

**Can Exposure to Framed Messages About Safety Reduce Risk Behaviours by
School-Aged Children?**

by

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ABSTRACT

CAN EXPOSURE TO FRAMED PEER MESSAGES ABOUT SAFETY REDUCE RISK BEHAVIOURS BY SCHOOL-AGED CHILDREN?

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Previous research has shown that when in an elevated positive mood state, children engage in more risk behaviours than when in a neutral mood state (Morrongiello, Stewart, Pope, Pogrebtsova, & Boulay, 2014). The current study examined whether delivering framed safety messages reduced risk behaviours when children are in a positive mood. 28 children (7-9 years old) were exposed to a message (gain-frame, loss-frame, or control message) regarding play behaviours on a specific risk-taking measure (an obstacle course). Children's risk-taking was measured before and after a positive mood has been induced, and the impact of framed safety messaging was examined. Results indicated the mood induction was successful and led to increased risk taking, and gain- and loss- framed messages differentially counteracted this mood effect and led to reduced risk taking. Implications for injury prevention are discussed.

Keywords: risk taking, positive mood, social norms, children, injury prevention

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Introduction

Overview of Unintentional Childhood Injury

Unintentional injury is the leading cause of death for children aged 1-19 in Canada and a significant cause of hospitalization (PHAC, 2014). Almost 400 Canadian children die annually due to injury. Between the years of 2008 and 2009, children and youth experienced 24, 000 injuries that required hospitalizations as a result of unintentional injury (PHAC, 2014). Importantly, however, research has shown that most of these injuries are preventable (Yanchar, Warda & Fuselli, 2012). Researchers have defined a child's death as preventable if "an individual of the community could reasonably have done something that would have changed the circumstances that led to the child's death" (Rimsza, Shackner, Bowen, & Marshall, 2002). Based on Rimsza and colleagues' review of the circumstances leading to child deaths in Arizona, it was estimated that more than 85% could have been prevented by environmental and/or behavioral modifications (Rimsza et al, 2002). Since risk taking behaviors increase injuries in children (Morrongiello, Kane, McArthur & Bell, 2012), the aim of the current study is to identify strategies to reduce risk taking during play in the uniquely vulnerable middle childhood age group (7-9 years old).

Risk-Taking in Childhood

The following literature review outlines factors that have been shown to influence children's risk-taking and are salient to the proposed study.

Age

Past research indicates that although injury rates do not increase as children enter elementary school, the factors that contribute to injuries do (Morrongiello, McArthur, Kane & Fleury, 2013). In addition, school-aged children represent a group of children who are more

likely to sustain multiple injuries (Boyce & Sobolewski, 1989). While infants and preschool children tend to be injured in a home environment because it is where they spend the most time, school-aged children are gaining more autonomy and independence from their parents, and are spending a larger quantity of time outside the home with their peers. As a result, many of the injuries that occur in this age group arise when children are away from home, in public parks, playgrounds, and school settings (Christensen & Morrongiello; Morrongiello et al., 2013). Due to the increased autonomy and decreased parental supervision of children in this age group, injuries in school-aged children are more likely to be a result of making individual decisions about engaging in risk behaviours, or making those decisions with the influence of their peers rather than the influence of their parents (Morrongiello et al., 2013).

Parental perceptions of appropriate supervision of school-aged children reveals considerable variation with child age. Some research indicates that parents believe it is appropriate to leave 9-10-year-old children unsupervised in the neighbourhood for several hours, while if the child is younger than 9 years old parents indicate they should not be left unsupervised for more than a few minutes (Peterson, Ewigman & Kivlahan, 1993). What parents report, however, seems not to align with what they actually do to supervise. Observational research indicates that children between the ages of 7 and 10 are routinely left unsupervised by their parents (35% of the time at home) and as parental supervision decreases, injury risk increases (Morrongiello, Kane & Zdzieborski, 2010). Given limited opportunities for direct supervision when school-aged children are away from the home (i.e. playing with friends at the neighbourhood park), this age group is a particularly vulnerable one. Hence, they are the focus of the current study.

Mood

The influence of mood state on propensity to engage in risk-taking has been examined fairly thoroughly in the adolescent and adult populations in the context of risky sex, illegal drug use, and alcohol consumption. Research reveals that mood state influences how likely someone is to engage in risky behaviour (Cooper, Agocha, & Sheldon, 2000; Chou & Lee, 2007; Holub, Hodgins, & Peden, 2005; Zapolski, Cyders & Smith, 2009). Being in a positive mood state increases risk taking and there are several reasons for this. Positive mood from winning a game can be transferred to another, unrelated event (i.e. engaging in some sort of risk behaviour) (Forgas, 1995). When people are in positive moods, they also tend to assign more positive attributions to risky situations, which increases their likelihood of doing the risky behaviors (Chou & Lee, 2007). Relatedly, De Vries and colleagues demonstrated that positive mood increases propensity to look for new and exciting situations (De Vries, Holland, Chenier, Starr, & Winkielman, 2010).

Although research on emotions and risk-taking in children is limited, the findings indicate that they, like adolescents and adults, are influenced by mood when making decisions on whether to engage in risky behaviours that could lead to injury (Morrongiello & Matheis, 2007; Morrongiello et al., 2014; Morrongiello et al., 2017). In one of the first studies examining how emotions impact children's risk-taking decisions, Morrongiello and Matheis (2007) found that children who anticipated experiencing fear in a play situation reported being more likely to engage in fewer risk behaviours, and those who anticipated feeling excited planned to engage in more risk behaviours. In another study specifically examining the impact of mood state (positive versus neutral), Morrongiello and colleagues (2014) found that when a positive mood is induced in school aged children, they are significantly more likely to intend to take more risks and

engage in more actual physical risk-taking than when in a neutral mood. Building on these findings, Morrongiello and colleagues (2017) examined whether this increase in risk-taking when in a positive mood state could be counteracted by exposing children to peer-communicated messages about avoiding risk behaviors. The findings indicated that this was an effective approach to reducing risk taking (Morrongiello et al., 2017). The current study extends this research by systematically studying how message framing affects children's risky behaviours when they are in a positive mood.

The Influence of Framing

Founded on prospect theory (Kahneman & Tversky, 1979), message framing is an approach that is used to highlight the advantages (gain-frame) or the disadvantages (loss-frame) of making a certain choice about a behaviour. Prospect theory is an economic theory based on the concept that people do not always make decisions in a rational way, particularly when deciding how to behave (e.g. buying a lottery ticket, engaging in a romantic relationship, etc). In contrast to many prior theories, prospect theory provides a framework for how people *actually* make decisions under risk (Kahneman & Tyversky, 1979; Tversky & Kahneman, 1981). According to this framework, decisions are influenced by the way in which information is delivered; people tend to organize information in a way that either highlights potential benefits associated with adopting a certain behaviour, or in a way that highlights the potential downsides of not adopting a certain behaviour (Tyversky & Kahneman, 1981). A simple example of framing would be looking at a glass of water as either half-empty or half-full; there is the same amount of water in the glass, but the way the volume is presented is different depending on the way it is framed.

Gain- and loss- framed messages have been used in health intervention research successfully in order to influence decision making in the context of alcohol consumption, smoking cessation, healthy eating, exercise, and car safety (Bannon & Schwartz, 2006; Latimer, Krishnan-Sarin, Cavallo, Duhig, Salovey & O'Malley, 2011; Lwin, Ho, Younbo, Leng, Wardoyo & Jung, 2016; Will, Decina, Maple & Perkins, 2015). Overall, research with adults indicates that gain-framed messages are more effective when the behaviour in question is perceived to be safe or risk-free, and loss framed messages are more effective for people who believe the behaviour to be risky or uncertain (Camenga, Hieftje, Fiellin, Edelman, Rosenthal & Duncan, 2014). Additionally, it has been shown that in adults, gain-framed messages are more effective for promoting behaviours that prevent illness or disease (i.e. sunscreen application) (Gallagher & Updegraff, 2011), whereas loss-framed messages are more effective for encouraging behaviours that could lead to the detection of an illness or disease (i.e. breast cancer screenings) (Cox & Cox, 2001). When considering the utility of message framing in this context, a prevention behaviour (e.g. physical exercise) can be seen as relatively low risk, whereas a detection behaviour (e.g. screening for a disease), is likely viewed as higher risk given the possibility of finding a disease.

While there is research that supports the utility of framing as a public health messaging technique, the literature has shown generally small and mixed effects (Gallagher & Updegraff, 2011; Pope, Pelletier & Guertin, 2017). One possible reason for the mixed results identified by Gallagher and Updegraff (2011) in their meta-analytic review was that the method applied by the majority of the studies conducted on message framing focused almost exclusively on *intentions* to change behaviour, rather than *actual* behaviour change. When participants' attitudes or intentions toward changing their behaviour was assessed as the outcome variable, there was no

significant effects of framing on the persuasiveness of health messages. However, when actual behaviour was the outcome variable, framed messages did affect the participant's behaviour, such that in general, gain-framed messages increased participants' engagement in prevention behaviours (e.g. physical activity, practicing safe sex) (Gallagher & Updegraff, 2011). While there were no significant results for loss-framed messages when looking at either prevention or detection behaviours, the results of this meta analysis indicate that simply examining someone's attitudes or intentions to engage in/avoid certain behaviours does not necessarily align with how they will truly behave. The current study aims to address this gap in the literature by examining actual behaviour, rather than intentions or attitudes.

Message Framing and Mood

Another reason that the research on framing has been limited is a general failure to examine factors beyond the message frame itself (Anghelcev & Sar, 2011; Gallagher & Updegraff, 2011; Pope et al., 2017; Wirtz, Sar & Ghuge, 2015). It has been suggested that in order to make framed messages the most effective, it should depend on both message features (e.g. frame, whether it is applicable/meaningful to the audience it's targeting) and individual features (e.g. psychological factors, cognitive variables) (Sar & Anghelcev, 2013). Once such individual factor that has been shown to interact with how people change their behaviour/intentions is mood (Anghelcev & Sar, 2011; Chang, 2007; Ferrer, Klein, Zajac, Lan, & Ling, 2012; Keller, Lipkus & Rimer, 2003; Mitchell, 2001; Sar & Anghelcev, 2013; Shen & Kollar, 2015; Yan, Dillard & Shen, 2010).

Based on the current research on mood and framing, there appear to be different hypotheses on how mood aligns with framed messages to influence behaviour. The first postulates that when an individual's mood is congruent with the frame (e.g. positive mood and

gain-frame, negative mood and loss-frame), the message will be more effective than if their mood is incongruent (negative/gain, positive/loss) (Chang, 2007; Keller et al., 2003). The second hypothesizes that people are motivated to maintain a positive mood, or repair a negative mood (Clark & Isen, 1982; Schaller & Cialdini, 1990). As such, those who are in a positive mood are more inclined to process positive messages to maintain their good mood, and those in a negative mood are also more likely to attend to positive messages in order to boost their mood (Chang, 2007; Keller et al., 2003). The final theory is more nuanced, and hypothesizes that when the information is particularly important/personally relevant, or when real loss is possible (e.g. breast cancer screening in a high-risk population), people in a positive mood are more protected by their happy emotions and are more likely to attend to threatening negative information than people in a negative or neutral mood (Keller et al., 2003; Wirtz et al., 2015).

Although these hypotheses contrast with each other, there is evidence to support all of them. The mood congruency theory has been successfully applied to promote intentions to change in a variety of areas including screening for eye health, healthy eating, colorectal cancer screening, health PSA's, and genital herpes (Anghelcev & Sar, 2011; Ferrer et al, 2012; Mitchell, 2001; Sar & Anghelcev, 2013; Yan et al., 2010). In all of these studies, participants whose mood aligned with the type of frame they received reported higher intentions to engage in both prevention and detection behaviours. Keller and colleagues (2003), Wirtz and colleagues (2015), and Chang (2007) found the opposite effect; participants in a positive mood were more attentive to loss-framed information, and the results for those in a negative mood found that either there was no difference between frames (Chang, 2007, Wirtz et al., 2015) or that those in a negative mood are more persuaded by gain-framed messages (Keller et al., 2003). The difference between these results appears to be due to the *relevance* or *risk level* of the information being presented. If

the information is perceived to be personally relevant and high risk, it seems that individuals in a positive mood are more apt to process negative information in order to make prudent risk-related choices (Keller et al., 2003). If, however, the information is perceived to be lower risk or less personally relevant, frames that align with mood are more effective to promote behavioural/attitudinal change.

Taken together, the research on mood and framing demonstrates that mood has an impact on how people process framed information. Given that mood is also a known predictor of risky behaviour both in adults and children, this is a potentially valuable area of research to explore. If, for example, either a loss- or gain- frame is shown to be more effective at decreasing risky behaviour when a child is in a positive mood, public health messaging in places like playgrounds and parks can be more effectively applied to reduce risk-taking that can lead to increased injury.

Message Framing and Children

While there has been considerable research conducted on message framing and health behaviours in adults, there is a substantial gap in the literature on framing effects in children and adolescents. The research that has been done has yielded mixed results on the effectiveness of message framing; while there is evidence that framing does have an effect on choices children and adolescents make (see Schlottman & Tring, 2005), the utility of gain- versus loss- framed messages has yet to be teased apart. In Camenga and colleagues' examination of adolescent preferences for gain- versus loss- framed messages relating to sexual health, they found mixed results on which type of frame youth found most convincing, with participants choosing both gain- and loss- framed messages (Camenga et al., 2014). In contrast, when examining smoking cessation, Latimer and colleagues found that adolescents are more likely to prefer loss-framed messages, which is in contrast with results from the adult population, where a gain-framed

message has been preferred (Latimer et al., 2011). Overall, results on message framing in the adolescent population remain preliminary and mixed, with some evidence that loss frames may be more effective at influencing youths' perceptions about engaging in certain health behaviours.

The existing literature on message framing relating to health behaviours in children is also quite sparse, but what does exist implies that message framing can be effective at modifying children's intentions and perceptions of engaging in certain health behaviours. For example, in Bannon and Schwartz's (2006) study examining the impact of message framing on children's nutrition choices, they found that combining gain- and loss- framed messages had an effect on children choosing apples as a snack as opposed to animal crackers compared to a control condition. Children were sorted into either a gain-framed group, in which they were shown a video stating the benefits of eating apples (i.e. apples are good for you, they give you more energy to play and be active, especially with friends) and showing children eating apples and playing with friends, a loss framed group, in which they were shown a video stating the consequences of not eating apples (i.e. apples are good for you, and if you don't choose to eat healthy foods like apples you will have less energy to play, especially with friends), and lastly a control group, in which the children were shown a video of other children playing games (Bannon & Schwartz, 2006). Results indicated that when combining the gain- and loss- framed message conditions, children were significantly more likely to choose apples as a snack rather than animal crackers compared to the control condition. When examining the gain- and loss- frames separately, the loss frame itself also yielded significant results, while the gain- frame did not. Despite its small sample size, this study did demonstrate that children are affected by message framing when encouraging healthy behaviours, and yielded preliminary evidence that loss-framed messages may be more effective than gain-framed ones.

Adding to Bannon and Schwartz's results, Wyllie and colleagues found that aligning the framing message with the type of health message (i.e. adoption versus cessation of a certain behaviour) was preferred in children aged 6-13 (Wyllie, Baxter & Kulczynski, 2015). In this context, they found that pairing a gain-framed message with a behavioural adoption approach (i.e. 'eat more fruit') was preferred to a loss framed message, and conversely, it was also preferable to pair a loss-framed message with a behavioural cessation approach (i.e. 'eat less candy') (Wyllie et al., 2015). This research implies that not only are framed messages effective at modifying attitudes and intentions in younger populations, they are also sensitive to the type of behaviour (whether adopting a healthy behaviour or ceasing an unhealthy one), similar to results found in adult and adolescent populations (Kim, 2006; Gallagher & Updegraff, 2011). This has also been seen in the context of encouraging exercise to prevent obesity; Lwin and Malik found that children who were exposed to a more positive framed message about engaging in exercise had more positive beliefs about exercising than those exposed to a loss-framed message emphasizing the negative health implications of obesity (Lwin & Malik, 2014).

With respect to risk-taking and injury prevention in children, message framing has received little research attention. However, Morrongiello and colleagues conducted studies that examined how tailored messages invoking fear (Morrongiello & Matheis, 2007) and encouraging children to recognize their past risky behaviour (Morrongiello & Landa, 2008) changed children's intentions to engage in risky playground behaviours. In the former study, children identified which types of behaviours they typically engaged in on a playground, and were then exposed to a video of a child actor playing on a playground and falling, presumably injuring themselves (e.g. crying out in "pain"). After this, children re-identified which behaviours they would be likely to engage in again, rating how dangerous they were and how likely they were to

be hurt if they did engage in them. Morrongiello and Matheis (2007) found that this fear manipulation significantly decreased the participants' intentions to engage in risky play in the future, and concluded that affective characteristics such as fear are important to consider when designing interventions relating to injury prevention. Using a similar design, Morrongiello and Landa (2008) demonstrated that cognitive factors are also important when designing injury interventions for children; by making participants aware of their past risky behaviours and having them advocate for safe play to their peers, they were able to alter the way that children thought about their own play behaviours, and reduce the intentions to play dangerously in the future (Morrongiello & Landa, 2008). Though neither of these interventions examine framing *per se*, they do indicate that safety messaging that emphasizes loss/getting hurt can change behavioural intentions relating to risky play in children through both cognitive and affective means.

Although the existing literature on framing is sparse for children and adolescents, there is evidence that message framing can have an effect on encouraging children to engage in behaviours that are good for them (i.e. healthy eating, exercise), and on discouraging children and adolescents from engaging in unhealthy or risky behaviours (i.e. smoking, risky sex). There has yet to be any research conducted on how message framing might impact children's risk decisions in the context of play situations that could lead to injury, and whether using a framing approach to safety messaging can enhance the impact that such messages have on not only perceptions and intentions, but on actual behaviour. This study aims to address this gap in the literature.

Current Research

The present study was an intervention that aimed to examine the impact that framed messages about safety had on counteracting the increase in risky behaviour that occurs when children are in an elevated positive mood state. Given that mood has been shown to interact with frame type in the past (see above section on mood and framing), this type of messaging may be a particularly useful way of reducing risky behaviour leading to injury in children. This study aimed to compare the impact that gain- and loss- framed messages have on behaviour to determine whether a more targeted approach to risk reduction has an effect on children's risk-taking when they are in a positive mood.

Research Questions

The current study addressed the following questions:

- 1) *Does a negatively framed message counteract the increase in risk-taking behaviour that occurs when children are in a positive mood?*
- 2) *Does a positively framed message counteract the increase in risk-taking behaviour that occurs when children are in a positive mood?*
- 3) *Is one frame (positive or negative) more effective than the other at counteracting the increase in risk-taking behaviour that occurs when children are in a positive mood?*

Method

Study Design

In order to assess risk-taking, participants' risky behaviours on an obstacle course were examined (see below for more information about the obstacle course). Each participant completed the obstacle course twice, once in a neutral mood state (baseline) and then in a positive one, so the change in risk taking due to positive mood state could be determined.

Further, in order to assess the impact of message frame on this change in risk taking, participants were divided into three groups: a gain-frame group, a loss-frame group, and a control group (no frame). Thus, analyses examined the change in risk taking as a function of mood state (1: neutral to aroused), and message type (3: gain-frame, loss frame, control message) with mood state as a within-participants factor and message frame as a between-participants factor.

Participants

Participants were recruited throughout the city of Guelph and the surrounding area (flyers, advertisements, and so on). Data from 28 participants between the ages of 7 and 9 years old was collected. 53% of the sample was female, and the mean age was 8.27 years ($SD = 0.83$ years). All children were developing normally (as reported by parents).

Materials

Obstacle Course. Prior research has indicated that an obstacle course is an effective method for measuring risk behaviours in children between the ages of 7 and 12 years old (Morrongiello, Walpole, & Lasenby, 2007; Morrongiello et al., 2017). The obstacle course is in a 14 x 15 meter room, and uses tires, aerobic steps and risers, a balance beam, gym mats, agility cones, and poles with bells attached to them (see Appendix A for photographic depiction). The child was told that their travel through the course is timed, and a button is on the wall for the child to start and stop this timing. Two cameras on opposite ends of the course filmed the entirety of the child's trip through the obstacle course in order for the researcher to code risky behaviours (trips, falls, knocking over equipment) after the fact.

Mood Induction. False positive feedback was used in order to invoke a positive mood in each child based on their score on a video game. Children play a video game called "Piñata," developed by Nathan Fox and colleagues. The game is relatively simplistic and easy to learn; in

order to gain points the participants must hit a cartoon animal with the space bar in order for it to break apart and collect the stars inside, much like a piñata. The participant goes through three rounds, starting off with a low difficulty level, increasing the difficulty in the second round, and decreasing the difficulty again in the last round. Morrongiello and colleagues (2014) found that an increased positive mood was reliably induced in 7-10-year-old children using this method in conjunction with the use of unconditionally positive feedback from the research assistants running the study (i.e. "you are so great at this game"). This procedure has also been used successfully in subsequent mood induction research (see Morrongiello et al., 2017). The positive mood and encouragement from the research assistants leads to a positive mood transfer to the child. In addition to the positive mood resulting from researcher feedback, the participant also gets to place their name at the top of a fabricated "Wall of Fame" (see Appendix B) in order to see that their score was higher than any other children to play the game before them.

Mood Ratings. Morrongiello and colleagues' (2014) adaptation of Laurent, Catanzaro, Rudolph, Lambert and Osborne's (1999) Positive and Negative Affect Scale for Children (PANAS-C) was completed by each participant twice during of the study: a neutral measure, and a positive induced mood measure. The child completed this using a star and a Velcro board to rate their moods in that moment (i.e sad, mad, happy, cheerful, and energetic) on a sliding scale from "not much at all" to "a lot" (see Appendix C for PANAS-C board), with higher scores on the positive mood adjectives equating to a more positive mood.

Filler Tasks. In order to neutralize the participants' mood, they were given a tedious 'filler' task to complete. This tasks consist of a worksheet that asks the participant to record all the words they could think of in a specific category (i.e. words that start with the letter 'w', sports, animals, vegetables and so on).

Framed Posters. The posters used in this study provided a visual display for the child and were read aloud by the child prior to entering the obstacle course for the second time. In order to ensure each child understood and processed the messages on the posters, they were asked to read them out loud to the research assistant and then asked a question to assess their understanding of the poster (e.g. “what do you think that means?”). The content of the posters contained either framed safety messages about the obstacle course, or a control message with no relevance to safety (see below).

Gain-framed poster. “Go slow through the obstacle course, and you’ll be safe, and have fun.”

Loss-framed poster. “Don’t go fast through the obstacle course, or you’ll trip and fall and get hurt.”)

Control poster. “The obstacle course was cleaned and vacuumed last Saturday.”

Procedure

Each participant was assigned to a condition (either a gain-frame, loss-frame, or control group) using a random number generator.

The study lasted approximately an hour. At the beginning of the study, the researcher led the participant into a separate room, leaving the parent to review the consent form. The researcher reviewed the assent form with the participant, encouraging questions and ensuring the participant understood their right to withdraw at any time.

After the assent had been signed and collected from the participant, the researcher left them with a filler task to work on alone for approximately 7 minutes in order to neutralize their mood. They were told that spelling doesn’t count and that there are no right or wrong answers in order to prevent a negative mood arising from concerns about spelling. When the neutralization

period was over, the researcher explained the PANAS-C mood ratings board to the child, defining mood adjectives if necessary, and their mood was measured for the first time. The participant then completed the obstacle course to measure their risk-taking behaviours when in a neutral mood (baseline). When the child completed the obstacle course task, they were told that their time will begin when they push the button on the wall, and that their time will stop when they press the button again once they have completed the obstacle course. The obstacle course task was video recorded for future coding of risky behaviours; cameras were unobtrusively positioned within the ceiling.

After the participant completed the obstacle course when in a neutral mood, the researcher introduced the positive mood induction using the Piñata video game. The game was explained to the child, and they were encouraged to try and get as many stars as possible, which would put them on the "Wall of Fame". Throughout the mood induction, the participant was verbally encouraged by the researchers, with enthusiastic phrases such as "you are so AWESOME at this," "I've never seen anyone do so well before!" and so on, in order to increase the participant's positive mood. After the game was complete, the researcher always praised the participant for 'beating' the high score with much enthusiasm. The participant then completed a mood rating to ensure the positive mood induction was effective.

Prior to completing the obstacle course for a second time in a positive mood, the child was exposed to a poster (gain-frame, loss-frame, or control group) that had been hung on the door to the obstacle course after their first run through the course. The researcher asked the child what the poster said and then asked a follow-up question to ensure the child understood the poster message (e.g. "what do you think the poster means?"). After the child read the poster, they completed the obstacle course for the second time in a positive mood.

After the obstacle course was completed by the child, they were given time to make a name tag to place at the top of the Wall of Fame. Finally, each child was debriefed on the purpose of the study. The child was gifted with a \$5.00 gift card from a variety of local stores in Guelph to thank them for their participation.

Data Coding

The obstacle course videos were coded in order to obtain a total sum of risky behaviours, from the time the child hits the button to start their time, to when they press it again to stop their time. Risky behaviours such as hitting into the wall and tripping/stumbling/falling were summed in order to create a total risk taking score, with a higher score indicating greater risk taking.

Results

Was the Mood Induction Procedure Successful in Inducing a Positive Mood State?

Mood rating scores were calculated by averaging positive mood adjective scores (i.e. happy, cheerful, excited, and energetic) completed by the child at two time points - after the neutral filler task (baseline) and after the child had completed the mood induction task. A paired-sample t-test was conducted on these mood scores to determine whether the mood induction procedure was effective in inducing a positive mood state in the participants (i.e., if the magnitude of this change in mood exceeded zero). Results revealed a significant increase in positive mood state after the mood induction procedure, with positive mood increasing by an average of 1.86 units ($SD = 1.56$) on the rating scale, $t(27) = 8.50, p < .001$.

Was Exposure to the Positive or Negative Framed Safety Message Successful to Counter the Increase in Risk-Taking that Occurs in a Heightened Positive Mood State?

Was The Manipulation Effective to Result in an Increase in Risk-Taking When in a Positive Mood?

In order to determine if the mood induction influenced risk taking in the same way as it did in previous research (Morrongiello et al., 2017), a paired sample t-test was conducted to compare risk taking when in an aroused versus neutral mood, with both measures taken from participants who had been exposed to no frame (control group). The t-test revealed a significant increase in risk taking for these children in the control condition, $t(7) = 6.11, p < .001$. As expected, based on past research, participants took significantly more risks when in an aroused mood state compared to a neutral mood state (M change = 2.00, $SD = 0.93$).

Did Exposure to Either Positive or Negative Safety Message Frames Counter This Effect?

To test whether the different safety messages buffered the effect of the mood induction on risk taking a change in risk taking score was computed by subtracting risk taking at baseline (before mood induction and frame exposure) from risk taking after exposure to the mood induction and safety frame message. A one-way Analysis of Variance (ANOVA) was conducted on these change scores, with safety message frame (2: gain, loss) as the between-participants variable. Results revealed that safety frame type produced differential effects in countering risk taking when in an aroused positive mood state, $F(1, 18) = 16.00, p < 0.05$, partial eta squared = .47. Hence, there was a significant difference between how the gain-framed message and the loss-framed message influenced change in risk-taking scores.

For What Frame Conditions Did the Change in Risk-Taking Exceed Chance Level (0)?

In order to examine the individual effects of the gain-framed and loss-framed safety

messages on risk taking, a paired-sample t-test was conducted for each group separately, comparing baseline with post-intervention risk taking scores.

Those participants who read gain-framed safety messages engaged in risk taking to the same degree as at baseline, $t(9) = 0.89, p > .05$. Hence, the message counteracted the increase in risk-taking that occurred in response to the mood induction (see control group effect above).

Participants who read loss-framed safety messages demonstrated a statistically significant decrease in their risk-taking behaviours (an average reduction of 2.00 points compared to baseline, $SD = 1.25$) when in a positive mood, $t(9) = -5.07, p < .05$. Thus, exposure to the loss-framed message went beyond simply counteracting the effect of the mood induction on risk taking, and actually decreased risk taking below that shown initially at baseline (i.e., before any information about injury risk in the obstacle course was mentioned).

Discussion

Unintentional injury is the leading cause of injury in children over the age of 1 (PHAC, 2014). A large majority of these injuries occur in school age children when they are unsupervised by their parents and are making their own decisions about risk taking or doing so in the company of their peers (Christensen & Morrongiello, 1997). Past research has demonstrated that children engage in increased physical risk-taking when they are in a positive mood (Morrongiello et al., 2014; Morrongiello et al., 2017), which is often the case when children are playing in the community (on playgrounds, parks, and so on). Because school-aged children are often not as closely supervised by their parents in these settings as younger children would be, interventions to reduce the amount of physical risk-taking leading to injury are extremely important.

One strategy that has proven successful in past research is utilizing message framing to target risk behaviours (Will et al., 2015; Bannon & Schwartz, 2006; Gallagher & Updegraff,

2011; Latimer et al., 2011; Lwin et al., 2016). The literature on message framing indicates that overall, messages that emphasize the positives of engaging/not engaging in a certain behaviour (gain frames) are more effective when the behaviour in question is safe or low risk, and messages that emphasize the negatives of engaging/not engaging in a behaviour (loss frames) are more effective when the behaviour is perceived to be risky or uncertain (Camenga et al., 2014; Gallagher & Updegraff, 2011). While the existing research on message framing is promising as a method of reducing risk-taking, the literature has yielded mixed results (Gallagher & Updegraff, 2011; Pope et al., 2017). It has been suggested that the differing results are due to a) a substantial lack of studies examining actual *behaviour*, as opposed to simply intentions to change, and b) a lack of consideration for possible factors that influence how framed messages are processed (e.g. mood). The current study adds to the message framing literature by considering these two gaps in research to date, and also applies message framing to a largely under-studied group, school-aged children.

Past research has demonstrated that safety messaging emphasizing loss (e.g. getting hurt when playing in a risky way) decreases intentions to engage in physical risk-taking in play situations (Morrongiello & Matheis, 2007; Morrongiello & Landa, 2008). Extending these findings, the current results demonstrate that something as simple as reading a poster promoting safety can decrease the *actual* risk-taking behaviours children engage in, even when in a positive mood state. Consistent with past research (Morrongiello et al., 2014; Morrongiello et al., 2017), children engaged in more risk-taking behaviours when they were in a positive mood. This increase in risk-taking when in a positive mood was counteracted by both the gain frame (“Go slow through the obstacle course, and you’ll be safe, and have fun.”) and the loss frame (“Don’t

go fast through the obstacle course, or you'll trip and fall and get hurt.”), however, there were differential effects depending on frame type.

Risk-taking for children in the gain-frame group did not change significantly from baseline (first run through the obstacle course, prior to the mood induction) to their test run (second time through the obstacle course, after the mood induction and after reading the gain-framed safety message). Given that risk taking increased significantly for children who were in the control group, these results indicate that the gain-framed message counteracted the increase in risk-taking that occurs when children are in a positive mood. The loss-framed group, however, had an even greater effect on risk reduction; results indicated that compared to baseline, risk-taking in the test condition was reduced to a level significantly *lower* than the participants' baseline risk-taking behaviours. This indicates that not only does a loss-framed message counteract the increase in risk-taking that occurs in a positive mood, it actually serves to reduce risk-taking below that which children engage in when in a neutral mood. While both gain- and loss- framed messages altered children's risk-taking behaviour in a positive way, loss messages were even more impactful.

There may be specific reasons for this differential effect; while the gain-framed message mentioned safety, the loss-framed message was more targeted, and focused on avoiding risk leading to specific injuries and outcomes (tripping, falling, and getting hurt). Because of this, the loss message may have appealed to children's beliefs about their vulnerability to injury, and the severity of the injury that might occur; as we know from past research (Morrongiello & Rennie, 1998; Morrongiello & Matheis, 2007), beliefs about severity and vulnerability to injury predict how likely children are to engage in risk-taking. Reminding children that they may get hurt in the loss-framed message may have increased their perception of danger, which decreased their risk-

taking to a greater extent than the gain-framed message, which more generally advocated for staying safe. Another possible reason for the greater effectiveness of the loss-framed message comes from the literature on mood and framing; some hypotheses about the interaction between mood and message frame indicate that when someone is in a positive mood, they are more likely to process negative information that is personally relevant because they are protected by their happy emotions, and do not feel threatened by the potential for loss (Keller et al., 2003; Wirtz et al., 2015). It is possible that the more specific message about tripping, falling, and getting hurt yielded more thorough cognitive processing than the gain-framed message, which may have resulted in more shallow, surface-level processing that is common when people are in a positive mood (Keller et al., 2003; Wirtz et al., 2015). This study did not explicitly examine the cognitive factors that contributed to the decrease in risk-taking exhibited by the participants; future research on such factors (e.g. perceived vulnerability and severity, depth of processing) would be valuable in order to better understand the mechanisms that underlie behaviour change in this population.

These results, though preliminary, are consistent with the research that demonstrates framing can have an effect on reducing risky behaviour. Although findings have been mixed, particularly in child and adolescent populations, these results are similar to past research demonstrating that gain- and loss- frames both have an effect on reducing risky behaviour (Bannon & Schwartz, 2006; Camenga et al., 2014; Wyllie et al., 2015), with loss frames being even more effective than gain frames (Bannon & Schwartz, 2006). These results add to the existing literature by exploring actual physical risk-taking, the influence of framing when considering affect, and the effect of framing on the at-risk middle childhood age group.

Practical Implications

The benefit of this particular research design was that it examined actual behaviour, rather than simply intentions, which have dominated the framing literature to date (Gallagher & Updegraff, 2011). This is undoubtedly a promising step forward for future real-world interventions, as the behaviour exhibited by the children in this study is more likely to generalize to their actual play behaviours than a measure of their intentions to take physical risks. Given that actual physical risk taking was mitigated by framed safety posters even when children were in a positive mood, framed posters may be a particularly useful intervention in places like public parks, where children are often happy and inclined to engage in increased risk-taking. In particular, loss-framed posters will likely work better than gain-framed posters when applied in a community setting, as they emphasize the potential for injury if children engage in risky play behaviours.

Not only are framed messages effective at reducing risk-taking in children, they are also incredibly cost-effective and easy to implement from a public health perspective. Loss-framed posters hung at the entrance to community playgrounds have the potential to reach multiple children simultaneously, which is a large advantage when compared to small-group or individual interventions to reduce risk-taking. If parents in particular are taught to make sure their children understand the safety message prior to allowing their child to play, it may further facilitate effective processing of the framed message.

Limitations and Future Research

The current study reveals promising results regarding how framed safety messages can be used to reduce children's risk-taking. Nevertheless, there are some limitations to this study that should be addressed in future research. Firstly, the sample size for this study was very small,

with ten children in each frame group (gain, loss), and eight children in the control group. As such, the power to detect a true effect is quite small. Future research should consider that power analysis indicates a sample size of 156 participants (with 52 participants in each of the three groups) would be more appropriate to detect a moderate effect size with a power set at 0.8.

Further, the sample was fairly homogenous in terms of demographic characteristics, which limits the generalizability of the results to more culturally and economically diverse populations. Prior to applying this research to community-level interventions, it will be important to ensure that the same effects are found in a more diverse population.

Lastly, with respect to the message frames themselves, the loss frame was more specific and tailored to a particular outcome (falling and getting hurt) than the gain frame, which may be one reason why it served to be more effective at reducing risk behaviours. If this was the case, then it would likely be beneficial to further tailor both the gain- and loss- framed messages to reflect specific features of the obstacle course (e.g. balance beam, tires), or in the future, playground (e.g. slides, monkey bars). Further tailoring the messages in this way may a) yield more accurate results with respect to effectiveness of one safety frame over another, and b) reduce risk-taking even further. In order to better understand the mechanisms by which the framed messages work for children, it would also be useful to include a brief survey of each child's perceptions about the messages themselves, in order to understand the cognitive factors influencing risk-taking.

Conclusion

This study reveals promising results concerning the impact of framed safety messages on the reduction of risk behaviours in school-aged children. Strategic use of framed safety messaging (in particular the use of loss-frames) has the potential to reduce the high rates of

unintentional injury in school aged children when they are in play situations and more likely to engage in risk taking due to being in a positive mood state. Future directions for research include exploring the cognitive factors involved in processing different frame types (gain versus loss), and implementing framed safety messaging on a community level to examine broader effects of peer safety message exposure on youth risk taking in community play settings like public playgrounds.

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Appendix A: Obstacle Course



Appendix B: Wall of Fame



Appendix C: PANAS Rating Board

