7

4.) It is probable that sex in this situation will lead to feelings of regret

Strongly disagree Strongly agree

1 2 3 4 5 6 7

5.) It is probable that sex in this situation will lead to getting new boyfriend / girlfriend (assume you are single).

Strongly disagree Strongly agree

1 2 3 4 5 6 7

6.) It is probable that sex in this situation will lead to raised self esteem.

Strongly disagree Strongly agree

1 2 3 4 5 6 7

7.) Having sex in this situation is unwise

Strongly disagree Strongly agree

1 2 3 4 5 6 7

8.) Having sex in this situation is necessary

Strongly disagree Strongly agree

1 2 3 4 5 6 7

9.) Having sex in this situation is safe

Strongly disagree Strongly agree

1 2 3 4 5 6 7

10.) Having sex in this situation is irresponsible

Strongly disagree Strongly agree

1 2 3 4 5 6 7

11.) Having sex in this situation is health damaging

Strongly disagree Strongly agree

1 2 3 4 5 6 7

12.) Having sex in this situation is a turn on

Strongly disagree Strongly agree

1 2 3 4 5 6 7

Back surgery / Feelings**1.) I can imagine experiencing reduced pain after this surgery**

Strongly disagree Strongly agree

2 2 3 4 5 6 7

2.) I can imagine experiencing improved sleep after this surgery

Strongly disagree Strongly agree

1 2 3 4 5 6 7

3.) I can imagine feeling frustration due to slow or nonexistent recovery after this surgery

Strongly disagree Strongly agree

1 2 3 4 5 6 7

4.) I associate this kind of surgery with being forced to take time of university / work

Strongly disagree Strongly agree

1 2 3 4 5 6 7

5.) I associate this kind of surgery with setbacks in recovery

Strongly disagree Strongly agree

1 2 3 4 5 6 7

6.) I associate this kind of surgery with improved physical condition

Strongly disagree Strongly agree

1 2 3 4 5 6 7

7.) Thinking about having the back surgery in this situation makes feel anxious

Strongly disagree Strongly agree

1 2 3 4 5 6 7

8.) Thinking about having the back surgery in this situation makes me feel stressed

Strongly disagree Strongly agree

1 2 3 4 5 6 7

9.) Thinking about having the back surgery in this situation makes me sweat

Strongly disagree Strongly agree

1 2 3 4 5 6 7

10.) Thinking about having the back surgery in this situation makes me feel afraid

Strongly disagree Strongly agree

1 2 3 4 5 6 7

11.) Thinking about having the back surgery in this situation gives me butterflies

Strongly disagree Strongly agree

1 2 3 4 5 6 7

12.) Thinking about having the back surgery in this situation makes me nauseous

Strongly disagree Strongly agree

1 2 3 4 5 6 7

Unprotected Sex / Feelings**1.) I can imagine unplanned pregnancy occurring after sex in this situation**

Strongly disagree Strongly agree

2 2 3 4 5 6 7

2.) I can imagine getting a boyfriend / girlfriend after sex in this situation. (Assume you are single)

Strongly disagree Strongly agree

1 2 3 4 5 6 7

3.) I can imagine feeling regret after sex in this situation.

Strongly disagree Strongly agree

1 2 3 4 5 6 7

4.) I associate sex in this situation with contraction of sexually transmitted diseases.

Strongly disagree Strongly agree

1 2 3 4 5 6 7

5.) I associate sex in this situation with feelings of pride

Strongly disagree Strongly agree

1 2 3 4 5 6 7

6.) I associate sex in this situation with raised self esteem

Strongly disagree Strongly agree

1 2 3 4 5 6 7

7.) Thinking about having sex in this situation makes me feel anxious.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

8.) Thinking about having sex in this situation makes me sweat.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

9.) Thinking about having sex in this situation makes me feel excited

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

10.) Thinking about having sex in this situation makes me feel afraid

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

11.) Thinking about having sex in this situation gives me butterflies

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

12.) Thinking about having sex in this situation raises my heart rate

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

Appendix 6: Items (dependent variables)

13.) I would have sex/ have the back surgery in this situation

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

Relative to the answer you provided above;

14.) I would be satisfied with this decision

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

15.) I would be confident this was the right decision

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

16.) I would consider this to be a rational decision

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

28.) I would take their opinion into account

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

29.) My family would approve of this decision

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

30.) I would take their opinion into account

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

31.) I would attempt to consider all the potential obstacles of making this decision

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

32.) I would take my level of control over the situation into account when making the decision.

Strongly disagree

Strongly agree

1 2 3 4 5 6 7

Appendix 7: Hartley's F Max Results

$$F_{max} = \frac{\text{largest of within - class variances}}{\text{Smallest of within - class variances}}$$

DV's	Fmax	df	Critical value	Sig
2	4.842	4,20	3.29	p<0.01
3	4.033	4,20	3.29	p<0.05
7	3.338	4,20	3.29	p<0.05

Appendix 8: descriptive statistics

DV 1

Decision strategy	Risk level	Mean	Std error	Skewness	Kurtosis
Feelings	High	4.159	.327	-.358	-1.325
	low	4.295	.326	-.170	.357
Cognitive evaluation	High	3.477	.352	.213	-1.656
	Low	3.682	.356	.067	-1.670

DV 7

Decision strategy	Risk level	Mean	Std error	Skewness	Kurtosis
Feelings	High	5.954	.220	-1.69	2.70
	low	5.747	.206	-1.35	1.33
Cognitive evaluation	High	6.409	.143	-1.79	3.14
	Low	6.023	.204	-1.81	3.24

DV 8

Decision strategy	Risk level	Mean	Std error	Skewness	Kurtosis
Feelings	High	5.909	.252	-1.047	.225
	low	5.432	.349	-1.296	.845
Cognitive evaluation	High	6.318	.134	-.340	-.962
	Low	6.046	.194	-.666	-.186

DV 14

Decision strategy	Risk level	Risk type	Mean	Std error	Skewness	Kurtosis
Feelings	High	Safe sex	6.000	.237	-.684	-.917
		Back surgery	5.000	.322	-.637	-.423
	low	Safe sex	6.227	.173	-.460	-1.310
		Back surgery	6.000	.237	-1.369	1.565
Cognitive evaluation	High	Safe sex	6.227	.197	-.897	-.185
		Back surgery	6.455	.143	-.860	-.242
	Low	Safe sex	6.409	.142	-.699	-.429
		Back surgery	6.091	.173	-.764	.640

DV 15

Decision strategy	Risk level	Mean	Std error	Skewness	Kurtosis
Feelings	High	5.591	.224	-.812	-.264
	low	5.682	.171	-1.13	1.583
Cognitive evaluation	High	5.182	.235	-.548	-.275
	Low	4.977	.238	-.557	-.203

DV 16

Decision strategy	Risk level	Risk type	Mean	Std error	Skewness	Kurtosis
Feelings	High	Safe sex	5.455	.307	-1.431	3.050
		Back surgery	5.591	.269	-.697	-.273
	low	Safe sex	4.773	.426	-.640	-.785
		Back surgery	5.682	.266	-.941	.119
Cognitive evaluation	High	Safe sex	3.500	.473	.416	-1.398
		Back surgery	5.091	.366	-1.150	1.284
	Low	Safe sex	3.955	.386	.444	-1.121
		Back surgery	5.500	.269	-.468	-.507

DV 18

Decision strategy	Risk level	Mean	Std error	Skewness	Kurtosis
Feelings	High	5.910	.246	-1.513	1.818
	low	5.401	.274	-1.178	.462
Cognitive evaluation	High	4.773	.315	-.677	-.868
	Low	5.182	.280	-.733	-.754

Appendix 9: ANOVA summary tables**DV 1**

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	6.821	1	6.821	6.236	.014
B (risk level)	1.026	1	1.026	.938	.336
AB	1.253	1	1.253	1.145	.288
Error	91.875	84	1.094		

DV 7

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	5.753	1	5.753	4.364	.040
B (risk level)	3.094	1	3.094	2.337	.130
AB	.230	1	.230	.174	.678
Error	111.193	84	1.324		

DV 8

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	6.276	1	6.276	4.712	.033
B (risk level)	.639	1	.639	.480	.490
AB	.639	1	.639	.480	.490
Error	111.875	84	1.332		

DV 14

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	2.909	1	2.909	4.228	.043
B (risk level)	2.909	1	2.909	4.228	.043
C (risk type)	5.114	1	5.114	6.513	.013
AB	1.375	1	1.375	1.998	.161
AC	3.273	1	3.273	4.168	.044
BC	.205	1	.205	.261	.611
ABC	3.682	1	3.682	2.928	.091
Error	69.955	84	.785		

Simple Main Effects for Selected Factors DV14

	Source of Variation	Sum of Squares	df	Mean Squares	F	P
Decision strategy at	Unprotected sex	38.192	1	38.192	10.701	.002
Error term		299.773	84	3.569		
Risk type at	Feelings	8.283	1	8.283	10.551	.002
Error term		69.955	84	.785		

DV 15

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	8.284	1	8.284	6.589	.012
B (risk level)	3.682	1	3.682	2.928	.091
AB	1.636	1	1.636	1.301	.257
Error	105.614	84	1.257		

DV 16

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	13.920	1	13.920	8.378	.005
B (risk level)	.409	1	.409	.246	.621
C (risk type)	48.091	1	48.091	20.240	.000
AB	3.862	1	3.862	2.216	.140
AC	12.023	1	12.023	5.060	.027
BC	1.455	1	1.455	.612	.436
ABC	1.841	1	1.841	.775	.381
Error	199.591	84	2.376		

Simple Main Effects for Selected Factors DV 16

	Source of Variation	Sum of Squares	df	Mean Squares	F	P
Decision strategy at	Unprotected sex	42.284	1	42.284	11.849	.001
Error term		299.773	84	3.569		
Risk type at	Cognitive evaluation	54.101	1	54.101	22.770	.000
Error term		199.591	84	2.376		

DV 18

Source of variation	Sum of squares	df	Mean Squares	F	P
A (strategy)	6.545	1	6.545	4.040	.048
B (risk level)	.182	1	.182	.112	.738
AB	1.136	1	1.136	.701	.405
Error	136.091	84	1.620		