Direct and indirect effects of mood on risk decision making in safety-critical workers

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Abstract

The study aimed to examine the direct influence of specific moods (fatigue, anxiety, happiness) on risk in safety-critical decision making. It further aimed to explore indirect effects, specifically, the potential mediating effects of information processing assessed using a goodness-of-simulation task. Trait fatigue and anxiety were associated with an increase in risk taking on the Safety-Critical Personal Risk Inventory (S-CPRI), however the effect of fatigue was partialled out by anxiety. Trait happiness, in contrast was related to less risky decision making. Findings concerning the ability to simulate suggest that better simulators made less risky decisions. Anxious workers were generally less able to simulate. It is suggested that in this safety-critical environment happiness had a direct effect on risk decision making while the effect of trait anxiety was mediated by goodness-of-simulation.

Keywords: Affect; emotion; anxiety; happiness; fatigue; cognition; risk; judgment; simulation

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According to the UK Health and Safety Executive (HSE) 09/10 statistics, fatal injury rates have shown a downward trend in recent years (152 deaths in 09/10), possibly reflecting the increased focus on improving the work environment and safety culture of high-risk industries. Despite this, according to the same statistics, non-fatal injuries remain a frequent occurrence in the workplace (233,000 reportable injuries according to the Labour Force Survey). There is a need to examine the factors that predict these continuing problems.

Risk decision making has been defined as 'the process of making choices with potential for either positive or negative outcomes' (Maner, Richey, Cromer, Mallott, Lejuez, Joiner, & Schmidt, 2007, p. 665). A safety-critical example of this would be for a maintenance engineer to choose to use a fast, but potentially unsafe method to complete a task rather than a slower, safer alternative. The fast method may result in a positive outcome (i.e. the job is completed more quickly) but there is a risk that safety could be compromised (resulting in a negative outcome). Laboratory research conducted by Isen and her colleagues (Arkes, Herren, & Isen 1988; Isen, Nygren, & Ashby, 1988; Isen & Patrick, 1983; Kahn & Isen, 1993) suggests there is a complex relationship between affect and risk. In some circumstances positive affective states seem to promote risk taking whereas in others positive affective states seem to promote risk aversion. Findings for negative affect are also mixed. Some studies have found an increase in risky decision making related to negative affect (e.g. Leith & Baumeister, 1996; Mano, 1992), whereas other studies have found that negative states lead to less risky, more self-protective behaviour (e.g. Forgas, 1995; Martin, Ward, Achee, & Wyer, 1993).

A number of limitations to previous work in this field may account for the equivocal findings. Firstly, a feature common to much of this research is the artificial manipulation of participant 'emotion' (defined as brief, context specific, and focused on a particular cause or intentional object, Keltner & Lerner, 2010). Until recently, there have been very few systematic studies of risk taking behavior where 'mood' (defined as longer lasting than emotion, less focused on a particular cause, and less context bound, Keltner & Lerner, 2010) is a consequence of participants' natural environment (cf. Hockey, Maule, Clough, & Bdzola, 2000) rather than induced experimentally. This selective focus has ensured that the effects of incidental affect remain unclear. This situation has been further complicated because recent mood-risk studies have chosen to use the terms mood and emotion interchangeably (e.g. Lerner & Keltner, 2001), despite the existence of a definitional distinction. The bias towards the study of induced emotion effects has also been compounded by a research focus on temporary states with little examination of the role of dispositional affect (traits[3]).

Secondly, much of the existing work has measured risk appraisal variables such as risk perception rather than risk taking, or risk decision making per se. For instance, one of the most widely used tasks in risk research is Johnson and Tversky's (1983) Perception of Risk Questionnaire, which asks participants to estimated the annual number of deaths in the US as a consequence of a series of 12 events including brain cancer, strokes, floods etc. Studies that have assessed personal risk behaviour have generally used gambling or lottery tasks as a means of defining rational behaviour. Hockey et al. (2000) suggested that these types of tasks "may have

[3] Loewenstein and Lerner (2003) provide an important distinction between affective trait (dispositional) and affective state (situational): "Whereas situational affect involves a transient reaction to specific events, dispositional affect represents a tendency to react in a particular affective way to a variety of events across time and situations" (p. 632).

only limited relevance to everyday choices, which normally have to be made in the face of uncertainty and ambiguity" (p. 826).

A third criticism of research on the role of affect in decision making is that it has taken a so-called "valence-based" approach (Lerner & Keltner, 2001). This involves the investigation of positive affective vs. negative affective influences, rather than the effect of specific emotions or moods such as anxiety, anger, and happiness. Recent research findings suggest that specific emotions or moods previously categorised as negative, such as anxiety and anger, can have a differential effect on risk behaviour, thus suggesting that the valence-based approach may be too indiscriminate (Lerner & Keltner, 2001).

In an attempt to explain the apparent superior predictive power of specific emotion or mood, researchers have begun to postulate on the potential mechanisms responsible for their effects. According to Loewenstein and Lerner (2003), emotions influence decision making in two ways: Indirect effects are those mediated by changes in expected emotions or changes in the quality and/or quantity of information processing. For example, anxious states can bias selective attention towards the negative elements of a decision scenario (see Mathews & MacLeod, 1994). In contrast, direct effects are not mediated by changes in expected emotions or in cognitive processing. For example, people in intensely angry states often rely on more automatic forms of reasoning (see Bodenhausen, Kramer, & Süsser, 1994), with little, or no consideration of how they may feel later (see Loewenstein, 1996). Consequently, a fourth limitation of existing research is that, despite this distinction between indirect and direct effects, few studies have looked at changes in information processing as a mediating mechanism, and those that have, have been largely confined to the study of social judgments rather than risk-related decision making (e.g., Bless, Schwarz, Clore, Golisano, & Rabe, 1996; Bodenhausen, Kramer, & Süsser, 1994; Bodenhausen, Sheppard, & Kramer, 1994; Forgas, 1998; Lerner & Tiedens, 2006; Tiedens & Linton, 2001).

Finally, one explanation for equivocal research findings on the effect of affect on risk decision making is that the nature of this relationship may be situation specific, or at least domain specific (see Gambetti & Giusberti, 2009). When discussing the finding that dispositional anxiety is associated with risk averse behaviour (on the Balloon Analogue Risk Task and the Risk-Taking Behaviours Scale), Maner et al. (2007) state that "theories addressing the link between decision making biases and individual differences in affective processing should be sensitive to both [the] generality, as well as domain-specificity, of these biases" (p. 673).

A few studies have redressed some, but not all, of these limitations. For example, Lerner and Keltner (2001) looked at the effect of specific, experimentally induced (state), and naturally occurring 'emotions' (trait), on risk perception and risk choice, using an *appraisal tendency framework (ATF*; Lerner & Keltner, 2000*)*. The underlying principle of the ATF is that each discrete emotion can be defined along a cognitive appraisal dimension, which sets it apart from other similarly valenced moods. For example, certainty and control are the central dimensions that distinguish anger and happiness from fear. Lerner and Keltner (2000) argue that it is the effect of specific emotion on appraisal tendencies that accounts for the differing effects on decision making and behaviour. For example, Lerner and Keltner (2001) found that anger and fear had opposite effects on risk. Whereas fearful participants exhibited pessimistic risk estimates and risk-averse choices, the risk estimates of angry individuals were more optimistic and their choices more risky. Trait happiness was also found to increase optimism to a similar extent as anger. Consistent with their appraisal-tendency framework, Lerner and Keltner (2001) also found that appraisals of certainty and control moderated and, in the case of control, also mediated the emotion effects. Lerner and Keltner's (2001) study demonstrates the need to study specific emotion and mood effects on risk as well as the importance of considering changes in information processing as a mechanism for changes in risk behaviour. However, the ability to generalise the findings beyond the study participants may be limited due to a reliance on an undergraduate student sample.

Although Hockey et al. (2000) also utilized student samples in two of their three reported studies, an attempt was made to preserve the ecological validity of their research findings by testing the effect of anxiety and depression on risk choice using an adaptation of a hypothetical scenario method used by Kogan and Wallach (1964) and Pietromonaco and Rook (1987). Participants were asked to imagine themselves in a variety of commonplace situations, such as arriving at a train station, and then decide on their likely course of action between two alternatives. One available option was risky, such as taking a fast but unreliable express train, while the other was more cautious, in this case taking the slower but reliable local train. In the same series of studies, Hockey et al. (2000) also investigated the effect of fatigue on risk in everyday decision making. Of the three naturally occurring negative moods (anxiety, depression and fatigue), only fatigue was significantly related to changes in risk taking. The more fatigued participants were, the greater was their preference for the risky option.

In an effort to generalise their results further, in the last of their reported studies, Hockey et al. (2000) assessed the effect of experimentally induced fatigue on the risky decision making of management trainees from a large chemical engineering company, using the same everyday risk task. Again, increased fatigue was associated with greater riskiness. The applied nature of this study signals an important move away from previous laboratory-based research. However, the ecological validity of these findings could have been further improved by assessing the effect of mood on hypothetical risk choices specific to the workplace, rather those involving everyday risk.

The current research attempts to overcome some of the limitations of previous work on mood and risk by taking place in the field (rather than laboratory) and assessing the indirect as well as the direct effects of specific (rather than valence-based) mood (rather than induced emotion) on risk decision making (rather than risk appraisal) in the specific domain of safety-critical work (rather than in general).

Specifically, the current research was designed to assess the direct influence of three forms of affect thought to be important in high-risk workplaces: *Fatigue.* Research on stress and human performance suggests that decision making under intense workload and/or time pressure is characterised by reduced mental effort and the use of shortcuts in information processing (Hockey, 1997; Maule & Hockey, 1993; Hockey et al., 2000). *Anxiety*. There has been a focus on the study of anxiety and risk appraisal and risk taking in the laboratory, but to our knowledge there have been no applied studies. In a domain-specific safety-critical environment, where risk or uncertainty may be more prevalent, the influence of anxiety on risk decision making may be quantitatively or qualitatively different (Maner et al., 2007). *Happiness*. Research suggests that it is in an organisation’s interest to maintain or increase employee physical and psychological well-being. For example, happy employees generally perform better than unhappy colleagues (e.g. Patterson, Warr, & West, 2004: Tsai, Chen, & Liu, 2007; Wright & Staw, 1999). The paradox, however, is that laboratory-based research suggests that happy people are often the most likely to take risks (e.g. Lerner & Keltner, 2001[4]).

In addition to the direct influence of these emotions on risk decision making, the present research sought to examine the potential mediating effect of changes in the nature of information processing. As this is the first study of its kind the method of measuring information processing was borrowed from the clinical research methodology used to examine the relationship between emotion and heuristic processing, specifically the use of the simulation heuristic. According to the simulation heuristic, judgements are based on the construction and running of a mental simulation of the situation of interest. It is thought that lucid simulations that 'run' easily lead to a greater subjective probability for the specific outcome in question (Kahneman & Tversky, 1982). In previous work, subjective probability judgements have been used as an indicator of risk appraisal (e.g. Lerner & Keltner, 2001).

In his Affect Infusion Model, Forgas (1995) states that heuristic and substantive processing are the most susceptible to the influences of affect. However, there is relatively little evidence available currently to support this assertion. The methodological problems associated with the measurement of heuristics in general, and mental simulation in particular, may contribute to this. Brown, MacLeod, Tata, and Goddard (2002) sought to capture the constructive, scenario building aspect of the simulation heuristic and examine its role in worry about, and subjective probability judgements of, future outcomes. They recruited women who were pregnant for the first time and asked them to simulate going into labor and arriving at the hospital on time (the desired outcome). The resulting response protocols were rated by the researchers for ''goodness-of-

[4] Lerner and Keltner (2001) also looked at the effects of anger on general risk. Anger was not included in the present study. The focus here is on specific safety-critical risk. Anger is not

simulation'' in terms of the simulation heuristic. The findings suggested that goodness-of-simulation increased the subjective probability judgments of a positive outcome and decreased worry. However, because subjective probability judgments are essentially risk appraisals, an alternative interpretation of the findings is that goodness-of-simulation decreased the perception of risk and decreased worry. Although ostensibly different in design, the present applied study used a similar measure of GOS in an attempt to further explore these relationships. Specifically, whether mood (fatigue, anxiety, happiness) affects risk decision making and whether any relationship is mediated by goodness-of-simulation.

In addition to the exploration of these relationships the present study utilized a between-groups experimental design in order to test whether, irrespective of the nature of information processing in the form of simulation quality, simply asking engineers to simulate would affect risk decision making. The opportunity to adopt an experimental strategy in an applied research is rare, and thus the rationale for the inclusion of such a hypothesis in the present study lies in the potential practical implications of the findings.

Hypotheses

We made five distinct hypotheses:

1. Specific trait and state mood namely anxiety, fatigue, and happiness will be associated with:

   (a) the riskiness of safety-critical decision making.

   (b) differences in the nature of decision-related information processing operationalised via ratings of 'goodness-of-simulation'.

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thought to be pertinent in our safety-critical population, or others.

2. There will be a difference in the riskiness of safety-critical decision making between the participants asked to simulate and the control group.
3. Ratings of goodness-of-simulation will be related to the riskiness of safety-critical decision making.
4. Ratings of goodness-of-simulation will mediate the relationship between specific trait and/or state mood, and the riskiness of safety-critical decision making.

Method

Participants and Design

The study was given ethical approval by the Internal Review Board of the first author's institution. The safety-critical population consisted of maintenance engineers from a UK train company. These engineers are responsible for the scheduled maintenance of rolling stock. They work a variety of rotating or permanent shift patterns covering days and nights. Their role requires them to undertake a range of work tasks, from the operation of heavy machinery such as the bogie drop, to manual dexterity tasks such as replacing worn bolts and washers. Accident statistics for these engineers indicate that the risks they negotiate are similar to those in other safety-critical work. The most common and minor injuries are the result of slips, trips, or falls, manual handling problems or errors, striking a stationary object or being struck by a moving object, or contact with a sharp object. While very rare, more serious injuries have occurred as a result of electric shocks, falls from height, heat burns, or becoming trapped between moving parts. On inspection of accident logs and incident reports it is evident that many of the negative outcomes described above are the consequence of risky decision choices. For example, in one incident three engineers escaped serious injury while checking train wheel ovality. A fourth engineer, located in the train cab, and unaware of the presence of his colleagues, made the decision to apply traction during a brake test rather than referring to his safety handbook for guidance. If the engineer had chosen to refer to the safety precautions contained in his handbook (e.g. to check the depot protection system to ensure no one is working under the train), then the incident would not have occurred.

A total of 43 maintenance engineers (42 males and 1 female, age range 16 - 64) were recruited to take part in the study. Participants were randomly assigned to one of two conditions, the cued to simulate group (experimental group, n = 21) or the not cued to simulate group (control group, n = 22). The experimental group was asked to write down their thoughts when completing the Safety Critical Personal Risk Inventory (S-C PRI). The control group made decisions on the S-C PRI without providing a written account.

Materials

Risk behaviour measure (S-C PRI). Risk behaviour was assessed using an adaptation of the Personal Risk Inventory (PRI; Hockey et al., 2000). The S-C PRI (Safety-Critical Personal Risk Inventory) was developed for the current study in collaboration with engineering experts from the train company. Accident statistics, logs, participant observation and safety-critical expert knowledge were used to compile 22 possible scenarios. The purpose of the S-C PRI was not to measure the engineers' technical knowledge but their risk taking behaviour in specific work situations. When developing the S-CPRI scenarios it was important to ensure that the level of detail in the scenario was not sufficient to promote a technical evaluation of the situation but provide hypothetical situations in which decision making may be subject to affective influence.

The final S-C PRI consisted of a set of 4 safety-critical hypothetical scenarios with the choice of two possible courses of action (A or B) for each. In order to control for any confounding effects of scenario framing the four different problems were balanced in terms of outcome valence (2 x positive and 2 x negative) crossed with effort (2 x high and 2 x low). The valence of the outcome was not made explicit but implied by the positive or negative framing of the scenario information (for examples, see below). The scenario design process was tested by asking three independent experts to rate several characteristics of each scenario. Firstly, these experts judged the two possible courses of action for each scenario, and consistently identified one option as "risky" and one as "safe". They were also asked to judge each scenario in terms of the effort required to implement either of the two possible actions using a five-point scale with end points labelled "a great deal of effort" and "very little effort". They were also asked to rate how positive an outcome would be for each scenario. The findings showed that the positively framed problems were associated with ratings of likely outcomes in the neutral to positive range of the scale whereas negatively framed problems were in the neutral to negative range of the scale. In addition, the perceived effort associated with implementing the safe action was rated as higher for high effort scenarios, and effort was rated as higher for the risky option in the low effort scenarios.

Two examples of scenarios from the S-CPRI are shown below. In the first, choosing the safe option has a greater effort or cost, (in terms of both time and physical work), and is positively valenced. In the second example, perceived effort was rated as higher (by the three independent expert raters) for the risky option and is negatively valenced. The risky choice is shown by an asterisk in both cases:

"You are nearing the successful completion of a job, while operating the earth switch you are attempting to move it back to the original position. You think that applying extra pressure will do the trick, but a sudden movement may result in injury. You need to decide… What will you do? (A) Apply more pressure* (B) Find a tool to assist you".

"You need to do some work under the train and have been told to wear a bump cap as there have been several occurrences of people banging their heads. You know that there are some difficulties involved with wearing these as they often get knocked off, thus causing further inconvenience. You need to decide… What will you do? (A) Wear the bump cap (B) Not wear the bump cap*".

To provide a graded measure of *riskiness*, rather than a dichotomous index of risk choices, respondents were asked to indicate their strength of preference towards either of the two options on a 10-point scale (from ''definitely A'' to ''definitely B''). Riskiness was scored by averaging across the items in the set (after reverse-scoring in cases where choice A was the risky one), so that higher values of riskiness refer to an increased endorsement of the risky alternative.

Trait fatigue measure. Stable mood was assessed using the Multidimensional Fatigue Inventory (MFI-20 Smets, Garssen, Bonke, & Dehaes, 1995). The MFI-20 is a 20-item scale that includes five dimensions of fatigue: general fatigue (GF), physical fatigue (PF), reduced activity (RA), reduced motivation (RM), and mental fatigue (MF). Participants indicate on a 5-point scale the extent to which they agree with the twenty statements presented (yes, that is true - no, that is not true). Participants are asked to report how they "have been feeling lately." In the present study the reliabilities of the sub-scales were acceptable (GF, $\alpha = .76$; PF, $\alpha = .76$; RA, $\alpha = .67$, RM, $\alpha = .61$; MF, $\alpha = .82$).

Trait anxiety measure. The trait version of the State Trait Anxiety Inventory (STAI: Spielberger, 1983) is a 20-item scale which assesses the frequency in which participants experience anxious feelings (e.g. are "nervous", "restless", or "feel like a failure"). Participants respond on a 4-point scale ranging from 1-almost never to 4-almost always. The scale was reliable ($\alpha = .92$).

Trait happiness measure. Lerner and Keltner's (2001) abbreviated version of Underwood and Froming's (1980) mood survey was used to assess trait happiness. The measure consists of six items designed to assess the chronic tendency to feel happy (e.g. "I consider myself a happy person"). A four-point scale was used ranging from 1 (*almost never*) to 4 (*almost always*). The scale also achieved a reasonable level of reliability (α =. 81).

State-mood measurement. Lerner and Keltner's (2001) adapted version of the Emotional Arousal Questionnaire (see Goldberg, Lerner, & Tetlock, 1999) asks participants to rate the extent to which they are currently feeling each of 16 separate affective states (*amused*, *angry, anxious, disgusted, downhearted, engaged, fearful, frustrated, happy, joyful, interested, irritated, nervous, mad, repulsed*, and *sad*. The response scale ranges from (1) "do not feel even the slightest bit" to (8) "most you have ever felt in your life". The items were presented in alphabetical order so as not to indicate the research interest in any single mood. In previous administrations of the measure a composite index of state fear (or anxiety) has been obtained by averaging responses for the *fear*, *anxiety*, and *nervous* items. This was repeated for the present study and the state fear scale was reliable (α = .81). A composite measure of state happiness was formed by combining the items *amused*, *happy*, and *joyful*. Again the internal reliability was acceptable (α = .78). To assess state fatigue, four adjectives were added to the 16 listed above in keeping with the alphabetical order. The four items formed the composite state fatigue index originally used by Hockey et al. (2000). The four items were *alert*, *energetic*, *fatigued*, and *tired*. In the present study these items also had a reasonable scale reliability (α = .81).

Procedure

To ensure that disruption to normal working was minimised and that data collection was spread over the shift, an attempt was made to recruit two participants per hour on shift. Workers were recruited via team leaders and randomly assigned to either the cued to simulate group (experimental) or the not cued to simulate group (control). The participants were then asked to read and complete the test booklet. The test booklet began by asking participants to complete items concerning biographical details, and their most recent work activity. Participants were then asked to complete the trait mood measures; the MFI-20, the STAI, and the trait happiness scale. Participants were then asked to rate their present feelings by indicating how they felt in response to the 20 items of the adapted Emotional Arousal Questionnaire (described above). Participants were then given a brief written introduction to the S-CPRI. Participants were reminded that they should imagine themselves in the various situations represented in the scenarios. They were provided with one example of a hypothetical scenario, emphasising the role-playing aspect of the task, and the correct use of the rating scales. The instructions for the two conditions differed only slightly. For the experimental group (cued to simulate) participants were asked to write down their thoughts and feelings on each scenario as they read the decision problem, and then make a decision. Participants who completed the control test booklet (not cued to simulate) were asked to read the decision problem and then make a decision. Finally, all participants were asked to rate their state mood on the adapted Emotional Arousal Questionnaire once more, and then were debriefed and thanked for their participation.

Goodness-of-Simulation Coding

To test hypotheses regarding the goodness-of simulation, 2 independent academics were recruited as raters in order to assess the quality of participants' written protocols. The method used to operationalise the simulation heuristic was a revision of the method used by Brown et al. (2002). 'Goodness-of-simulation' (GOS) was measured on 7 dimensions: *logical sequence* (the extent to which successive elements of the simulation are connected logically, with each step following from the previous one), *temporal order* (the extent to which temporal ordering is communicated explicitly (‘‘then . . . ’’, ‘‘until . . . ’’) or clearly implied so that a sense of temporal flow is established), *sensitivity to contingency* (the extent to which the author shows an awareness of alternative possibilities at various points in the simulation), *minimisation of uncertainty* (the extent to which the simulation either increases or decreases a sense of uncertainty), *coverage of problem space* (the extent to which the simulation gives a comprehensive account of all of the basic elements of the situation), *flows smoothly* (a subjective judgment on the part of the rater of how well the simulation flows), and *time allocation* (the extent to which the respondent communicates an awareness of and responsiveness to time constraints). Expanded definitions of the rating criteria used in the present study are provided in Appendix A. An example of one engineer’s written simulation protocol is provided in Appendix B.

Inter-rater reliability. Two raters made blind ratings of 72 simulations (4 simulations x 18 experimental participants[5]) on the seven GOS dimensions using a 5-point scale. During the analysis of inter-rater reliability it was evident that there was a large discrepancy between raters’ ratings of *time allocation*. (The inter-rater correlation for this dimension was .25, so this dimension was excluded from further analysis.)

The inter-rater reliability data for the remaining dimensions are provided in Table 1. Exact agreement between raters ranged from 32% to 46%, agreement within one rating point ranged from 76% to 85%, and inter-rater correlations ranged from .63 to .74. (*Sensitivity to contingency* had the lowest reliability and *logical sequence* had the highest.) Reliability was clearly adequate

[5] Three participants failed to provide a written account of their thoughts and feelings, reducing the effective sample of participant data to 18.

for all dimensions. When ratings differed by more that 1 point, a standard procedure (employed by Brown et al., 2002) was followed. Firstly the two raters discussed each of these ratings, and when a consensus could be reached, ratings were adjusted so that they differed by 1 point at most. If no consensus could be reached, a third rater arbitrated and provided a third rating. The final set of ratings consisted of the agreed set of ratings, and an average of any disputed ratings.

The GOS dimension intercorrelations are shown in Table 2. These variables, for the most part, are highly correlated, and consequently, all had reasonably high loadings on the first, and only principal component extracted from the correlation matrix with an eigenvalue of at least 1 (3.73). Because the individual dimensions appeared to measure a single component, dimension ratings were aggregated to form a composite measure of goodness-of-simulation.

Results

Simple Correlations and Multiple Regressions

To test hypothesis 1a, that trait and state mood would be associated with the riskiness of safety-critical decision making, riskiness scores for the whole sample were correlated with trait and state anxiety, fatigue, and happiness (All correlations are shown in Table 3.). Greater riskiness was associated with more trait anxiety, and trait mental fatigue (but not with the other trait fatigue dimensions on the MFI), and less trait and state happiness. No significant relationships were found between state anxiety or fatigue and risk. Multiple regression analyses were used to further examine the combined and unique effects of specific state and trait moods. Firstly, risk decision making was simultaneously regressed on trait anxiety and trait mental fatigue. Together the two trait moods accounted for 22% of the variance in risk decision making, $F(2, 40) = 6.95$, $p = .003$, however only trait anxiety contributed significant additional variance to the regression equation, $\beta = .39$, $t(42) = 2.41$, $p = .02$. In a second regression analysis risk decision making was simultaneously regressed on trait happiness and state happiness. Together they accounted for 15% of the variance in risk decision making, $F(2, 40) = 4.72$, $p = .01$, but only trait happiness contributed significant additional variance, $\beta = -.40$, $t(42) = 2.48$, $p = .02$.

To further test hypothesis 1a the mood-risk correlations were repeated for the control group and the cued to simulate group separately. For the control group, neither trait nor state anxiety or fatigue were significantly correlated with risk decision making, while both trait and state happiness had a seemingly direct effect on risk (see Table 4.). The predictive validity of control group happiness was tested with multiple regression. Together state and trait happiness accounted for 24% of the variance in risk decision making, $F(2, 19) = 4.29$, $p = .03$, although once again only trait happiness contributed significant additional variance, $\beta = -.52$, $t(21) = 2.14$, $p = .046$.

For the cued to simulate group, the relationship between trait happiness and risk was statistically non-significant. Also, there were no significant associations between state anxiety, fatigue, or happiness, and risk decision making on the S-CPRI. There were, however, significant positive correlations for both trait anxiety and mental fatigue on the MFI, and risk (All correlations can be seen in Table 5). Again, risk decision making was simultaneously regressed on trait anxiety and trait mental fatigue. Together they accounted for 33% of the variance in risk, $F(2, 18) = 5.92$, $p = .01$, however only trait anxiety added unique variance to the regression equation, $\beta = .56$, $t(20) = 2.46$, $p = .02$.

Trait and state mood were then correlated with mean ratings of goodness-of-simulation for the cued to simulate group to test hypothesis 1b. Table 5 shows these correlations. Trait anxiety on the STAI was found to correlate with the mean goodness-of-simulation rating of the six goodness-of-simulation dimensions, across all S-CPRI scenarios, in that the higher the trait anxiety score the lower the ratings of GOS. None of the MFI trait fatigue dimensions was significantly correlated with mean GOS, suggesting that dispositional fatigue did not affect the workers' ability to simulate. There was no significant relationship between trait happiness scores and ratings of goodness-of-simulation. State mood measured immediately prior to the completion of the S-CPRI was then correlated with goodness-of-simulation. Happiness was found to be the only specific momentary mood related to mean GOS. Higher scores on the state happiness scale were associated with higher mean goodness-of-simulation ratings which suggests that the happier the workers were at the time of testing the better their mental simulation. State anxiety and state fatigue were not significantly correlated with mean GOS.

To assess hypothesis 3, that ratings of goodness-of-simulation were related to the riskiness of safety-critical decision making, mean GOS was correlated with riskiness scores. Higher mean GOS ratings were related to lower risk scores on the S-CPRI (see Table 5.).

Effect of the Experimental Manipulation

Success of the randomization procedure was checked using MANOVA. *Condition*, with two levels (not cued to simulate versus cued to simulate) was the independent variable and age, gender, and marital status the dependent variables. The omnibus test, $F(3, 39) = 0.43$, $p = .74$, and all the univariate tests were nonsignificant meaning that randomization to condition appears to have been successful.

Hypothesis two was tested using a one-way ANOVA, which revealed no effect of the cue to simulate on risk decision making, $F(1, 41) = .10$, $p = .76$. The mean riskiness score for participants who were asked to write down their thoughts and feelings before making a decision on the S-CPRI (cued to simulate; $M = 3.85$, $SD = 2.44$) was not significantly different to the mean riskiness score for those that did not (not cued to simulate; M = 3.63, SD = 2.19). To test for any effects of the manipulation on mood state, a series of three ANCOVAs were conducted, with group as the independent variable (cued to simulate vs. not cued to simulate), post-S-CPRI state mood entered as the dependent variable, and pre-S-CPRI entered as a covariate. There were no significant effects of the manipulation on any of the three mood states; anxiety, fatigue, or happiness (all *p*’s > .14).

Mediation Analysis

Finally, hypothesis 4, that ratings of goodness-of-simulation will mediate the relationship between specific mood, and the riskiness of safety-critical decision making, was tested. As Table 5 shows, only mean GOS could be considered a potential mediator of the relationship between trait anxiety and risk. Specifically, it appears participants with higher trait anxiety had lower mean GOS, and participants with lower mean GOS made riskier decisions.

A simple mediation analysis was conducted with trait anxiety as the independent variable, risk decision making as the dependent variable, and mean GOS served as the potential mediator. Considering the problems associated with the Sobel (1982) test (Baron & Kenny, 1986) when using small samples, Preacher and Hayes’ bootstrapping method with bias-corrected and accelerated confidence intervals was used in order to test the mediation hypothesis (see MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004). Bootstrapping involves resampling random subsets of data in order to gain a non-parametric approximation of the sampling distribution of the product of the mood-mean GOS and mean GOS-risk paths. Because the sample size was small in the present study the analyses presented here are based on 20,000 resamples, the maximum available using the Statistical Package for Social Sciences (SPSS) script for simple mediation (Preacher & Hayes, 2004). The analysis revealed that GOS mean (95% *CI* = .81, 4.83, *estimate* = 2.46) significantly ($p < .05$) mediated the effect of trait anxiety on risk decision making (Figure 1.). The model accounted for 65% of the variance in riskiness, $F(2, 13) = 15.11$, $p = .0004$.

Discussion

In testing four hypotheses the current study sought to examine the direct and indirect influences of specific trait and state mood on risk in safety-critical decision making. Hypothesis 1a concerned the effects of stable and momentary mood on the riskiness of decision making on the S-CPRI. Simple correlations revealed several medium strength (according to Cohen, 1988) mood-risk relationships for the whole sample. While trait mental fatigue and trait anxiety were both positively correlated with riskiness, happier workers (generally, and at the time of testing) were more risk averse. Happy workers in the control group were also less risky (with medium to large effect sizes), but there were no effects of fatigue or anxiety. For those workers cued to simulate there were medium to large positive relationships between trait anxiety and risk, and trait mental fatigue and risk, but happiness did not correlate with riskiness.

The remaining hypotheses refer to the possible indirect effects of information processing on the mood-risk relationship. Although there was no significant main effect of the experimental manipulation (i.e., whether participants were cued to simulate or not) on risk or mood, the results concerning experimental group GOS ratings support the existence of several indirect effects. Firstly, there was a strong negative correlation for mean GOS and risk decision making on the Safety-Critical Personal Risk Inventory (S-CPRI). This finding suggests that the better the engineers' simulations, the less risky their decisions. In order to assess whether the seemingly direct effects of trait anxiety in the experimental group were mediated by goodness-of-simulation further correlations were conducted and a mediation model created. Significant associations included the negative correlation between trait anxiety and mean S-CPRI GOS, implying that the more anxious engineers were the less well they simulated. Mediation analysis revealed an indirect effect of trait anxiety on riskiness via mean goodness-of-simulation. Those workers who were generally anxious were less able to simulate and made riskier decisions.

The current research attempted to overcome some of the limitations of previous work on mood and risk. The present study was applied (rather than laboratory-based) and assessed both the direct and indirect effects (rather than just the direct effects) of specific (rather than valence-based) mood (rather than induced emotion) on risk decision making (rather than risk appraisal) in the specific domain of safety-critical work (rather than in general). The findings are broadly consistent with findings of increased risk under negative mood (e.g. Leith & Baumeister, 1996; Hockey et al., 2000; Mano, 1992), and decreased risk under positive mood (e.g. Isen & Geva, 1987; Isen & Patrick, 1983), but are at odds with recent literature on the specific effects of happiness and anxiety (e.g. Lerner & Keltner, 2001; Maner et al., 2007). Lerner and Keltner's (2000, 2001) research suggests that happy people feel more in control and certain and thus make riskier choices whereas anxious people feel uncertain and less in control, and are risk averse. However, the pattern of findings in the current study suggests that there may have been a more direct effect of happiness on risk. Future research should assess the appraisal tendencies of control and certainty so that their contribution can be evaluated. Similar valence-based results have been interpreted in terms of a mood regulation model, which assumes a desire to maintain positive moods and to repair negative moods. Risky decisions are thought to be rejected under positive moods because the likely loss will upset the good mood state, whereas the likely gain from a low risk decision would serve to enhance or maintain it (Isen & Geva, 1987; Isen, Nygren, and Ashby, 1988).

The adoption of mood regulation strategies may also account for the effect of both fatigue and anxiety in the present study. Perhaps fatigued or anxious workers were motivated to take risks in order to repair their negative affect. On reflection, this is unlikely for a number of reasons. Firstly, effects were confined to that of dispositional fatigue and anxiety rather than state mood for the cued to simulate group. Secondly, it is questionable whether fatigue can be classed as a specific form of negative affect in the way that anxiety has been (Hockey et al., 2000). For example, fatigue is often considered to be a natural state, usually occurring at the end of a period of prolonged wakefulness, or physical or mental activity. Hockey and colleagues are the only other authors to investigate the effect of fatigue and anxiety on risk decision making. They found that higher ratings of both stable and state fatigue were associated with riskier choices on a general version of the PRI. In contrast, there was no effect of either trait or state anxiety. However, they did find a significant interaction for fatigue and anxiety, in that high levels of fatigue reversed what they termed the protective function of anxiety, thus resulting in risk taking behaviour. Given this finding, in the present study it was important to separate the effects of anxiety and fatigue. In line with the findings of Hockey et al. (2000) a multiple regression analysis revealed a combined effect of trait anxiety and mental fatigue on risk decision making. However, only trait anxiety had a unique influence on risk in the safety-critical decision making of the cued to simulate group. The subsequent interpretive problem is how to explain this effect. The mood regulation model offers one explanation but it is unlikely, for the reasons outlined previously. A more likely explanation is that trait anxiety has an indirect effect on risk. Indeed several studies have found that anxiety can affect the nature of information processing (e.g. Conway & Giannopoulos, 1993; Derryberry & Tucker, 1994). Again, these studies have taken a valence-based approach and found that while positive affect tends to broaden attentional focus, negative affect narrows attentional focus. Studies that have examined the specific effects of anxiety or fear on selective attention have largely substantiated these valence-based findings (Mathews & MacLeod, 1994; Mineka, Rafaeli, & Yovel, 2003). As well as narrowing attention, fear and anxiety lead to the selective perception of threats and dangers. For example, in studies using dot probe (Mathews, 1993) or dichotic listening tasks (Mathews & MacLeod, 1994), highly anxious individuals respond more quickly to, and more readily have their attention drawn towards, threatening stimuli, compared with nonanxious individuals. It is plausible that this bias in selective attention could account for our findings. Our risk decision measure consisted of a hypothetical scenario followed by two choice options, one risky and one safe. Irrespective of the scenario content, the risky option (e.g. "apply more pressure") may have implied a degree of threat or danger, compared to the safer alternative (e.g. "find a tool to assist you"), and thus drew the attention of anxious workers. The present findings concerning goodness-of-simulation support the notion of an indirect mood-risk relationship. Trait anxiety was negatively correlated with mean ratings of GOS. This means that generally anxious engineers were less able or willing to simulate on the S-CPRI (perhaps due to a narrowing of, or bias in, selective attention). The results of the mediation analysis in the present study are also consistent with the idea that trait anxiety exerted its effects via (poor) goodness-of-simulation.

Limitations

Of course there are other possible mediators of the impact of trait anxiety on risky safety-critical decisions. For instance, contextual factors in risky situations (e.g. importance, Hockey et al., 2000; familiarity and salience, Gambetti & Giusberti, 2009; time-pressure, Maule et al., 2000) and appraisal tendencies (control and certainty, Lerner & Keltner, 2001; and accountability, Lerner & Tetlock, 1999) have been found to play a role in mood-risk relationships. Individual differences in safety attitudes, experience, and adherence could also be important (e.g. prior hazard experience, Wiegmann, Goh, & O'Hare, 2002). Further research is necessary to evaluate these factors alongside GOS in safety-critical environments.

Two independent raters evaluated the simulation protocols, which in turn, acted as a manipulation check. However, individual differences in participants' ability to simulate was not controlled for and thus could have influenced the findings. It is suggest that future work utilising a similar measure of goodness-of-simulation also control for simulation ability. Recent studies of simulation effects in other domains have used Tellegen and Atkinson's (1974) absorption scale for this purpose (e.g. Armitage & Reidy, 2012).

The S-CPRI is an adapted version of a measure developed by Hockey et al. (2000) and used by Maule et al. (2000) to measure risky decision making. The hypothetical nature of the scenarios makes it difficult to assess whether participants would actually make the same decision choices in similar real-life situations where other factors may play an important role (e.g. the potential mediators listed above). However, the scenarios used in S-CPRI represent a considerable improvement over previous scenarios. Nevertheless, it would be desirable if possible for future studies to assess decision making in real risky, safety-critical situations.

Implications

It is apparent that complex relationships exist between psychological well being (e.g. specific mood), the use of simulation, and risk decision making in this sample of safety-critical train maintenance engineers. In simple terms the results seem to fit well with the recommendations made on the back of research findings in other areas of organisational psychology. For instance, the finding here that trait and state happiness can contribute to workers making less risky decisions would suggest that in this specific safety-critical environment there may be a safety benefit associated with the maintenance, or improvement, of employee well-being. The potential reduction in risk can be tentatively added to the existing list of positive outcomes thought to accompany employee happiness or job satisfaction (e.g. lower injury rates, Barling, Kelloway, & Iverson, 2003; reduced absenteeism, Ybema, Smulders, & Bongers, 2010; more organisational commitment, Griffin & Bateman, 1986; better productivity, Patterson et al., 2004, etc.)

The organisational implications of the trait anxiety effects are less straightforward. As disposition is relatively stable, the most obvious course of action would involve changes to employee selection processes. The inclusion of trait mood measurement during the recruitment of safety-critical workers could allow organisations to reduce the potential for personal risk. However, this strategy may be seen as discriminatory and as such it would be unwise to offer this as a recommendation on the back of one small-scale study.

Perhaps the most interesting source of a risk reduction intervention in the present setting is the manipulation of goodness-of-simulation. The strong negative correlation for goodness-of-simulation and risk, and its mediating role in the relationship between anxiety and risk, suggests that if simulation can be improved then risk taking may be reduced. It is felt that the most realistic form of intervention would have to be implemented during training sessions rather than during actual work tasks (to avoid the effect of distraction). One possible example of such a training intervention could concentrate on improving general GOS by asking engineers to simulate common work task scenarios such as those used in the S-CPRI. The study findings imply that such a training intervention could benefit safety-critical engineers in general, and in particular those who are naturally anxious.

Conclusion

This was the first applied study to assess the direct and indirect effects of mood on risk decision making using a domain-specific risk task. Despite the need for replication, the findings have a number of potential implications for safety-critical workers in terms of the influence of mood on risk, and the use of the simulation heuristic. The results of this study suggest that if a workplace can foster positive rather than negative moods, and encourage good mental simulations of risky work situations, then associated decision choices will be less risky.

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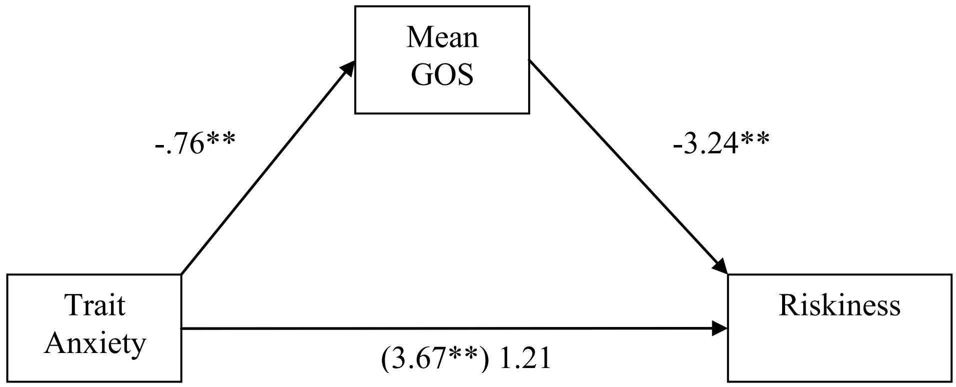

Note: Path values represent unstandardized regression coefficients. Tests of statistical significance are based on t-tests. The value in parentheses indicates the strength of the path prior to the inclusion of the mediating variable, p < .05; p < .01***

Figure 1. The mediating effect of trait anxiety on riskiness for the cued to simulate group

Table 1. Inter-rater reliability for the seven goodness-of-simulation dimensions.

Aspect	*Agreement*			
	Exact	*Within 1 point (including exact)*	*Arbitrated ratings*	*Inter-rater correlation*
Logical sequence	29 (40%)	58 (80%)	0 (0%)	.74
Minimisation of uncertainty	26 (36%)	58 (81%)	4 (5%)	.72
Temporal order	27 (37%)	55 (76%)	1 (2%)	.70
Flows smoothly	33 (46%)	61 (85%)	2 (3%)	.68
Coverage of problem space	29 (40%)	61 (85 %)	0 (0%)	.64
Sensitivity to contingency	23 (32%)	60 (84%)	2 (3%)	.63

Note: N = 18, number of simulations = 72

Table 2. Intercorrelations of GOS dimensions and loadings on the principal component.

Aspect	*1*	*2*	*3*	*4*	*5*	*6*
1. Logical sequence	**.97**					
2. Temporal order	.90	**.95**				
3. Sensitivity to contingency	.59	.52	**.54**			
4. Minimisation of uncertainty	.90	.86	.55	**.94**		
5. Coverage of problem space	.63	.60	.91	.60	**.64**	
6. Flows smoothly	.90	.89	.61	.84	.52	**.93**

Note: N = 18, number of simulations = 72. Loading on the 1st principal component appear on the diagonal and in bold.

Table 3. Mood and risk intercorrelations, means and standard deviations, for all workers.

	1	2	3	4	5	6	7	8	9	10	11
1. Riskiness	3.73 (2.29)										
2. Trait Anxiety	.41**	1.83 (0.50)									
3. State Fear (Anxiety)	.07	.64**	1.64 (0.98)								
4. General Fatigue (MFI)	.03	.14	.24	2.32 (0.83)							
5. Physical Fatigue (MFI)	.01	.19	.27	.71**	2.02 (0.85)						
6. Reduced Activity (MFI)	.17	.22	.32*	.54**	.61**	2.09 (0.79)					
7. Reduced Motivation (MFI)	.27	.22	.22	.53**	.55**	.37*	1.94 (0.76)				
8. Mental Fatigue (MFI)	.36*	.53**	.47**	.31*	.35*	.46**	.54**	1.91 (0.84)			
9. State Fatigue	.24	.21	.31*	.63**	.38*	.43**	.44**	.32*	3.71 (1.32)		
10. Trait Happiness	-.36*	-.72**	-.52**	-.23	-.17	-.17	-.37*	-.40**	-.21	3.11 (0.61)	
11. State Happiness	-.31*	-.47**	-.30	-.34*	-.28	-.36*	-.32*	-.28	-.41**	.48**	5.09 (1.47)

*Note: N =43, *p < .05, **p < .01. Mean scores appear on the diagonal with standard deviations in parentheses.*

Table 4. Mood and risk intercorrelations, means and standard deviations, for the control group (not cued to simulate).

	1	2	3	4	5	6	7	8	9	10	11
1. Riskiness	3.63 (2.19)										
2. Trait Anxiety	.25	1.92 (0.58)									
3. State Fear (Anxiety)	.19	.70**	1.71 (1.06)								
4. General Fatigue (MFI)	-.02	-.11	-.01	2.36 (0.83)							
5. Physical Fatigue (MFI)	.04	.10	.10	.70**	2.05 (0.96)						
6. Reduced Activity (MFI)	.19	.07	.15	.58**	.67**	2.11 (0.83)					
7. Reduced Motivation (MFI)	.37	.29	.33	.70**	.66**	.54**	1.90 (0.89)				
8. Mental Fatigue (MFI)	.25	.59**	.79**	.12	.11	.37	.49*	1.70 (0.72)			
9. State Fatigue	.23	.01	.22	.74**	.41	.39	.48*	.23	3.78 (1.41)		
10. Trait Happiness	-.46*	-.81**	-.60**	-.08	-.15	-.15	-.52*	-.52*	-.12	3.14 (0.69)	
11. State Happiness	-.51*	-.49*	-.39	-.29	-.38	-.39	-.42	-.26	-.27	.70**	4.74 (1.70)

*Note: N =22 *p < .05, **p <. 01. Mean scores appear on the diagonal with standard deviations in parentheses.*

Table 5. Mood, goodness-of-simulation, risk correlations, means and standard deviations, for the cued to simulate group.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Riskiness	3.85 (2.44)											
2. Mean GOS	-.70**	2.97 (0.49)										
3. Trait Anxiety	.61**	-.65**	1.74 (0.39)									
4. State Fear (Anxiety)	-.01	-.26	.56**	1.56 (0.90)								
5. General Fatigue (MFI)	.17	-.40	.61**	.48*	2.27 (0.84)							
6. Physical Fatigue (MFI)	-.03	-.29	.28	.39	.79**	2.00 (0.75)						
7. Reduced Activity (MFI)	.23	-.44	.42	.47*	.50*	.54*	2.06 (0.77)					
8. Reduced Motivation (MFI)	.11	.05	.17	.08	.38	.38	.18	1.99 (0.61)				
9. Mental Fatigue (MFI)	.46*	-.38	.56*	.25	.61**	.60**	.60**	.49*	2.12 (0.92)			
10. State Fatigue	.31	-.39	.49	.31	.47*	.37	.47*	.49*	.51*	3.63 (1.24)		
11. Trait Happiness	-.27	.33	-.65**	-.34	-.36	-.10	-.17	-.08	-.20	-.28	3.08 (0.54)	
12. State Happiness	-.14	.52*	-.40	-.09	-.37	-.20	-.36	-.30	-.38	-.58**	.27	5.46 (1.12)

*Note: N =18 *p < .05, **p < .01. Mean scores appear on the diagonal with standard deviations in parentheses.*

APPENDIX A: RATING CRITERIA FOR SIMULATION PROTOCOLS

Rating criteria adapted from:

Brown, G. P., MacLeod, A. K., Tata, P., & Goddard, L. (2002). Worry and the simulation of future outcomes. *Anxiety, Stress and Coping, 15*, 1-17.

A. Logical sequence

The extent to which successive elements of the simulation are connected logically with each step following from the previous one. Transitions between simulation elements are either explicitly included or clearly implied so that the simulation flows logically.

1. Logically disjoined – hard to follow
2. Basic logical thread is apparent, but mainly fragmented, or logic is due to prompting.
3. At least one logical transition is missing and this results in impaired flow.
4. No logical transitions are missing, but at least one needs to be inferred, resulting in slight impairment in flow.
5. All logical transitions are made explicit and there is little impairment in flow.

B. Temporal order

The extent to which temporal ordering is communicated explicitly (‘‘then . . . ’’, ‘‘until . . . ’’) or clearly implied so that a sense of temporal flow is established.

1. Elements are scattered in time.
2. Significant scatter or only ordered due to prompting.
3. No more than one clear jump or digression.
4. Basic temporal sequencing present, but is not made explicit through use of words like until, then, etc.
5. No digressions or jumps.

C. Sensitivity to contingency

The extent to which the author shows an awareness of alternative possibilities at various points in the simulation. Indication of planning in the face of uncertainty, e.g., through backup plans or consideration of potential alternatives.

1. No suggestion that contingencies are considered.

2. Little suggestion that contingencies are considered or contingencies result from prompting.
3. Some suggestion that uncertainty is recognised, but not enough is included to be confident of planning in the face of uncertainty.
4. Consideration of contingencies is clearly implied, but not made explicit, e.g., through clear mention of alternative outcomes.
5. Explicit mention of contingencies (e.g., through use of words like otherwise, if, unless, etc. or mention of clear backup plans) and alternative outcomes are clearly considered.

D. Minimization of uncertainty

The extent to which the simulation either increases or decreases a sense of uncertainty.

1. Uncertainty is heightened rather than minimised.
2. Uncertainty is introduced that is not adequately addressed or is only addressed when prompted.
3. Uncertainty is not introduced, but inherent uncertainty is unacknowledged or inadequately addressed.
4. Only slight uncertainty due to omission of detail.
5. Uncertainty is minimised as far as can be reasonably expected.

E. Adequate coverage of the problem space

The extent to which the simulation gives a comprehensive account of all of the basic elements of the situation.

1. Substantial gaps in coverage of problem space.
2. Partial coverage of problem space or only in response to prompting.
3. Most of problem space covered, but more than two clear gaps.
4. Problem space covered with only two clear gaps.
5. Problem space covered with at most one clear gap.

F. Flows smoothly

A subjective judgment on the part of the rater of how well the simulation flows.

1. Simulation does not flow and is difficult to follow.
2. Impaired flow.
3. Simulation flows, but haltingly.

4. Simulation flows easily with only minor halts.
5. Simulation flows easily.

G. Realistic time allocation

The extent to which the respondent communicates an awareness of and responsiveness to time constraints.

1. Optimal timing is not mentioned and no indication time is considered.
2. Little indication time is considered or only in response to prompting.
3. Consideration of time is only implied, but is not made explicit.
4. Time constraints are explicitly mentioned, but recognition of time pressure or excess time not clear.
5. Clear sense is communicated of working toward optimal timing.

APPENDIX B: AN EXAMPLE OF AN ENGINEER'S WRITTEN SIMULATION PROTOCOL AND RISK DECISION CHOICE

HP1: Earth Switch

You are nearing the successful completion of a job, while operating the earth switch you are attempting to move it back to the original position. You think that applying extra pressure will do the trick, but a sudden movement may result in injury. Do you…

Please remember that your task is to read the scenario while keeping the decision choice in mind, and at the same time, write down what is going through your mind, *as it happens*.

PLEASE WRITE DOWN YOUR THOUGHTS BEFORE MAKING YOUR DECISION.

What will you do?

Apply more pressure	5	4	3	2	1	(1)	2	3	4	5	Find a tool to assist you

_ *I may try to apply extra pressure by using a tool to increase leverage. But I would be careful NOT to apply sudden movement and would do all possible to minimize injury to myself and damage to equipment. At the end of the day, I must realize that the earth switch was designed to operate without excessive force so if it doesn't operate with just slightly extra pressure – I WOULDN'T apply even more pressure OR use a bigger/different tool. What I WOULD DO is ask myself why it isn't operating properly.*