Bicycle helmet wearing can increase risk taking and sensation seeking in adults

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Abstract

Humans adapt their risk-taking behaviour based on perceptions of safety; this risk compensation phenomenon is typified by people taking more risks when using protective equipment. Existing studies have looked at people who know they are using safety equipment, and have specifically examined changes in behaviours against which that equipment might reduce risk. We demonstrate risk-taking increases in people who are not explicitly aware they are wearing protective equipment; furthermore, this happens for behaviours which could not be made safer by that equipment. In a controlled study where a helmet, rather than a hat, was used as the mount for a head-mounted eye-tracker, participants scored significantly higher on laboratory measures of both risk-taking and of sensation-seeking. This happened despite there being no risk for the helmet to ameliorate and despite it being introduced purely as an eye-tracker. The results suggest unconscious activation of safety-related concepts primes globally increased risk propensity.

Keywords: risk-taking, sensation-seeking, social priming, bicycling, protective equipment, behaviour change

HELMET WEARING INCREASES RISK TAKING AND SENSATION SEEKING

Introduction

People's perceptions of safety influence their risk-taking. Studied under such rubrics as risk compensation (Adams & Hillman, 2001), risk homeostasis (Wilde, 1998) or risk allostasis (Lewis-Evans & Rothengatter, 2009), the phenomenon is typified by people taking more risks when using protective equipment (Adams, 1982), or at least reducing their risk-taking when protective equipment is absent (Fyhri & Phillips, 2013, Phillips, Fyhri & Sagberg, 2011). Behavioural adaptation in response to safety equipment has been reported in such domains as driving with and without in-car safety devices (Sagberg, Fosser & Sætermo, 1997), children running obstacle courses with and without safety gear (Morrongiello, Walpole & Lassenby, 2007), and bicyclists descending a steep hill with and without helmets (Phillips et al., 2011). Work to date has assumed that people only respond to safety measures of which they are aware – an idea encapsulated in Hedlund's first rule of risk compensation: "If I don't know it's there, I won't compensate for a safety measure" (Hedlund, 2000). Moreover, research to date has kept behavioural responses within the domain of the safety measure, such that the measure (e.g., seat belts) might reasonably be expected to alter risk and thereby behaviour (e.g., driving speed) (Janssen, 1994).

Here, we changed both these approaches. First, we induced people to wear a helmet without their necessarily being aware they were wearing safety equipment: participants were (falsely) told they were taking part in an eye-tracking study so we could exploit the fact the SensoMotric Head-mounted Eye Tracking Device comes with both a bicycle helmet and a baseball cap as its standard mounting solutions. At random, participants were assigned to wear one mount or the other and were simply told it was the anchor for the eye-tracker. Second, we divorced risk-taking behaviour from the safety device by using a computerized laboratory measure called the Balloon Analogue Risk Task (BART) (Lejuez et al., 2002) in which the helmet could do nothing to change risk. We also measured sensation seeking and anxiety as possible explanatory variables for any effect.

Method

Participants

Eighty participants (15 male and 24 female in the helmet condition, 19 male and 22 female in the cap condition) aged 17-56 years (M = 25.26, SD = 6.59) took part in the study; no monetary reward was offered for participation. An a priori power analysis showed that 40 participants per condition should be sufficient to detect standardized changes in the outcome measures down to a Cohen's d of .63 at a power level of .80. This was deemed sufficient as we hoped to see relatively substantial effects of the helmet manipulation.

Materials

State anxiety was measured using the State Trait Anxiety Inventory (STAI) form Y-1 (Spielberger, 1983). This offers 20 questions that measure a person’s chronic levels of anxiety and 20 that measure their feelings of anxiety right at the moment of response. Participants here answered the latter set. The Balloon Analogue Risk Taking task (BART – Lejuez et al., 2002), programmed in Real Studio, had participants press a button to inflate an animated balloon on a computer screen. Each inflation made the balloon larger and increased the amount of fictional currency earned. If the balloon burst (which it would do at a random point between one and 128 inflations), all earnings for that trial were lost. At any point, participants could choose to stop pumping and “bank” their accrued money. After the balloon burst, or after a decision to bank, the next trial began. Each person completed 30 trials and their risk-taking score was the mean number of pumps made on trials where the balloon did not burst. This score would be higher when participants risked losses by trying to maximise their score and would be lower if participants avoided risk and played more conservatively. Sensation Seeking was measured using the Sensation Seeking Scale (SSS) Form V (Zuckerman, Eysenck & Eysenck, 1978). The SSS measures four dimensions (10 self-report items each) of sensation seeking behaviour: Thrill and Adventure Seeking, Disinhibition, Experience Seeking, and Boredom Susceptibility. Bicycling frequency was measured using a Likert scale ranging from one (never) to six (five times a week or more). If a person bicycled more than 'never', helmet wearing frequency was measured using a Likert scale ranging from one (never) to six (always).

Either an Abus HS-10 S-Force Peak bicycle helmet or a Beechfield B15 5-panel cap was used to support the SensoMotric Head-mounted iView X™ HED-4.5 Eye-Tracking Device (with its delicate 45-degree mirror removed; see Figure 1). The scales were presented using Bristol Online Surveys via a web browser, along with the BART, on a 19" 4:3 LCD monitor. The experimenter "operated" an Applied Science Laboratories (ASL) Eye-Trac6 Desk Mounted Optics with Eye-Trac PC system. A fake 9-point eye-tracking calibration program was written in Real Studio to increase the verisimilitude of the eye-tracking procedure.

Fig. 1.

An eye-tracker was used to induce participants to wear either a hat (left) or a helmet (right) during testing.

Procedure

This study was conducted in the University of Bath's Department of Psychology's eye-tracking laboratory. Participants were brought into the laboratory and told that they would complete a number of computer-based risk-taking measures whilst their point of gaze was measured using a head-mounted eye-tracker. After reading and agreeing to information about the study, displayed on the computer screen, they entered their age and gender and proceeded to complete the STAI Y-1. A screen then appeared saying that the eye-tracker would now be set up; the experimenter placed the cap- or helmet-mounted eye-tracker on the participant's head, making a show of carefully aligning everything as in a real eye-tracking procedure. The experimenter then moved to the ASL computer where they ran the fake calibration software on the participant, and conspicuously adjusted the eye-tracking controls to make it appear to the participant that they really were being eye-tracked. The participant then completed the SSS, played the BART, and completed the STAI Y-1 again. A screen then appeared saying that the eye-tracker was to be turned off and the experimenter removed the apparatus from the participant's head. The participant then completed the final STAI Y-1 before being presented with a debrief where they were informed of the deception, asked not to share details of the experiment with anyone else, reported their bicycling frequency and, if they did cycle, their helmet-wearing likelihood.

Results

As shown in Figure 2, helmet-wearing was associated with increased mean risk-taking scores (40.40 [SD = 18.18] v 31.06 [SD = 13.29], *t*[78] = 2.63, *p* = .01, *d* = 0.59) and increased mean sensation-seeking scores (23.23 [SD = 7.00] v 18.78 [SD = 5.09], Welch *t*[69.19] = 3.24, *p* = .002, *d* = 0.73). These effects cannot be explained by the helmet affecting anxiety, as this did not change significantly as a function of Condition (*F*[1,78] = 0.19, *p* = .66), Time (*F*[2,156] = 2.37, *p* = .10) or the Condition × Time interaction (*F*[2,156] = 1.18, *p* = .31). Note that anxiety scores were square-rooted before analysis to allow for the skew seen in Figure 2c. There was no relationship between risk-taking and Gender (*t*[78] = 0.45, *p* = .66), Bicycling Experience (*rho* = .12, *p* = .27), extent of Helmet Use when bicycling (*rho* = .06, *p* = .60) nor, in regression modelling, any interactions of all these variables (e.g., the Condition × Bicycling Experience interaction showed *t* = 0.39, *p* = .70). Prior research has shown that helmets do not affect cognitive performance in demanding laboratory tasks (Bogerd, Walker, Brühwiler & Rossi, 2014), meaning the results cannot be attributed to this either.

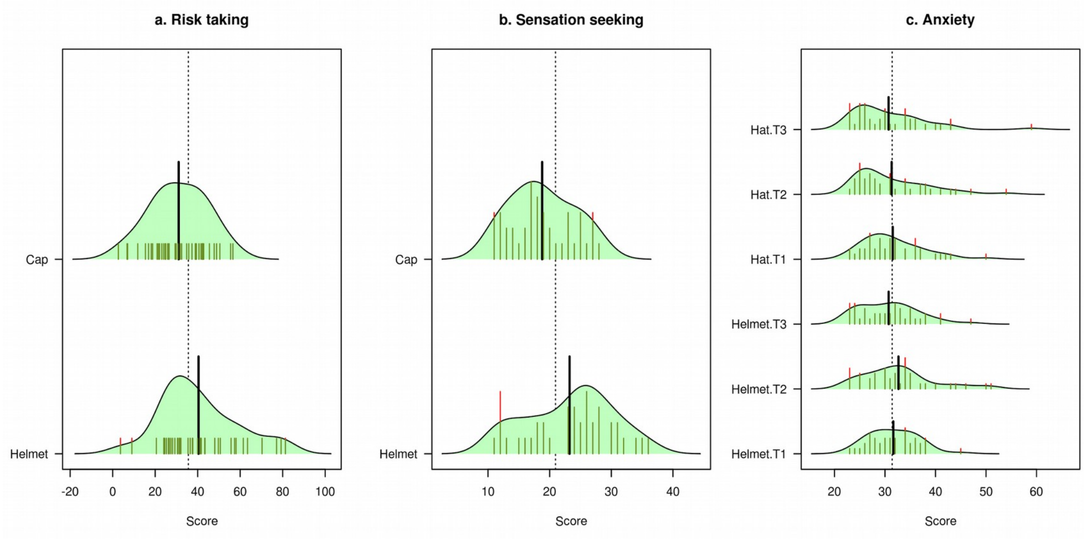

Fig. 2.

Scores for (a) the BART risk-taking test, (b) the Sensation-Seeking Scale and (c) the STAI anxiety measure. Plots show overall mean scores with a vertical dotted line and mean scores for each condition with bold vertical lines; individual participants' scores are shown as rug points (stacked where more than one person obtained the same score) and kernel density curves are used to illustrate the overall distribution of scores within each condition. T1, T2 and T3 refer respectively to time points before, during and after donning the eye-tracker.

Discussion

Laboratory measures showed greater risk-taking task and sensation-seeking when participants wore a helmet, rather than a hat, when tested. These effects arose even though the helmet was introduced as a mount for an eye-tracking apparatus and not as safety equipment, and even though it could do nothing to alter participants' level of risk on the experimental task. Notably, the effect was an immediate shift in both risk-taking and sensation-seeking. This is different to previous work on unconscious influence, such as experiments on the persuasive effects of head movements (Wells & Petty, 1980) and environmental cues on consumer behaviour (Berger & Fitzsimons, 2008), which looked instead at longer-term attitudinal changes from more overt signals.

Our findings are plausibly related to social priming, wherein social behaviours are cued by exposure to stereotypes or concepts (Bargh, 2006). However, whereas social priming is generally understood in terms of behaviour directed towards another person, the effects in this study were individual, focused on the risk-taking propensity of a person acting alone during exposure to a safety-related prime. Schröder and Thagard (2013) produced computational models of social priming in which primes activate shared cultural concepts in people's minds, which in turn are associated with actions; through these links, the actions become available to the behavioural selection process. Speculatively, if what we saw in this study *were* to be understood through such mechanisms, with the helmet invoking concepts of protection from risk, and thereby subconsciously shaping behaviours, our findings might suggest Schröder and Thagard's social priming framework operates even when its interaction target component (another person with whom to interact) is absent.

Our findings initially appear different to some other studies. Fyhri and Phillips (2013; Phillips et al., 2011) found risk-taking in downhill bicycling, measured through riding speed, did not simply increase when a helmet was worn; rather, specifically the people who normally cycled with a helmet took fewer risks when riding without one. Why did the participants in Fyrhi and Phillips (2013) who were not habitual helmet users not react to wearing a helmet with increased risk-taking, as our experiment might suggest they would? Clearly more work is needed definitively to pin down all the mechanisms here, but for now we speculate the difference might be related to considerable variations between the two studies' procedures. Fyhri and Phillips greatly emphasized the physicality of their task (“to increase the difference in measures between the helmet-on and -off conditions, all participants were instructed to cycle using one-hand in both conditions” – p. 60) which provides a direct link between the action (bicycling) and the condition (helmet-wearing) that is absent in our study. Moreover, that study used a repeated-measures design, in which participants were aware they were riding a bicycle both with and without a helmet. This could have meant behaviour changed through mechanisms different to those seen here, where participants only took part in one condition and were not aware of any manipulation, nor even that they were specifically wearing a safety device.

The practical implication of our findings, in which risk-taking changed in a global way when the helmet was worn, might be to suggest more extreme unintended consequences of safety equipment in hazardous situations than has previously been thought. The idea that safety equipment might make people take risks against which that equipment offers protection has considerable (Adams, 1982, 1995; Adams & Hillman, 2001; Hedlund, 2000), although not uncontroversial (McKenna, 1988), history. If this laboratory demonstration of globally increased risk-taking arising from localized protection were to be replicated in real settings, this could suggest people using protective equipment against specific hazards might also be unduly inclined to take risks against which that protective equipment cannot reasonably be expected to help. This is not to suggest the safety equipment will necessarily have its specific utility nullified, but rather to suggest there could be changes in behaviour wider than previously envisaged.

Author Contributions

T. Gamble and I. Walker developed the study concept, designed the study, performed the data analysis and interpretation, and drafted the manuscript.

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