



Understanding risk compensation in children: Experience with the activity and level of sensation seeking play a role

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ABSTRACT

The aims of this study were to determine if children 7–12 years show risk compensation when engaging in ecologically valid recreational sports tasks, and to explore how experience with the activity and extent of sensation seeking influence this. Children were positioned up on a platform, on a bike or wearing rollerblades, and they were presented varying heights and inclines from which they selected the greatest one they go down when wearing and not wearing safety gear appropriate to the activity; when making their ratings they anticipated actually doing the task. Results revealed that children engaged in significantly more risk taking when wearing safety gear, thereby demonstrating risk compensation, and this was significantly greater for the activity with which they had greater experience. However, children high in sensation seeking demonstrated significantly more risk compensation in both the high and low experience activities, although the injury risk appraisals that predicted risk compensation varied with experience level. Implications for the design of injury prevention programs and directions for future research are discussed.

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1. Influences on children's risk taking

Unintentional injury in childhood has been cited as one of the leading causes of death and disability for children in most developed nations (Canadian Institute of Child Health [CICH], 2000; National Center for Injury Prevention and Control [NCIPC], 2010; World Health Organization [WHO], 2005). For school-age children, many injuries occur when they are away from home and making their own decisions about injury-risk activities (Shanon et al., 1992). Research has shown that children engage in behaviors that put them at risk of injury for a variety of reasons (Morrongiello and Lasenby-Lessard, 2007). Some of the key determinants of risk taking are extent of experience with an activity, injury-related cognitions, anticipated emotions in reaction to risk taking, gender, and children's behavioral attributes.

Greater risk taking is more likely among children who: have more experience with an activity (Lasenby-Lessard et al., *in press*; Morrongiello and Dawber, 2004); think there is little danger, that they are not vulnerable to injury, and that they would not be seriously injured (Morrongiello, 1997; Morrongiello and Rennie, 1998); and feel less fear and more excitement when engaging in risky activities (Morrongiello and Matheis, 2004); and boys (Coppens and Gentry, 1991; Ginsburg and Miller, 1982; Morrongiello and

Rennie, 1998; Rosen and Peterson, 1990). A variety of personality and behavioral characteristics also influence risk taking decisions (see Schwebel and Gaines, 2007, for extensive review). In particular, sensation seeking (i.e., "the need for varied, novel and complex situations and experiences and the willingness to take physical and social risks for the sake of such experiences", Zuckerman, 1979, p. 10) strongly relates to risk taking behaviors in adolescence and adulthood (Bouter et al., 1988; Brown et al., 1974; Heyman and Rose, 1980; Hymbaugh and Garrett, 1974; Rowland et al., 1986; Straub, 1982; Zuckerman, 1979, 2007), as well as in childhood (Morrongiello and Lasenby, 2006; Morrongiello et al., 2004a,b; Morrongiello and Sedore, 2005). In a recent study examining the impact of accumulated experience with an activity on risk taking decisions, for example, children high in sensation seeking were especially likely to react with increased risk taking once they accumulated some experience with an activity (Lasenby-Lessard et al., *in press*). Thus, high sensation seekers emerged as a unique high risk group who needed very little prompting to increase their level of risk taking, presumably because doing so increases their level of arousal (Zuckerman, 1979) and satisfies a need for novel and intense stimulation (Zuckerman, 2007).

2. Risk compensation

One influence on risk taking that has recruited much attention and about which there is some controversy is the use of safety gear. Unquestionably safety gear reduces children's risk of serious

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injury. However, research has shown too that individuals sometimes react with *increased* risk taking when they wear safety gear, a phenomenon commonly known as *risk compensation*. While risk compensation theorists agree that safety initiatives (e.g., safety gear, environmental modifications to roads or products) produce positive effects by reducing injury risk, they argue that the full benefit of such effects will not be realized in individuals who show risk compensation. Although there is debate about the nature and scope of this phenomenon (Adams and Hillman, 2001; Hedlund, 2000; Thompson et al., 2001), and not all research has found support for this phenomenon (see Thompson et al., 2001, for review), risk compensation has been observed in athletes (Biasca et al., 2002; Braun and Fouts, 1998), adults when driving (Potvin et al., 1988; Simonet and Wilde, 1997; Stanton and Pinto, 2000), parents of young children (Morrongiello and Major, 2002; Viscusi, 1984, 1985; Viscusi and Cavallo, 1996), and even in school-age children (DiLillo and Tremblay, 2001; Morrongiello et al., 2007a,b).

In organized sports, for example, wearing safety gear has been associated with increased aggressive and injurious behavior by hockey players, as well as resistance to calling penalties by coaches and referees (Biasca et al., 2002). Adult drivers have been shown to behave more recklessly (e.g., speeding) when wearing seat belts (Stanton and Pinto, 2000). Product safety interventions directed towards children also have been found to lead to risk compensation. For example, with the invention of childproof caps on medication there was an increase of 3500 cases of poisoning in children under the age of five, presumably because parents were less vigilant about the handling and storage of these 'safer' bottles (Viscusi, 1984). The introduction of safety mechanisms on cigarette lighters also has been linked to reduced parental caution about these products (Viscusi and Cavallo, 1996). Similarly, parents have been shown to react with increased tolerance for risk taking when their children are wearing safety gear during recreational sports and play activities (Morrongiello and Major, 2002). Even during childhood wearing safety gear has been shown to result in more reckless risk taking behavior (DiLillo and Tremblay, 2001; Morrongiello et al., 2007). Thus, despite debate about how robust and generalized risk compensation is, research demonstrates unequivocally that this phenomenon occurs across a broad age range and across numerous activities.

3. Current study

Building on past research, the current study examined if the extent of risk compensation shown by school-age children varies as a function of the extent of experience with an activity, and what role individual-difference factors (sensation seeking, injury-related appraisals, emotional reactions) play in this process. Children participated in both high experience (bicycling) and low experience (rollerblading) activities, and to assess for risk compensation a within-participant design was used (cf. Streff and Geller, 1988) in which each child's risk taking when not wearing safety gear was compared to their risk taking when wearing gear. Bicycling and rollerblading were used in this study because both carry a potential for serious injury risk, children are aware of this risk (Adams et al., 1996; Pudupud and Linares, 1997), children in this region are more likely to bike (high experience) than rollerblade (low experience), and both activities have designated safety gear that is encouraged or mandated for use during these activities. To assess sensation seeking, children completed a standardized questionnaire (Morrongiello and Lasenby, 2006). Appraisals of injury-risk cognitions (danger, vulnerability, potential injury severity) and emotions (excitement, fear) in response to risk taking also were measured to explore if these provide insight into the mechanisms by which risk compensation operates.

4. Methods

4.1. Participants

A sample of 99 children 7–12 years of age was divided into four groups: young girls ($N = 27$, range: 7–9 years, $M = 8.76$, $SD = 0.93$), young boys ($N = 23$, range: 7–9 years, $M = 8.97$, $SD = 0.64$), older girls ($N = 25$, range: 10–12 years, $M = 11.47$, $SD = 0.85$), and older boys ($N = 24$, range: 10–12 years, $M = 11.673$, $SD = 0.81$). Participants were randomly selected from the Child Development Research Unit Database at the University of Guelph; a database comprised of over 13,000 families who have previously indicated an interest in participating in research on child development. Mothers were predominantly Caucasian (98%) and generally well educated, with 79% having completed a university or college degree, 16% having completed some university or college courses, and 4% having completed high school. Family income fell within the mid- to high-socioeconomic status range, with 63% earning \$80,000 and above, 25% earning between \$60,000 and \$80,000, 12% earning between \$40,000 and \$60,000, and 1% earning under \$40,000 per year. Children were English speaking, normally developing, and no child had experienced an injury resulting in hospitalization. Children were pre-screened over the phone and were asked to rate their level of experience bicycling and rollerblading on a scale of 1–5. Only children with high experience bicycling (ratings of 4 = do it regularly and often when it is nice weather or 5 = do it very often when it is nice weather) and low experience with rollerblading (ratings of 1 = have never done it or 2 = have done it a little but not more than 3x) were selected for participation in the current study; participation rate = 74%. The Institutional Review Board at the University of Guelph provided approval for this research and parents and children granted consent prior to participating.

4.2. Measures

Risk taking tasks: Each child participated in a task that was designed to allow for risk compensation to occur. Specifically, children were randomly assigned to participate in either an incline (speed) or a height task, with the constraint that the groups be balanced by age and sex; two different types of tasks (judgements based on speed and height) were used to ensure variation in risk taking and because pilot tests revealed both were interesting for children at these ages. For both of these tasks an apparatus was custom built that would allow the children to choose varying heights and inclines according to the level of risk they were willing to take with and without safety gear on.

The platform on which the child stood was on the top of the apparatus and was three feet wide and six feet long; this size accommodated a bicycle on the platform. Wood boxes were built to go under the platform and to act as steps for the child to go up and down so s/he could survey the different height conditions (i.e., 6, 12, 18, 24, 30, 36, and 42 in.) or incline conditions before making his/her risk taking selection (i.e., what is the greatest height or steepest incline condition the child would bike or rollerblade down). For the incline condition, three ramps were designed for each of the seven step heights (6–42 in.) and these were constructed such that at each height there was a ramp that would lay at a 20 degree angle, a 32.5 degree angle and a 45 degree angle; these angles correspond to those that are rated as novice, intermediate, and advanced angles, respectively, for slope (speed) based recreational activities such as rollerblading and skiing (Beaudry, 1994). The selection of higher step heights and greater incline angles, therefore, indicated greater risk taking.

Ratings: Once children made their risk taking decision (height or incline), they positioned themselves at that location, sitting on the bike or standing and wearing rollerblades, and were asked to

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