

Can A Storybook Intervention Increase Children's Home Safety Knowledge  
and  
Decrease Risk Behaviours?

by  
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## ABSTRACT

### CAN A STORYBOOK INTERVENTION INCREASE CHILDREN'S HOME SAFETY KNOWLEDGE AND DECREASE RISK BEHAVIOURS?

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The goal of this study was to examine whether a storybook about home safety would increase hazard recognition, and reduce risky behaviour in children three through five years of age. Participants were randomly assigned to either receive the storybook intervention or a control condition. While robust group differences were not found, the results revealed trends as expected. There was a significant increase in hazard identification scores from pre- to post-intervention in the intervention but not the control condition, with greater reading time positively associated with larger improvements. Moreover, while children in the control group showed a marginally significant increase in number of hazards they touched from pre- to post-intervention, those in the intervention group did not. The pattern of these findings suggests that the storybook intervention, to some extent, positively impacted both knowledge and behaviour. Suggestions for future research are discussed.

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## Can A Storybook Intervention Increase Children's Home Safety Knowledge and Decrease Risk Behaviours?

Unintentional childhood injury is the number one cause of death to children in North America (Baker, O'Neill, & Ginsburg, 1992; Canadian Institute of Child Health [CICH], 2002; Centers for Disease Control, 2009). It is a leading cause of emergency room visits and hospital stays, and results in permanent disability in 30 000 children annually (Rodriguez, 1990). In pre-school aged children these injuries most commonly occur in the home (Shannon, Bashaw, Lewis & Feldman, 1992). To manage home injury risk for young children most parents utilize three strategies (supervision, hazard removal, and teaching children about safety) to varying degrees depending on the child's age (Morrongiello, Ondejko & Littlejohn, 2004a, b). Parents typically emphasize home safety rules for children between the ages of two and four years, though prior research has shown that the assumption that children at the age of four have good recollection of such rules or are able to recognize home hazards based on rules is not supported (Morrongiello, Midgett & Shields, 2001; Schooley & Kelly, 2008).

Children six and under have been shown to be particularly poor in hazard recognition (Schooley & Kelly, 2008). In one study, for example, the aim was to guide future injury prevention programs by determining what hazards children between the ages of 3-17 years could recognize on their own. As described by the Health Belief Model, recognition of a threat can lead to corresponding behaviour change (Rosenstock, Strecher & Becker, 1988). Thus, an important goal of interventions targeting injury prevention in the home should acknowledge and improve recognition of hazards. As Schooley & Kelly (2008) demonstrated, this might be especially important in children six years or younger, as they only recognized a maximum of 50% of hazards set up in a mock home that participants walked through. Though the authors suggest that this may not be an issue because those in this age range are typically supervised closely in the home, there is evidence that this is not always the case (Morrongiello, Corbett, McCourt & Johnson, 2006). In fact, children between 2 – 5 years are typically out of their caregiver's view 20% of the time they are awake. Thus, finding ways to promote young

children's awareness of home hazards and knowledge of safety is essential to reducing their risk of injury. The present study will address this issue by testing an intervention that uses a picture storybook, and aims to increase children's knowledge of home hazards and reduce interactions with hazards.

#### *Health and Safety Education Interventions*

There have been a number of methods tested for teaching health related behaviours to young students. One study attempted an intervention with the purpose of increasing knowledge about sun safety among four and five year old preschoolers (Loescher et al., 1995). The authors assessed both the children's pre-test and post-test cognitions regarding sun safety to determine the effectiveness of using an age-appropriate curriculum of puppet shows, games, art activities, songs and storybooks. Significant differences between pre- and post-test assessments were found for both knowledge and comprehension of sun safety for those who received the curriculum, but not in the control group (Loescher et al., 1995). Similar positive results were obtained in a study aimed at teaching parent-child pairs about sun safety using education videos and sun protection incentives for children, as well as a brochure for their parents (Glasser, Shaheen, Glenn & Bastani, 2010).

It appears that fire safety knowledge can also be taught to young school-aged children (Carbone & Hammon, 1988; Eckelt, Fannon, Blades & Munster, 1985; Linares & Linares, 1979; Varas, Mondozi & Harper, 2001), and that fire prevention interventions can impact safety behaviours as well (Hwang, Duchossois, Garcia-Espana & Durbin, 2006). Similarly, there are programs that have effectively improved poison hazard knowledge in students exposed to the intervention (Globe, Johnson, Conant & Frausto, 2004; Liller, Craig, Crane & McDermott, 1998). A range of methods were used including educational lessons, modelling, reinforcement, puppet shows, a parent-child interactive colouring book and related arts and crafts activities (Globe et al., 2004). Knowledge scores of the first grade participants significantly improved from pre-test to post-test after participating in the program. Correspondingly, employing the use of an education video, songs, puppet shows, a story board and poison look-a-likes for kindergarteners as well as "invisible" gas experiment demonstrations, discussion, books,

vocabulary lists, scenario acts and poison look-a-likes for grade three students (Liller et al. 1998) appeared to impact knowledge of poison prevention in both age groups. Those who received the intervention were consistently able to respond to more post-test survey questions correctly than the controls, who were not exposed to the poison curriculum.

The previously discussed evidence suggests that young children are able to improve knowledge through education programs. Similarly, a review of early childhood health promotion demonstrated justification for interventions directed at preschoolers (Guyer et al., 2009). More specifically, four health topics were assessed for their impact on child and lifespan health, namely; tobacco exposure, unintentional injury, obesity and mental health. The evidence suggests that all four cause significant problems both for the individual and society, leading to health issues and related costs. The authors therefore conclude that there is a necessity for prevention in early childhood (Guyer et al., 2009). Moreover, there is good evidence that a healthy life course is determined by health behaviours in the youngest years, and interventions can significantly impact these behaviours. This was especially true of tobacco exposure and unintentional injury (Guyer et al., 2009).

For these reasons, a number of health education approaches have focused on the safety of children in the kindergarten to elementary school age range. Different intervention methods have been assessed in the realm of pedestrian safety (Hotz et al., 2009; Rivara, Booth, Bergman, Rogers & Weiss, 1991; Violano, Davis, Lane, Lofthouse & Carusone, 2009). For example, in a large group of kindergarten to grade five children, the WalkSafe educational curriculum produced significant increases in post-test pedestrian safety knowledge for those in the younger grades (kindergarten to grade three; Hotz et al., 2009). The intervention was multi-method and included workbooks, videos, pedestrian crossing simulations, and direct teaching sessions. Although behaviour change was not assessed, the multi-method intervention was effective in improving knowledge in young children. Focusing on behaviour change, Rivara et al. (1991) evaluated a program that aimed to improve pedestrian behaviours of children from kindergarten to grade four through video feedback, teaching and parent-child workbooks. The purpose of introducing the books was to involve the parents, allowing for a more active role and

creating awareness of their children's abilities and limitations in this realm (Rivara et al., 1991). Safety behaviours were improved in all age groups, with the younger children demonstrating the greatest improvement. Though the majority of the change was found only for specific behaviours (i.e. looking versus stopping), it is important to note the intervention was effective even at the youngest ages and the take home workbook that incorporated parents working with their child contributed to this positive outcome. More specifically, the change in looking behaviour from pre- to post-intervention was only significant after the addition of the workbook. This was similarly the case for a summary variable measuring overall pedestrian performance (Rivara et al., 1990). Overall, these findings support the notion that children's health-related behaviours can be both learned and influenced through appropriate education programs, and parent participation can enhance children's learning.

#### *Home Safety Interventions*

There is evidence that interventions improve behaviours, at least for some aspects of home safety (Kendrick et al., 2008; Kendrick et al., 2008). More specifically, the results of one meta-analysis revealed that poison prevention practices of both parents and children can be impacted positively by both the provision of safety equipment and education (Kendrick et al., 2008). This was especially true when the intervention was delivered in a home setting.

The majority of such education programs included safety advice from a multitude of providers, such as health professionals, researchers, video-tapes, etc (Kendrick et al., 2008). Similarly, home fall prevention practices of parents and children (aged 0-19) have been shown to be increased through the use of interventions providing both education and either free or inexpensive safety equipment (Kendrick et al., 2008).

#### *Interventions Using Books*

Although there is limited literature on the use of books in delivering safety interventions for children, it has proved effective in increasing knowledge as part of other health education programs (Holzheimer, Mohay & Masters, 1998; Loescher et al., 1995; Vigano, 1983). Vigano (1983) reported that comic books were useful in the teaching of water sanitation to students in Honduras. Not only was it an effective method of

significantly increasing knowledge of both contamination and decontamination of water in comparison to regular health class, but the majority of the children and teachers endorsed liking the comic book.

Storybooks also have proven a resourceful tool in increasing young children's knowledge about prevention and management of asthma (Holzheimer et al., 1998). Holzheimer and colleagues divided children aged two to five with diagnosed asthma into conditions in which they were presented with a video tape or picture book about asthma, both, or a control condition with unrelated materials; a parent was similarly involved in all conditions. The book was designed to be entertaining, with colourful illustrations and a small amount of related text. Knowledge regarding asthma was significantly better in all experimental groups as compared to the control, with the combination of video tape and picture book proving the most effective. In comparing the video tape to the picture book, the results revealed that the latter produced greater increases in knowledge, a fact that the authors attributed to the self-pacing nature of books. They suggest that this allowed parents to control their children's attention to necessary information, and to review and reinforce their learning (Holzheimer et al., 1998).

### *Illustrations and Learning*

The present study will focus on the use of picture storybooks as a technique for teaching preschool aged children about home hazards and safety behaviours. Pictures appear to be especially important in the interpretation of story books for younger children (Walsh, 2003). Responses from kindergarten and grade one children indicate that pictorial stimuli impact the children's interpretations and comprehension. It appeared that their responses went beyond the text in cognitive, affective and cultural understanding, while also allowing the students to read the pictures, irrespective of their specific word comprehension (Walsh, 2003). Illustrations also appear to be preferential for books presented to those in earlier grades (Brookshire, Scharff & Moses, 2002). Not only was comprehension highest for both those in first and third grade when text and pictures were included (as compared to text or illustration alone), but when given a choice, the children preferred pictures which were more realistic than abstract (Brookshire et al., 2002).

Picture story books can therefore be an enjoyable and effective method of teaching young children.

#### *Illustrations and Memory*

Illustrations also appear to facilitate children's memory for material (Greenhoot & Semb, 2007). Children were presented with a pre-recorded verbal story, a verbal story with corresponding illustrations, a verbal story with irrelevant pictures or just the illustrations of the main events. Their recall was then assessed after a five minute distracter task, as well as one week later. Memory for the story differed by age such that the effect of illustrations was especially beneficial for those in the upper end of the age range (46 to 63 months). Recall was best in the verbal and relevant illustration condition as compared to all others, but only for the older children (one standard deviation above the mean age, 61 months; Greenhoot & Semb, 2007). It is important to note that since the overall performance in the condition that was only presented with pictures was poor, the improved memory in the verbal and picture condition was not due just to the illustrations alone but to providing support for children's interpreting of the pictures.

#### *Illustrations and Attention*

There is also evidence that preschoolers largely focus on illustrations in shared story book reading with their mothers or teachers (Evans & Saint-Aubin, 2005). This appears to be true regardless of the page arrangement, font size, number of words per page or the attractiveness of the illustrations. Moreover, the children's focus on picture detail does not seem to be affected by story content, unless the text specifically points out the detail (Evans & Saint-Aubin, 2005). Thus, illustrations are particularly effective at promoting young children's attention when viewing books.

#### *Present Study*

The current study tested the use of a picture storybook as a method for teaching preschool aged children (3-5 years) about home hazard risks and safe practices. The primary goal of the study was to determine if children's awareness of home hazards can generalize and allow them to recognize novel exemplars of similar types of injury risks. Developmental age of the population was considered in the creation of the storybook. Consistent with previous interventions using similar methods, the text was kept concise

and the pictures were realistic (i.e., actual photos of children) as opposed to being schematic (e.g., line drawings or clip art) and the pictures corresponded to what was written on the page (Holzheimer et al., 1998). Parents were involved in delivery of the intervention storybook and they were encouraged to read it several times to their children between lab visits.

The research design comprised two groups of children: one who received the intervention storybook, and the other who received a control storybook about healthy eating. The children were recruited and randomly assigned to groups. Performance in each group was assessed before and after exposure to the intervention, with knowledge of hazards assessed by asking the children to sort photos of hazards. Risk behaviour was assessed by exposing children to ‘contrived hazards’ that corresponded to the types of hazards mentioned in the storybook. It was hypothesized that for children who received the intervention, there would be a significant increase in their knowledge that would not exist for the control group. More specifically, comparing the performance of each group over time would reveal a non-significant difference for the control group and a significant increase for the intervention group. Moreover, it was expected that there would be a significant decrease in risky interactions with hazards for the intervention group from pre-test to post-test but that risky hazard interaction would be a non-significant from pre-test to post-test for the control group.

## Method

### *Participants*

Participants were 52 mothers of normally developing children ages 3-5 years ( $M = 3.94$  years,  $SD = .75$  years), as well as their child. They were recruited via schools, daycare centers, and using the database at the Child Development Research Unit (CDRU) at the University of Guelph. Of the 52 children, 27 were assigned to the intervention group (*Careful Puppy* Storybook) and the remaining to the control group (*Healthy Apple* Storybook), with 15 girls and 12 boys in the former and 12 boys and 13 girls in the latter.

Focusing on preschoolers, Holzheimer et al. (1998) obtained an increase of 1.55 items in knowledge based on a storybook intervention (asthma focus) but only an increase of .28 items in the control group, with the difference in change score between

groups being 1.27 items. Based on 80% power to detect this size difference, the determined requirement was a minimum of 18 participants per group. Hence, the current sample provided adequate statistical power for detecting group differences of this size.

Sample demographics were comparable across groups for income and maternal education, with the overall sample comprising families in the following annual income brackets: below \$20 000 (3.70%), \$40 000 – 59 999 (11.10%), \$60 000 – 79 999 (22.20%), and above \$80 000 (63%). Maternal education included: high school diploma (11.10%), some or completed college (25.90%), some or completed university (29.60%), and some or completed advance degree (33.30%). Nearly all participants were Caucasian.

### *Materials*

#### *Careful Puppy Storybook*

Based on extensive pilot testing, a picture storybook was developed to be used by parents to teach their children about hazards and injury-risk behaviours in the home. The book included photos of children in the target age range doing safe and unsafe activities at home. Stickers were included for the child to decide whether each item was safe or unsafe. The book was designed such that the text reflected a puppy who was interested in having the children join him as a detective, finding out what was safe or unsafe, and putting a stop to the latter. A typical page included two photographs and text describing each (Appendix A). There was place underneath each for the child to affix a safe or unsafe sticker based on their decision. Designed to be interactive, mother's were asked then to follow up by stating how the injury could happen, what type of injury could occur, reinforce that the behaviour was unsafe and ask the child to suggest an alternative, safer activity. The unsafe pictures consisted of a child actor/actress who was the same age as the participants engaging in risky behaviours in different areas of the home. Each picture reflected one of four categories of hazards: poison, falls, cuts or burns; a complete listing appears in Table 1. The hazards were identified based on discussions with parents of preschoolers, reviews of injury statistics citing mechanisms of injury (national CHIRPP data) and consultation with Safe Kids Canada staff. The storybook photos were directly aligned with the hazards assessed in the knowledge and behaviour measures. The book came with reminder cards which indicated to parents what safety messages to

emphasize as they read the book with their child (i.e., name the potential injury, mechanism of injury, risk behaviour, and discuss alternative safer behaviour).

Table 1

*Pictures by Injury Type Category*

Injury Type Category	Action Performed by Child in Picture
Fall	<ol style="list-style-type: none"> <li>1. Jumping on couch</li> <li>2. Climbing bunk bed ladder</li> <li>3. Colouring while sitting on a child-sized table</li> <li>4. Climbing onto a child-sized table</li> <li>5. Climbing onto the kitchen table</li> <li>6. Jumping on bed</li> <li>7. Climbing a bookcase</li> <li>8. Walking down cluttered stairs</li> <li>9. Climbing on dresser</li> <li>10. Running through a cluttered hallway</li> <li>11. Playing on stairs</li> </ol>
Burn	<ol style="list-style-type: none"> <li>1. Sitting near a lit candle</li> <li>2. Being near a barbeque</li> <li>3. Looking into a fireplace</li> <li>4. Opening a fireplace door</li> <li>5. Touching a hot mug</li> <li>6. Putting fingers near/in a socket</li> <li>7. Taking food out of the oven</li> <li>8. Grabbing the kettle</li> <li>9. Grabbing a pot on the stove</li> </ol>
Cut	<ol style="list-style-type: none"> <li>1. Playing with a fireplace poker</li> <li>2. Holding a knife</li> <li>3. Holding scissors</li> </ol>
Poison	<ol style="list-style-type: none"> <li>1. Holding perfume</li> <li>2. Holding makeup</li> <li>3. Holding/Pouring out a bottle of pills</li> <li>4. Holding Windex</li> </ol>

*Healthy Apple Storybook*

The control group children received a storybook that was developed as a means of teaching children about healthy eating behaviours. The book was identical to the intervention one in format and length and included pictures of children showing different healthy and unhealthy behaviours, with pictures and corresponding sentences about topics such as hygiene, food and snack choices as well as proportion control. The Healthy Apple Storybook was similarly interactive, providing sticker choices for the child to decide which picture was healthy or unhealthy.

### *Contrived Hazards Room*

Drawing on previous successes using the ‘contrived hazards’ method (Morrongiello & Dawber, 1998; Morrongiello, Schell & Schmidt, 2010), the child was observed in a laboratory that has been created to appear as a natural situation that provides opportunity to interact with injury-risk hazards that would exist in the home (Morrongiello & Dawber, 1998). The hazards have been modified to prevent actual harm (e.g. scissors glued shut). This was used to assess pre-test and post-test intervention risk behaviours. The hazards found in the room fell into the same categories as those seen in the storybook (falls, poison, burns and cuts).

### *Card Sorting Task*

Pictures of the same child actor/actress was used in a card sorting task to assess pre-test and post-test child knowledge of hazards in the home, as well as the parent’s judgement about their child’s understanding of home hazards. Both child and parent were asked to sort a number of picture cards into safe and unsafe categories. Activities depicted were chosen so that they were clearly demarked. The maximum score that could be received was a total of 36 correct. Children were asked to further discuss these photos, answering questions regarding how they are unsafe, and what a safer activity might be. Picture hazards fell into the same categories as those seen in the storybook (falls, poison, burns and cuts), however, none of these were identical those seen previously by the participant to be certain increases in knowledge are not based on recall effects. Thus, children were exposed to three photo variations of each hazard outlined in Table 1; one used for pre-intervention testing, a second for the storybook intervention, and a third for post-intervention testing. Each set of 3 pictures were randomly assigned to pre/post-intervention, then the order which the participant viewed them in was further randomized.

### *Questionnaire Measures*

The *Family Information Sheet (FIS)* (Appendix B) provided demographic information about family income and parent education. The *Post Intervention Follow-up* (Appendix C) was a questionnaire designed by the authors of the study. It was intended to assess mothers’ opinions of the storybook. This included how much they enjoyed the book, as well as ratings of the child’s interest and understanding.

### *Procedure*

Volunteer participants were told the study was concerned with increasing children's health knowledge. The length of the study and all aspects of the general procedure were explained so that they could make an informed decision about participation. Informed consent and child assent (Appendix D and E, respectively) was received from all participants prior to beginning the study.

At the initial lab visit, the child was randomly assigned to either the intervention or control group and parental consent was obtained. Separate researchers were assigned to the mother and child to help them complete their independent tasks. Each researcher followed their respective scripts to be certain that procedures were standardized across participants. During this visit, the child spent five minutes in the contrived hazards room to assess the child's pre-test intervention hazard-directed behaviours. The child then completed a photo sort task, in which they sorted a deck of photos of children doing different things at home into 'safe to do' and 'not safe to do' boxes. This was intended to measure the child's pre-test-intervention safety knowledge. The mother simultaneously completed the *FIS*, as well as independently completed the safety sort task based on what she thought her child would know about safety. The parent was sent home with one of the two storybooks, but did not know whether the child was assigned to the intervention or control group, and did not know that the main focus was on safety. The mother was requested to read the storybook with their child at least five times over the course of two weeks while tracking the amount of time spent reading and comments regarding the book. Instructions were given to guide the mother's reading, requiring her to name the type of injury pictured, mention how the injury could happen, state clearly that it is not a safe thing to do and ask the child to generate safer activity alternatives. The instructions were identical for the control with the exception of focusing on healthy eating. Reminder cards were sent home with those in both groups, to reinforce these given instructions.

During the next two week time period, all participants received their respective storybook activities at home. The intervention was intended to be interactive. Each mother read the storybook while the child was requested to respond whether or not the

behaviour depicted was healthy or not healthy, safe or unsafe, depending on the assigned condition.

Both the mother and child returned for a second lab visit two weeks after the intervention. The same procedures were followed for the child as the first lab visit, except the child waited in different contrived hazards room that contained novel exemplars of hazards for the four injury categories (burn, cut, fall, poison). Moreover, the parent safety sort task was replaced with the Post Intervention Follow-Up questionnaire.

## Results

### *Did the Storybook Impact Children’s Knowledge of Hazards?*

For each child a percent correct score was calculated based on their photo sort performance at the pre-test and post-test intervention periods. A split-plot Analysis of Variance (ANOVA) was applied to these data with group (2: Intervention, control) as a between-participant factor and time (2: pre-test intervention, post-test intervention) as a within-participant factor. As shown in Table 2, there was a significant main effect of time,  $F(1, 50) = 7.10, p < .05$ , partial eta squared = .12, reflecting the fact that post-intervention performance was generally higher than pre-intervention performance. There was no significant main effect of condition,  $F(1, 50) = .50, p = .48$ , partial eta squared = .01, or interaction of group x time,  $F(1, 50) = 2.51, p = .12$ , partial eta squared = .05.

Table 2

*Percent Correct and Number of Hazard Interactions for Pre- Compared with Post- Intervention Periods for Intervention (n = 27) and Control (n = 25) Groups*

Hazard	Group	Pre-Intervention <i>M (SD)</i>	Post-Intervention <i>M (SD)</i>
Identifications	Intervention	84.91 (6.01)	94.24 (6.11)
	Control	90.22 (6.84)	92.59 (7.09)
Interactions	Intervention	0.93 (1.38)	1.11 (2.17)
	Control	0.29 (0.62)	0.83 (1.37)

Although the interaction was only  $p = .12$ , paired-sample t-tests were conducted to directly test the hypothesis. Examining the extent of change over time in each group revealed important differences. Specifically, paired-sample t-tests were employed to assess whether each group's hazard identification scores significantly differed from time 1 to time 2. There was a significant increase in the percent correct hazard identification in the intervention group from time 1 to time 2,  $t(26) = 2.33, p < .05$ . In the control condition, there was no significant change over time ( $p > .05$ ). Hence, the storybook seemed to produce the desired effect of increasing young children's safety knowledge. Consistent with this interpretation, total time using the storybook ( $M = 95.21$  mins,  $SD = 55.23$  mins) was positively correlated with the increase in hazards identified,  $r = .79, p < .01$ . Therefore, the more the children read the safety storybook, the greater their increase in safety knowledge. This was not the case for the control storybook,  $r = .11, ns$ . Interestingly, correlations comparing what children actually knew at pre-intervention with what parents thought they knew were all non-significant. There was no significant relationship between mothers' and children's total percent correct identification scores overall ( $p > .05$ ) or for injury category scores (fall, burn, poison and cut), all  $p > .05$ . The correlation for the overall score is listed in Table 3 and for the injury category scores in Table 4. Hence, parents were generally not a good judge of their young child's safety knowledge.

Table 3

*Correlation Between Parent and Child Total Correct Card Sorting Task Scores*

Total Score	Child
Parent	.01

Note \* $p < .05$ , \*\* $p < .01$

Table 4

*Correlations Between Parent and Child Hazard Identification Scores Divided by Injury Category*

Injury Type	Fall	Burn	Cut	Poison
	.04	.03	-.16	-.20

### *Did the Storybook Impact Children's Interactions with Hazards?*

Based on behaviour in the contrived hazard situations, children were assigned a score to indicate the frequency of interactions with hazards during the 5 minutes they were in the room at pre- compared with post- intervention lab visits. A split-plot ANOVA was applied to these data with group (2: Intervention, control) as a between-participant factor and time (2: pre-test intervention, post-test intervention) as a within-participant factor. As shown in Table 2, results revealed no significant group x time interaction,  $F(1, 49) = .72, p = .40$ , partial eta squared = .01. The main effects of time,  $F(1, 49) = 3.00, p = .10$ , partial eta squared = .06, and condition,  $F(1, 49) = 1.53, p = .22$ , partial eta squared = .03, were also not significant.

Although the interaction was not significant, paired-sample t-tests were conducted to directly evaluate the hypothesis. Specifically, these tests were employed to assess whether each group's hazard identification scores significantly differed from time 1 to time 2. In terms of change in the number of hazards touched, the intervention group's scores did not significantly change over time ( $p > .05$ ), while in the control group there was a marginally significant increase in hazards touched over time,  $t(23) = 1.97, p < .10$ . There was no correlation ( $p > .05$ ) between time reading the book and change score in hazard interactions in the intervention group, likely because there were relatively few hazard interactions.

### Discussion

Unintentional injury in childhood is a serious concern, frequently leading to emergency room visits, hospitalizations, permanent disability and death (Baker et al., 1992; Canadian Institute of Child Health [CICH], 2002; Centers for Disease Control, 2009; Rodriguez, 1990). Home hazards appear to be especially important for preschoolers, with evidence suggesting that this the most common source of injuries for this age group (Shannon et al., 1992). Given that parents do not routinely provide continuous supervision, instead allowing young children out of sight for up to 20% of time at home (Morrongiello et al., 2001; Morrongiello et al., 2006; Schooley & Kelly, 2008), the present study set out to assess whether a storybook intervention could improve

home hazard knowledge in preschool aged children and affect their behaviour around home hazard risks.

The results showed that trends in the data were as expected, such that there was a significant increase in knowledge over time for the intervention group as well as a marginal inhibiting effect of a developmental increase in hazards touched over time that was experienced by the control group. Of course, this needs to be cautiously considered in light of the fact that the differences were not robust. This may be in part due to the fact that many participants in both groups achieved high hazard identification scores initially at time 1, thereby limiting the magnitude of potential change. Nonetheless, it is important to note that the more the participants read the book, the more their hazard identification scores improved, further supporting that there were some positive effects of the intervention. This relationship was significant, even though mothers' hazard identification scores were not related to their child's scores, suggesting that parents are not aware of their children's home safety knowledge. This result appears inconsistent with previous research showing that parents with children in this age range rely on teaching rules to prevent injuries, thereby presumably assuming their beliefs are in line with what their child knows (Morrongiello, Midgett & Shields, 2001). While few studies have focused directly on improving home safety in pre-school aged children, previous research has suggested that young children are able to increase their knowledge in areas of fire, poison, sun and pedestrian safety (Glasser et al., 2010; Globe et al., 2004; Hotz et al., 2009; Hwang et al., 2006; Liller et al., 1998; Loescher et al., 1995). The majority of these studies employed a multitude of methods such as videos, education, puppet shows, brochures and storybooks, and resulted in a positive impact on participant knowledge. Hwang et al., 2006 were even able to impact fire safety behaviours. The results of the present study suggest that, especially with increased exposure, young children showed improvement in their home hazard knowledge over time. Moreover, the intervention, to some degree, was able to prevent an increase in hazard touching and therefore had some impact on home safety behaviours.

Pedestrian safety interventions have similarly been assessed by examining changes in participant performance over time (Rivara et al., 1991; Violano et al., 2009).

Rivara et al., (1991) was able to demonstrate some change in participant pedestrian safety behaviours post-intervention. The authors suggested this result was caused by the use of a parent-child workbook. Similar to the *Careful Puppy* storybook, the intention of their workbook was to be both interactive and informing of areas their child was lacking. Through the use of this, their participants showed an increase in certain pedestrian safety behaviours over time. It has also been demonstrated that young children were able to increase their pedestrian safety knowledge over time (Violano et al., 2009). While the *Careful Puppy* Storybook was not able to evoke differences between the intervention and control groups, there were trends in expected directions, indicating some effect on knowledge and behaviour over time.

Although there is little prior evidence regarding the use of safety storybooks, their use to teach other health topics to children (e.g., asthma), has been established [Holzheimer et al., 1998]. Holzheimer et al., 1998 were able to improve children's asthma knowledge and management through the use of a picture book and video tape. Similar to the pedestrian safety intervention (Rivara et al., 1991), the authors attributed the effectiveness of the picture book to the fact that this type of media can be tailored to the individual based on their needs for review, thereby reinforcing information. The current study provides further evidence for interactive storybooks as a potentially effective method of learning over time, impacting both knowledge and behaviour. It is furthermore the first study suggesting evidence that storybooks can be used to impact home safety in young children.

The *Careful Puppy* Storybook was specifically designed to be both interactive and allow for the parent to become aware of the child's need areas about safety knowledge. By having the parent ask the child to answer safety questions as they read the story, this latter part of the design was especially self-paced, having the parent go over incorrect responses, which was expected to spark further discussion. This also provided the opportunity for parents to become familiar with their child's level of safety knowledge. The latter point is important because parents were not highly accurate in judging their child's knowledge of home hazards, and past research has shown that misjudgements by parents about children's safety knowledge can elevate young children's risk of injury

(Morrongiello, Midgett & Shields, 2001). Hence, one benefit of a storybook approach is that it is delivered by parents, which provides the opportunity for improving parents' accuracy in appraising their child's safety knowledge. This can then lay the foundation for parents to decide what safety topics merit further discussion and education.

It also appears that the mothers in the study felt that using a storybook to communicate health topics was an acceptable and effective tool to communicate safety knowledge to their children. The majority (70.40%) of those who received the *Careful Puppy* Storybook indicated that they found reading it with their child enjoyable. This suggests that mothers may be likely to use this storybook intervention with their children outside of a research study. Moreover, on average, mothers felt that from the *Careful Puppy Storybook*, their children learned between a little and some health information ( $M = 2.50$ ,  $SD = .85$ ) while also improving their health behaviours from a little, to somewhat ( $M = 2.30$ ,  $SD = .99$ ). Parent participants seemed to feel that the intervention fulfilled its intended use. If parents feel the intervention is a useful teaching tool that as well can be enjoyed, they may be more likely to employ it generally and enthusiastically.

#### *Practical Implications*

The findings of this study have several potential practical implications. There is a definite need for effective home injury prevention techniques targeted at pre-school aged children (Guyer et al., 2009; Morrongiello, 2006; Shannon et al., 1992). The results of this study suggest that children are able to learn through shared storybook reading about home safety, increasing their hazard identification. Moreover, while the preschoolers were not able to decrease their risky behaviour, they were able to inhibit what appeared to be an increase in hazard touches over time. This latter point is especially important considering the fact that evidence suggests that children with injuries were more likely to come from homes with significantly more fall, burn, poison and ingestion hazards (LeBlanc, 2006). As the study results suggest that young children may be likely to increase in risky behaviour and touch more hazards over time, a storybook that prevents this will likely decrease injuries in the home. This will be essential in homes with more hazards.

### *Limitations and Future Research*

There are some limitations of this study that should be recognized and reconciled through future research. As mentioned previously, many of the children were able to achieve very high scores on the hazard identification task at pre-intervention. This, unfortunately, reduced the possibility of participants demonstrating greater magnitudes of change throughout the study, possibly contributing to the lack of robust between group differences. Future research should focus on using more ‘unknown’ hazards to assess the storybook’s impact on knowledge. Moreover, knowledge could be assessed using more rigorous methods. Similar to the technique used by Schooley & Kelly (2008), a mock-up home where children are required to recognize real life hazards may prove more difficult and induce more impact on risky behaviour, while also providing the ability to generalize better to real life situations.

Given the study’s small sample size, there is a need for the intervention to continue with more participants to determine if the results generalize to a larger population. Moreover, the majority of the participants in the study were recruited as a convenience sample from a research database of families interested in research participation. Future research should focus on random samples of children from schools within the community in order to reduce any possible bias of parents who, in general, may be more health conscious.

It is especially important to note that the majority of the sample was Caucasian (94%) and had a household income of over \$80,000 a year (68%). Evidence suggests that there is a difference in parental knowledge of safety issues related to socioeconomic status (Colley, 1994). Given the relationship between parent safety knowledge and use of safety equipment, there may be a particular need to focus home safety interventions on those in lower socioeconomic groups. This particular intervention should be assessed to determine its impact and necessity within these groups.

The intervention took place over a short period of time, assessing participants’ hazard knowledge and interaction levels twice over a two week interval. This limited the results to short term data, and failed to analyze whether the storybook’s impact on change in knowledge scores or behaviour would be long term, or if repeated exposure would lead

to a greater effect. Holzheimer et al., (1998) suggested that conditions who were only exposed to one resource had limited short-term impact without repeated exposure. Further exposure at later points had a greater effect on their participants' asthma knowledge. It is therefore important in the research to assess the long term impact of the intervention, and how repeated exposure over time may affect knowledge and behaviour, potentially producing even more positive effects than observed herein.

Finally, a potential limitation of the study is that the intervention took place at home with mothers as the provider. Although parents were given clear guidelines about what to discuss with their child about each hazard, it is uncertain whether or not this aspect of program delivery was adequately standardized across participants, and this may have affected our ability to capture effects. In addition, the results demonstrated that increased time reading the storybook was positively correlated with higher change in hazard identifications scores during the course of the intervention. This suggests that a certain amount of time may be required to achieve significant increases in knowledge. The results of Holzheimer et al. (1998) similarly recommended that increased exposure time may increase intervention impact on knowledge. Future research should focus on employing different types of teaching strategies and study times to examine their impact on performance and identify best practices to use in storybook delivery.

### *Conclusions*

The results of this study are preliminary, but they suggest the intervention has the potential to be effective in increasing knowledge and reducing risk behaviours in young children. The intervention group showed a significant increase in hazard recognition from pre- to post- intervention, while the control group did not. Moreover, with respect to risky behaviour, the participants who received the control book demonstrated a marginally significant increase in the number of hazards touched from pre- to post- intervention, while the intervention condition did not. The pattern of these findings suggest the *Careful Puppy* storybook holds promise as a means of positively impacting young children's safety knowledge and behaviours.

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Appendix A

*Photograph of a Typical Careful Puppy Storybook Page*

8

This child is jumping on the couch.



This child is playing with a fire poker.



Should these children get GREEN or RED stickers for the things they are doing in these photos?



## Appendix B

### YOUR DATE OF BIRTH

Please indicate your date of birth: \_\_\_ / \_\_\_ / \_\_\_ (DD/MM/YY)

### EDUCATION

Please check the HIGHEST level of education that applies.

#### Mother

#### Father

_____	Some high school	_____
_____	High school diploma	_____
_____	Some college	_____
_____	College degree	_____
_____	Some university	_____
_____	University degree	_____
_____	Some graduate training	_____
_____	Graduate degree (MA, PhD)	_____
_____	Post-graduate training	_____

### SAFETY COURSES AND PARENTING COURSES

Please indicate if any of the following courses has been taken.

**Mother**

**Father**

_____	First-aid course	_____
_____	CPR course	_____
_____	Pre-natal course	_____
_____	Parenting course	_____

**INCOME**

Please check your family's annual take-home income.

_____	Below \$20, 000
_____	\$20, 000 - \$39, 999
_____	\$40, 000 - \$59, 999
_____	\$60, 000 - \$79, 999
_____	Above \$80, 000

**CURRENT MARITAL STATUS:**

Married     Divorced     Separated     Widowed     Never-married

**HOUSING**

Please check whether you rent or own your current place of residence.

Rent     Own

**EMPLOYMENT:**

Do you work outside the home on a regular basis?

No

Yes:    About how many hours per week?

Who looks after your child while you are at work? \_\_\_\_\_

Where does this occur:  In your home

Not in your home

**ETHNICITY**

Please indicate how you would best describe yourself.

White

Asian or Asian American

- \_\_\_\_\_ Black or African American
- \_\_\_\_\_ Hispanic or Latino
- \_\_\_\_\_ First Nations or American Native
- \_\_\_\_\_ Other

**CHILDREN'S DATES OF BIRTH**

Please indicate the sex and date of birth for the child we talked to you about today.

Child in study: \_\_\_ / \_\_\_ / \_\_\_ (DD/MM/YY)

Sex: \_\_\_\_\_ Male \_\_\_\_\_ Female

How many OLDER brothers does this child have that:

\_\_\_\_\_ Live at home: What are their ages? \_\_\_\_\_

\_\_\_\_\_ Live elsewhere

How many OLDER sisters does this child have that:

\_\_\_\_\_ Live at home: What are their ages? \_\_\_\_\_

\_\_\_\_\_ Live elsewhere

How many YOUNGER brothers does this child have that:

\_\_\_\_\_ Live at home: What are their ages? \_\_\_\_\_

\_\_\_\_\_ Live elsewhere

How many YOUNGER sisters does this child have that:

\_\_\_\_\_ Live at home: What are their ages? \_\_\_\_\_

\_\_\_\_\_ Live elsewhere

Appendix C

P #: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

**Storybook Questionnaire**

**Was it difficult for you to find time to read this book with your child?**

Yes No

**Did you enjoy reading the storybook with your child?**

Yes No

**Did your child usually enjoy reading the book with you?**

Yes No

**How well do you feel your child understood the book?**

(1 = not at all, 2 = somewhat, 3 = half/half, 4 = a fair amount, 5 = very well)

1 2 3 4 5

**How much do you think your child learned from this book?**

(1 = nothing much, 2 = a little, 3 = some, 4 = a fair amount, 5 = a lot)

1 2 3 4 5

**How much did the book improve your child's ability to discuss health related behaviours?**

(1 = not at all, 2 = a little, 3 = somewhat, 4 = a fair amount, 5 = very much)

1 2 3 4 5

**How much did the book improve your child's knowledge about healthy behaviours?**

(1 = not at all, 2 = a little, 3 = somewhat, 4 = a fair amount, 5 = very much)

1 2 3 4 5

What did your child enjoy the most about the storybook?

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Do you have any suggestions on how to improve the storybook?

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Appendix D

## Is a Storybook an Effective Way to Teach Children Health Information?

**Investigators:**

Project Director:

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Director of the Child Development Research Unit  
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Undergraduate Student:

Melissa Bell, BA

Research Assistant:

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### Parent Consent Form

#### Aim of the Research

Evidence suggests that preschool aged children are able to learn about health when given the right kind of education programs. We are conducting a study to determine whether a storybook is an effective way to teach children about health topics (e.g., home safety). We need many participants and hope you will give permission for your child to be one of them.

#### What Will Happen?

This study will be conducted at the Child Development Research Unit (CDRU) at the University of Guelph. To participate you must be able to come visit us on campus twice, and also read a storybook with your child in between your two visits.

STEP 1: During your initial visit to the CDRU on campus, we will ask you to fill out of a few short questionnaires and complete some activities with us. We will also teach you how to complete

Discussion Recording Forms and Reading Logs, which you will use over the course of the next two weeks to indicate how often you read our storybook with your child, and how often you had health-related discussion together, especially with regards to injury information.

During this visit we also will ask your child to sort photographs of children doing things at home (e.g., eating a cookie, climbing up a ladder) into different categories (e.g., safe, unsafe) and we will observe your child's activities in different contrived situations. These situations will be video recorded for purpose of data collection. We will also send you home with the storybook that we would like you to read with your child.

STEP 2: For the next 2 weeks, we will ask that you read this book with your child as many times as possible, at least five times. Some children read books about safety (e.g., hazards in the home) and others read books about health (e.g., healthy eating, taking care of your teeth).

STEP 3: Finally, there will be a second CDRU visit with both you and your child. We will talk about your discussions in the home and the photograph sort task will be completed again so we can see if exposure to the story books enhanced children's safety knowledge.

All children receive a small gift every time we see them and parents receive a gift card for Tim Hortons or Blockbuster Video (\$5). At the conclusion of the project, we talk in more detail about the purpose of the project with you and your child and answer any questions you may have regarding the study.

This research has been cleared by the Research Ethics Board at the University of Guelph. The study is being carried out in accordance with the University of Guelph's ethical standards for research and the Municipal Freedom of Information and Protection of Privacy Act. Should you have any questions please contact S. Auld, Research Ethics Officer, 519-824-4120, ext. 56606, sauld@uoguelph.ca.

You and your child's participation is voluntary and there are no known risks associated with participation. It will be made perfectly clear to your child that he or she may terminate involvement in this study at any time for any reason and may refuse to answer any questions asked. Responses to all questions will be kept strictly confidential and only group summaries will be reported. Confidentiality is limited by the law, in the case that any of the information

received reveals child abuse. Personal information will not be given to anyone or appear on any questionnaires. The video recordings may be considered identifiable but all data will be stored in a secure lab, and electronic data will be stored on a password protected database. Five years after the publication of the results, data will be destroyed . A copy of the results will be sent upon study completion. The complete dataset will be stored in a secure manner for 5 years, as specified by the Canadian Psychological Association.

If you have any questions or comments concerning the procedure or purpose of this study, please feel free to ask a research assistant at this time.

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The purpose of this study has been explained to me, and I have been given the opportunity to ask any questions I may have about this research. I understand the procedures and that my children and myself can withdraw from the study at any time without penalty, even after participation has begun.

**My signature below indicates my, as well as my child's, willingness to participate in this study.**

**Name of Parent (please print):** \_\_\_\_\_

**Signature:** \_\_\_\_\_

## Appendix E

### **ASSENT:**

**“So today we’re going to be doing a few activities with both you and your mom. Before we begin though, we want to make sure you understand what we are going to do together.**

**To start, while your mom does some activities with us, we are going to ask you to wait in this room for about 5 minutes. After this, we will show you some photos of kids doing different things at home and we will ask what you think about what they’re doing. We just want your ideas and no one else will know what you tell us – so whatever you tell us is just for us to know.**

**Over the next few weeks your mom and you will read a special storybook together that we made up ourselves!**

**Finally, you and your mom will come back here together to re-do some activities we will be doing today. Once again while your mom does some work for us we will have you wait in this room. Afterwards, we will show you some pictures and asked you some question about what you think of them.**

**Do you have any questions about what we will be doing?**

**Is it okay with you to do all of this with us? If so, just say YES so we know that you understand and that you are willing to participate.”**