Brief Report: Don't Kiss a Sleeping Dog: The First Assessment of "The Blue Dog" Bite Prevention Program

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Objective The authors attempted to remedy the current lack of empirically evaluated dog-bite prevention programs for children under 7 by assessing children's learning success with the "Blue Dog" CD.
Methods Ninety-six 3-, 4-, 5-, and 6-year-old children used the interactive CD in an initial exposure phase, a training and a testing phase. Half received verbal feedback, and the other half additional practice with parents. All children were re-tested after 2 weeks. **Results** There were significant increases in safe choices after the training phase at all ages, with older children performing better than younger children. Children still retained their ability to make safe choices after 2 weeks. Interestingly, children practicing with parents performed better than others when under 6 years. Verbal feedback did not play a role, the CD is equally effective without.
Conclusions Children learned successfully about safe behavior with dogs; thus, the CD can help educate children about dog-bite prevention.

Key words accidents and injuries; children; educational interventions; health behavior; prevention/control.

Epidemiological data indicate that in the US, 4.5 million people are bitten by dogs each year with a total of 885,000 needing medical attention (CDC, 2009). On average 1 person in 100 is a victim of a dog bite needing medical attention (Overall & Love, 2001) with children twice as likely to be hospitalized than adolescents or adults (e.g., Ozanne-Smith, Ashby, & Stathakis, 2001). However, this estimate may be low as not all dog bites are reported (Beck & Jones, 1985) or lead to hospitalization (Kahn, Robert, Piette, de Keuster, Lamoreux, & Levêque, 2004). Even emergency department staff with specific reporting training have proven too busy to report dog-bite incidents (Bernardo, Gardner, O'Dair, Cohen, Lucke, & Pitetti, 2002). Almost half of school children interviewed reported they were bitten (Beck & Jones, 1985; Spiegel, 2000) and 20% of parents who own dogs report that their child had been bitten by the family dog (Wilson, Dwyer, & Bennett, 2003). In a study involving around 400 preschool children, about 10% had been bitten. Of these, 65% were under five (Lakestani, Donaldson, Verga, & Waran, 2006). Most bite incidents occurred with familiar dogs. In addition, recent National Health Service statistics in the UK have shown a 40% increase in dog-bite figures based on Accident and Emergency admissions (NHS, 2008).

A significant correlation has been found between the age of the child victim and the incidence of facial injuries: younger children are more often injured in the face, neck and upper torso regions (Brogan, Bratton, Dowd, & Hegenbarth, 1995; Mitchell, Nanez, Wagner, & Kelly, 2003; Schalamon, Aindhofer, Singer, Petnehazy, Mayr, & Kisset al., 2006) leading to life-threatening medical conditions or psychological sequelae like Post-Traumatic Stress Disorder (Peters, Scottiaux, Appelboom, & Kahn, 2004). Seventy percent of all fatal dog bites involve children (Mathews & Lattal, 1994; Sacks, Sattin, & Bonzo, 1989). The majority of bite accidents occur in the home environment and involve children under the age of 7 bitten by a familiar dog (Brogan et al., 1995; Kahn et al., 2003, Lakestani et al., 2006; Schalamon et al., 2006). Child–dog interactions like approaching the dog while eating or surprising it while sleeping seem to trigger up to 86% of accidents at home. Similar to other injuries, most dog bites in children happen while there is no active adult supervision (Kahn et al., 2003).

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Prevention in the past five decades has generally been approached by teaching children safety rules or how to recognize dog signaling (De Keuster, Moons, & de Cock, 2005; Love & Overall, 2001). Recently, however, it was found that young children do not discriminate a dog's body signals, but look mainly at the dog's face instead. Furthermore, they often do not understand the dog's facial expression and can confuse a fearful or angry dog with a friendly one (Lakestani et al., 2006). Concerning the effectiveness of safety rules, studies on domestic accidents show that young children's knowledge of home safety rules does not predict injury frequency. The best predictors of child safety are compliance with home safety rules and parental supervision (Morrongiello, Midgett, & Shields (2001). Prevention work in road traffic accidents (RTA) came to similar conclusions – increasing knowledge alone does not necessarily induce a preventive effect (Zeedyk et al., 2001). Thus, RTA prevention has shifted from rules and guidelines to parent–child interaction and skills training like recognizing and judging risk situations and coordinating information, perception, and action (Barton, Schwebel, & Morrongiello, 2007). While increased knowledge is a precondition for behavior change, knowledge alone without development of other risk judgment or behavioral skills does not suffice. Thus, while it has been stressed that measuring knowledge improvement has to happen before measuring (changed) behavior is possible (Zeedyck, 2003:495), not only knowledge, but also the above skills, such as recognizing and judging situations, should be taught and measured when assessing a prevention program.

Taking into account a multidisciplinary approach, and profiting from progress in prevention research, the Blue Dog CD (and accompanying booklet) was developed to teach children and parents how to recognize and judge situations that can trigger biting behavior in a household situation and to demonstrate safe behavior skills. The program was created to be child-friendly, enjoyable, and easy to use, widely accessible, and it can be used whenever children and parents choose to (De Keuster et al., 2005). As children who are bitten are 5 years on average, and as most get bitten by a familiar dog, this interactive CD was developed with the aim of helping children from 3 to 7 years of age to understand how to behave safely with dogs in a home setting. As Okita (2004) found that especially children of 5 years and younger transfer spontaneously between virtual and real-world mediums as they learn, the program teaches via the character of the Blue Dog about safe and unsafe interactions with dogs (De Keuster et al., 2005). Thus, the CD was created as an interactive edutainment tool with educational messages wrapped in an entertaining context.

Importantly, when a prevention tool comes into existence, there is a need for assessment, as can be seen by Zeedyk and Wallace's (2003) evaluation of a popular British RTA prevention video which, when used in a casual fashion, had no educational impact on parents or children – despite contrary beliefs of the parents. The medical and veterinary literature has produced extensive recommendations on how dogs and children should interact, but very few programs have been assessed as to their effectiveness (Chapman, Cornwall, Righetti, & Sung, 2000; Spiegel, 2000; Wilson, Dwyer, & Bennet, 2003). These programs focus mainly on public safety rules, such as how to behave when encountering an unfamiliar dog and are typically aimed at older children (7–8 years). Only Wilson et al. (2003) works with younger children who were tested using photographs of unknown dogs. The ''Blue Dog'' is so far the only program that is directed at children under 7 years and teaches them about safety with familiar dogs, but has so far not been evaluated. However, to promote children's health and to prevent injury, it is vital to ascertain that prevention programs work. The following first assessment of the Blue Dog program attempts to remedy the current lack of assessed prevention tools, especially for the most vulnerable group: younger children interacting with familiar dogs. Our aim was to find out if the ''Test Yourself'' module on the CD can teach children successfully about safe and unsafe behavior with dogs in a home context. We measured if the program enables children to recognize and judge risk situations correctly and whether the program is therefore a useful learning tool. We predicted a learning effect with children performing better having undergone the training trials. We expected to find age differences with older children performing better than younger children. We also expected knowledge retention insofar as children should still remember how to behave safely in the given test situations after two weeks. The role of verbal feedback and practice with parents was also investigated. Thus, this experimental research addresses a comprehensive set of research questions to gain detailed insights about children's learning progress using the CD.

Method

Participants

A total of 102 children participated. Twenty-four 3-year-olds (mean age 3;3; age range 3;2–3;6; 13 boys) were tested of which eight had a dog; 24 4-year-olds (mean age 4;2; age range 4;1–4;9; 11 boys) of which 11 had

a dog; 24 5-year-olds (mean age 5;2; age range 5;1–5;8; 10 boys) of which 13 owned a dog; and 24 6-year-olds (mean age 6;5; age range 6;1–6;10; 14 boys) of which 14 had a dog. A further six children were tested, but excluded due to the following reasons: one 4-year-old showed inappropriate behavior and five 3-year-olds did not stay attentive during the task. Sample size is appropriate and based on an *a priori* power analysis. All children attended primary or nursery schools in Lincolnshire, UK and were healthy native English speakers. We obtained ethical approval from the University Ethics Committee and the Lead of Clinical Psychology, and consent from the schools, parents' and the children themselves in line with Ethics and BPS guidelines.

Stimuli

Visual stimuli consisted of video clips using Flash MX 2004 software. The CD initially included four rather long animated stories only. For assessment purposes, we created an additional ''Test Yourself'' module that was added to the original CD. This module comprises a subset of the Blue Dog interactive prevention scenes, which contained all main prevention messages, but was short enough not to exceed children's attention span. All scenes show interactions between cartoon dogs and children (half boys, half girls, Table 1, see Supplementary Data online). In each trial the child can decide whether a cartoon child interacts with the dog or undertakes another activity (e.g., play with a toy, call the parent, etc.). Eight different trials of 10 s each were shown in the initial exposure phase, then 16 in the training phase and then eight in the testing phase. In the training phases, 2 × 8 trials were shown as we first showed the scenes with the unsafe and then the safe outcomes. In the testing phases, different cartoon actors and different cartoon dogs were used to test transfer of knowledge and children's ability to generalize. Scenes were run in computer-randomized orders. Eight distracter scenes (Table 2, see Supplementary Data online) were created and interspersed with the testing scenes.

Auditory stimuli were used solely in the Verbal Feedback Condition, within the training phase only. Sixteen different auditory stimuli were recorded. Eight stimuli gave positive verbal feedback, while the child saw safe outcomes, eight further stimuli consisted of warning feedback, while the child saw the unsafe outcomes (Table 3, see Supplementary Data online). We recorded all stimuli with a female adult speaker on the same day to avoid voice variations, using child-directed speech. They were digitally recorded at 22.05 kHz into signed 16-bit files and normalized to 80% to control pitch amplitude using Cool Edit Pro. All other auditory stimuli are instrumental sounds, which accompany trials to avoid spoken words and create a program that could function without depending on language.

Procedures

Using a pretest/posttest evaluation design, research assistants tested children separately in a quiet area using a laptop (screen 27 × 22 cm). They used standardized instructions to describe the task to the child and checked that the child could identify and use the blue and yellow computer keys (Appendix 1, see Supplemental Data online). All children participated in all four experimental phases: exposure, training, and test phases 1 and 2 (re-test). Half of the children in each age group were randomly assigned to receive verbal feedback in the training phase. Children in the initial exposure and in the testing phases were asked to choose what they wanted to happen next (by choosing one of the pointing blue and yellow hands) and to remember to make the child in the game play safely. The task took ~12–20 min. After completion, children were thanked for their help and debriefed. Children received a specially made T-shirt and a participation certificate. Before children came back for re-testing, parents of half of the children who had consented to watch the CD two or three times a week with their children at home, now received a CD with detailed instructions how to use it and a diary/questionnaire to mark that they had looked at the CD together with their children (Parental Practice Condition). These were used later to confirm that parents had indeed watched the CD with their children. Two weeks later all children were re-tested. This time children participated in the testing phase only (test 2).

Measures

In the exposure phase, children gave their initial, untrained (baseline) responses. They could gain up to eight correct answer points. After the training phase, test 1 followed and children could gain a maximum of eight safe answer points. After 2 weeks they could also gain eight points in test 2.

Results

An ANOVA of Age Group (3, 4, 5, and 6 years) × Verbal Feedback (yes/no feedback) × Parental Practice (yes/no support) × Test Phase (safe answers in exposure phase, test phase 1, re-test phase) was carried out with repeated measures on the last factor. The analysis produced the

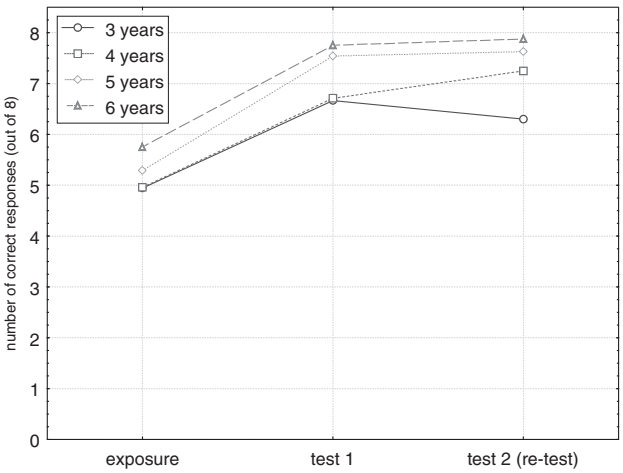

Figure 1. Overview: Number of correct responses as a function of test phase and age group.

following results. First, a highly significant main effect for learning ($F(2,160) = 87.91$; $p < .0001$; $\eta_p^2 = .524$) between the first exposure phase and the test phases demonstrates the significant improvement in children's performance at all ages (first exposure versus test 1: ($F(1,80) = 98.09$; $p < .0001$; first exposure versus test 2: ($F(1,80) = 119.48$; $p < .0001$; test 1 versus test 2: not significant). Figure 1 demonstrates this effect for all age groups. As expected, results show a main effect of age with older children exhibiting more correct responses than younger children ($F(3,80) = 7.26$; $p < .0002$; $\eta_p^2 = .214$). There was also a significant main effect of Parental Practice ($F(1,80) = 15.67$; $p < .0002$; $\eta_p^2 = .164$) and an interaction between Parental Practice and Test Phase ($F(2,160) = 3.23$; $p < .04$; $\eta_p^2 = .039$) which shows that children who received additional practice with their parents seem to retain their acquired knowledge better than those without parental support – there is a significant difference in the second test phase with children practicing with their parents performing significantly better than the control group ($F(1,80) = 39.95$; $p < .0001$). Especially children from 3 to 5 years of age profit from additional practice with their parents. By 6 years of age, children perform equally well with and without additional practice with their parents. Planned comparisons reveal that while 3-year-olds' performance drops significantly from test 1 to test 2 without parental feedback, the reverse is the case when additional parental support is given ($F(1,80) = 5.16$; $p < .026$). We found similar results for 4-year-olds ($F(1,80) = 5.19$; $p < .025$); see Supplementary Data online for overview Figs 1 and 2. We tested about equal numbers of boys and girls, but no gender effects were found. Moreover, no effects of dog ownership were found either. Additionally, the data were transformed into proportional data and arc sine transformations were carried out. The results were near identical, and thus are not described in the manuscript.

Discussion

The aim of the Blue Dog prevention program is to educate children and their parents about the safest way to interact with their dog in a household setting. The aim of this study was to carry out the first assessment of whether children can learn from this CD at all. According to our results, the Blue Dog prevention messages comprised in the ''Test Yourself'' module are highly effective in teaching children about safe behavior with dogs. Children showed highly significant improvement in their performance from exposure to testing phases, and thus show clear evidence of learning. As expected, children's performance improved with age. Children still retained their knowledge and the ability to make safe choices after 2 weeks. Additional practice with their parents was an important factor in teaching children the lessons from the Blue Dog – especially younger children showed better results. Without practicing with parents especially 3-year-olds' performance declines quickly. Interestingly, the reverse is the case when they do practice with their parents – they show significantly improved knowledge instead. Thus, the importance of practicing with parents has to be stressed, especially at this young age. The importance of parental guidance has also been emphasized by Reisner, Shofer, and Nance (2007) and Love and Overall (2001). In addition, our research also shows the development of the role of parental practice – its importance declines as children get older and with 6 years of age children have become more independent learners and perform equally well with or without parental support. Thus, future applications of this or other (bite) prevention programs should integrate practice with parents at the earlier ages. Prerecorded verbal feedback did not improve performance, so the CD is usable without additional verbal feedback. This in turn enhances its usability as the CD can be distributed and used easily (evidenced by the fact that 94% of children could follow the instructions without problems and that children stated they enjoyed taking part with parents confirming this) and presumably without being bound by language barriers. We found neither gender nor dog ownership effects; instead, all tested children learned from the CD, and having a dog did not seem to enhance or decrease the learning effect. Thus, also children who do not have a dog at home profit from the CD. This is

important for a prevention tool as children encounter other dogs, familiar and unfamiliar, even if they do not own a dog themselves, for example, the neighbours' dogs, their grandmother's dog etc., and it is important that they, too, understand the prevention messages. As all tested children learned successfully, the program can be used as a training or self-managed computer-based intervention to learn to recognize and judge risk situations with dogs. Based on these results, we conclude that this is the first interactive dog-bite prevention CD that is suitable for young children, possibly of any language background, and that is successful in teaching them about safe behavior with dogs as is demonstrated by children making safe choices in the interactive learning environment.

From a clinical perspective, it may be a useful tool for child psychologists, teachers, and veterinarians to educate children on safe behavior with dogs. If children and their parents become aware of risk situations with their dog, then this in turn has implications for clinical practice insofar as it may reduce dog bite incidents and psychological trauma in the future. In line with Standards of Evidence (2004), it can be concluded that the Blue Dog CD is efficacious for producing better awareness of risk situations. We tested under as close to real-life conditions as possible, and teachers are currently administering the CD in several schools in the UK, children can use it by themselves, and it comes with an additional manual (and support if necessary). However, as this is the first study of its kind on the Blue Dog program, so far, efficacy is based on this single study. Once replicated, broader applications can be supported.

Future research should also invest in longitudinal projects to assess how long children retain this knowledge, and thus, how effective the prevention works. Further research will have to show in more detail whether and how children's successful learning is transferred not only to other dogs and children seen on a CD, but also to real child–dog interactions. One example for an ethically justifiable study that does not put children at an additional risk of getting bitten, but still employs real children and dogs, would be a large-scale epidemiological long-term study to test if and how children use their knowledge and skills to judge real-life situations with their own dog and other dogs and how parents contribute to their decision making. Other research could also investigate the nature of practicing with parents further and study the best conditions and learning/teaching/feedback mechanisms for improving children's safety, including the parent guide. Other forms of feedback or learning could also be investigated as not all parents have access to computers. With future studies like these in place, children could be educated to behave safely with dogs and a reduction in dog-bite incidents in children should occur.

Conclusion

This first assessment study suggests that children from 3 to 6 years of age learn from the specifically adapted ''Test Yourself'' module on the Blue Dog CD. Children demonstrate improved knowledge as indexed by their correct safety decisions. While older children show more correct answers than younger children, all tested children show significantly improved judgments of risk situations. Practice with parents leads to better learning success, especially in younger children. Verbal feedback did not improve performance, thus, the CD may be usable independent of language background showing potential for international application. Children retained the acquired knowledge and showed their ability to make safe choices about behavior with dogs for at least 2 weeks. Our aim for the current study—to investigate first if children can learn to judge the safety messages from the CD—has been reached as we can confirm that 3–6-year-olds do indeed demonstrate successful learning. Thus, it can serve as a useful learning and awareness tool.

Supplementary Data

Supplementary data can be found at: http://www.jpepsy.oxfordjournals.org/.

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