

**Can groups stave off fatigue? The effects of group monitoring upon fatigue induced cognitive impairment.**

**Non-technical summary of results.**

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## *Aims and brief methodology*

Fatigue, whether induced through sleep deprivation or mental exhaustion, is a widespread problem in a variety of contexts such as medical, manufacturing, transportation and military. The symptoms of fatigue include poor decision making and lowered vigilance and increased reaction time. Ways of preventing or staving off fatigue typically focus on individuals, ignoring the potential role of group processes. The current research addressed this gap in our understanding by testing whether social processes can reduce the effects of fatigue.

The *group monitoring hypothesis* (Abrams, Hoptrow, Hulbert & Frings, 2006) argues that several group processes can reduce the impairment caused by factors such as sleep deprivation. Specifically it is argued that group members can pool information, use comparisons between judgements as a form of quality control and can be highly motivated avoid letting down fellow group members. To test this, participants took part in a series of tasks which tested the effects of fatigue upon vigilance, risk-taking and problem solving ability. By having both fatigued and reasonably alert people take part in the study either in groups or on their own the effects of group decision making processes and fatigue were examined independently and interactively.

To test the *group monitoring hypothesis*, two hundred and twenty six officer cadets were recruited from the University of London Officer Training Corps. Data collection took place in two waves – the first in October 2009, the second in February 2010, as part of their regular field exercises. Participants took part in the study either when reasonably alert (i.e. no sleep deficit) or while fatigued (two or more nights of significantly disrupted sleep, sleeping outside in cold rainy conditions, coupled with high levels of exertion). Participants completed a number of task (see below) while either alone ( $n = 47$ ) or in groups of four ( $n = 179$ ). Order of tasks was counterbalanced. All participants were debriefed and paid for their time on completion of the exercise.

*If you would like to know more about this study please contact the Principle Investigator (Daniel Frings) at [fringds@lsbu.ac.uk](mailto:fringds@lsbu.ac.uk)*

### Risk assessment

**What we did:** Participants were shown a hand of two cards assigned to them, and one of two cards shown to the dealer. They had to bet whether they would get a higher total than the once the dealer's final card. They were also asked to rate each bet for attractiveness. Bets were constructed to be high or low risk. In reality, bets were not played out. Group members made bets alone (pre-discussion phase), and then in groups (discussion phase).

**Notable findings:** Group membership did not appear to have an effect upon bet size. Both fatigued and non-fatigued participants were able to differentiate between higher and lower risk bets in terms of objective levels of risk. However, they did not find high risk bets less attractive than low risk bets, and did not wager less upon them

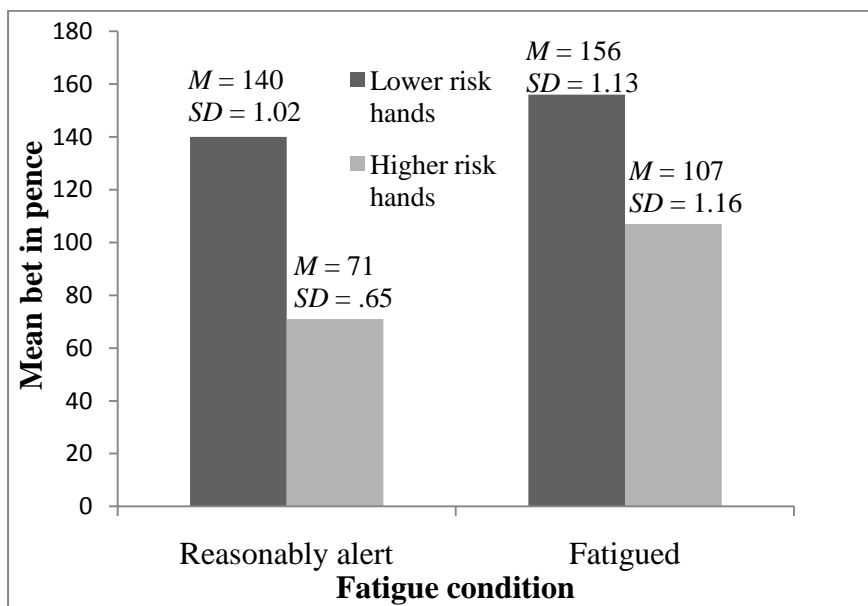


Figure 1: Amount bet on low, medium and high risk bets.

**Implications:** These findings suggest that fatigue increases risky behaviour not through changing perceptions of levels of risk, but affecting the attractiveness of risk. Decision makers should consider whether they are being more tolerant of risk when fatigued. This research has been accepted for publication in the Journal of Gambling Studies.

## Problem solving

**What we did:** Groups and individuals were asked to solve a series of maths problems with the most efficient method possible. All problems could be solved with 4 steps except the eighth. Additionally, the latter half of the problems could be solved in two steps. Inability to switch between the four step and the two step problems indicates a degree of cognitive inflexibility.

**Notable findings:** Groups solved more problems ( $M_{\text{grp}} = 8.05$ ,  $SD_{\text{grp}} = 1.58$ ) than individuals ( $M_{\text{ind}} = 5.03$ ,  $SD_{\text{ind}} = 2.02$ ). Individuals showed inflexible cognition in relation to the task when fatigued. In the fatigued condition, groups had more flexible cognition than individuals. Groups were unaffected by fatigue.

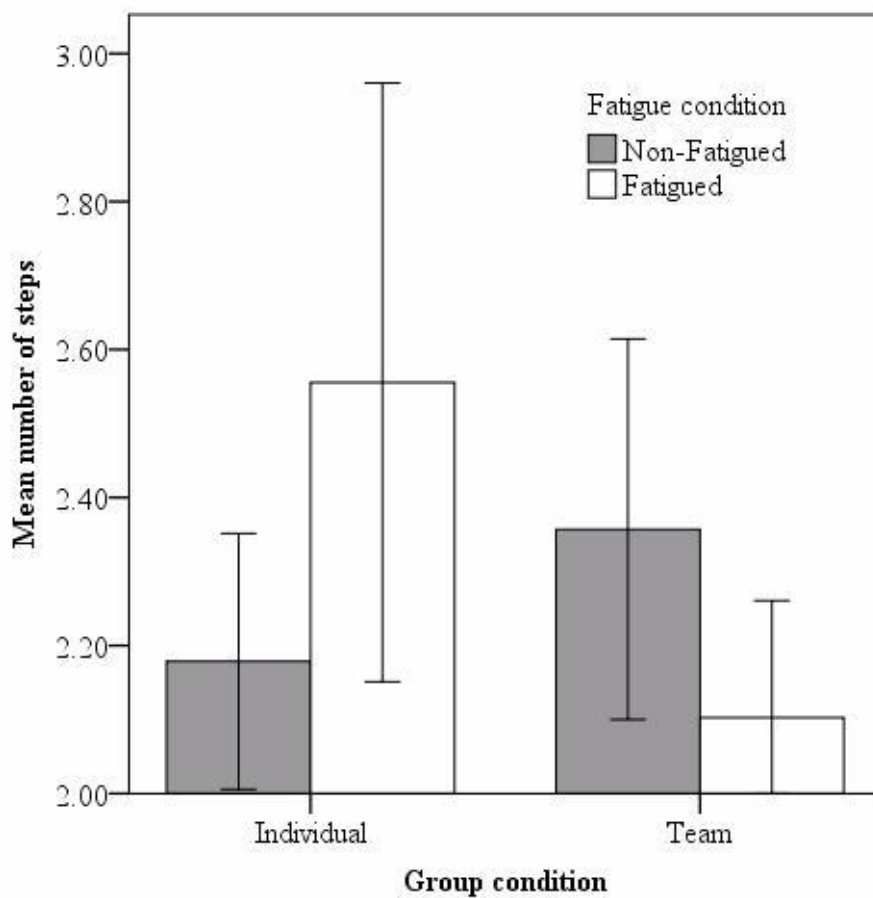


Figure 2: Number of steps taken during critical trials (2-step problems).

**Implications:** Fatigue negatively impacted individuals' cognitive flexibility. This suggests that, in fatigued situations, solutions should be generated (or at least reviewed) by a team.

This research has been formally written up and submitted for publication in the Journal of Experimental: Applied.

## Audio Vigilance

**What we did:** Participants listened to a short (2.5 mins) speech and were asked to estimate how many times the word ‘the’ was spoken. Group members made an individual judgement (*pre-discussion*), had a group discussion and then made a collective decision, and finally made a second individual judgements (*post-discussion*).

**Notable findings:** Fatigue had no effects on task performance. Group membership led to less errors when groups.

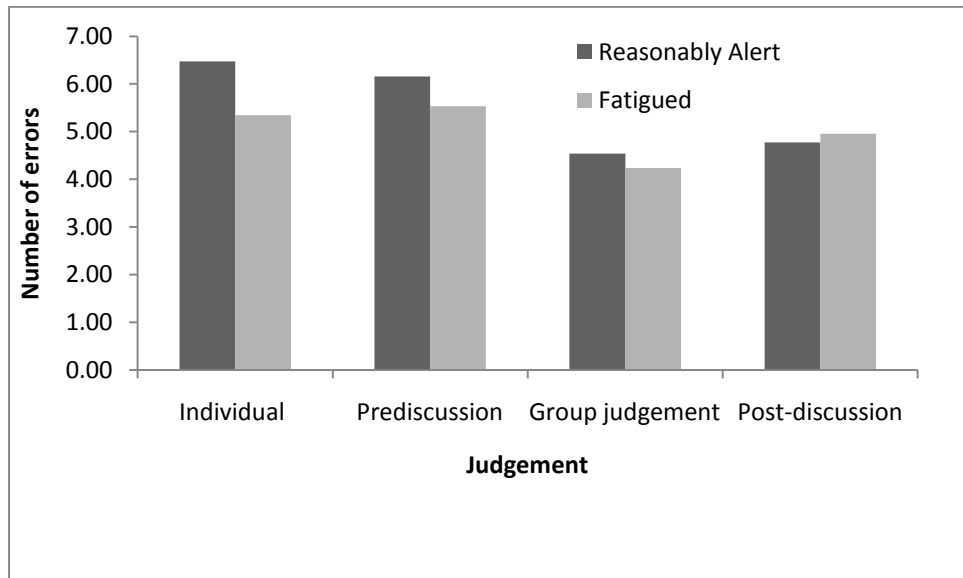


Figure 3: Mean errors in the audio vigilance task.

**Implications:** It appears that the moderate level of fatigue experienced by participants was insufficient to affect vigilance. It supports existing literature that shows that error levels in cumulative judgement tasks can be reduced when group members discuss their judgements.

## Visual Vigilance

**What we did:** Participants watched a series of sets of four faces appear for around two seconds. After each trial, they had to indicate whether either one of a pair of target faces were present or absent by pressing different keys on a response pad. They completed this task either alone or in a group while fatigued or reasonably alert. The task lasted seven minutes.

**Notable findings:** Neither fatigue nor group membership had any effect upon the percentage of trials correctly responded to. However, examination of reaction times suggests that individuals are quicker at this task when fatigued. In contrast, groups are slower when fatigued.

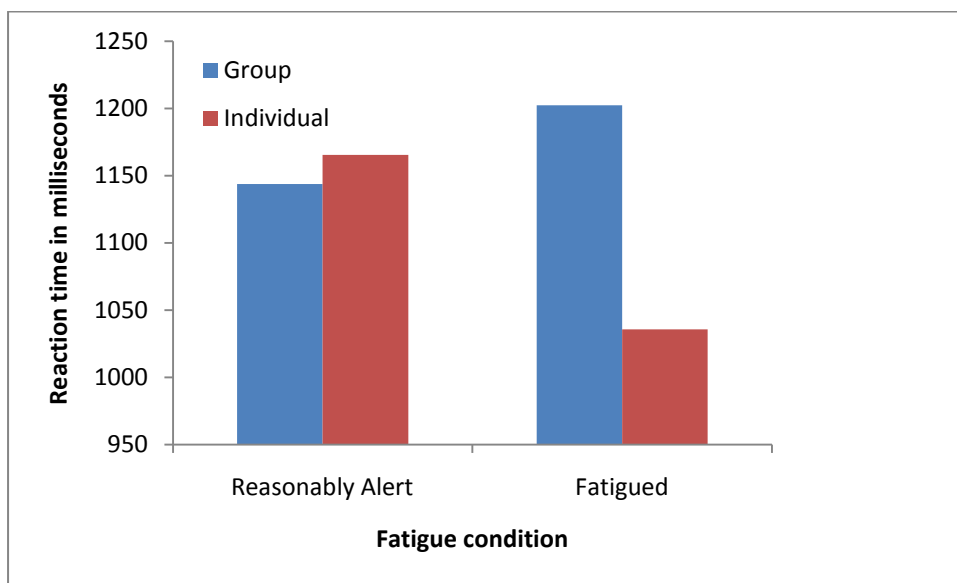


Figure 4: Mean reaction time to target present trials.

**Implications:** It appears some form of compensatory effect may be present amongst individuals, although with a small sample size this conclusion should be treated with caution. This warrants further investigation. It also appears that in this task, group membership hindered rather than helped fatigued participants. This difference may be due to the nature of the task – group members were unaccountable to one another so may have engaged in social loafing.