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Risk Assessment by British Children and Adults

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Abstract

We present data illustrating how preschool-aged British children ranked the danger of different situations and adults rated various external causes of mortality. Ranks were calculated from 34 children's ratings of dangers presented by eight scenarios using a three-dimensional diorama. Lion and hippopotamus figurines were presented to characterize historical threats with intentional agency. Children ranked the lion followed by the hippopotamus as presenting the greatest danger. When these ranks were pooled to reflect a general category of animal attacks, the children's ranks failed to reflect the national statistics on childhood deaths. Adult ratings for the prevalence of 20 external causes of mortality in the general public were positively correlated with the actual frequency of mortality due to these causes. Nevertheless, adults were seen to underestimate their personal susceptibility to the same dangers. Children and adults differ in risk assessment based initially on early childhood predispositions, with experience altering risk assessment to match the local environment.

Keywords: risk assessment, external causes of mortality, agency, children, adults

1. Introduction

Humans live in an unpredictable and dangerous world. Even with all the comforts and amenities of modern life, people of all ages are regularly killed by external injuries. In fact, the 2005 mortality statistics published by the United Kingdom's Office for National Statistics (ONS) showed that external injuries killed nearly 16,500 individuals in England and Wales of which over 13,000 of these were accidental (Office for National Statistics, 2006). These data indicate that external injuries are the number one cause of death for people under age 35 in England and Wales and the fifth largest causes of death for all age groups. The prevalence of deaths due to accidental injury began to receive considerable attention from governments and health care communities during the latter part of the 20th century. In 1966, concern over accidental injury in the United States lead the American National Academy of Sciences and National Research Council to deem accidental injury "the neglected disease of modern society" (National Academy of Sciences/National Research Council, 1966).

Of particular interest to this study is the fact that children, who are under the protective care of adults, are still consistently killed and maimed by external injury. This high degree of childhood harm prompted the British government to implement a variety of programs in an attempt to reduce by one-third the injury related death rate for children over a 25-year period (Department of Health, 1992). Death rates due to external injury have been dropping slowly, but 55 years after the 1966 National Academy of Sciences and National Research Council publication highlighting accident rates, external sources of injury continue to constitute a strong source of mortality in the United Kingdom.

The present study examines the perception of external dangers in British preschool children and adults. We studied both children and adults to assess the effects of life experience on risk assessment. Our methods differ between the two age groups to accommodate the limitation of conducting survey research with young children. The breadth of children's fears include irrational components that are unimportant in the modern world, such as nighttime fears in which children imagine the nearby presence of something scary (reviewed by Coss & Goldthwaite, 1995; King, Ollendick, & Tonge, 1997). The theme of being chased by frightening figures that characterize beings with harmful intentions is also common in children's nightmares (Hartmann et al., 1987).

Children also engage in dangerous activities routinely in real life, such as climbing playground equipment and trees that can result in falling leading to serious injury or death. Infants and young children also do not perceive

the inherent risks of water and can drown in seemingly safe settings, sometimes in the presence of inattentive adults (Coss, Ruff, & Simms, 2003). The current study used a simulated environment to examine children's assessment of a wide range of external sources of danger, most of which are reported in the national statistics.

Adults were also surveyed to compare their knowledge of risk from, and personal susceptibility to, common dangers relative to the national statistics. Our methods differ between the two age groups to accommodate the limitation of conducting survey research with young children. For the adult study, we asked adults to rate their likelihood of dying from 20 external causes of death and to rate the prevalence of these dangers in the general public. This comparison of personal risks and those of the public were derived from survey research conducted in the United States. Weinstein (1984, 1987) suggests that adults tend to underestimate their personal susceptibility to dangerous health risks they have not experienced or those they feel they can control. In these contexts, adults can regulate their own actions to mitigate dangers.

1.1 Experimental Questions and Hypotheses

Whereas adults appear to have an optimistic bias in their own likelihood of avoiding dangerous circumstances, children's state of cognitive development and lack of experience might foster a greater concern for biotic threats with perceived intentionality as much more dangerous than abiotic threats that do not express intentionality (Barrett, 2005a,b). Children might feel more vulnerable in the presence of large dangerous animals, such as those observed safely in zoological parks. Muris and colleagues (2000) note that children are most fearful of animals that are not encountered naturally in urban settings, such as snakes, lions (*Panthera leo*), and tigers (*P. tigris*) (also see Maurer, 1965). In addition to their prominence in nightmares, irrational fears of animals might reflect the ease of learning about their dangerousness from other sources, such as social information and conditioning through real experiences (cf. Muris et al., 2000; Seligman, 1971). It is important to consider that the ease of learning specific environmental threats likely characterizes the evolutionary history in which fitness was enhanced by rapid and efficient learning (see Seligman, 1970). As an extension of this construct, the pronounced fear of some wild animals by children in urban environments could reflect the rapid learning processes for avoiding dangers that were ecologically important in human ancestors.

Although lions are very salient to young children (Penkunas & Coss, 2013a,b), there are other species that were not human predators but are currently extremely dangerous to humans. These include elephants (*Loxodonta africana*), Cape buffalo (*Syncerus caffer*), and hippopotamuses (*Hippopotamus amphibious*) whose ancestors were hunted extensively in southern and eastern Africa and now mob humans defensively as members of their predator guild (Thuppil & Coss, 2012). Unlike lions that have been a long-term threat to hominins for the past 3.5 million years (Coss & Moore, 2002; Packer, Ikanda, Kissui, & Kushnir, 2005; Treves & Naughton-Treves, 1999), hippopotamuses are a comparatively recent danger as this species began to treat humans as predators (Brooks, 1978). As a likely consequence of this long period of conflict, lions attack people mostly at night and hippopotamuses attack people in boats, killing nearly as many people as lions do (Dunham, Ghiurghi, Cumbi, & Urbano, 2010; Treves & Naughton-Treves, 1999). During the dry season, hippopotamuses can also be dangerous on land as they wander widely in search of food and water (Smithers, 1983).

This ease of learning to associate danger with animals can stem from an underlying cognitive bias towards threatening stimuli. Inexperienced (i.e. without previous exposure) primates from several species recognize large-bodied felids, such as leopards (*P. pardus*), as inherently dangerous (Coss & Ramakrishnan, 2000; Davis, Parr, & Gouzoules, 2003; Schel, Tranquilli, & Zuberbühler, 2009) and children detect lions rapidly in computer displays (Penkunas & Coss, 2013a,b). As such, it is reasonable to predict that preschool children will perceive a lion as very dangerous. In contrast, hippopotamuses have posed serious threats to humans in a time frame unlikely to engender an inherent recognition that hippopotamuses are dangerous. Hence, we predicted that children will perceive a hippopotamus as less threatening than a lion. Nevertheless compared with abiotic threats, children can prescribe intentional agency to both of the large animals in which they might infer a desire to do harm. Because of this potentially perceived agency, we predicted that children will appraise these large animals as more dangerous than the abiotic threats. Outside of occasional trips to zoological gardens where British children can observe the behavior of lions and hippopotamuses safely, any inference of personal danger from these animals has not been shaped by direct interactions.

In light of the findings of Weinstein (1984, 1987, 1989) that American adults underestimated their personal susceptibility to health risks and several external causes of injury, we predicted that British adults would similarly underestimate a more extensive list of external causes of death compared with their prevalence in the general public presented in the national statistics. Conversely, the children were not predicted to accurately estimate the true prevalence of danger to children in their age group.

2. Method

2.1 Experiment 1

This study was designed to test the prediction that children do not hold an appropriate appraisal of modern risks but instead display risk appraisals that highlight the dangers that were regularly encountered in human prehistory. As originally proposed by Öhman (1986) and Mineka (Öhman & Mineka, 2001; Mineka & Öhman, 2002), the rapid identification of evolutionarily ancient threats and the advancement of behavioral systems to contend with such threats would have been favored by natural selection. Following this theory, the first experiment tested the predication that children will rate two large mammals, the lion and hippopotamus, as more dangerous than other threats common in modern times.

2.1.1 Child Participants

Thirty-four 3 to 5 year old children (19 girls with a mean age of 4 years 4 months and 15 boys with a mean age of 4 years: range 3 years to 5 years 8 months) were interviewed at six preschools and childcare centers in Liverpool, England. All participants were able to understand and complete the tasks presented by the experimenter. Parental consent for each child was obtained prior to being interviewed for the study.

2.1.2 Simulated Outdoor Setting

As noted by Popper and Kroll (2006), children under the age of 7 years old have difficulty ranking items by order of magnitude. To measure children's ranking of situations in which they perceived danger we employed the "ranking by elimination" technique used successfully by preschool children for ranking up to eight different foods in taste-preference studies (see Birch, 1979a,b, also discussed in Guinard, 2000). Because this technique involves simply pointing at the selected item, we adapted this method to assess children's perception of environmental threats.

A model diorama representing a hypothetical outdoor setting was constructed using pieces from two Fisher-Price® Little People® playsets, consisting of figurine caricatures of children, adults, and miniature urban and natural environmental features. These Fisher-Price® toys were selected for the diorama because of their familiarity to children who have likely played with them in their homes and preschools. As shown in Figure 1, the model diorama consisted of a car, road, building, picnic table, large tree, waterfall, and rock formation placed on low tables within each of the six preschool classrooms. To evaluate children's assessment of dangerous animals, two realistic looking Schleich®-brand figurines, a maned lion and a hippopotamus with gaping mouth (height and length respectively, 6.2 cm × 10 cm and 6.4 cm × 10 cm), were positioned in the diorama. These figurines were selected for study because, as mentioned above, lions and hippopotamuses constitute serious threats to humans (Okello, 2005; Treves & Naughton-Treves, 1999), reports of which span many centuries (Baker, 1891; Eltringham, 1999). To exemplify the threat from hippopotamuses, the second author (RGC) actually experienced a mobbing attack from two hippopotamuses while aboard a 6 m flat-bottom skiff on the Chobe River, Botswana.

Eight Fisher-Price® Little People® figurines (height = 6.3 cm) were placed in the diorama to simulate people interacting with their environment. The figurines were placed in the following locations within the diorama: 1) standing behind the window on the ground floor of a building, 2) sitting in the car on the road, 3) facing the car at a distance of 5 cm, 4) standing next to the picnic table, 5) standing on the edge of the waterfall facing the water, 6) lying on the branch of the tree 15 cm from the top of the table, 7) standing 5 cm from the facing lion, and 8) standing 5 cm from the facing hippopotamus. The eight figurines represented people encountering eight scenarios of differing potential danger (see Figure 1). These specific scenarios were selected for depiction in the diorama because they represented both ancient threats, such as encountering dangerous large-bodied mammals or drowning, and modern threats, such as riding in a car or crossing a busy road. The figurine standing by the table was included to represent a low-risk situation. This simulated outdoor setting provided the backdrop for the experimenter who read a short script to the child describing how each figurine was interacting with its surroundings.

Figure 1. A diorama consisting of eight Fisher-Price® figures representing people encountering potentially dangerous scenarios

Note. The relationships between the lion and hippopotamus figurines near human figurine caricatures in the bottom left.

2.1.3 Experimental Procedure

A single participating child sat in a chair facing the diorama while the experimenter sat next to the child also facing the diorama. After giving the experimenter verbal assent to be interviewed, the child was presented with a description of the situation each figurine was encountering. The experimenter pointed to the corresponding figurines within the diorama as the script was read aloud. The narration presented to each child was as follows: "Let's pretend that these toys make up a little town where all these people live. Let's look at what the people are doing. (1) Here's a kid in front of a hippopotamus. (2) This child is in a tree. (3) Here's a kid at a picnic table. (4) This child is next to a waterfall. (5) Here's a kid standing by a lion. (6) This child is in a building. (7) Here's a kid crossing the road. (8) And this is a person in a car."

After the narrated tour of the diorama was completed, the experimenter proceeded to present the participating child with the task of ranking each situation in the diorama from most dangerous to least dangerous. The experimenter read the following question to each participant: "Now, which of the people do you think is in the most danger?" Oral and gestural responses from the participant were recorded by the experimenter. Infrequently, a child would point to more than one figurine or in the direction of a group of figurines. In this situation, the experimenter prompted the child to touch the figurine that they intended to identify. The first-ranked figurine chosen by the child as in the greatest danger was then removed. The experimenter requested the child to pick next figurine that was in the greatest danger by asking: "Now who is in the most danger?" The selected figurine was again removed and the question was repeated. This ranking by elimination procedure was repeated until all but one figurine was identified and removed from the diorama. With this procedure, each child established a ranked order of the eight figurines from the most to least dangerous situations.

2.1.4 Actual Causes of Child Mortality

The Diagnosis Handbook, Series 2 (DH-2) published by the Office for National Statistics (ONS) was consulted for the five years of 2001 to 2005 (Office for National Statistics, 2002-2006) to determine the actual threat that the eight dangers posed to children in England and Wales. The DH-2 is an annual publication that provides data on the causes of death for these geographic regions. These data are separated by the underlying cause of death, sex, and age group. Data on the frequency of mortality for the eight dangers represented in the diorama were extracted from this document for children aged 1 to 9 years. The dangers were then ranked by their prevalence in

England and Wales for this age group. The 1 to 9 year-old age group was chosen from the DH-2 as the closest age class for comparison with the children in the sample, although the current participants were 3 to 5 years old. Twenty-six external causes of mortality and morbidity chosen from the DH-2 were determined to correspond most appropriately with the eight dangers presented to the children in the diorama (Table 1).

Table 1. Risks presented to children in the diorama asses children's perceptions of external causes of death and corresponding ICD-10 codes for each danger

ICD-10 Code	Danger presented in model
V02 Pedestrian injured in collision with 2-3 wheeled motor vehicle	Crossing the road
V03 Pedestrian injured in collision with car pick-up truck or van	Crossing the road
V04 Pedestrian injured in collision with heavy transport vehicle or bus	Crossing the road
V40-49 Car occupant injured in transport accident	Riding in the car
W13 Fall from, out of or through building or structure	Standing in the building
W14 Fall from tree	Lying in the tree
W15 Fall from cliff	Standing by the waterfall
W54 Bitten or struck by dog	Encounter lion/hippopotamus
W55 Bitten or struck by other mammals	Encounter lion/hippopotamus
W65-74 Accidental drowning and submersion	Standing by the waterfall
No data available	Standing by the table

2.2 Experiment 1 Results

The distribution of all the children's ranks was significantly different from chance for six of the eight risks depicted in the diorama; that is, the children ranked six scenarios in a nonrandom fashion. These reliable distribution differences were: standing near the lion χ^2 (33) = 25.77, $p < .001$; standing near the hippopotamus, χ^2 (33) = 23.41, $p < .01$; crossing the road, χ^2 (33) = 14.94, $p < .05$; standing next to the waterfall, χ^2 (33) = 20.59, $p < .01$; riding in the car, χ^2 (33) = 34.24, $p < .001$; standing in the building, χ^2 (33) = 34.24, $p < .001$. To evaluate whether the 34 children as a group were consistent in their rankings of the eight situations, the ranking orders were examined for consistency using Kendall's coefficient of concordance (W) with 9,999 random permutations (Legendre, 2005). A relatively strong consensus was evident among the children for the rank order of the eight dangers, $W = .37$; Friedman's χ^2 (7) = 87.37, $p = .0001$. According to Siegel and Castellan (1988, p. 271), a statistically significant value of W may be interpreted as meaning that the children are "applying essentially the same standard in ranking" the eight scenarios we selected for study. Siegel and Castellan also recommend that the pooled ordering of ranks may serve as a "standard" which is used herein to compare the children's ranks with the National Morbidity and Mortality Statistics published in DH-2. The overall rank for each of the eight scenarios appears in Table 2.

Table 2. Ranks for the eight scenarios presented to the children in the diorama calculated from the rankings given by child participants

Danger identified in model	Sum of ranks for all participants	Overall rank
Encountering lion	90	1
Encountering hippopotamus	103	2
Crossing the road	124	3
Standing next to the waterfall	137	4
Lying in the tree	144	5
Standing by the table	185	6
Person in the car	216	7
Standing in the building	225	8

Because the DH-2 has only one animal category for reporting deaths due to animal attacks, for analytical purposes we combined the two categories of figurines standing near the lion and the hippopotamus into a single category of being attacked by an animal. The ranks assigned by the children for standing near the lion and hippopotamus were averaged and summed to determine the overall rank for this combined category of animal attack. The average rank for the combination of the two animal-related categories was 2.44 and this category was ranked as the most dangerous situation by the children. After the ranks for these two animal situations were combined, the children's ranks continued to show a high level of concordance, $W = .33$; Friedman's χ^2 (6) = 66.71, $p = .0001$.

The mean ranks of the combined scenario of encountering an animal and the other six scenarios were used to compare the children's perceptions of the dangers with the actual mortality statistics for these seven dangers in England and Wales (Office for National Statistics 2002-2006). The incidences of deaths for each of the extracted DH-2 (Office for National Statistics, 2002-2006) categories were totaled across the five years of 2001 to 2005 for 1 to 9 year-old children (Table 3). Because only seven scenarios were ranked by the children, the correlation-permutation program described by Legendre and Legendre (1998) was employed using 9,999 permutations to evaluate this relationship. As predicted, the correlation coefficient indicated virtually no statistical relationship between the children's mean ranks for the seven dangers and the actual number of deaths for the same dangers calculated from the national statistics, r (5) = -.052, $p = .94$, two-tailed test.

Table 3. Overall ranks for each of the seven scenarios in the diorama versus the actual ranks calculated for the seven scenarios using data from the national statistics

Danger in Diorama	Rank from children's responses	Rank from 2001-2005 DH-2
Encountering animal	1	5
Crossing the road	2	1
Standing next to waterfall	3	3
Lying in the tree	4	6.5
Standing by the table	5	6.5
Person in the car	6	2
Standing in the building	7	4

2.3 Experiment 2

The second experiment was developed to measure how adults appraise sources of external injury. In comparison with children with less experience, adults were predicted to have incorporated their life-history experience, including extensive exposure to media, into their assessment of risks. This experiment examined adults' ratings of dangers and whether these ratings differed when considering risks in relationship to their personal safety compared with the prevalence of the same risks to the general public. It has previously been shown that Americans routinely rate themselves as less vulnerable to health and safety risks when comparing themselves to the hypothetical "average person" (Weinstein, 1984). The present study explored this egocentrism by determining if British adults reliably underestimated their susceptibility to the most common causes of death due to external injury.

2.3.1 Adult Participants

Fifty-five adults (29 men and 26 women; $M = 32$ years of age) completed a questionnaire measuring their perception of personal risks and risks to the public in England and Wales. Participants were recruited by the experimenter in university halls of residence and a local coffee shop.

2.3.2 Adult Ratings of External Causes of Mortality

The experimenter briefed potential participants on the purpose of the study and explained the directions for completing the questionnaire. The questionnaire consisted of 20 external causes of death: accidental poisoning, accidental strangulation, airplane accident, animal attack, assault, being hit by a car while walking, boating accident, bicycle accident, car accident, choking, drowning, falling down stairs, falling from building, hit by thrown or projected object, house fire, hypothermia, medical (nonsurgical) malpractice, motorcycle accident, suicide, and surgical malpractice.

The first portion of the questionnaire asked participants to rate their personal concern of dying from each of the 20 risks on a seven-point interval scale. A response of 1 indicated that the participant was not concerned that the scenario would lead to his or her death. A response of 7 indicated that the participant was very concerned that the scenario would lead to his or her death. The second part of the questionnaire measured the perceptions of the same 20 external causes of death to the general public in England and Wales. Participants were asked to rate the 20 causes of death on a 7-point interval scale to indicate the relative number of deaths they thought were caused by each scenario in the general population. A response of 1 indicated that the participant believed relatively few deaths were caused by that scenario while a response of 7 indicated that they believed a relatively large number of deaths were caused by that scenario. Table 4 lists the ICD-10 codes (Office for National Statistics, 2002-2006) for the external causes of death and corresponding risks presented in the survey. The total number of fatalities recorded for each external cause of death for people aged 20 years and older was summed for the years 2001 to 2005 to determine the actual rank of the dangers presented in the questionnaire.

Table 4. Risks presented to adults in questionnaire to asses adult's perceptions of external causes of death and corresponding ICD-10 codes

ICD-10 Code		Corresponding Survey Risk
V01-V09	Pedestrian injured in transport accident	Hit by car as a pedestrian
V10-V19	Pedal cyclist injured in transport accident	Bicycle accident
V20-29	Motorcycle rider injured in transport accident	Motorcycle accident
V40-49	Car occupant injured in transport accident	Car accident
V90-V94	Water transport accidents	Boating accident
V96-V97	Air and space transport accidents	Airplane accident
W10	Fall on and from stairs or steps	Falling down stairs
W13	Fall from, out of or through building or structure	Fall from building
W20	Struck by thrown, projected or falling object	Hit by thrown or falling object
W54	Bitten or stuck by dog	Animal attack
W55	Bitten or struck by other mammals	Animal attack
W65-W74	Accidental drowning and submersion	Drowning
W76	Other accidental hanging and strangulation	Accidental strangulation
W79	Inhalation and ingestion of food causing obstruction of respiratory tract	Choking
X00	Exposure to uncontrolled fire in building or structure	House fire
X31	Exposure to excessive natural cold	Hypothermia
X40-49	Accidental poisoning by and exposure to noxious substances	Accidental poisoning
X60-X84	Intentional self-harm	Suicide
X85-Y09	Assault	Assault
Y60-Y69	Misadventures to patients during surgical and medical care	Surgical malpractice
Y84	Other medical procedures as the cause of abnormal reaction of the patient, or of later complication, without mention of misadventure as the time of the procedure	Medical (non-surgical) malpractice

2.4 Experiment 2 Results

For 13 of the 20 risks presented to the adults in the questionnaire, a statistically significant difference was found between the participants' ratings of personal concern for the listed dangers and their ratings of the prevalence of these dangers as causes of death in the general public. Among these 13 statistically reliable differences, the participants rated 12 of the different dangers as more likely to afflict individuals in the general public than themselves: accidental strangulation ($Z = -2.24$, $p < .05$), assault ($Z = -2.36$, $p < .05$), being hit by a car ($Z = -2.88$, $p < .01$), bicycle accident ($Z = -5.27$, $p < .001$), boating accident ($Z = -2.50$, $p < .05$), car accident ($Z = -3.75$, $p < .001$), falling down stairs ($Z = -3.20$, $p < .01$), house fire ($Z = -3.60$, $p < .001$), hypothermia ($Z = -4.36$, $p < .001$), medical (nonsurgical) malpractice ($Z = -2.61$, $p < .01$), motorcycle accident ($Z = -4.84$, $p < .001$), and suicide ($Z = -5.27$, $p < .001$). Only the danger of airplane accidents received a significantly higher rating for personal concern compared with its ratings as a cause of death for the public ($Z = 2.47$, $p < .05$).

A rank was calculated from the participants' ratings for personal concern and prevalence in the public for each of the dangers. These ranks were used to compare the public's perception of the dangers to the actual statistics on adult mortality and morbidity for these 20 risks for the years 2001 through 2005 (Table 5). A statistically significant positive correlation was found between the ranks calculated from the actual fatality frequency in England and Wales (Office for National Statistics, 2002-2006) and the ranks calculated from the participants' perceptions of risk to the public caused by the 20 dangers, Spearman's r (18) = .71, $p < .01$. However, the statistical association between the participants' ranks for their personal concerns and the actual ranks of fatalities for these external causes of death was not statistically significant, Spearman's r (18) = .30, $p = .19$.

Table 5. Ranks calculated from participants' concern that they may die from each of the dangers, the participants' ratings of how common each cause of death is in the general population, and the actual frequency of death for each external cause of death

External cause of death and ICD-10 code(s)	Rank for personal concern	Rank for belief of prevalence in the public	Actual rank for adult death
Car accident, V40-V49	1	1	2
Hit by car, V01-V09	2	2	5
Assault, X85-Y09	3	5	7
House fire, X00	4	3.5	8
Drowning, W65-W74	5	8	10
Choking, W79	6	12	9
Surgical malpractice, Y60-Y69	7	9	16
Airplane accident, V95-V97	8	18	19
Medical malpractice, Y84	9	10	15
Hit by object, W20	10	17	17
Falling down stairs, W10	11	11	4
Riding motorcycle, V20-V29	12	3.5	6
Fall from building, W13	13.5	15	13
Accidental poisoning, X40-X49	13.5	14	3
Hypothermia, X31	15	7	12
Animal attack, W54 and W55	16	20	20
Suicide, X60-X84	17	6	1
Riding bicycle, V10-V19	18	13	11
Boating accident, V90-V94	19	16	18
Accidental strangulation, W76	20	19	14

3. Discussion

A three-dimensional diorama depicting an outdoor environment containing eight figurines engaged in actions of differing risk was presented to 34 children to assess their ranking of endangerment. The findings using this diorama revealed that preschool-aged children ranked realistic-looking figurines of a lion and hippopotamus as creating the most danger to nearby human figurines. This result must be viewed in the context that these children have never interacted directly with these animals. Nevertheless, they appear to know that these animals are extremely dangerous. Moreover, the pattern of overall rankings among the children was reliably consistent.

The children's choices of animal threats as the highest-ranking danger might be biased by their viewing predator-prey interactions on BBC television which has increased in programming frequency in recent years to capture and maintain adult viewer interests (Bernard Walton, BBC Producer, personal communication, 1990). Whether viewing predator-prey interactions influenced these choices must be considered in the context of research by Cantor and Nathanson (1996) indicating that viewing animal violence on television has little influence on children's news-induced fears. In a related finding, survey research by Rusca and Tonucci (1992) indicated that urban British and Italian children have positive preferences for large carnivores, such as lions and tigers, possibly due to their perceived "athleticism and ferocity" (also see Kaltenborn, Bjerke, Nyahongo, & Williams, 2006). However, children living in rural areas are fearful of dangerous animals they see occasionally, such as wolves (*Canis lupis*) in Norway and lions in Tanzania (cf. Bjerke, Ødegårdstuen, & Kaltenborn, 1998; Entwistle & Stephenson, 2000).

A complementary interpretation for the high rankings of danger posed by the lion and hippopotamus invokes the construct of perceived intentional agency in these stationary animal figurines. It must be noted from the literature on predator-prey interactions that a variety of species recognize the intentional agency of stationary predators. Some aspects of predator behavior are innately inferred by prey at a very early age (Coss, 1991). This is especially apparent for nonhuman primate infants and juveniles when they detect predators in static postures. Realistic-looking models of these predators engendered the same recognition of potential threats that characterized the actual threats (Coss & Ramakrishnan, 2000; Meno, Coss, & Perry, 2013).

Children can also attribute intentional agency to a variety of static images of animals (Dolgin & Behrend, 1984). In the current study, children clearly attributed to the lion and hippopotamus a desire to harm the nearby human figurines. Such a bias for inferring agency in the animal figurines representing historically dangerous animals might reflect ecologically important assessment processes enhancing survival in the past (see Barrett, 2005 a, b). In contrast, a tree or waterfall that can engender high levels of danger from falling or drowning do not exhibit mental states or intentions. This lack of perceived agency for these situations might have made the potential dangers less apparent.

Further evidence that young children are attentive to lions as potential dangers is supported by visual-search studies of preschool-aged children in India and the United States. In these experiments, both children and adults were reliably faster at detecting static images of lions compared with antelope (Penkunas & Coss, 2013 a, b). This lion-detection bias was consistent for children in both cultures, and even among children in rural India living in settings with tigers and leopards. Such continuity across cultures arguably suggests that lions are very salient to young children. Nevertheless in the current study, the role of parental modeling of animal fears cannot be discounted as a contributing explanation for children ranking the two facing animals as representing the greatest threats (Muris, Steerneman, Merckelback, & Meesters, 1996).

Unlike the children studied herein, the pattern of adult ratings of external causes of death in the general public was reliably similar to the pattern of actual deaths reported in the national statistics. This distinction between the ratings of danger by children and adults indicates that, although the children were most attentive to the animal threats, the adult assessments reflected the threats prevalent in their actual environment. On the other hand, when the adults were asked to consider the dangers in relation to their own mortality, the correlation between their ratings and the national statistics was not statistically reliable. The overly optimistic evaluations of adults' personal health and safety risks compared with their actual prevalence to the general public has been described previously by Weinstein (1984; 1989). Weinstein (1984) concluded that adults tend to underestimate their vulnerability to risks which they believe they have control over.

The results here may illustrate this phenomenon since several of the dangerous scenarios in the questionnaire are associated with activities adults routinely carry out in a safe manner, such as walking down stairs and eating. On the other hand, the one danger rated as more personally threatening compared with its prevalence to the general public was dying in an aircraft accident, a situation in which passengers in airplanes have no control over. Disparity between adults' consideration of dangers in relation to themselves versus the general public may help

to explain the high rate of injury related deaths in adults. Although adults in our study were able to accurately specify which dangers prevailed in the general public, they did not appropriately recognize their own personal susceptibility to the same dangers. Our findings are consistent with previous research showing that adults are particularly poor at judging the probability of threats to themselves, a property that appears strongly resistant to debiasing interventions (Weinstein & Klein, 1995). The individual's estimation of their own expertise in completing these seemingly benign actions may have influenced their ratings for the corresponding causes of death.

The lack of appropriate ratings by the children for the external causes of mortality and the adult's underestimation for their personal susceptibility may contribute to the high death rate due to accidental injury in the modern world. How robust these findings are across cultures and the timing of ontogenetic changes in risk appraisal are issues in need of further research.

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