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Fear and Exhilaration in Response to Risk: An Extension of a Model of Injury Risk in a Real-World Context

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Abstract: This paper explored a model that predicted children's actual injury risk behavior from their current typical reported reactions of excitement versus fear in risky play situations. Fourth-grade children were asked to report on their current typical levels of fear and excitement in response to common play situations, including those involving play in the water. A week or more later, the same children were observed during their turn at free play on the diving board of a local swimming pool. Reporting that current responses to risky play situations resulted in fear was related to lower rates of actual risky behavior and higher rates of protective behavior, whereas reporting current responses of exhilaration to risky situations was related to higher rates of some kinds of actual risky behavior. These relationships were even stronger when only water-related play situations were considered. The data are consistent with findings from observed behavior where the risk was academic, social, or sports-related failure rather than injury. Further, this is the first study to document that children's perceptions of their own current cognitive reactions to risky play situations predict their actual concurrent risky behavior in a potential physical injury situation. Thus, these findings suggest an important tool for future prevention programs.

The exploration of the factors underlying children's risk taking is a surprisingly underresearched area. Miller and Byrnes (1997) provided one of the most recent models describing the factors behind children's risk-taking behavior. Specif-

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ically, they evaluated risks of failure in academic, social, and sports-related (e.g., making a basket in basketball) situations. They hypothesized that certain responses to given situations, including reactions such as anxiety or sensation seeking, would influence the rate at which children took risks. They found substantial empirical support for these relationships. The literature with adults supports similar findings. For example, adults who value sensation seeking tend to take more risks than sensation avoiders (e.g., Zuckerman, 1979).

Although electing to try a harder math problem or making a more difficult shot at basketball can effectively be used to evaluate the internal factors influencing children's behavior, few risks have more serious consequences for children than the risk of physical injury. In fact, injuries are the leading killer of children in the U.S.; more than 22,000 die, 600,000 are hospitalized, and almost 16 million children are seen in emergency rooms every year (Rodriguez & Brown, 1990). The epidemiological literature that does describe injury rates has focused on broad descriptors such as family factors, socioeconomic status, or child attributes (Rivara & Mueller, 1987), without articulating the behavioral mechanisms that account for the relationship between these factors and injury (Peterson, in press; Scheidt et al., 1988). For example, behavioral data show that children who are more arrhythmic and impulsive have a higher probability of injury (Matheny, 1987), but there are few data to articulate what may be responsible for this relationship. Injuries remain one of childhood's most ubiquitous and yet least understood stressful events. There are many possible explanations for why some children are more likely to sustain injury than others. It may be that some children are exposed by their caregivers or environments to risk. Hyson and Bollin (1990) have suggested that, as parental supervision decreases with children's advancing age, internal appraisals of risks made by children may influence important risk-taking decisions. This notion is consistent with the concept first elaborated by Zuckerman (1979), and later applied by Miller and Byrnes (1997), to several non-injury risk behaviors, that children who are exhilarated by risk or who tend to downplay the negative aspects of injury are more likely to engage in physically risky behavior.

There are no data to directly support this premise, although there are studies that provide indirect support. Some previous investigations have utilized careful laboratory measures to look at models of children's affective responses to simulated, not actual, risk situations (Peterson, Gillies, Cook, Schick, & Little, 1994), and they have found exhilaration and fear to relate to simulated risk taking. Other researchers have yielded global observations of real-world risk-taking behaviors (such as walking on a high wall at a zoo; e.g., Ginsberg & Miller, 1982), but have not measured fear or exhilaration. There have been no studies that have linked the measures of current child affect to actual risk-taking behaviors in physical injury situations. The present study attempted to do both.

After obtaining an initial assessment of children's current emotional responses to risk situations, we employed a concurrent measure of real-life behavior that

is often perceived by children as physically risky but actually is not. Specifically, children's diving board behaviors at a local swimming pool were observed in order to assess risk-taking tendencies. Thus, this study is the first to explore the link between children's current cognitions about injury (their own beliefs and affective reactions toward risk taking) and actual physical risk taking.

Given the past literature, we anticipated that children who currently reported feeling fearful in physically risky situations would take fewer actual risks and engage in more protective behaviors, whereas children who reported feeling exhilarated or excited by risky situations were expected to exhibit more risk taking. If it is possible to link cognitive appraisal with actual risk taking, it would be possible to easily and inexpensively identify children who may require more preventive intervention to avoid injury, as well as suggesting specific targets, such as exhilaration, for intervention.

Method

Participants

All eligible fourth graders within a midwestern city received a letter inviting them to participate in this research project and children were asked to return the permission form to the school. Fourth graders were the only children involved in a swimming program, an integral part of risk measurement, as seen below. Of the 264 students receiving a form, 133 students (49%) returned permission forms; 98% of these parents gave permission to participate. Data were collected on all of the 63 boys and 67 girls whose parents agreed that they could participate, who agreed themselves to be part of the study, and who presented for swimming lessons.[1] Unfortunately, it was not deemed feasible to obtain data on socioeconomic status and racial/ethnic background. First, we asked about injury history, and we have found in our earlier research that parents tend to dislike pairing their name with injury history. If, in addition, we were to ask for other private information (e.g., race, income), such requests might have limited the parents' willingness to return permission forms. As it was, parents merely had to check "yes" to any medically attended injuries and sign the form. Revealing personal information about income and injuries could have made some parents more hesitant to do so; thus, we determined that, given the homogeneity of the current grade school population (90% Caucasian and middle-class), we would get the more representative population if we made consent as easy as possible. Relying on fourth graders to get the form home, have parents sign, and return the form undoubtedly also limited the number of permission forms obtained. It may be important to note that those children who did bring permission forms back almost universally had received permission to participate.

[1] Throughout the study, *n*s differ slightly because of missing data (a child might miss his or her swim date) or because on two occasions outlying scores were removed from analyses.

Experimenter and Observers

Two female undergraduates served as experimenters. One male and five female undergraduates participated as observers. Both the experimenters and the observers were uninformed of experimental hypotheses and of the general injury literature. They each engaged in approximately 20 hours of training, using both didactic discussion and videotapes of children taken during free play at a diving board prior to actual on-site data collecting. To protect against interrater drift, the video training was repeated midway through data collection to address coding differences and review established coding rules.

Fear and Exhilaration

The naturalistic tendencies of the child to respond to a risky situation with fear and exhilaration were measured by the Fear/Exhilaration Affective Response (FEAR) questionnaire. This questionnaire, written by the first author of the current paper, has been used successfully in other studies of children's expected consequences of simulated bicycle injuries (Peterson et al., 1994).

Fear/Exhilaration 1. Ten vignettes were initially presented to the children, each describing a risk situation (e.g., "If I'm riding my bike downhill and all of a sudden the path becomes steep and rocky, I feel ..."; "If I'm at the ocean swimming and the waves sometimes go over my head, I feel ..."). The physical outcome of each risky activity was thus open-ended, allowing children to provide their own conceptualizations of possible physical consequences. The children were asked how fearful and how excited they would be, using 10 cm visual analogue scales: one marked "Scared," with anchors 1 = *not at all*, 3 = *a little scared*, and 5 = *very, very,* and the other scale labeled "Excited," with the same anchors (except the middle anchor = *a little excited*). The concepts were portrayed as conceptual opposites, with fear as a negative and excited as a positive emotion. The measures explored current (rather than past or future) reactions to risk situations; thus, reactions were not necessarily conceived of as stable personality traits, but rather as typical of these fourth graders' current cognitive appraisals of risk.

Specifically, children received instructions defining "scared" as a bad feeling (e.g., "like if a big dog suddenly jumped out, growling, and you thought it might bite you"). "Excited" was defined as a good feeling (e.g., "up or nearly ready to burst, like if you were just about to run a race or find out if you won a contest or not"). Children received extensive discussion about the independence of "scared" and "excited," with a story of three children going on a roller coaster, each experiencing a different set of reactions (the first child is not at all scared, but very excited; the next is both excited and scared, and the third child is highly scared but not at all excited). Half of the vignettes involved water-related activities, to check if the relationship between fear, exhilaration, and risk might be injury-type specific; the other five vignettes involved other activities such as bicycle riding and climbing.

Fear/Exhilaration 2. The same 10 vignettes with the same anchors were repeated a second time, but with additional information about the outcome of the activity (e.g., "I'm riding my bike downhill and all of a sudden the path becomes steep and rocky and I'm going so fast that I might hit a rock and cause my bike to crash. If I crash here, I will scrape my legs pretty badly. As I'm going down the hill, I feel ..."). This second sequence was designed to accomplish the goal of determining how much of the children's own conceptualization of possible physical consequences (supplied by Fear/Exhilaration 1), as opposed to consequences supplied for them (emerging from the measures of Fear/Exhilaration 2), influenced the fear/exhilaration response.

The overall coefficient alpha for a pretest of the instrument on 62 other children of this age was .90 for Fear and .86 for Excitement. The correlations between Part 1 and Part 2 were moderate for both fear, $r(62) = .51$, and excitement, $r(62) = .65$. This suggested that the consequences had some, but not a great, impact on how children experienced excitement and pain, depending on the outcome of the injury event sequence. Because of potential differences in the relationship between outcome-based and non-outcome-based situations, the measures from Part 1 and Part 2 were analyzed separately.

Injury Risk Behavior

As noted earlier, unlike past research that has either involved laboratory measures of children's views of risk or global behavior measures of actual risk behavior, the present study attempted to do both. Actually observing a child engaging in a behavior that has a high likelihood of injury has serious ethical problems. After using an initial measure of children's typical cognitive responses (the FEAR questionnaire), we then employed a measure of a behavior that was often perceived by the children as physically risky but actually was not. Specifically, the children were observed independently on the diving board of a swimming pool during free play at the end of a supervised swim lesson by observers uninformed about the children's self-reported data. A frequency count was made for each behavior for each child for both risk-taking and protective behaviors (defined below). The situation was identical for all students in that their parents were not present, they were in their own elementary school class context, and all the lessons occurred in the same pool at the same time of day, as students were bussed in to the local high school midday, one class at a time. Each child had one or two free-play periods at the diving board. On those occasions when a child had more than one turn at the diving board, averaged frequencies per turn taken were used for risk taking. A large number of individual behaviors were used, and in order to yield interpretable results, we created two empirically and conceptually derived composites for risky behavior and two for self-protective behavior. A composite was considered complete if the overall coefficient was reduced when any of the included variables was deleted (Schmitt, 1996). Each coefficient alpha for the four composites is giv-

en below. Each child spent approximately the same time on the board (as they were urged by the instructor and other children to let others have their turn), so the data were recorded as a simple frequency per day.

Risk Behavior A. This empirically derived composite included frequency of running or skipping (defined as faster than walking speed, both feet off the board after each step and last step must be with one foot only on the board) on the diving board, diving in any way other than feet first (including twisting greater than 90 degrees, diving headfirst, or hugging knees to chest while diving), and bouncing off the diving board (defined as a clear interruption of forward motion, both feet not in contact with the board at the same time, and there is an upward motion of the body when leaving the board; coefficient alpha = .61). Week 1 was correlated with Week 2 behavior, $r(79) = .52$, and thus scores from the 2 weeks were combined for a more robust single score.

Risk Behavior B. This empirically derived composite included frequency of jumping from the board without bouncing (any departure from the board feet first without bouncing) and playing in the water (any behavior in the water other than swimming, such as playing tag). This coefficient alpha was .77. Week 1 behavior was significantly (although only moderately) correlated with Week 2 behavior at $r(79) = .32$, and thus these scores from Week 1 and Week 2 were combined to form a more robust index.[2]

Protective Behavior A. This empirically derived composite was made up of wearing a life jacket, stopping or pausing on the board, walking in a timid or frightened manner (e.g., slower than normal walk, holding onto the rails along the diving board, obviously shaking, slumped shoulders) down the board, and seeking instructor assistance (asking the instructor to get into the water to catch the child when he or she enters the water); the coefficient alpha was .57. Week 1 data were correlated with Week 2 data, $r(79) = .40$, and thus they were combined.

Protective Behavior B. This category included refusing to dive or to jump to enter the water (going to the end of the line for the diving board when the child's turn came, going in from the side, going up the steps to the slide and then moving down again), with a coefficient alpha of .86, and a correlation of Week 1 with Week 2 of $r = .75$, such that the weeks could be combined to yield a single protective score.

Procedure

Approximately 1 week before the behavioral observations, copies of the FEAR questionnaire were given to the children in their classroom. Children were told that there were no right or wrong answers and that the experimenter was only

[2] A third form of behavior, flipping off or somersaulting off of the board, was observed but was found to be uncorrelated with either of the other forms of risk behavior or the naturalistic tendencies measures, and had a low coefficient alpha (.43), so it will not be considered further in this report.

interested in what they thought about and felt in certain play situations. A female undergraduate experimenter, uninformed of the experimental hypotheses and the injury literature, assisted the children in defining the terms (as described under each of the measures) and then read each of the vignettes out loud, as the children followed and made an X on the visual analogue scales to indicate their feelings. Simultaneously, a second female undergraduate circulated among the participants to answer questions, to assist them to stay on the current question number, and so forth. Their questionnaires had a code number on them that was linked by the first author to their name, to allow examination of the relationship between their questionnaire responses and their behavior later observed at the swimming pool. The list linking code numbers and names was destroyed at the end of the study.

The participants then began a daily 2-week swim class. Each subject was observed by three observers during the first available free-play period (small groups of children were allowed at the diving board each day, apparently randomly determined by the swim instructor). After all of the groups had experienced one free-play period, the first group had its second period and thus the second observation, until all children had been observed for two free-play swim periods.

Results

Reliability

One coder's observational data were consistently below .80, and this individual's data were dropped from the study. All remaining observer pairs showed acceptable reliability (Pearson *r*s for Risk scores ranged from .83 to 1.0 and for Self-Protect scores ranged from. 74 to 1.0).

Relationship Between Affective Responses and Risky Behaviors

Because we were using a measure of a child's current general reactions to a variety of risk-taking situations to predict later real-world behavior, we anticipated a relationship similar to the moderate relationships found between some general cognitive response styles and behavior in adults (e.g., Zuckerman, 1983). However, using self-report to general situations to predict a single category of risky behavior would not be anticipated to produce high correlations indicating large effects. Thus, we had to consider the statistical power of our tests. There was excellent power to detect medium effects in the entire sample (e.g., .96). However, power dropped to below the .80 mark, suggested by Cohen (1977) as a reasonable amount or power to test medium effects if tests were performed separately for boys and girls. Furthermore, the power to test whether there was a difference between boys and girls was only .50 with the present sample. Thus, the following analyses of necessity collapsed across gender, and it remains for future research to examine potential differences due to gender.

Fear and risky behaviors. As shown in Table 1, each relationship between the children's reports of typical responses of fear to play situations and both types

TABLE 1
CORRELATIONS (DEGREES OF FREEDOM) AND *n* BETWEEN REPORTED TYPICAL EMOTIONAL RESPONSES AND ACTUAL RISKY BEHAVIORS

	Observed Diving Board Behaviors			
Self-Reported Reactions	Risk A	Risk B	Protect A	Protect B
Scared 1 All (n = 75)	−.31++	−.28**	.37++	.26**
Scared 2 All (n = 79)	−.23**	−.22**	.19*	—
Scared 1 Water (n = 76)	−.40++	−.31++	.48++	.34++
Scared 2 Water (n = 80)	−.31++	−.28+	.30++	.21*
Excited 1 All (n = 72)	.26**	—	−.26**	—
Excited 2 All (n = 75)	.26**	—	−.19*	—
Excited 1 Water (n = 75)	.34++	—	−.36++	—
Excited 2 Water (n = 77)	.28+	—	−.21*	—

Note. Degrees of freedom vary slightly due to differential child absences at the completion of the questionnaire and the swimming pool; * marginal significance at $p < .06$–$.09$; ** significant at $p < .02$–$.05$; + significant at $p < .01$; ++ significant at $p < .001$–$.007$; using a Bonferroni correction within measures, only findings of $p < .01$ should be regarded as statistically significant. Other correlations are shown as these are the first data in this area and findings may direct future research.

of actual risky behavior was significant (rs = –.22 to –.31). The more fearful the children rated themselves as being in a natural tendency to general play situations, the fewer risky behaviors they exhibited. Predictably, each of these relationships was slightly stronger when children's fears to only water-related events were considered (rs = –.28 to –.40).

Excitement and risky behaviors. Conversely, at least for risky behaviors such as running and skipping on the diving board and bouncing on it, children who reported being excited in risky situations (rs = .26), especially those involved in water-related events (rs = .28 to .34), were more likely to exhibit these behaviors. Note that the relationship of risk behaviors was in an opposite direction for fear and excitement, as predicted.

Relationship Between Affective Responses and Protective Behaviors

Fear and protective behaviors. For protective behaviors, each rating of children's fear was positively related (rs ranged from marginally significant, r = .18, $p < .12$, to highly significant, r = .37, $p < .001$) to the behavior. All relationships were either marginally or highly significant for protective behaviors and the fearful ratings due to water (rs range = .21, $p < .06$ .to .48, $p < .0001$).

Excitement and protective behaviors. Some protective behaviors (Protect A) were either marginally (r = –.19, $p < .09$) or significantly (r = –.26, $p < .03$) related to reports of excitation, and the relationships were stronger (rs = –.21 to .30, $p < .07$ to $p < .002$) for reports of excitation in water-related play. Again, all of the relationships between the FEAR questionnaire and observed behaviors are summarized in Table 1.

Discussion

These results support the theoretical model suggested by laboratory data on injury risk behaviors (e.g., Peterson et al., 1994) and demonstrated within other forms of real-world risk taking (social, academic, and sports related; Miller & Byrnes, 1997), suggesting that children's general responses of fear or exhilaration in response to perceived risky play situations actually are related to children's concurrent risky behavior in the real world; Although researchers (e.g., Hyson & Bollin, 1990) have speculated that children's internal appraisals of risk may influence actual physical injury risk-taking behavior, the study provides some of the first evidence that the two are linked. Reporting that one currently responds to many risk situations with fear was related to real-world fearful responding in an apparent risk situation. Conversely, reporting that one responds with excitement to many current risk situations is associated with more apparently risk-taking behavior on the diving board.

The relatively clear, though often low-level, relationships between the children's reports of fear and exhilaration when they supplied their own consequences and when the consequences were specified for them suggests that the FEAR questionnaire measured a general cognitive approach toward current risky activities that was not completely dependent upon children's concerns about injury in anyone situation. Said differently, the FEAR appears to measure children's more general current cognitive response to injury risk. However, it is true that stronger relationships were found when self-report of reactions to risk situations was limited to those most like the one experienced in person; reported reactions of fear or excitement to water-related play related somewhat more strongly to diving board behavior than did emotional responses to other play situations.

Such findings are important both to understanding how risky behavior is selected by children and, subsequently, in yielding potentially preventive solutions. At the most molar level, findings such as these suggest that children who do not currently have the protective influence of fear or who respond to risky situations with enhanced exhilaration may require more intense supervision than other children. At another level, they may suggest a point of intervention with the child. It is unclear yet if persuasive interventions or modeling might alter these internal, cognitive and emotional antecedents to injury, causing the child to proceed more cautiously.

There are a number of limitations to the current study. Because of the nature of the design, we were unable to collect socioeconomic status and ethnic or racial data. The current sample size did not allow examination of potential gender differences. The children were drawn from a midwestern town characterized by a pri-

marily middle-class, Caucasian population. Further, only about half of the available participants returned permission forms. However, if only the most or the least fearful children returned forms, this should produce a restriction in range, making it difficult to find relationships and suggesting that our current findings are quite robust. However, the extent to which the current findings represent children at higher risk (e.g., children in poverty, ethnic minority children, etc.) is unclear.

Furthermore, we cannot determine the causal direction of the study's finding. One possibility is that children's fear or exhilaration reactions to risks serve to guide their subsequent injury-relevant behaviors. In contrast, a small number of adult studies (e.g., Horvath & Zuckerman, 1993) have suggested that risk appraisal may be a consequence rather than a cause of risky behavior; risk taking being rewarded may lead to both increased real-world risk taking and reports of exhilaration in response to risky behavior. It is also quite possible that causal links occur in both directions. It will be extremely important for future studies to utilize instruments such as the FEAR in a more prospective fashion to determine the causal direction of these relationships and the extent to which such cognitive appraisals may change with time and world experience.

In addition, children in the present study were performing a behavior of apparent but not actual risk. Diving into water of unknown depth is a leading cause of spinal-cord injury. However, these children were diving into a pool of known depth and they were closely supervised. Constructing a design in which children's emotional responding is tapped (which rules out a simple naturalistic observation study) and then observed in actual risky responding creates a clear ethical dilemma. One of the challenges to future research is to find acceptable ways of more closely examining the factors relevant to the model that links children's beliefs to their risk for injury in the real world. The present study provides a beginning step in this direction, showing that by fourth grade, children can identify their typical current cognitive appraisal of a risk situation, both negative (fear) and positive (excitement), and that these responses are related to risky behavior occurring some weeks after the reports were given. These findings may be very important to the prevention area as observation of risk taking is difficult, time-consuming, and expensive, whereas using a self-report instrument is quick, easy, and inexpensive. Future research may extend the use of self-reported reactions to other antecedent cognitions and conditions that may allow even more accurate prediction of those children most at risk for the leading cause of death in childhood, physical injury.

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