Does Exposure to General Warnings in Framed Messages Reduce Risk Behaviors in School-Aged Children?

by

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ABSTRACT

DOES EXPOSURE TO GENERAL WARNINGS IN FRAMED MESSAGES REDUCE RISK BEHAVIORS IN SCHOOL-AGED CHILDREN?

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Children in a heightened positive mood state engage in more risk-taking behaviors (Morrongiello et al., 2017; Morrongiello et al., 2014; Seasons, 2018). Framed safety messages (gain- or loss- framed) can counteract this increase in risk taking that occurs when children are in a heightened positive mood (Seasons, 2018). In previous research, framed safety messages have consisted of behaviourally targeted messages that place an emphasis on avoiding risk behaviors leading to specific injuries and outcomes. The current study examined whether delivering more general warning messages in framed contexts had a differential effect on reducing risk taking in children when in a heightened positive mood. 26 children (aged 7-9 years old) were exposed to a general safety message (gain-frame, loss-frame, or control message) regarding play behaviors on an obstacle course (risk taking measure). Children’s risk-taking running the obstacle course was measured before and after a positive mood induction. Results indicated that the mood induction was successful and led to increased risk-taking. Gain-framed and loss-framed safety messages both counteracted this increase in risk-taking, but loss-framed messages yielded larger reductions. There was no differential effect based on exposure to general versus behaviorally targeted framed safety messages. Implications for injury prevention are discussed.

Keywords: risk taking, positive mood, children, injury prevention
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Introduction

Unintentional Injury in Children

Unintentional injuries are the leading cause of death, disability, and hospitalization for children over the age of one in most developed nations (Centers for Disease Control and Prevention, 2015; Public Health Agency of Canada, 2013; World Health Organizations, WHO, 2010). Although rates are declining, each year nearly 16,500 Canadian children are hospitalized from unintentional injuries, with an average of 210 of these hospitalizations resulting in death (Parachute Canada, 2016). Notably, there is strong research evidence suggesting that the majority of these paediatric injuries are preventable (Rimsza, Schackner, Bowen & Marshall, 2002; Canadian Paediatric Society, 2012; Philippanksis et al., 2004). In a study by Rimsza, Schackner, Bowen & Marshall (2002), 95% of all deaths of children under the age of 18 years old were analyzed. It was estimated that more than 85% of the deaths were preventable (Rimsza et al., 2002). Thus, although unintentional injuries pose a significant health threat to children, the majority of these deaths are preventable. Therefore, identifying interventions that effectively prevent injuries is of high priority for researchers. This issue was addressed in the current study.

Risk Taking in Children

There are many factors that place children at risk for injuries, a primary one being risk-taking behavior. Physical risk-taking (i.e., engaging in a behavior that increases risk of injury when there are alternatives that do not do so) is a significant predictor of injury in children, with past research demonstrating that children who engage in physical risk-taking experience more injuries across childhood (Flavin, Dostaler, Simpson, Brison & Pickett, 2006; Moran et al., 2012; Morrongiello, Kane, McArthur & Bell, 2012; Morrongiello, Sandomierski & Valla, 2010). Similarly, there is also a correlation between children’s intention to engage in risk-taking
behavior and their actual risk-taking behavior (Morrongiello, 2004). Based on these findings, examining risk-taking in children is a viable method for identifying children who are at the greatest risk of injury. A number of individual difference characteristics have been shown to influence children’s risk taking (see Morrongiello, Corbett & Switzer, 2013; Morrongiello & Lasenby-Lessard, 2007, for review). Below is a review of some of the factors that are relevant to the current research.

**Age.** Middle childhood (6-12 years) is a period of particularly heightened risk for injury. Although previous studies have shown that injury rates do not increase as children enter elementary school, the factors that contribute to these injuries do (Morrongiello, Kane, McArthur, & Bell, 2012). School-aged children are continuously gaining independence outside of the home and are therefore left unsupervised for longer periods of time. Previous research has demonstrated that as parental supervision decreases, risk for injury increases (Morrongiello, Kane & Zdzieborski, 2010). As a result of increased autonomy and the decrease in parental supervision that occurs during middle childhood, many injuries to children in this age group occur on playgrounds, in public parks, and in school settings (Morongiello et al., 2017; Morrongiello et al., 2013). Furthermore, school-aged children represent a large portion of a category known as “accident repeaters” (i.e., children who are unintentionally injured multiple times over a prolonged period of time; Boyce & Sobolweski, 1989). As a result, school aged children represent a vulnerable group in regard to risk of injury. Consequently, they are the focus of the current study.

**Mood.** Previous studies have repeatedly shown that mood states influence the risk decisions of adults and adolescents. For example, positive mood states during adolescence have been linked to an increase in risky behaviors such as alcohol consumption, gambling, illegal drug
use, risky driving, and unsafe sexual practices (Cooper, Agocha, & Sheldon, 2000; Holub, Hodgins, & Peden, 2005; Rhodes, Pivik & Sutton, 2015). The Affect Infusion Model (AIM), which was developed by Forgas in the early 1990’s, is one model that provides insights into the impact of mood state on risky behaviors. This model postulates that affect that is elicited by one event can be transferred to another unrelated event (Forgas, 1995). Hence, when in a positive mood, people tend to assign positive attributions to risky situations, while the reverse is true when people are in a negative mood. The positive appraisal of risky situations when in a positive mood state, therefore, leads the individual to appraise the situation as less risky than they normally would in a neutral mood state. A study by Chou and Lee (2007) resulted in findings consistent with this model; it was found that the tendency to take risks was greater when participants were in an induced positive mood than when they were in an induced negative mood. The results from both Forgas’ (1995) and Chou and Lee’s (2007) studies indicate that riskier decisions are made when in a positive mood state due to the misperception of a reduction of risk, compared to when in a neutral or negative mood state.

The limited research on emotions and risk-taking in children suggests that children, like adolescents and adults, are influenced by mood when making decisions on whether to engage in risky behaviors that could lead to injury (Morrongiello et al., 2017; Morrongiello et al., 2014; Morrongiello & Matheis, 2007). In 2007, Morrongiello and Matheis found that children who experienced fear engaged in less risk behaviors, and those that experienced excitement engaged in more risk behaviors. In another study specifically examining the impact of mood state (positive versus neutral), Morrongiello et al., (2014) found that when a positive mood is induced in school aged children, they are significantly more likely to engage in physical risk-taking than when in a neutral mood. In 2017, Morrongiello et al. extended these findings and examined
whether this increase in risk-taking that occurs when children are in a heightened positive mood could be counteracted by exposure to peer-communicated messages about avoiding risk taking. The study demonstrated that this was a useful approach to reducing risk taking that occurs when children are in a heightened positive mood (Morrongiello et al., 2017). Seasons (2018) further built upon these findings and examined the effect of framed safety messages that targeted a specific risk behavior (i.e., speeding through an obstacle course) and injury outcome (i.e., falling) on children’s risky behaviors when in a positive mood. Specifically, children between the ages of 7-9 were exposed to either a gain-framed safety message (“Go slow through the obstacle course, and you’ll be safe and have fun”), a loss-framed safety message (“Don’t go fast through the obstacle course, or you’ll trip and fall and get hurt”), or a control message, when in a heightened positive mood before going through an obstacle course. The findings indicated that these targeted framed safety messages both successfully counteracted the increase in risk-taking that occurs when children are in a heightened positive mood, although the loss frame had greater impact than the gain frame to reduce risk taking. The current study aims to extend these findings and examine whether there is a differential effect of more general framed safety messages on risk taking in children.

**Prospect Theory and the Effects of Framing on Health Behaviours**

Prospect theory suggests that individuals respond differently to factually equivalent information depending on whether it is framed in terms of costs (loss-frame) or benefits (gain-frame) (Kahneman & Tversky, 1979). According to prospect theory, individual’s preferences are therefore sensitive to how information is framed. Specifically, the benefits of performing a behavior (gain-frame) or the potential consequences of not performing a behavior (loss-frame), are highlighted.
Message framing is an application of prospect theory in which persuasive messages are written in order to make some aspect of the potential benefits or risks of engaging (or not engaging) in a certain behavior salient for the target audience (Wirtz, Sar & Ghuge, 2015). For decades, investigators have explored the impact of gain- and loss- framed messages on adults’ health behaviors. Researchers have investigated the effects of framed safety messaging on smoking cessation, sun-screen application, performing of breast self-examinations, participation in physical activity, and participation in safe sexual practices (Garcia-Retamero & Cokely, 2014; Jung & Villegas, 2011; Li, Cheng & Fung, 2014; Toll, Salovey, O’Malley, Mazure, Latimer, & McKee, 2008; Wansink & Pope; 2014). Given the complexities of applying prospect theory to health behavior decisions, the focus on risk as uncertainty has typically been translated to risk as severity in this research (Rothman & Salovey, 1997). Consequently, prevention behaviors are considered “low risk” because their consequences (i.e., avoiding illness) are arguably more desirable than the consequences of detection behaviors (i.e., confirming illness), which are considered “high risk” (Harrington & Kerr, 2017). Applying the tenants of prospect theory, health intervention researchers have hypothesized that loss-framed messages convince individuals to engage in detection behaviors, which are inherently risky given their potential to indicate the presence of disease (e.g. Pap testing, HIV testing, and mammography), while gain-framed messages persuade individuals to engage in prevention behaviors which are not inherently risky (e.g. sunscreen use, smoking cessation, and dental hygiene) (Harrington & Kerr, 2017; Wirtz et al., 2015). An example of a gain-framed message might be “If you have regular mammograms, you increase your chances of detecting breast cancer at an early, more treatable stage”, while an example of a loss-framed message might be “If you don’t have regular mammograms, you reduce your chances of detecting breast cancer at an early, more treatable
stage” (O’Keefe & Jensen, 2009). Several studies lend support to the logic of emphasizing gains for promotion behaviors (Detweiler et al., 1999; Harrington & Kerr, 2017; Rothman, Salovey, Antone, Keough & Martin, 1993; Wirtz et al., 2015) and emphasizing losses for detection behaviors (Banks, Salovey, Greener, Rothman, Moyer, Beavais, & Epel, 1995; Harrington & Kerr, 2017; Meyerowitz & Chaiken, 1987; Wirtz et al., 2015).

Despite evidence supporting the efficacy of framed messaging in promoting health behaviors, a meta-analysis conducted by Gallagher & Updegraff (2011) suggests that there are some exceptions to the usefulness of this approach. Specifically, the results indicated that many studies have used immediate measures of attitudes towards a health behavior or intentions to engage in a behavior as the outcome of interest, while far fewer have assessed actual behavior change (Gallagher & Updegraff, 2011). Furthermore, in the studies that utilized attitudes or intentions to engage in a behavior as the outcome variable, researchers observed no significant moderating effect of framing on the persuasiveness of health messages (Gallagher & Updegraff, 2011). Given the current study’s focus on testing for differential effects of framed messages, the study examines actual behavior change as opposed to intentions or attitudes.

**The Effects of Mood and Message Framing**

Some investigators have suggested that message framing researchers have placed too much emphasis on testing the main effect of message framing rather than assessing potential moderator variables (Wirtz et al., 2015). Recently, researchers have investigated the effects of individual-level variables, such as mood, with message framing. Currently, there are three main theories that suggest why people in a positive or negative mood will differ in their reaction to framed messages.
The mood-maintenance theory hypothesizes that when individuals are in a positive mood, they will attend to information that is more likely to maintain their positive mood, while individuals in a negative mood tend to notice and interpret events negatively (Keller, Lipkus & Rimer, 2003; Schaller & Cialdini, 1990). Mood state may influence one’s receptivity to a gain or loss frame given that an individual’s feelings may serve as information about one’s current situation (Rothman & Salovey, 1997). In other words, people process information that is consistent with their affective state more thoroughly (Wegener, Petty & Smith, 1995). According to the mood-maintenance theory, negative moods may confirm that potential losses are possible, whereas positive mood may underscore the salience of potential gains (Keller et al., 2003). Thus, individuals may be more persuaded by gain-framed arguments when in a happy mood, but loss-framed arguments may become more persuasive when in a sad mood. Similarly, the hedonic contingency theory suggests that individuals in a positive mood are motivated to process uplifting messages and avoid negative information (Wegener & Petty, 1994). Based on this theory, researchers have hypothesized that individuals in a positive mood are more persuaded by gain-framed messages than loss-framed messages. The hedonic contingency framework also suggests that when individuals are in a positive mood, they are more sensitive to the mood-changing consequences of their actions than individuals in a negative mood (Keller et al., 2003). In other words, people in a negative mood do not care as much about how the information will spoil their mood given that they are already in a negative mood. Therefore, the hedonic contingency theory suggests that individuals in a positive mood prefer gain-framed messages to loss-framed messages, however, framing effects are attenuated when individuals are in a negative mood. The third theory of the effects of mood and message framing is a departure from the previous two theories and focuses on the role of mood in the context of meaningful losses.
and gains. Specifically, when the information is particularly relevant to an individual, people in a positive mood are more protected by their happy emotions and are therefore more inclined to attend to threatening negative information than people in a negative mood (Keller et al., 2003; Wirtz et al., 2015). Thus, this theory suggests that people in a positive mood consider negative information carefully by making prudent risk-related decisions. The increased focus on potential losses among individuals in a happy mood is a departure from previous theories. Isen and Geva (1987) suggest that this distinction may be explained by the high level of risk and the potential of real loss.

Despite the variations in the aforementioned theories, there is evidence to support all three. In a 2010 study which consisted of two experiments, Yan, Dillard & Shen demonstrated that when measuring individual’s intentions to receive comprehensive eye exams and eat less junk food, gain framing was most effective when coupled with a positive mood, and loss framing was most persuasive when participants were in a sad mood. Thus, this study lends support to the theory of mood-maintenance. Studies examining individual’s intentions to receive colorectal cancer screenings and receive genital herpes testing have yielded similar results (Ferrer et al., 2012; Mitchell, 2001). Conversely, other researchers have found opposite effects. More specifically, some studies have found that individuals in a positive mood are more attentive to loss-framed messages, while those in a negative mood and more persuaded by gain-framed information (Chang, 2007; Wirtz et al., 2015). The literature suggests that one of the moderating factors contributing to the differences in these findings is perceived risk. If the information is perceived to be high risk, then individuals in a happy mood are more inclined to process negative information in order to make a cautious risk-related decision and avoid negative consequences that could be substantial, such as an injury (Keller et al., 2003; Wirtz et al., 2015). However, if
the information is about low risk events, then individuals are more likely to attend to framed messages that align with their current mood state (Keller et al., 2003).

In sum, it is evident that an individual’s mood can impact their processing of framed safety messages. Given that mood is a known predictor of risk taking in both adults and children, it is a worthwhile area of literature for researchers to further explore and lays the groundwork for the current study.

Message Framing in a Paediatric Population

Despite the extensive literature on message framing and health behaviors in adults, there is a significant gap in research on the effects of framing in the pediatric population. Much of the research in this population has been focused on adolescents. Studies evaluating the effectiveness of framed safety messages in adolescents have examined its effects on behaviors that include smoking cessation, healthy eating habits, condom use, and STD screening (Garcia-Retamero & Cokely, 2011; Kim, 2013; Latimer et al., 2012; Satia, Barlow, Armstrong-Brown & Watters, 2011; Urban, 2006). In Latimer and colleagues’s (2012) evaluation of targeted smoking cessation messages for adolescents, the loss-framed message resulted in more positive attitudes towards quitting than did the gain-framed version. However, in a separate study that investigated reducing fat consumption in adolescents, researchers found the opposite effect; participants found gain-framed messages most salient (Satia et al., 2011). That is, participants who were exposed to a gain-framed message expressed more intent to reduce their intake of fatty foods than those who were exposed to a loss-framed message. In studies examining the effects of message framing on sexual health behaviors, results have indicated that gain-framed messages induce greater adherence to prevention behaviors (e.g., condom use), whereas loss-framed messages are more persuasive for promoting illness-detecting behaviors (e.g. completing an STD
screening) (Garcia-Retamero & Cokely, 2011). Thus, the effect of message framing in the adolescent population is mixed.

The research on message framing in younger children is limited but suggests that message framing may be an effective tool for adjusting children’s health behaviors. In a seminal study by Bannon & Schwartz (2005), researchers tested the influence of nutrition message framing on snack choice among kindergarteners (i.e. choosing to eat apples vs. animal crackers). Children were assigned to watch either: a gain-framed nutrition message (i.e. the positive benefits of eating apples), a loss-framed nutrition message (i.e. the negative consequences of not eating apples), or a control video. The findings imply that both gain and loss-framed messages promoting healthy snacks have the potential to positively influence children’s behavior. Specifically, researchers found that when combining the intervention groups (gain-frame and loss-frame), significantly more children chose apples than did in the control group (Bannon & Schwartz, 2005). When examining the intervention groups separately, results indicated that children viewing the loss-frame video were significantly more likely to choose apples than children in the control condition. However, the gain-frame did not yield statistically significant results. This preliminary study suggests that children’s health behaviors are influenced by message framing, and that loss-framed messages may be more persuasive than gain-framed messages for young children.

Wyllie, Baxter & Kulczynski (2015) built upon these findings and investigated the effectiveness of gain- and loss- message framing utilized in public service announcements aimed at promoting healthy eating habits in children. Results indicated that message frame was most effective when it was congruent with message approach. That is, when employing a behavioral adoption approach, a gain-framed message was more effective (e.g., “Eat more fruit”), whereas
loss-framed messages (e.g., “Eat less candy”) was more useful for promoting cessation of a problem behavior (Wyllie et al., 2015). Additionally, Wyllie and colleagues’ (2015) research suggests that the effect of framed messages is sensitive to the nature of the behavior (engaging in a healthy behavior vs. stopping an unhealthy behavior); this echoes the findings from adult and adolescent populations (Banks et al., 1995; Detweiler et al., 1999; Gallagher & Updegraff, 2011; Garcia-Retamero & Cokely, 2011).

**Message Framing and Reduction of Risk-Taking**

The research examining the effects of message framing on risk-taking in children is extremely limited. Within the literature, there is currently one study that specifically investigated how message framing impacts children’s risk decisions in the context of play situations that could lead to injury. In her seminal study, Seasons (2018) investigated the impact of gain- and loss-framed messages on counteracting the increase in risky behavior that occurs when children are in a heightened positive mood. Notably, this study examined the effects of these messages on children’s *actual risk-taking behaviors*, as opposed to their risk taking intentions. Specifically, children’s risky behaviors on an obstacle course were examined twice, once in a neutral mood state and then again in a positive mood state. In order to assess the impact of message frame on the change in risk taking, participants were exposed to either: a gain-frame message, a loss-frame message, or a control message. Results indicated that gain-framed messages counteracted the increase in risk-taking that occurs when children are in a heightened positive mood (Seasons, 2018). Furthermore, risk-taking in the loss-framed group of children was reduced to a level significantly lower than the participant’s baseline risk-taking (Seasons, 2018). Thus, while both gain- and loss-framed messages reduced children’s risk-taking behaviors when in a heightened positive mood, loss-framed messages were significantly more impactful than gain-framed
messages. It is important to note that loss-framed messages used in this study focused on a specific behavioral target (going fast) and mentioned specific injuries (falling) and outcomes ( tripping, getting hurt) that could come from risk taking; the loss-framed message read “Don’t go fast through the obstacle course, or you’ll trip and fall and get hurt”. This approach can work well if there is a specific risk behavior to be targeted, however, the question remains as to whether one can use this approach in situations where a more general warning is to be issued because the risk behaviors can vary considerably. The current study addressed this issue.

Current Research

The current study aims to build upon Seasons (2018) research and examine whether exposure to more general loss-framed messages had a similar impact on the reduction of risk-taking in school aged children when in a heightened positive mood. That is, does exposure to a general warning in framed messages have the same effects on reducing risk taking in children that targeted framed messages have? This is an important question because in some situations where messaging might be used to reduce injury risks there may not be a specific behavior to target but a more general type of behavior. For example, on skateparks, doing any risky trick that can increase risk of falling can lead to injury and should be avoided. Further, examining this difference will contribute to a better understanding of the most effective types of messages to implement in any future community-based interventions aimed at reducing children’s risk taking.

Research Questions

The current study addresses the following questions:

1) Do general loss-framed messages counteract the increase in risk-taking behavior that occurs when children are in a heightened positive mood?
2) Do general gain-framed messages counteract the increase in risk-taking that occurs when children are in a heightened positive mood?

3) Is one frame (positive or negative) more effective than the other at counteracting the increase in risk-taking behavior that occurs when children are in a heightened positive mood?

4) Is there a differential effect of general versus behaviourally targeted safety messages on reduction in risk taking that occurs when children are in a heightened positive mood?

Method

Overall Study Design

To assess risk-taking, participant’s risky behaviors on an obstacle course were studied (see below for more information about the obstacle course and coding). Each participant completed the obstacle course twice, once in a neutral mood (baseline) and once in a positive mood, so that increases in risk-taking due to positive mood could be determined. In order to assess the impact of message frame on this increase in risk-taking, participants were divided into three groups: 1) general gain-frame group, 2) general loss-frame group, 3) control group (no frame). Analyses examined the change in risk-taking as a function of mood state (neutral vs. aroused) and message frame type (general gain-frame, general loss-frame, control) with mood state as a within-participant factor and message frame as a between-participant factor. Age and sex were controlled for in the primary analyses.

Participants

Participants were recruited through an existing database via phone calls; families signed up for the database based on community recruitment advertising research on child development
(e.g., posters, information letters in child swim classes). Data from 26 participants between the ages of 7 and 9 years was collected ($M = 8.75$ years, $SD = 0.78$), with 60% of the sample being male. All children were typically developing (cognitive, physical, social), as reported by parents. All (100%) participants were Caucasian, with 79% of mothers reporting an annual household income of $80,000 or higher. Of participant’s mothers, 28% obtained a college degree, 36% obtained a university degree, and 40% of participant’s mothers completed some graduate level training. The study was approved by a Research Ethics Board and parents gave written consent and children gave written assent.

**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). The obstacle course is located in a 14 x 15-meter room, and includes truck tires, aerobic steps and risers, a balance beam, gym mats, agility cones, and poles with bells attached to them (see Appendix A). The child was told that their travel through the course would be timed, and a button lights up on the wall for the child to start and stop this timing. Two unobtrusively located cameras, positioned on opposite ends of the course, filmed the entirety of the child’s trip through the obstacle course for later coding of risky behaviours. Arrows on the floor indicate the path to be followed through the course.

**Mood Induction.** The difficulty in researching naturally occurring events that evoke positive mood has prompted the popularized use of standardized mood induction procedures (see Nummenmaa & Niemi, 2004, for review). Experimental induction of emotion can provoke a state of feeling that is comparable to naturally occurring emotions (Westermann, Spies, Stahl, & Hesse, 1996). In the past, false positive feedback about performance has successfully produced
positive feelings in research participants (Morrongiello et al., 2017; Morrongiello et al., 2014; Seasons, 2018, Parrot & Sabini, 1990). The current study utilized this approach, with the participants being given false positive feedback about their score on a computer game.

Participants played a video game called “The Piñata Task” which was originally developed by Helfinstein and colleagues (2013). The game is relatively simplistic and easy to learn; in order to gain points, the participants must hit a cartoon animal, using the space bar to control a stick, in order for it to break apart and collect the stars inside, much like an actual piñata. The participant completed three rounds, starting off with a low difficulty level so they would do well, increasing the difficulty in the second round so their score would drop, and decreasing the difficulty again in the last round to create a rebound effect and a very positive score. The high score by the child results in his/her name being placed at the top of a “Wall of Fame” (see Appendix B), with the research assistant making a celebration of this outcome, all of which enhances the child’s positive mood. This game has been found to reliably induce an increased positive mood in 7-9 year olds in past studies (Morrongiello et al., 2017; Morrongiello et al., 2014; Seasons, 2018).

Mood Ratings. An adaptation of Laurent, Catanzaro, Rudolph, Lambert and Osborne’s (1999) Positive and Negative Affect Scale for Children (PANAS-C) (See Appendix C) was completed by the participant two times throughout the course of their visit to confirm they were in a neutral state before risk taking and a positive induced one after completing the computer game. The child completed this rating using a visual analogue scale on the wall to rate their mood in that moment (i.e., sad, mad, happy, excited, cheerful, and energetic) with the sliding scale going from “Not at all” to “A lot”. Higher scores on the positive mood adjectives reflected a more positive mood in the participant.
**Filler Tasks.** In order to neutralize the participant’s mood, filler tasks were presented to participants as “boring” work that needed to be completed. The filler task consisted of worksheets that asked the participant to record all the words they could think of in a specific category (i.e., words that start with the letter ‘a’, sports, animals, vegetables, etc.). They were told that spelling doesn’t count and that there are no right or wrong answers, just to do their best. Based on the past research (Morrongiello et al., 2014), children completed these filler tasks for 7 minutes to ensure a neutral mood state was obtained.

**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 (after the mood induction procedure). 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).

*General Loss-framed poster.* “**WARNING:** Children have gotten injured on the obstacle course. Don’t do anything risky or you can get badly hurt.”

*General Gain-framed poster.* “Be careful going through the obstacle course, and you’ll be safe and have fun.”

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

**Procedure**

Each participant was assigned to a condition (general gain-frame, general loss-frame, or control group) using a random number generator. The study lasted approximately 45 minutes. At the beginning of the study researcher led the participant to a separate room, and the guardian
reviewed and signed a consent form in the waiting room. The researcher reviewed the assent form with the participant and ensured that they understood their right to withdraw consent at any time.

As shown in Figure 1, the participant was then left in the study room with a filler task to complete for approximately 7 minutes, in order to neutralize their mood. Once the neutralization period was complete, the researcher explained the PANAS-C mood ratings board to the child and measured the child’s mood for the first time. The participant then completed the obstacle course to measure their risk taking when in a neutral mood (baseline). The obstacle course task was video recorded for future coding of risky behaviors.

Once the participant completed the obstacle course in a neutral mood, the researcher then introduced the Piñata video game, thus beginning the mood induction procedure. The game was explained to the child, and they were encouraged to get as many stars as possible, which will put them on the “Wall of Fame”. Throughout the mood induction, the child was verbally encouraged by researchers, and given unconditional positive feedback such as: “you are SO AMAZING at this,” “I’ve never seen anyone get so many points before!” and so on, in order to increase the participant’s positive mood. Next, the participant completed a second mood rating using the PANAS-C board in order to ensure that the mood induction was effective. They then went to complete the obstacle course for a second time (while in a heightened positive mood). On their way to the room, the child was exposed to a poster (general gain-frame, general loss-frame, or control) that was hung on the door to the obstacle course. The researcher acted surprised to see it and asked the child to read what the poster says (“What does it say?”) and then asked a follow-up question to ensure that the child understood the message of the poster (e.g. “What do you think this poster means?”). The child then completed the obstacle course for a second time while in a
heightened positive mood. Once again, the obstacle course video was recorded for future coding of risky behaviors.

Lastly, the child was then debriefed on the purpose of the study and was gifted with a $5.00 gift card from a variety of local stores.

**Data Coding**

The obstacle course videos were coded in order to obtain a total sum of risky behaviors, as in previous research (Morrongiello et al., 2014; Morrongiello et al., 2017; Seasons, 2018). Risky behaviors are those indicating recklessness, such as hitting the wall, tripping, or jumping between different parts of the course, and were summed to create a total risk-taking score, with a higher score indicating higher risk taking. Reliability on coding was assessed by having another person independently code 25% of the video records; there was 91% agreement. The data of the primary coder were analyzed.

**Results**

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

Positive mood rating scores were calculated by averaging positive mood adjective scores (i.e. happy, cheerful, excited, and energetic). A paired-sample t-test was conducted comparing baseline mood ratings with those after the mood induction task, in order to determine whether the mood induction procedure was effective in inducing a positive mood state in participants. Results confirmed a significant increase in positive mood was obtained, with positive mood increasing by an average of 1.76 Units ($SD = 1.15$) on the rating scale, $t(25) = 7.87, p < .001$ from 6.70 in neutral to 8.46 when in a positive mood state.

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

To test whether the mood induction increased risk taking as in past research (Morrongiello et al., 2014; Morrongiello et al., 2017; Seasons, 2018), a paired-sample t-test was conducted to compare risk taking when in a positive heightened versus a neutral mood, with both measures being taken only from participants in the control group (no exposure to framed safety message). The t-test revealed a significant increase in risk taking for children when in a heightened mood state and not exposed to any safety messages, \( t(6) = 7.12, p < .001 \) (\( M \text{ increase} = 1.86, SD = 0.69 \)). Thus, the mood induction procedure had the desired impact on risk taking.

b) *Did Exposure to Either Positive or Negative Safety Message Frames Counter This Increased Risk Taking Effect?*

In order to determine whether the different safety messages countered the effect of the mood induction on risk taking, a change in risk taking score was calculated by subtracting risk taking at baseline (prior to completing the mood induction and frame exposure) from risk taking after exposure to the mood induction and safety frame message. A one-way Analysis of Covariance (ANCOVA) was conducted on these change scores, with safety message frame (2: gain, loss) as the between-participant variable and age and sex entered as covariates. Results indicated that safety frame type produced differential effects in countering risk taking when in a heightened positive mood state, \( F(1, 17) = 30.32, p < .001 \), partial eta squared = .46.

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

In order to further 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.
Participants who were exposed to the *gain-framed* safety messages engaged in risk taking to the same degree as they did at baseline, \( t(8) = 2.00, p > .05 \). Therefore, the gain message counteracted the increase in risk-taking that occurred in response to the mood induction, reducing risk taking to the level shown at baseline before the mood induction occurred.

Participants who were exposed to the *loss-framed* safety messages showed a statistically significant *decrease* in their risk-taking behavior when in a heightened positive mood (an average reduction of 2.50 points, \( SD = 1.05 \)) compared to baseline, \( t(9) = -5.84, p < .001 \). Hence, exposure to loss-framed safety messages 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 exposure to the loss-framed safety message).

**Was There a Differential Effect of General Versus Targeted Safety Messages on Reduction in Risk Taking that Occurs in a Heightened Positive Mood State?**

In order to evaluate whether there was a differential effect of general versus targeted safety messages on participant’s risk taking when in a heightened positive mood, risk taking change scores from the current study were compared to risk taking change scores from Season’s (2018) data set. Specifically, a factorial Analysis of Covariance (ANCOVA) was conducted on risk taking change scores, with message level (2: targeted, general) and safety frame (2: gain, loss) as between-participant factors and age and sex as covariates. Results indicated that there was no differential effect on risk taking based on message level, \( F(1, 38) = .26, p > .05 \), partial eta squared = .007. That is, the magnitude of change in risk taking was comparable whether the participant was exposed to a general safety message from the current study or a more behaviorally targeted safety message in Season’s (2018) study.

There was a differential effect on risk taking based on safety frame, \( F(1, 38) = 45.23, p < .001 \), partial eta squared = .56. Specifically, participants who were exposed to loss-framed safety
messages in both the general and behaviorally targeted groups demonstrated a significant lower level of risk taking compared to baseline, whereas participants who were exposed to gain-framed safety messages in both the general and targeted groups performed at baseline levels. These results were confirmed by one-sample t-tests from both the current study (see results section above) and Season’s (2018) study (i.e., participants who received loss-framed messages showed significantly less risk taking post-intervention compared to baseline, \( t(9) = -5.07, p < .05 \), whereas those who received gain-framed safety messages engaged in risk taking to the same degree as at baseline, \( p > .05 \)). Thus, regardless of whether children were exposed to more general or behaviorally specific safety messages, gain and loss messaging counteracted the increase in risk taking when in a positive mood state, but loss messages produced greater reductions in risk taking than gain messages.

Discussion

In industrialized nations, unintentional injuries are the leading cause of death, disability, and hospitalization for individuals above the age of one year (Centers for Disease Control and Prevention, 2015; Public Health Agency of Canada, 2013; World Health Organizations, WHO, 2010). Many of these injuries among school-aged children occur when they are away from the home and engaging in play at community parks, playgrounds, and skateparks (Morongiello et al., 2017; Morrongiello et al., 2013). Furthermore, past research has shown that children in heightened positive mood states engage in more physical-risk taking, and that the impact of positive mood on risk-taking behaviours in this age group is substantial, due to the fact that children participating in play situations with peers are likely to be in a heightened positive mood state (Morrongiello et al., 2014). Given that school-aged children are gaining more autonomy and are often left unsupervised
in these situations, identifying interventions targeted at reducing risk-taking leading to injury is of great importance.

Researchers have examined the effects that framing of safety messages may have on targeting and reducing risky behaviors (Gallagher & Updegraff, 2011; Jung & Villegas, 2011; Toll, Salovey, O’Malley, Mazure, Latimer, & McKee, 2008). Overall, for adults, several studies suggest that loss-framed messages are more effective when presenting information that is inherently risky, while gain-framed messages are more useful when presenting low-risk information (Harrington & Kerr, 2017; Wirtz et al., 2015). However, the evidence on this is somewhat mixed (Gallagher & Updegraff, 2011). The literature suggests that the reason for mixed results may be twofold: 1) many studies have implemented intentions to engage in a behavior as the outcome of interest as opposed to actual behavior change (Gallagher & Updegraff, 2011), and 2) these studies did not investigate the effects of individual-level variables, such as mood which influences risk taking.

Season’s (2018) study addressed this gap in the literature by examining the effects of mood on actual risk-taking behaviors. Further, Season’s (2018) study applied safety message framing to an under-studied, more vulnerable group: school-aged children. Her results indicated that the increase in risk taking that occurs when children are in a heightened positive mood was counteracted by both a gain-framed safety message (“Go slow through the obstacle course, and you’ll be safe, and have fun.”) and a behaviorally targeted loss-framed safety message (“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. The gain-framed message counteracted the increase in risk-taking that occurs when children are in a heightened positive mood state, resulting in children showing baseline levels of risk taking even when in a heightened positive mood (Seasons,
2018). On the other hand, participant’s risk taking in the loss-framed group was reduced to a level significantly lower than their baseline risk-taking behaviors. These results suggest that both gain-framed and loss-framed safety messages can be effective in reducing participant’s risk-taking behaviors, however, loss messages are more impactful than gain messages. It is important to note that the loss-framed safety message in Season’s (2018) study were targeted towards specific behaviors (e.g., tripping and falling). The current study aimed to determine whether more general messages about staying safe would have the same effect of reducing risk taking in school aged children when in a heightened positive mood state. Importantly, the results indicate that general messages can be as effective as behaviorally specific messages. Moreover, the effects of framed safety messages were consistent with Season’s (2018) study. That is, the increase in risk taking that occurs when children are in a heightened positive mood was countered by both the gain-framed safety message and the loss-framed safety message, but the loss-framed safety message had a greater effect on reducing risk-taking than the gain-framed safety message.

There are several possible reasons for these differential effects. Firstly, it is plausible that in both studies, the loss-framed message may have appealed to children’s beliefs about their vulnerability to injury. Previous research suggests that these beliefs predict how likely children are to engage in risk-taking (Morrongiello & Matheis, 2007; Morrongiello & Rennie, 1998), and therefore, loss-framed messages may have increased participant’s perception of danger, leading to a decrease in their risk-taking behaviours. This explanation garners support from research on adult populations, which indicates that if information is perceived to be high-risk, individuals in a happy mood are more inclined to process negative information in order to make a cautious risk-related decision (Keller et al., 2003; Wirtz et al., 2015).
Considering the literature on mood and message framing may give some insight into another possible reason for the greater effectiveness of loss-framed safety messages. Specifically, some researchers have hypothesized that individual’s in a positive mood are protected by their happy emotions and are thus more likely to attend to negative information (Keller et al., 2003; Wirtz et al., 2015). Given that the participants were in a heightened positive mood prior to reading the loss-framed messages, it is possible that they considered the negative information more carefully by making cautious risk-related decisions.

**Practical Implications**

Importantly, this study examined actual risk-taking behaviors rather than attitudes or intentions, which addressed a salient limitation in previous message framing research (Gallagher & Updegraff, 2011). By investigating actual behaviours, this study lends significant support and insight for future community-based interventions. In particular, risk-taking behaviours demonstrated by participants in the study are more likely to generalize to real-world situations (i.e., on playgrounds, skateparks, etc.) than intentions to take risk as assessed in previous research.

The main aim of the current study was to determine whether *general* framed safety messages had a differential effect on reducing risk-taking behaviours in school-aged children than *targeted* framed safety messages. This is an important question for intervention purposes, particularly in real-world situations. The fact that there was no differential effect on risk taking based on whether participants were exposed to targeted versus general framed safety messages suggest that placing an emphasis on specific risk-taking behaviors (i.e., speeding) and outcomes (i.e., tripping and falling) is not necessary in order to reduce risk-taking behaviours in school-aged children during play situations. This makes this intervention approach feasible then to apply in situations in which there are a variety of potential risk behaviors (e.g., playgrounds, skate parks),
which makes targeting a specific one impractical and likely to limit effectiveness of the intervention. Related to this, unlike previous studies in which children heard peers communicating social norms, in this study the effects were achieved by having children read posters. The use of posters is a much more cost-effective and practical approach for communicating safety norms and messages within the community. For example, hanging loss-framed posters at the entrance of playgrounds, parks, skateparks and so on would have the potential of reaching several children simultaneously, in an incredibly cost-effective manner. Research with adolescents has also demonstrated the effectiveness of posters to evoke behavior change (Alstead, Campsmith, Halley & Hartfield, 1999; Krieger et al., 2013).

Finally, results from this study may help to inform the implementation of future interventions, specifically regarding what content will be most effective in reducing risk-taking behaviours for children in play situations. Specifically, it is likely that while loss-framed safety messages will work better than gain-framed safety messages, both behaviourally targeted and general messages would be equally effective at reducing risk-taking behaviours in school-aged children.

Limitations and Future Research

Despite the significance of the findings from this study, there are some limitations that should be recognized and addressed in future research. First, this study was comprised of a relatively small sample size. Future studies are encouraged to employ a larger sample size in order to ensure the validity of the results. Second, the sample was relatively homogeneous in demographic characteristics. Extending to test a more diverse sample of children is important to determine if results vary with ethnicity and/or income level. Third, the study design involved participants being specifically directed towards reading and explaining their understanding of the
framed safety messages by the research assistant; this was done to ensure they noticed the poster and any change in risk taking could be attributed to this. If framed safety posters were implemented in community settings, it may be that children would not engage in this depth of processing. Future research should consider the impact that the level of processing of these messages may have on the reduction of risk taking that was seen in the current study. In a community, it may be best to use cell phone alert type procedures to draw youth attention to safety messages (Fjeldsoe, Marshall & Miller, 2009; Head, Noar, Iannarino & Harrington, 2013). Lastly, in order to better understand the mechanisms by which the framed messages work, it would be helpful to include a brief survey of each child’s perceptions about the messages themselves, in an effort to better understand the cognitive factors that influence risk-taking decisions and behaviors. It seems likely that these messages impacted their appraisal of injury risk (e.g., danger, vulnerability), but direct testing of this hypothesis is merited in future research.

**Conclusion**

This study provides an important contribution to the literature on the effects of framed safety messages on reducing risk taking in school-aged children. The results from this study are consistent with previous research; exposure to loss and gain-framed safety messages can reduce the amount of risk-taking that children take when in a heightened positive mood, thus potentially reducing the high rates of unintentional injuries that occur during play situations. Further, this study reveals that general as well as behaviourally targeted framed safety messages are equally effective at reducing risk-taking, creating opportunities for either to be potentially effective in future interventions. In future research, it will be important to examine the effects of framed safety messaging in a community setting and determine if these positive effects can be realized in a real-world setting.
References


Figure 1

Baseline (Neutral Mood)

Filler Task → Mood Rating (Neutral) → Risk Taking Control Task (Neutral) → Mood Induction Task → Mood Rating (Positive) → Risk Taking Test Task (Positive)

Exposure to Framed Safety Message (Control, Loss or Neutral)

Test (Heightened Positive Mood)
Appendix A: Obstacle Course
Appendix B: Wall of Fame