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Evaluation of primary caregivers' perceptions on home trampoline use

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ABSTRACT

Trampolines are widely used by children, but trampoline injuries can be severe and may require hospital care or even surgery. This pilot study examined the effectiveness of an educational intervention on caregivers' perceptions of trampoline use and safety for their children.

Primary caregivers were recruited from the orthopedic clinic at the Children's Hospital at our institution in 2015. Caregivers were asked to complete a survey at two time points, initially in clinic and one week post educational intervention. The educational intervention was a pamphlet outlining trampoline safety data. Data analysis occurred in 2016.

From the 100 primary caregivers recruited, 39 caregivers owned a trampoline, and 10 had presented to the emergency department with their child for an injury related to trampoline use. After educational intervention, caregivers had higher rating of perceived danger associated with trampolines (6/10 vs. 8/10, $p < 0.001$). Additionally, a greater number of caregivers were more knowledgeable on the safe age of trampoline use (56% vs. 91%, $p < 0.001$) and safe number of jumpers (45% vs. 86%, $p < 0.001$). Finally, there was a 29% increase in the proportion of caregivers who at least agreed that trampolines are dangerous (pre: 44% vs. post: 73%, $p < 0.001$), however 50% of caregivers would still allow their child to use a trampoline.

Overall, the results of this study show that a simple educational intervention can help to increase knowledge around safe trampoline practices and increase awareness of injury. Further, this study can act as initial evidence for future studies to implement this type of intervention long-term.

1. Introduction

Trampolines account for up to 15% of pediatric orthopedic injuries requiring hospital care during the summertime and 40% of all trampoline injuries in children are classified as severe (Briskin and LaBotz, 2012; Berger et al., 2014; Eberl et al., 2009a). The American Academy of Orthopedic Surgeons, the Canadian Pediatric Society, and the Canadian Academy of Sports Medicine have all strongly discouraged the use of home trampolines (Briskin and LaBotz, 2012; Eberl et al., 2009b). Injuries related to trampolines include soft tissue sprains and bony fractures, yet can be as severe as cervical spine fractures and injuries to the spinal cord and head (Berger et al., 2014; Hurson et al., 2007). Despite the well documented risk of injury associated with home trampolines, the use and purchase of trampolines has remained the same (Briskin and LaBotz, 2012; Castellani et al., 2009).

A study from the American Academy of Pediatrics concluded that trampoline safety equipment, such as safety nets, padding, and mats do not decrease the risk of severe injury on a trampoline (Berger et al., 2014; Alexander et al., 2010; Eager et al., 2013). Instead this may cause parents to wrongly assume that there is little to no risk for injury with safety equipment thus allowing greater risk taking by their children (Alexander et al., 2010; Morrongiello and Major, 2002). Some of the other main risk factors for injury include being under the age of 6, allowing more than one jumper at a time, and being lighter weight (Briskin and LaBotz, 2012; Berger et al., 2014; Eberl et al., 2009a, 2009b; Furnival et al., 1999). Even while under adult supervision, it is estimated that 73% of injuries related to trampoline use happen in children who are younger than 6 years of age (Briskin and LaBotz, 2012; Berger et al., 2014; Smith and Shields, 1998) and when injured, 22% to 37% of children under 6 years need to be seen in the emergency department (Furnival et al., 1999; Wootton and Harris, 2009). Further, three-quarters of all trampoline injuries occur when multiple children are jumping together and lighter children are 14 times more likely to sustain an injury than heavier children (Hurson et al., 2007; Wootton

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and Harris, 2009; Linakis et al., 2007; Nysted and Drogset, 2006; Woodward et al., 1992).

Parents lack accurate information on the risks related to trampoline use and consequently their perception of trampoline risks are vague (Morrongiello and Major, 2002; Eager et al., 2012). A previous study on the perceptions of trampoline safety found that 64% of parents reported that the safety level of a trampoline was moderate and 20% of parents reported that a trampoline was dangerous. Parents believed that a trampoline was neither extremely safe nor extremely dangerous (Stepan et al., 2013). Currently, there is a lack of research outlining the perspectives of parental understanding of risk associated with home trampoline use and to our knowledge there is no literature on the effects of educating parents on this topic.

The objectives of this pilot study were to ascertain primary caregiver's baseline understanding of the risks associated with home trampoline use, to educate caregivers with the well-established risks associated with home trampoline use, and to evaluate if this education would have any influence on the reported future regulation of home trampoline use for their children. This pilot study aimed to act as an important first step in understanding the knowledge parents have on specific aspects of trampoline safety and further the effectiveness of a simple short-term educational intervention on the dangers of trampoline use.

2. Methods

2.1. Study sample

Beginning August 2015, every primary caregiver of children under the age of 18, treated for any orthopedic injury at the Children's Hospital at our institution as an outpatient was surveyed. Families were included in the study regardless of whether they owned a home trampoline or their child used a trampoline outside of their home. Caregivers were recruited either before or after they saw the orthopedic surgeon in clinic. Trampoline safety was not discussed by the orthopedic surgeon during this time, in order to ensure that all trampoline safety knowledge came from the educational pamphlet and was identical for each caregiver. Prior to participant recruitment, a power calculation was completed, which showed that 57 total participants were required to obtain 80% power. A total of 100 participants were recruited for the study by November 2015. Additional participants were recruited to ensure that the required sample size from the power calculation would still be achieve even after accounting for an average of 20% lost to follow-up. Exclusion criteria included the inability to provide consent by the primary caregiver and the inability to read or understand English.

After consent was obtained, a survey was given to the caregivers in clinic, which assessed caregivers' understanding of the risks associated with trampoline use. Once the survey was completed, caregivers received an educational pamphlet outlining documented trampoline safety data. The caregivers were asked to complete a second identical survey online within one week of reading the pamphlet and completing the first survey. Caregivers were called at home to encourage completion of the second survey.

2.2. Measures

There is currently no standardized survey intended to investigate trampoline risk, therefore the survey was developed by the research team for this pilot study. The survey contained basic demographic questions for the child (e.g., age, type of injury) and 15 questions specifically targeting trampoline use and knowledge, including 6 multiple-choice, 8 five-point Likert scale questions, and 1 question on a scale from 0 to 10. The caregivers' perception of how dangerous a trampoline is for their child was scored from 0 (not dangerous) to 10 (very dangerous). Two multiple choice questions were yes/no questions that measured whether the caregiver owns a trampoline and if they had previously been to the emergency department for an injury related to a trampoline. Other multiple-choice questions included: 1. What is the safe age to use a trampoline (answer: 6+ yrs. based on the literature that the majority of injuries occur to children under the age of 6), 2. How many children are allowed to jump on a trampoline at the same time (answer: one), 3. What is the main cause of injury while using a trampoline (answer: a fall), and 4. What is the most serious injury sustained from a trampoline (answer: head/neck injury).

The five-point Likert scale included responses from strongly disagree, disagree, neutral, agree, and strongly agree. The 8 questions captured the caregiver's opinions on: 1. Safety nets preventing injury, 2. Children performing somersaults or flips, 3. Supervision reduces injury, 4. Open/receptive to restrict trampoline use based on family doctor/pediatrician recommendation, 5. Open/receptive to trampoline safety education by a family doctor/pediatrician, 6. Shape of the trampoline makes it safer, 7. Risk for injury is related to weight, and 8. Trampoline is a dangerous activity for my child.

2.3. Statistical analysis

The surveys were completed online using the Research Electronic Database Capture (REDCap) application (Harris et al., 2009). The initial survey was input manually into REDCap by the research team. The results of the surveys were compiled and analyzed in 2016, using SPSS version 22 (IBM Corp. Armonk, NY). Non-parametric analyses were used to assess statistical significance between responses. Wilcoxon Signed Ranks tests were used to compare caregiver's perceptions before and after the educational intervention and McNemar's test was used for analysis of dichotomous responses. Finally, Mann-Whitney's *U* test was used for our subgroup analysis. Ethics approval was obtained from the Health Science Research Ethics Board of Western University (REB #106932).

3. Results

A total of 100 primary caregivers were surveyed for this study and all caregivers completed the second survey at 1 week after reading the educational pamphlet. The average age of their children was 9.3 years (sd = 4.1), and 39 caregivers owned a trampoline. A total of 10 children had previously presented to the emergency department with an injury related to home trampoline use. When caregivers were asked to rate how dangerous they felt a trampoline is for their child, there was a significant increase in their rating of danger from 6/10 pre-education to 8/10 post-education ($p < 0.001$). In terms of trampoline education, a greater proportion of caregivers correctly identified: the safe age for a child to use a trampoline (pre-education: 56% vs. post-education: 91%; $p < 0.001$) (Fig. 1), the number of children allowed on a trampoline (pre: 45% vs. post: 86%, $p < 0.001$) (Fig. 2), and that falls were the most common form of injury (pre: 34% vs. post: 62%, $p < 0.001$) (Fig. 3). There was no significant difference in knowledge pre and post-education for head/neck injuries being the most serious injury sustained on a trampoline (pre: 76% vs. post: 85%, $p = 0.089$).

After administering the educational pamphlet, the proportion of caregivers who understood that rectangular trampolines are safer than circular increased by 62% (pre: 17% vs. post: 79%, $p < 0.001$) and almost 50% more caregivers understood that weight plays a factor in the risk of injury (pre: 20% vs. post: 67%, $p < 0.001$). After learning about safety equipment and injury prevention, the proportion of caregivers who thought safety nets prevent injury decreased from 63% to 56% ($p = 0.027$), and the number of caregivers who thought it is safe to do somersaults or flips on a trampoline with a safety net decreased by almost 20% (pre: 26% vs. post: 7%, $p < 0.001$). Further, 16% fewer caregivers believed that adult supervision prevents injuries after reading the pamphlet (pre: 57% vs. post: 41%, $p = 0.047$).

From the educational intervention, 84% of caregivers said they

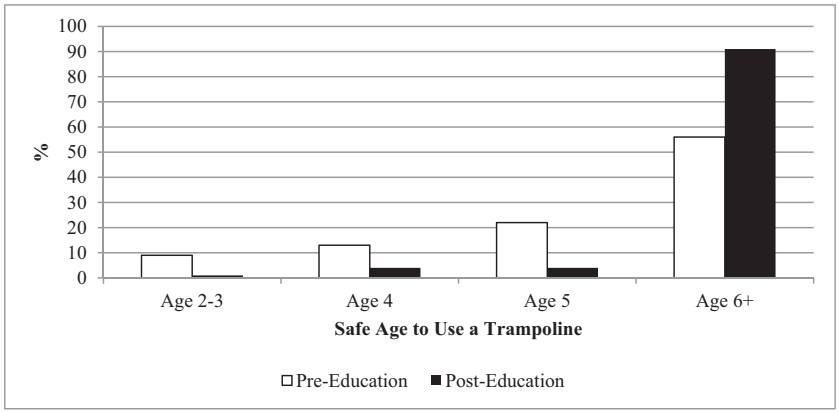

Fig. 1. Distribution of responses for the safe age for a child to be on a trampoline pre and post-educational intervention.
Note. Data collected between August and November 2015 at Children's Hospital, London Health Sciences Centre.

would be receptive to learning about trampoline safety from their family doctor or pediatrician and 61% said they would consider restricting home trampoline use based on their family physician's or pediatrician's recommendation. Although there was a 29% increase in the proportion of caregivers who agreed that trampolines are a dangerous activity for their child post education (pre: 44% vs. post: 73%, $p < 0.001$), 50% of caregivers would still allow their child to use a trampoline, even after reading the educational pamphlet.

A subgroup analysis was performed to compare caregivers that would (50%) and would not (50%) allow their child to use a trampoline post-education. There was no significant difference in the initial rating of danger associated with trampoline use between parents who did (6.7/10) and did not (6/10; $p = 0.07$) allow their child to use a trampoline. Those who did allow their child on a trampoline had significantly older children, with the average age being 11.3 years (sd = 3.3), compared to 7.2 years of age (sd = 3.9; $p < 0.001$) in children not allowed to use a trampoline.

4. Discussion

Overall, the main finding from this study was that providing caregivers with an educational intervention on home trampoline use appeared to increase their knowledge around safety and injury risk. It is reassuring to see that a simple pamphlet-based trampoline safety educational intervention can result in almost three-quarters of caregivers realizing the dangers associated with trampoline use. This accounts for an increase of almost one-third from pre-education levels. Based on these results, it appears that this type of educational intervention can be a success when examining learning over a short period of time. Further, it is encouraging that these safety facts can strongly translated to a change in perception of trampoline safety.

Although recommendations to improve the safety of trampoline use have been previously published, these recommendations have likely been ignored by the end user (Briskin and LaBotz, 2012; Berger et al., 2014). The significant change on the survey from pre to post-education does not guarantee a change in caregiver behavior, but does help to indicate a comprehension of the educational material for injury prevention and advocacy. Unfortunately, despite the significant changes in responses reflecting a greater appreciation for the danger associated with home trampoline use, half of caregivers are still willing to allow their child to use a trampoline. Although initially surprising, this was expected as it would be unrealistic to think that our short-term intervention would cause such a dramatic change in use. Further, the intentions of the intervention were to provide knowledge on safe practices so it would be unfair to judge the success of our short-term intervention strictly on reductions in the rate of continued trampoline use. Instead, just like many other interventions or behavior change strategies it may be more effective to teach caregivers safe practices or prevention instead of abstention, since the literature already states that approximately 55% of patients who previously sustained an injury from a trampoline continue to play (Brown and Lee, 2000; Smith, 1998).

Without a longitudinal study tracking the injury rate of families who received the intervention, it is difficult to conclude whether our intervention reduce the rate of injury through better knowledge of safe practices. We are confident that caregivers did gain knowledge on safe practices from our intervention because we were able to show a

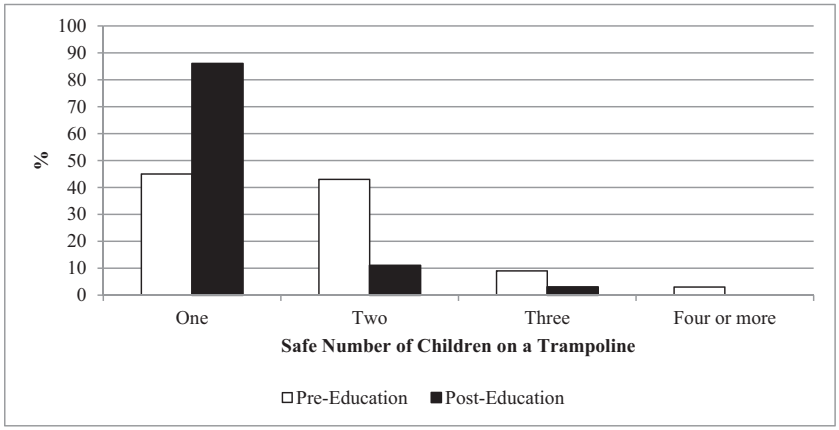

Fig. 2. Distribution of responses for the safe number of children on a trampoline at one time pre and post-educational intervention.
Note. Data collected between August and November 2015 at Children's Hospital, London Health Sciences Centre.

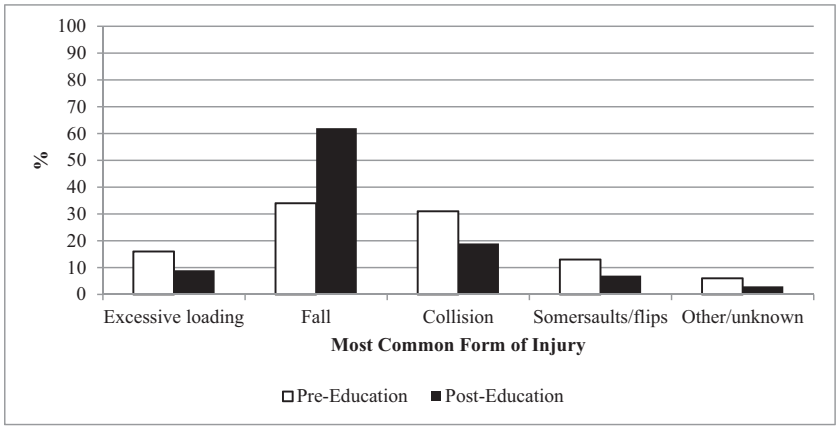

Fig. 3. Distribution of responses for the most common form of injury pre and post-educational intervention.
Note. Data collected between August and November 2015 at Children's Hospital, London Health Sciences Centre.

statistically significant change towards safer practices on 8 of 9 safety-related questions. Moreover, we were able to show that a large proportion of our caregivers (84%) reported that they would be receptive to education on trampoline safety by their family physicians or pediatricians. In addition, 61% of caregivers reported that they would be receptive to recommendations against home trampoline use by their family physician or pediatrician. This helps to show that caregivers are open to educating themselves and may not require a great deal of convincing to change their trampoline practices towards their children.

There may be a role for the combination of education through pamphlets, as well as a formal discussion with a primary health care provider to help improve safety practices and injury prevention. The key factor for increasing safety towards trampoline use is for caregivers to understand the risk of injury and how to prevent injury. Hopefully, given such a significant change in perception post education, the proportion of caregivers who were willing to allow their child on a trampoline despite understanding the danger, may consider safer practices and thus in turn, may reduce the total number of injuries sustained on home trampolines.

4.1. Limitations

The main limiting factor to this pilot study was that the survey was not validated prior to its administration to caregivers. This may call into question the validity of some of the survey responses, however, the survey was developed from an extensive review of the literature and by content experts (Orthopedic surgeons). The next steps will be to modify the wording of several questions (e.g., one could argue that there is no truly “safe” age for trampoline use) and to validate this survey for future studies. Another limitation was the short duration between the two assessment points. Unfortunately, a longitudinal study design was out of the scope of the current study and based on the lack of literature on educational interventions for trampoline use, we felt a logical first step in this process would be to ensure that we captured the important indicators of trampoline education and tested the effectiveness of this type of intervention within this demographic. As a result, the findings from this pilot study can act as a solid initial piece of evidence for future studies to implement this type of intervention long-term. Further, future studies should also examine injury rate and ED admission within families who have received such intervention in order to truly comment on its effectiveness.

5. Conclusion

Despite the ongoing push for trampoline safety education, trampoline injuries continue to be one of the most consistent causes of childhood injury among emergency departments in Canada and the United States (Public Health Agency of Canada, 2009). The distribution of educational pamphlets in the offices of local family doctors, pediatric clinics, and specialized orthopedic clinics may help to increase awareness on trampoline safety as well as aid in injury prevention. The findings from this study show that education in the form of a pamphlet has a role in effectively disseminating information to caregivers. It may be unrealistic to stop the use of trampolines all together, but it is our duty as physicians, caregivers, and educators to ensuring that the individuals who continue to use or allow their children to use trampolines, do it is the safest possible manner.

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Conflicts of interest

None.

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