The *Safety Detective Program:* Evaluating a Community-Based Safety Intervention for Kindergarten Children

by

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ABSTRACT

THE *SAFETY DETECTIVE PROGRAM:* EVALUATING A COMMUNITY-BASED SAFETY INTERVENTION FOR KINDERGARTEN CHILDREN

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The purpose of the current study was to evaluate the effectiveness of a safety intervention for young children. The *Safety Detective Program* was designed to teach young children (4-6 years) about general home safety concerns, and to be delivered in a group setting. The aim of the program is to increase children's knowledge and understanding of home safety hazards and injuries. The current study used a randomized group, pre-post design to evaluate the effectiveness of the *Safety Detective Program*. A photo sort task and follow-up interview was used to measure intervention (n = 93) and control (n = 43) group participants' knowledge and understanding of home safety hazards before and after program delivery. Children in the intervention, but not the control, group exhibited significant gains in their knowledge and understanding of home safety hazards, indicating that the *Safety Detective Program* has the potential to improve the safety of young children.

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The *Safety Detective Program:*

Evaluating a Community-Based Safety Intervention for Kindergarten Children

The term unintentional injury has come to replace "accident" in child health and safety literature due to the fact that the latter implies a chance or non-preventable event and studies have shown that most child injuries are preventable (Langley, 1988; Rimsza, Schackner, Bowen, & Marshall, 2002). In most industrialized nations worldwide, unintentional injuries are a major cause of hospitalization and the leading cause of death for children beyond the first year of life. In fact, unintentional injuries account for 40% of *all* child deaths in high-income countries; drowns, poisoning, falls, and burns are the most common child injuries to lead to death at home (WHO, 2008). The agony that parents and children will face in the event of a disfiguring burn or paralysis due to a fall is unimaginable. When a family suffers the death of a child, the emotional loss is devastating. Fortunately, from 1979 to 2002, Canada saw a significant decline in the annual number of deaths in children ages 0-14 due to unintentional injuries, with injuries (per 100 000 children) declining from 1201 in 1979 to 334 in 2002 (Pan et al., 2006). While this finding offers encouragement for the effectiveness of child safety interventions, it also indicates that there is more work to be done.

For children under the age of 6, unintentional injuries are most likely to occur in the home, where they are presumably being supervised (Rivara, 1995). In fact, inadequate supervision plays an important role in child injury incidences and accounts for an estimated 43% of unintentional injury deaths for children aged 0-6 years (Landen, Bauer, & Kohn, 2003). Caregiver-focused interventions have been shown to enhance supervision and reduce young children's injury risk (Morrongiello, Zdzieborski, Sandomierski, & Munroe, 2012). However, as

children develop and become more independent they are increasingly allowed more time on their own (Morrongiello, Kane, & Zdzieborski, 2011). Hence, parent-focused interventions need to be supplemented with those that improve children's knowledge of safety hazards and behaviours. Furthermore, the Health and Physical Activity section of the Ontario Kindergarten Curriculum states that "safety is an integral part of being healthy, so young children need to start learning how to identify safe and potentially unsafe situations, how to handle them, and when to ask for help" . The current study was developed with this goal in mind.

Past injury prevention strategies aimed at children have included interactive computer games (Morrongiello, Schwebel, Bell, Stewart, & Davis, 2012), school based curricula (McConnell, Leeming, & Dwyer, 1996), immersive learning environments (Lamb, Joshi, Carter, Cowburn, & Matthews, 2006), and community based programs (Liller, Craig, Crane, & McDermott, 1998). However, many of these programs have involved the co-facilitation of researchers, teachers, parents and specialized community members (e.g., firefighters) and are, therefore, very costly and challenging to implement. Furthermore, most of these initiatives are narrow in scope and target only a specific type of injury (e.g., burns, poisons) or risk factor (e.g., bicycle helmet use), leaving gaps in children's knowledge of other injury type hazards. Addressing this issue, the *Safety Detective Program* was designed to a) teach young children about the most common and fatal injuries that they are susceptible to in the home (i.e., falls drowns, poisons, burns), and b) be delivered in a community setting. The current study utilized undergraduate students to deliver the program to local kindergarten classrooms, at which time an evaluation of the program's effectiveness was conducted.

The *Safety Detective Program* uses an inductive reasoning approach to elicit a change in children's understanding of home safety. Older children and adults can successfully enlist

deductive reasoning in their decision making processes (e.g., fire is dangerous, therefore this candle may burn me), however young children are less likely to reason in this "top-down" fashion (Galotti, Komatsu, Voelz, 1997). Inductive reasoning is a strategy used by both adults and children when making hypotheses and decisions. This is an approach which entails making "bottom-up" inferences based on specific experiences and examples (e.g., I was burned by fire, therefore fire is dangerous). Due to young children's lack of experience in the world, and therefore fewer exemplars to base their decisions on, their safety judgements are often inaccurate. A focus on inductive reasoning and causal knowledge has been shown to help children make general predictions about future events (Gopnik et al., 2004). For this reason, it has been suggested that child-focused safety interventions should concentrate on assisting children in seeing the relationship between injury risks and their deleterious outcomes (Coppens, 1986). Therefore, the *Safety Detective Program* places an emphasis why different hazards and injury behaviours are dangerous. Furthermore, children are provided with situational examples for each injury risk, which can help with the internalization of material (Hamers, de Koning, & Sijtsma, 1998).

The Health Belief Model was also considered while designing the *Safety Detective Program.* This is a model which has been broadly applied to health problems, and in terms of safety it postulates that an individual's injury prevention behaviours are directly related to their perceived susceptibility of injury, severity of injury, cost and benefits of the prevention behaviour, and self-efficacy in carrying out prevention behaviours (Carlson Gielen, & Sleet, 2003; Klassen, Morag MacKay, Moher, Walker, & Jones, 2000). Therefore, children are taught that they are susceptible to serious injuries in their homes on a daily basis (e.g., "Just because you haven't been hurt doing something dangerous before, doesn't mean it won't happen"), given

strategies to avoid hazardous situations (e.g., “When a grown-up is cooking, stay out of the way!”), and reminded that they are now “Safety Detectives”, capable of keeping themselves safe.

To evaluate the effectiveness of the *Safety Detective Program* a Randomized Control Trial (RCT) was used within a community setting (i.e., local schools). The key outcome measure was a change in children’s knowledge and understanding of general home safety hazards, measured using a photo sort activity with follow-up structured interviewing. Children in the control group took part in the same evaluative measure, but were not exposed to any safety intervention materials between evaluation sessions. It was hypothesized that children in the safety intervention group would display significant improvements in their knowledge of general home safety hazards, while children in the control group would not display improvements.

Method

Participants

Project approval was first obtained from the Research Ethics Board at the University of Guelph, followed by the Research Liaison Committee at the Upper Grand District School Board (UGDSB). Information about the *Safety Detective Program* and evaluative project was sent to principals of UGDSB elementary schools where a full day kindergarten program was in place. Three schools agreed to take part in the program evaluation, with all three kindergarten classrooms at each school participating.

Parents of children in each of participating classroom received an information letter and consent form, which outlined the purpose of the project. Parents were asked to return a signed copy of the consent form if they wished for their child to participate in the program evaluation (87% response rate). A community sample of (n = 170) children was recruited through this process.

Two of the three kindergarten classrooms at each school were randomly assigned to receive the *Safety Detective Program*, while the remaining classroom served as a control group. Any child who wished to participate and had a signed consent form was able to participate in measurement tasks, though only children who were: (a) able to speak English fluently; (b) typically developing; (c) able to comply with task demands; (d) present at both measurement sessions, and e) able to identify safe photos with greater than chance (50%) accuracy at both baseline and outcome sessions were included in the program evaluation (n = 135). Children who were excluded from the evaluation for any of the aforementioned reasons (n = 35) were able to continue taking part in program activities (Appendix A). Descriptive information about children in the intervention (n = 93) and control (n = 42) groups can be found in Table 1.

As per the UGDSB ethics agreement, children who did not have a signed consent form were not able to participate in measurement tasks, but were still able to participate in program activities if they so desired. Within the intervention group, 90% of children attended 5 or more of the 6 program sessions delivered to their classroom. Children in the participating classrooms received a small toy at the end of each session; parents of children in the participating classrooms were not compensated, as they were not required to do anything beyond taking their children to school as they usually would.

Protocol

Classrooms that had been randomly assigned to receive the *Safety Detective* program participated in six bi-weekly sessions between the baseline and outcome evaluations, while the control group classrooms received no programming between evaluations. Children in the intervention group also participated in a ‘specific knowledge’ evaluation at the beginning of each injury-specific session. When each classroom in a school had completed their outcome

measurement session, programming was delivered to children in the control classrooms, in order to ensure equal access to the potential benefits of the *Safety Detective Program.*

Safety Detective Program. The program is comprised of six, 40-minute sessions, each consisting of games, songs, crafts and stories that are designed to be fun and engaging for children, while incorporating key lessons about home safety (Appendix B); pilot testing was used in developing and refining these materials. In addition to introductory and summary sessions, the program includes four sessions which each focus on a different injury risk (i.e., drowns, falls, burns, poisonings). Activities are set up in a "circuit" fashion, enabling children to move from one activity to the next in a small group, so that each child has participated in every activity by the end of the 40 minute session. Furthermore, each activity is centred around a different main message, with the goal of children learning a different main message at each circuit (Appendix C). At the end of each session, the program coordinator provides a "wrap-up" to the class as a whole, at which time main messages are reiterated and for any injury-specific session, a safety slogan is rehearsed together (Appendix D). Children are also provided with take-home activities after each session that aim to encourage the use of knowledge and skills covered in the program. At the beginning of each session, the previous take-home activity is discussed with the intent of further solidifying knowledge, as repetition and required recall have been shown to foster learning and memory of learned information (Chi, DeLeeuw, Chiu, & LaVancher, 1994). Parents are also provided with an information sheet after each session, which outlines the goal of their child's take-home activity, the main messages covered during that session, and facts about the safety issue at hand.

Undergraduate student volunteers received training on how to deliver the Safety Detective program to each intervention classroom. Volunteers were provided with a manual,

which outlined main messages, activities, and goals for program delivery. A one-hour training session also took place, in which all volunteers were trained on the program material, as well as the concept of guiding children towards main messages and lessons through the play based activities. Additionally, before each session, volunteers would be given a short (10 minute) review on the activities and main messages for the upcoming session.

Photo Sort Task. Children were individually evaluated on their baseline and outcome knowledge of general home safety using a photo sorting task (Appendix E) that has been used in previous research on preschoolers' understanding of home hazards. Using two sets of 30 photos (20 hazardous; 10 nonhazardous), with each set containing slight variations of the same photos, children were randomly assigned to receive one of the two sets at baseline and then received the alternate set during the outcome evaluation. There was slight variation in the photo sets so children had to generalize knowledge and recognize similarities across exemplars, which provides a more stringent test of ability to use knowledge effectively. Also, this procedure minimized practice effects, as children would see slightly different photos at the baseline and outcome evaluations. Each photo set was comprised of the same number of burn, fall, poison, and drown photos (Appendices F and G).

The photo sort task consisted of two parts: sorting and explaining. During the sorting task, children were asked to decide if the activity in the photo was "okay" or "not okay" for them to do at home. Each correctly assigned photo was worth one point, resulting in possible total identification scores ranging from 0 to 30. In addition to a score for overall accuracy of photo sorting, a hazard-specific score was calculated for each child based on their accuracy in sorting the 20 hazardous photos only.

After sorting all 30 photos, children were asked to explain why they said it was "not okay" to do what was displayed in each of the photos that they had sorted in this way. Research assistants provided children with one prompt (e.g., "Tell me more.", "What do you mean?") if they provided an answer that was unclear. Audio recordings were coded and used as a means of evaluating each child's performance on the explanatory portion of the task, with scores ranging between 0 and 4: 0 (*no response, don't know, unrelated*: "It would make a mess"*)*, 1 (*unclear*: "That would be very hot"*)*, 2 *(general*: "She could get hurt"*)*, 3 *(specific*: "He might touch the oven, and it's very hot."*)*, or 4 (*specific injury*: "They will burn their hand."*)* was assigned to children's explanations of each "not okay" photo (Appendix H). As a result, total possible scores on this task ranged from 0 to 80. As a means of controlling for rater biases, three research assistants were each randomly assigned to code three classes at baseline, and three different classes at outcome and they were unaware of group assignment or time point. Inter-rater reliability averaged 92% agreement for coding children's understanding, based on 20% of the sample being coded independently by two coders.

Specific Knowledge Questions. After each injury-specific program session (i.e., drown, fall, burn, poison) children participated in an individual evaluation of their program specific knowledge of material from the previous session. These short interviews were conducted by a program volunteer, and occurred within the classroom. These four questions were open-ended and focused on children's recollection of the previous session's main messages and safety slogan (Appendix I). Audio recordings were used as a means of coding children's performance on this task, with each answer being scored as 2 = correct, 1 = generally correct, or 0 = incorrect. Answers were scored as correct if the child provided an answer that had been explicitly taught;

whereas answers that were not exact, but conveyed a good understanding of the main message, were scored as generally correct.

Results

Overall Photo Identification

In order to evaluate the impact of the *Safety Detective Program* on children's ability to identify both safe and unsafe photos (30 photos), a mixed-measures Analysis of Covariance (ANOVA) was conducted using overall identification scores on the photo sort task. Scores were calculated based on the number of photos children correctly identified as "okay" or "not okay", divided by the total number of photos and then converted to a percent, with possible overall scores ranging from 0 to 100. Entering age and sex as covariates, condition (2: intervention, control) was used as a between-participant factor and time (2: baseline, outcome) was used as a within-participant factor. There was a significant interaction between time and condition, $F(1, 131) = 74.48$, $p<.001$, *partial* $\eta^2 = 0.36$, indicating that accurate identification of safe and unsafe behaviours varied across time by condition (Figure 1).

Follow-up ANOVAs were conducted to explore the nature of the significant interaction. First, ANOVAs were conducted on overall baseline and outcome scores separately, with condition (intervention, control) as the between-participant factor. As shown in Table 2, overall photo sort scores were not significantly different between groups at the baseline evaluation, $F(1, 133) = .18$, $p > .05$, but these scores were significantly higher for children in the intervention than control group at the time of the outcome evaluation, $F(1, 133) = 79.86$, $p<.001$, *partial* $n^2 = 0.37$. Next, ANOVAs were conducted separately for intervention and control groups, with overall scores at each time point (baseline, outcome) as the within-participant factor. For children in the control group, overall scores did not significantly differ between the baseline and outcome

evaluations, $F(1, 41) = 2.61$, $p > .05$, while children in the intervention group achieved significantly higher scores at the outcome compared to baseline evaluation, $F(1, 92) = 185.01$, $p < .001$, *partial* $n^2 = 0.67$.

Thus, at the start of the program, children in both conditions were able to identify hazardous and non-hazardous photos with the same low/moderate degree of accuracy. However, after taking part in the *Safety Detective Program*, children in the intervention group displayed significantly greater accuracy in sorting photos in this manner when compared to their control group counterparts.

Hazardous Photo Identification

A mixed-measures ANCOVA was conducted to explore the intervention program's impact on the identification of hazardous photos specifically (20 photos). Hazard identification percentage scores were calculated based on the number of hazardous photos children correctly identified as "not okay", with possible scores ranging from 0 to 100. Entering age and sex as covariates, condition (2: intervention, control) was used as a between-participant factor, and time (2: baseline, outcome) was used as a within-participant factor. A significant interaction was found between time and condition, $F(1, 131) = 61.01$, $p < .001$, *partial* $\eta^2 = 0.32$, indicating that accuracy in identifying hazardous photos varied aver time as a function of condition (Figure 2).

The interaction was further explored using follow-up ANOVAs. First, hazard scores at the baseline and outcome evaluations were separately analyzed using ANOVAs with condition (intervention, control) as a between-participant factor. Though the groups did not differ significantly at baseline evaluation, $F(1, 133) = .39$, $p > .05$, the intervention group had significantly higher hazard identification scores than the control at the outcome evaluation, $F(1, 133) = 67.22$, $p < .001$, *partial* $\eta^2 = 0.34$. Next, separate ANOVAs were used to evaluate the

effect of time (baseline, outcome) for condition separately, with time as a within-participant factor. While the control group showed no significant difference from baseline to outcome, $F(1, 41) = 2.70$, $p > .05$, the intervention group displayed a significant increase in their accuracy of identification of hazardous photos at the time of the outcome evaluation, $F(1, 92) = 143.56$, $p<.001$, *partial* $\eta^2 = 0.61$. An item analysis is located in Tables 3 and 4, which outlines the percentage of children which correctly identified each hazardous photo from photo set A and B at the baseline and outcome evaluations.

To summarize, intervention and control children exhibited similar levels of hazard identification at the baseline evaluation. However after taking part in the *Safety Detective Program,* children in the intervention condition showed significant improvements in their ability to identify hazardous photos, while children in the control condition showed no changes in these skills.

Understanding of Hazard Specific Photos

Children's understanding of the injury risk inherent in photos which they identified as "not okay" was explored through a mixed-measures ANCOVA. A coding scheme was used to assign a score from 0 to 4 for children's understanding of each hazardous photo that they identified as "not okay". Scores from each hazardous photo (20 photos) were combined for a total understanding score for each child, with a possible range of 0 to 80. Entering age and sex as covariates, condition (2: intervention, control) was used as a between-participant factor, and time (2: baseline, outcome) was used as a within-participant factor. As shown in Figure 3, a significant interaction was found to exist between time and condition, $F(1, 128) = 85.54$, $p<.001$, *partial* $\eta^2 = 0.40$, indicating that children's understanding of the behaviours in hazardous photos

varied as a function of time and condition (Table 5). Follow-up ANOVAs were used to further explore the significant interaction of time and condition on understanding of injury hazards.

To begin, baseline and outcome understanding scores were examined separately using ANOVAs, with condition (intervention, control) as a between-participant factor. The two groups did not differ in their understanding of hazardous photos as the baseline evaluation, $F(1, 130) = 0.99$, $p > .05$, but there was a significant difference between groups at the outcome, $F(1, 130) = 73.76$, $p < .001$, *partial* $\eta^2 = 0.36$. Next, ANOVAs were conducted on intervention and control groups separately, using baseline and outcome hazard understanding scores as a within-participant factor. While children in the control condition showed no change in their understanding of hazardous behaviours across time, $F(1, 41) = .18$, $p > .05$, children in the intervention displayed a significant increase in understanding, $F(1, 89) = 224.93$, $p < .001$, *partial* $\eta^2 = 0.72$.

Thus, children in both the intervention and control condition displayed a similarly low level of understanding of hazardous behaviours at the baseline evaluation. However, children who received the intervention program exhibited a significantly higher level of understanding at the outcome evaluation when compared to their control condition peers, as well as their baseline performance. These results indicate that the *Safety Detective Program* has a significant impact on children's understanding of hazardous behaviours that lead to injury.

Specific Program Knowledge

The ability of children in the *Safety Detective Program* to recall slogans and messages from previous sessions was evaluated in order to obtain a measure of program specific knowledge retention. Children were asked four, open-ended questions following each specific

hazard week (i.e., drown, fall, burn, poison), and answers were scored as incorrect, generally correct, or correct.

Due to occasional missing individual data, performance on the specific knowledge questions is reported at the group level for each injury specific session. As shown in Table 6, a larger percentage of children tended to answer the questions about main messages correctly (i.e., Q1, Q2, Q3), when compared to those pertaining to slogans (i.e., Q4). Furthermore, when considering both correct and generally correct answers, on average, 79% of children provided appropriate responses indicating recall of program specific information over a one week interval. Although individual patterns of specific knowledge scores could not be obtained, the group patterns observed suggest that children performed with greater accuracy when they were required to provide general, rather than verbatim, information.

Discussion

Primary injury prevention strategies, as opposed to secondary or tertiary strategies, aim to prevent injuries from occurring. Both passive (e.g., mandated hot water heater settings) and active (e.g., parent education) injury prevention strategies have been employed as a means of preventing unintentional child injuries. Previous active interventions to improve safety for young children have largely focused on improving parent knowledge and/or supervision behaviours (Morrongiello, Zdzieborski, Sandomierski, & Munroe, 2012), which is important but may not be sufficient to prevent injuries given many arise from children acting independently when not directly supervised (Morrongiello, Brison & Corbett, 2009).

Child safety interventions to date have either been costly and challenging to deliver, or focused on only one injury type (McConnell, Leeming, & Dwyer, 1996); Lamb, Joshi, Carter, Cowburn, & Matthews, 2006; Liller, Craig, Crane, & McDermott, 1998), rather than providing

children with a more general understanding of home hazards that can lead to injury. Addressing these gaps, the *Safety Detective* program was designed to teach kindergarten children (4-6 years) about hazards relevant to the most common injuries that occur to them in and around the home, namely - burn, fall, poison, drowning (WHO, 2008). The *Safety Detective Program* can be delivered to groups of children in six relatively short sessions (40 minutes), without the need for specialized equipment or personnel. While active child participation is required, parent involvement is almost entirely passive; making this an ideal program to be delivered at the classroom level. All program activities were designed with the aim of being fun and engaging for young children, while covering important lessons about home safety.

The current evaluation confirmed the hypothesis the *Safety Detective Program* results in an increase in children's knowledge and understanding of home safety hazards. Specifically, when compared to the control group, those who participated in the intervention were more accurate in their identification of hazardous behaviours. Furthermore, children in the intervention group exhibited better comprehension of the risks associated with hazardous behaviours, earning higher scores than children in the control group on a task measuring hazard understanding.

Current models of early childhood education stress the importance of combining play and learning in a way that is most beneficial for children (Samuelsson, & Carlsson, 2008). Activities in the *Safety Detective Program* achieve this goal in that they are centered around a main message, while largely relying on child engagement and curiosity. For example, during the drown prevention week, children worked together to create a water safety storybook by drawing pictures and sharing what they would want other children to know about the topic. Throughout this process, a trained undergraduate student would make observations and inquires about the children's drawings (e.g., "Oh no! It looks like he's getting into the bath all by himself.", "Why

can't she stand up the tub?"). Similarly, children's sharing of their own injury experiences was met with the same inquisitive and collaborative approach (e.g., "Ouch! Did that hurt?", "Uh oh! What happened when you touched the stove?"). This reciprocal and child-focused approach was applied to games, stories, songs, and crafts, as a means of maintaining children's engagement and learning.

In using an inductive reasoning approach to increase children's knowledge and understanding of home safety concerns, the intervention program outlines the cause and effect of injury risks and provides specific examples of the deleterious outcomes that can results from hazardous scenarios. Previous research on child learning has suggested that this type of approach increases the internalization and generalization of acquired knowledge (Gopnik et al., 2004; Hamers, de Koning, & Sijtsma, 1998). In fact, the current evaluation did find that when faced with questions about specific program content, children tended to be less likely to remember slogans or the exact examples that had been provided to them, and more likely to provide appropriately generalized answers that reflected a deep level of understanding of the safety issue. These results provide promise that they intervention-based knowledge will generalize to children's experience in their homes and the common home hazards that they will encounter there.

Furthermore, the *Safety Detective Program* utilizes tenets of the Health Belief Model, as a means of conveying to children that they are susceptible to serious injuries, and also capable of preventing injuries from happening. Though there was no formal evaluation of children's perceived personal injury beliefs prior to or after the program, several classroom teachers noted that their students had become more vigilant of safety in the classroom, and often used their "Safety Detective" persona to tell others about potential hazards. Though anecdotal, these

observations suggest that children did, in fact, come to believe that they were susceptible to injury and capable of making changes to moderate these risks.

Finally, children who participated in the safety program were able to internalize main messages and slogans, retaining these for up to one week and explaining these effectively, demonstrating generalization of program specific material.

The Safety Detective Program had a significant effect on the intervention group's knowledge and understanding of hazardous behaviours when compared across time (partial $\eta 2 = 0.61$ and 0.72, respectively). Though previous child-focused interventions have proven to be successful, most of these programs have failed to report effect sizes, making it difficult to ascertain the impact that the Safety Detective Program has had in comparison. Of those programs which have reported effect size estimates, smaller effect sizes have been observed (partial $\eta 2 = 0.11$ to .06) when evaluating children's acquisition of safety knowledge (Morrongiello, Schwebel, Bell, Stewart, & Davis, 2012; Schwebel, Morrongiello, Davis, Stewart, & Bell, 2011)

Limitations and Directions for Future Research

The current evaluation used children's abilities to identify hazardous and non-hazardous photos accurately as a knowledge measure, and their stated reasoning behind such hazardous classifications as a measure of understanding. While the observed effect of the intervention on knowledge and understanding is promising, evidence of behavioural changes would provide further support for the program, as knowledge does not always translate to behaviour change (Englander et al., 1993). Such a measure could be obtained through home-placed 'contrived hazards' (i.e., items that appear to be dangerous, but that have been modified to pose no harm Cataldo et al., 1992; Morrongiello & Dawber, 1998), such as has been recently done in a study of

young children's home hazard interactions (Morrongiello, McArthur, Goodman, & Simone, in press). Alternatively, parent reports of chid injury rates could be collected before and after program delivery. This type of practical outcome has been successfully measured through hospital records following interventions at larger population levels (Ytterstad, & Søgaard, 1995), but are challenging to obtain and evaluate in smaller community samples.

Given that the current evaluation was based on a community sample of kindergarten classrooms, parent informed information was not easily obtainable. Therefore, individual differences in child temperament, injury history, and risk-taking propensity were unknown. These factors are known to play a part in children's risk of injury, and would therefore be of value in determining the effectiveness of the intervention program on children who exhibit a greater risk of injury (Morrongiello & Dawber, 2000; Morrongiello & Sedore, 2005). Similarly, children who were not typically developing or could not comply with task demands (e.g., behavioural difficulties), were not included in the evaluation. Unfortunately, these groups are also at an increased risk of injury (DiScala, Lescohier, Barthel, & Li, 1998; Sherrard, Tonge, & Ozanne-Smith, 2002). Hence, developing interventions for these groups is an important initiative for future research.

Furthermore, while schools within the Upper Grand District School Board are comprised of diverse children and families, the obtained sample may not be representative of the Canadian population. Therefore, the results of the current evaluation may not generalize to groups of children from different backgrounds (e.g., religious, socio-economic, culture, region). Future evaluations would benefit from obtaining more diverse populations, therefore increasing the external validity of the results.

Finally, due to the fact that the current evaluation occurred during the second half of the school year, follow-up evaluations beyond the outcome measure were not feasible. It would be beneficial to obtain follow-up knowledge and understanding scores for children in both the control and intervention groups, as a means of evaluating the stability of the significant findings.

Conclusion

The current evaluation of the *Safety Detective Program* indicates that kindergarten children (ages 4-6) experience significant increases in their knowledge and understanding of home safety issues and hazardous behaviours after exposure to the intervention. The program is relatively inexpensive and can be delivered to groups of children, without the need for special equipment, personnel, or intensive training. These promising results suggest there is merit in taking the next step to evaluate if the *Safety Detective Program* reduces children's risk behaviors.

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Table 1

Demographic Information (Age in Years, Sex) for Children in each Condition (Control, Intervention)

AGE	SEX	CONDITION		TOTAL
		Control	Intervention	
4		11	31	42
5		22	44	66
6		9	18	27
	Male	19	49	68
	Female	23	44	67

Table 2

Mean (SD) Percent Correct for Overall Score (Out of 30 Photos) and Hazard Specific Score (Out of 20 Hazard Photos) on the Photo Sorting Task at each Time Point (Baseline, Outcome) for Children in each Condition

SCORE	TIME	CONDITION	
		Control	Intervention
Overall	Baseline	56 (12)	57 (13)
	Outcome	52 (12)	73 (12)
Specific	Baseline	39 (20)	42 (21)
	Outcome	34 (21)	65 (20)

Table 3

Percent of Intervention Group to Correctly Identify Hazardous Items from Photo Set A at Baseline and Outcome

Photo	Injury Type	Baseline	Outcome
11	Burn	44.4	70.2
12	Burn	84.4	89.4
13	Burn	17.8	51.1
14	Burn	95.6	87.2
15	Burn	66.7	74.5
16	Fall	68.9	78.7
17	Fall	42.2	63.8
18	Fall	35.6	55.3
19	Fall	26.7	63.8
20	Fall	35.6	59.6
21	Fall	24.4	55.3
22	Drown	28.9	51.1
23	Drown	37.8	66.0
24	Drown	26.7	42.6
25	Drown	37.8	53.2
26	Drown	13.3	36.2
27	Drown	28.9	72.3
28	Drown	53.3	83.0
29	Drown	44.4	66.0
30	Drown	44.4	74.5

Table 4

Percent of Intervention Group to Correctly Identify Hazardous Items from Photo Set B at Baseline and Outcome

Photo	Injury Type	Baseline	Outcome
11	Fall	33.3	73.9
12	Fall	56.3	67.4
13	Fall	29.2	47.8
14	Fall	20.8	52.2
15	Fall	41.7	63.0
16	Fall	10.4	21.7
17	Burn	56.3	80.4
18	Burn	60.4	87.0
19	Burn	83.3	91.3
20	Burn	20.8	50.0
21	Burn	68.8	78.3
22	Poison	41.7	78.3
23	Poison	43.8	76.1
24	Poison	54.2	82.6
25	Poison	45.8	82.6
26	Drown	12.5	28.3
27	Drown	31.3	65.2
28	Drown	41.7	76.1
29	Drown	31.3	45.7
30	Drown	35.4	54.3

Table 5

Mean (SD) Score for Understanding of Hazard Specific Photos as a Function of Time (Baseline, Outcome) and Condition (Control, Intervention)

TIME	CONDITION	
	Control	Intervention
Baseline	10.98 (7.67)	12.81 (10.72)
Outcome	11.52 (10.56)	33.67 (15.06)
Change Score	0.55 (8.26)	20.85 (13.19)

Table 6

Percentage of Intervention Group with Correct Answers to Program Specific Knowledge Questions

	Question 1	Question 2	Question 3	Question 4
Drown	95	93	57	34
Fall	85	76	93	76
Burn	32	84	90	25
Poison	52	42	76	7

Table 7

Percentage of Intervention Group with Correct or Generally Correct Answers to Program Specific Knowledge Questions

	Question 1	Question 2	Question 3	Question 4
Drown	95	93	57	97
Fall	85	76	93	94
Burn	74	84	90	56
Poison	77	44	76	14

Figure 1

Mean Total Percentage of Safe and Unsafe Photos Correctly Identified as “Okay” or “Not Okay” by Children in the Control and Intervention Groups at Baseline and Outcome Evaluation

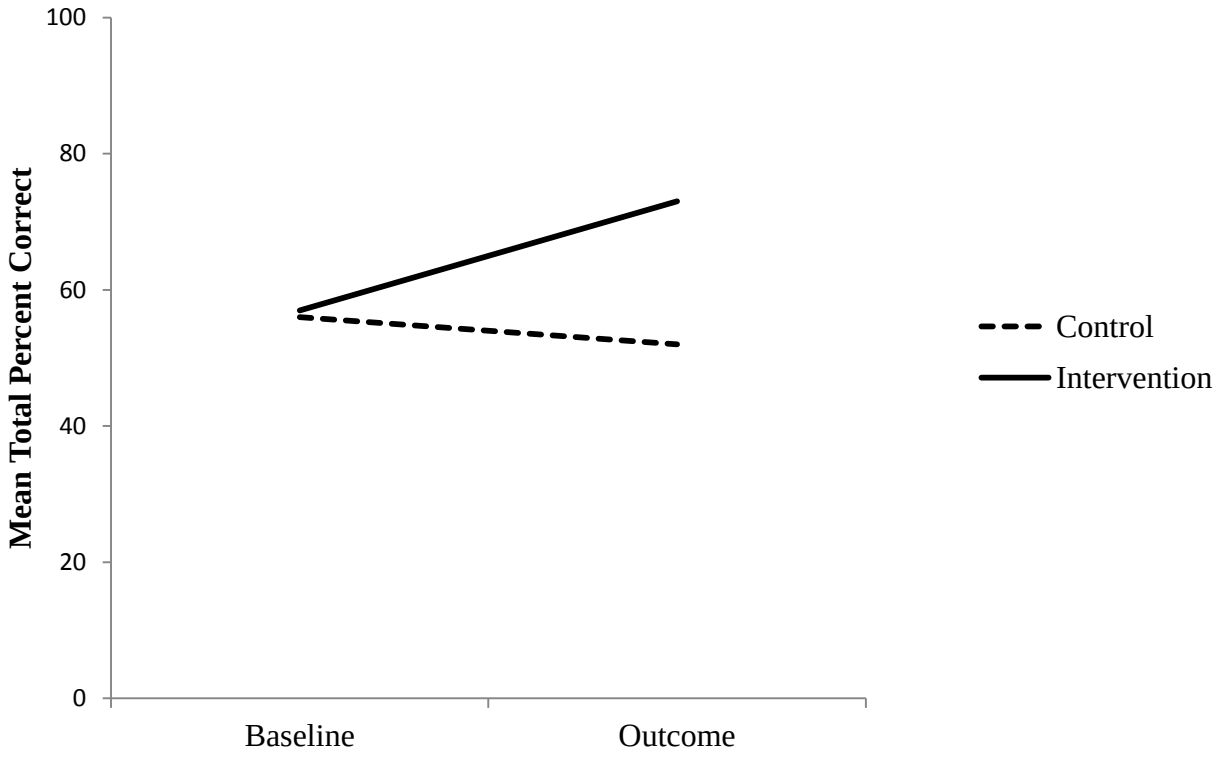


Figure 2

Mean Percentage of Hazard Photos Correctly Identified as "Not Okay" by Children in the Control and Intervention Groups at Baseline and Outcome Evaluation

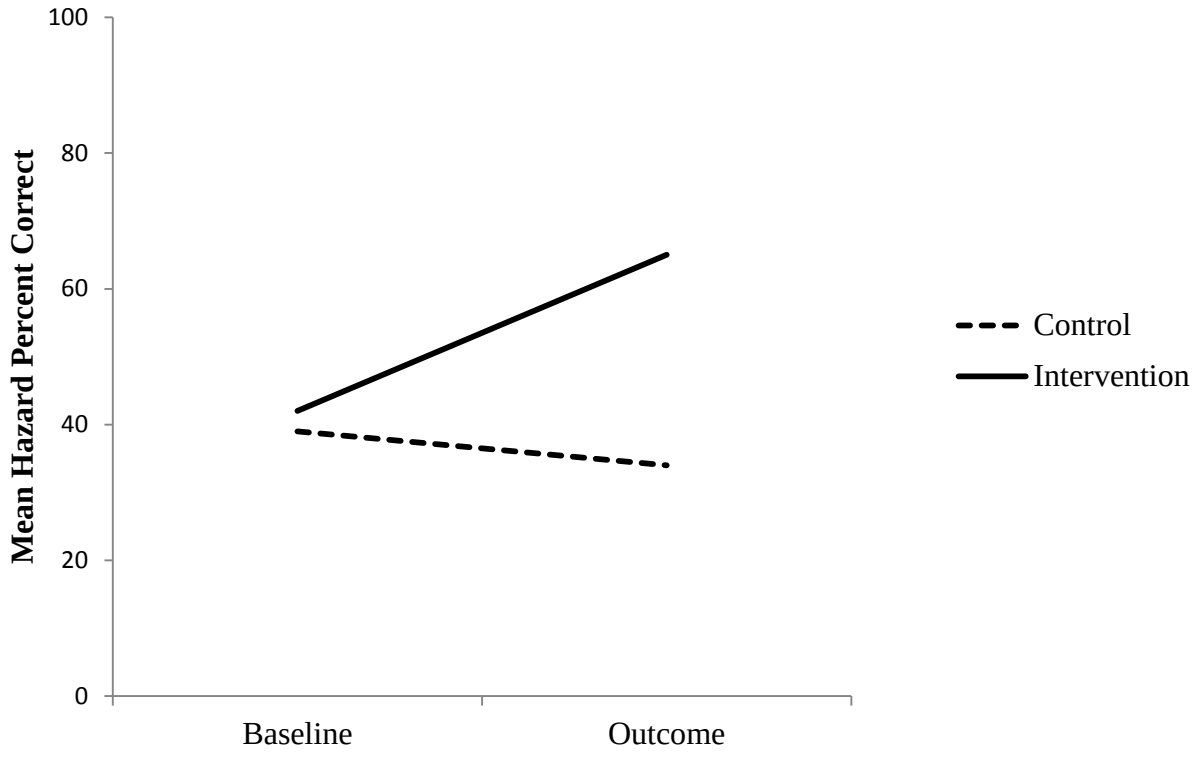
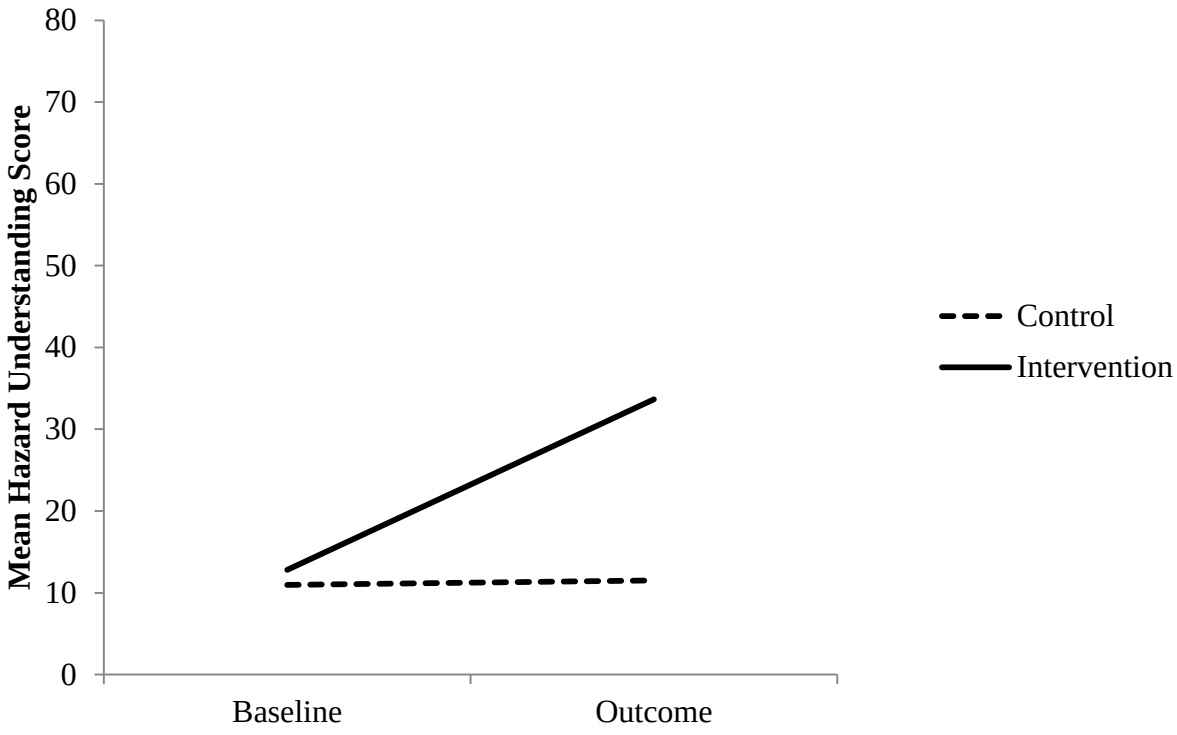
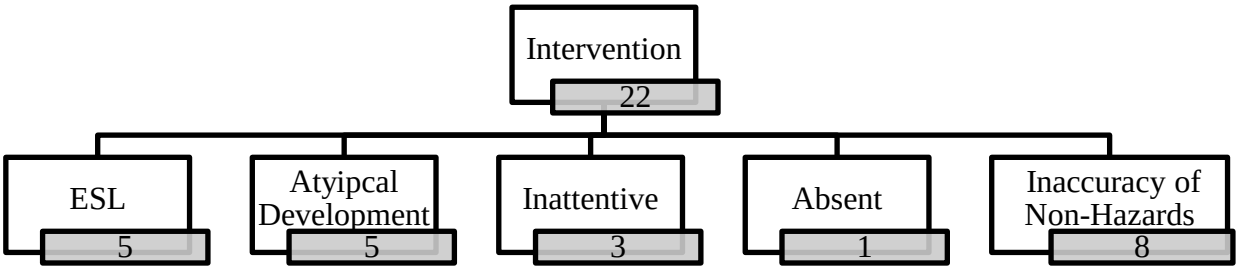


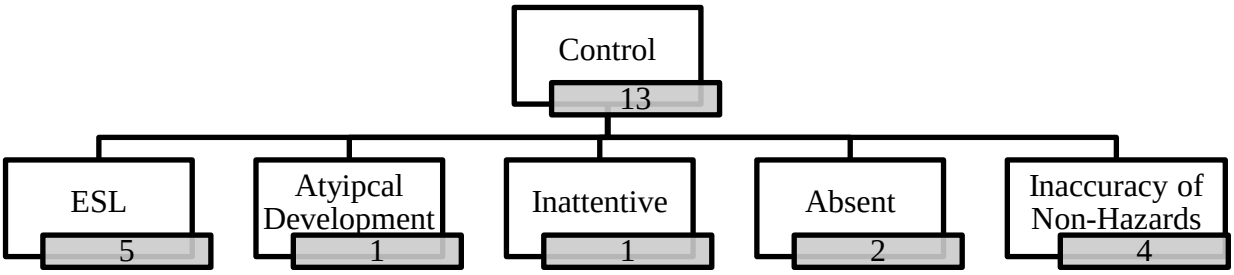
Figure 3

Mean Hazard Understanding Scores for the Control and Intervention Groups at Baseline and Outcome Evaluation



Appendix A: Children Excluded from the Evaluation





Appendix B: Session Activities for the Safety Detective Program

Session	Topic	Activity
1	General Home Safety	Book: "Careful Puppy Saves the Day!" Activity: Decorate "Safety Detective" buttons Take Home: Picture hazard search
2	Drown	Book: "Watch Out! Near Water" by Claire Llewellyn Song: Water Safety Song (Tune: Mary Had a Little Lamb) Activity: Make a water safety storybook Take Home: Keep a foam rubber ducky safe in the bathtub
3	Fall	Book: "Humpty Dumpty" by Daniel Kirk Song: Fall Safety Song (Tune: Twinkle Twinkle Little Star) Activity: Make paper bag monkeys Take Home: Identify falls hazards in a picture
4	Burn	Book: "No Dragons for Tea" by Jean E Pendziwol Song: Burn Safety Song (Tune: Old Macdonald) Activity: Make burn safety placemats Take Home: Identify burn hazards at home
5	Poison	Book: Sam & Ella Learn All About Poison Safety! Song: Poison Safety Song (Tune: I'm a Little Teapot) Activity: Play a safety board game Take Home: Identify poison hazards in a picture
6	General Home Safety	Book: "Watch OUT! At Home" by Clair Llewellyn Activity #1: Play safety bingo Activity #2: Play a safety memory game Take Home: Match pictures of hazards to the injuries they could case

Appendix C: Main Messages of the Safety Detective Program

Session	Topic	Main Messages
1	General Home Safety	a. Even in your own house, there are many ways you could get hurt! b. Just because you haven't been hurt doing something dangerous before, doesn't mean it won't happen. c. Be a Safety Detective! You have the power to keep yourself safe.
2	Drown	a. Never get in or out of the bathtub on your own. You could slip and fall under the water and then drown. b. Always sit on your bottom in the bathtub. If you stand up, you could slip and fall under the water and drown. c. You should never be alone in the bathtub. Always make sure a grown-up is with you so they can help you if you need it.
3	Fall	a. Toys and trinkets are fun to play with, but should be cleaned up once playtime is over because they are easy to trip over. b. Shelves, dressers and other pieces of big furniture are not for climbing on and may fall on you if you do this. If you need something that is too high for you to reach, get a grown-up. c. Stairways are not a place to play or clown around, because it's easy to slip and fall down them.
4	Burn	a. When a grown-up is cooking, stay out of the way! b. Things that are hot sometimes may not be other times. You never know! Just in case, don't touch. c. Candles and fires are only for grown-ups to use. Do not go near these things!
5	Poison	a. Only grown-ups can touch or use chemicals. (e.g., cleaning products, beauty products, medicine) b. Don't put anything in your mouth without asking your parents first. (e.g., berries, plants, medicine) c. Always look for poison symbols, but remember that things without the symbol can be poison too!
6	General Home Safety	a. Whenever you're not sure about a safety rule, talk to your parents. b. Even when your parents aren't near, follow the safety rules. c. Be a Safety Detective! Keep yourself safe by remembering what Careful Puppy has taught you.

Appendix D: Slogans for the Safety Detective Program

Session	Topic	Slogan
2	Drown	“Water is no place to clown around; if you’re not careful you could drown.”
3	Fall	“No jumping on the bed, you can fall and bang your head.”
4	Burn	“One thing you must learn: anything that gets hot can cause a burn.”
5	Poison	“If you’re not sure just what it is: don’t sniff, touch, or lick, or you’ll get very sick.”

Appendix E: Photo Sort Protocol

"I'm going to show you some photos of young children doing different things around the house. I want you to put each photo into one of these two boxes. This box is for things that are okay for the child to do and this box is for things that are not okay for the child to do. Just put each photo in whichever box you think. You don't have to put an equal number in each."

Hand the child each card one by one (in random order), and say the following:

1) "This child is (READ PHOTO DESCRIPTION). Is this something that is okay or not okay to do?"

Once you have sorted each photo into the OKAY or NOT OKAY boxes, interview further about the NOT OKAY photos.

"Now we're going to talk a bit more about these photos that you said were not okay."

2) "This is a picture of a child (READ PHOTO DESCRIPTION) and you said this was not something the child should be doing. Tell me why the child shouldn't be doing this."

-If child says "I don't know", then give ONE prompt: "Just tell me what you think about WHY the child should not do it." Regardless of what they answer, then move on to question #3.

- If the child says something unclear, then give ONE prompt for clarification if necessary, such as: "Tell me more about what you mean." Regardless of what they answer then move on to #3.

-An answer would NOT be classified as unclear, and therefore WOULD NOT be prompted if:

1) They say this is not safe, or they would get hurt, die, etc.
2) They mention a specific injury hazard (e.g., cut, burn, fall, poison, etc.)
3) They mention a type of injury or harm to your body (e.g. break your arm, poke your teeth, etc.)
4) They mention making a mess, getting in trouble/being punished (mom would be mad, I would get a time out, the police would come, etc.)

3) Is this something that your mom and dad let you do at home sometimes?

-Code YES, or NO, or DK (If they say "I don't know"

Appendix F: Photo Set A Descriptions

Non-Hazard

1. Playing with a toy
2. Reading a book
3. Eating a cookie
4. Colouring a picture at a little table
5. Playing with a toy
6. Colouring a picture at a kiddie table
7. Playing with toys
8. Sitting on a bean bag chair
9. Putting on her shoes
10. Talking on the phone

Hazards

Burn

11. Smelling the yummy food that's cooking
12. Getting some yummy cookies for a snack
13. Having some hot chocolate
14. Making himself a nice mug of hot chocolate
15. Blowing out a candle that Mom forgot to blowout

Fall

16. Getting a piece of fruit from the bowl
17. Getting a toy from her room
18. Getting a book to read
19. Walking down the stairs
20. Running inside to get a cold drink after playing outside all afternoon
21. Playing with some toys

Drown

22. Playing in the pool while Dad is making lunch in the house
23. Running herself a nice bath
24. Having a bath while her Mom puts her little brother to bed
25. Getting out of the tub while her Dad gets her pajamas from the other room
26. Going into a pool to cool off

Poison

27. Helping to clean the windows
28. Smelling a nice bottle of perfume
29. Looking at some pretty makeup
30. Moving some medicine away to tidy up

Appendix G: Photo Set B Descriptions

Non-Hazard

1. Talking on the phone
2. Looking at photos
3. Reading a book
4. Reading a book
5. Playing with a toy
6. Playing with a toy
7. Eating a cookie
8. Colouring a picture at a kiddie table
9. Sitting on a bean bag chair
10. Putting her shoes on

Hazard

Fall

11. Playing with some toys
12. Getting a snack from the kitchen
13. Getting a toy from her room
14. Walking down the stairs
15. Running inside to get a cold drink after playing outside for the afternoon
16. Getting a book to read

Burn

17. Blowing out a candle that mom forgot to blow out
18. Getting some yummy cookies for a snack
19. Making some yummy hot chocolate
20. Having some hot chocolate
21. Smelling the yummy food that's cooking

Poison

22. Helping to clean the windows
23. Looking at some pretty makeup
24. Tidying up by moving some medicine
25. Smelling some pretty perfume

Drown

26. Playing in the pool while Mom gets her towel from inside
27. Getting into the tub while Dad gets her towel from the other room
28. Running herself a nice bath
29. Getting into the pool to cool off while Dad is making lunch inside
30. Having a nice bath while Mom and Dad make dinner

Appendix H: Photo Sort Task Audio Coding Scheme

0 = UNRELATED to issue of safety OR NOT RELEVANT to the hazard in that photo.

-make a mess, get in trouble, break something, time out/not allowed, too young/little

1 = UNCLEAR as to their level of understanding. Based on what is said it could be injury relevant but you would have to fill in a lot of information to make this connection. They may mentioning that supervision or adult assistance is required. Child does not explicitly describe an injury or a way of getting hurt.

-poison: might get on you, could spray/spill/touch it, only grown ups
-burn: hot, could go near it/get too close, only mom/dad can
-fall: table could break, chair could fall, ask mom for help, need grown up to do it
-drown: should not be standing, too deep, not without mom/dad

2 = GENERAL understanding demonstrated. Mentions getting hurt, crying, "ouch", etc., but is not specific about how the child could get hurt or what the type of injury might be.

-get dead/die, heart stop working, stop breathing, get hurt

3 = SPECIFIC understanding demonstrated. Child describes a way to get hurt that is relevant to the hazard but does not name the specific type of injury that could occur.

-poison: ANY mention of poison symbol (even as "cross" or "skull" symbol), spray in eyes/mouth, eat it/get sick/throw up
-burn: could touch the hot pot, will hurt their skin
-fall: could trip and go bang down the stairs, might bump head on the table
-drown: could slip/fall, too deep & might not be able to swim

4 = INJURY type is explicitly named (fall, cut, burn, poison).

Appendix I: Specific Knowledge Questions

Drowning

1) Who should always be with you when you are in water?
   Answer: Grown-up/Adult/Parent/Mom/Dad
2) Why is it dangerous to stand up in the bathtub?
   Answer: Slip/Fall
3) What happens if you stay under water for too long?
   Answer: Can't Breath/Drown
4) Finish this saying: "Water is no place to clown around; if you're not careful you could…"
   Answer: Drown

Falls

1) Why is it important to pick your toys up when you are finished with them?
   Correct: Trip/Fall
2) What should you do when you need to reach something that is up high, like on a table or shelf?
   Answer: Ask for help/Get grown-up
3) What can happen if you are not careful on the stairs?
   Answer: Fall
4) Careful Puppy always says: "No jumping on the bed, you can fall and…"
   Answer: Bang your head

Burns

1) When a grown-up is cooking, where should you be?
   Answer: Out of the way
2) Who is allowed to use fire?
   Answer: Grown-ups/parents/mom/dad
3) Is it okay to touch something that gets hot (like a stove) when you don't think it's on?
   Answer: No
4) Careful Puppy always says: "One thing you must learn: anything that gets hot…"
   Answer: Can cause a burn

Poison

1) What does it mean when you see a sign like this? *Show poison symbol*
   Answer: Poison
2) What do you call things like cleaning spray, medicine, and paint?
   Answer: Chemicals
3) Can things be poisonous when there is no symbol?
   Answer: Yes
4) Careful Puppy always says: "If you're not sure just what it is: don't sniff, touch, or lick…"
   Answer: "Or you'll get very sick!"