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Keeping baby safe: A randomized trial of a parent training program for infant and toddler motor vehicle injury prevention

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Abstract

Motor vehicle crashes are responsible for much death and disability among infants and toddlers. This study evaluated *Keeping Baby Safe In and Around the Car*, a multimedia DVD designed to improve knowledge about car seat installation among parents of infants and toddlers. The randomized controlled trial was conducted with 195 parents of children aged 0–24 months. Effective car seat use was evaluated via a written knowledge quiz and car seat simulation. Results from analyses of covariance models show that posttest scores for the intervention condition were significantly higher than those of the control condition on both knowledge and car seat simulation measures. The results, consistent across outcome measures and regardless of child age, suggest that viewing the *Keeping Baby Safe In and Around the Car* DVD resulted in significant gains in parents' car seat knowledge and their ability to discriminate the critical elements of correct car seat installation. Dissemination of engaging multimedia DVDs such as this program might reduce motor vehicle crash-related injuries to infants and toddlers.

Keywords

Unintentional injuries; Car seat safety; Randomized control trial; Infants; Parent training; Observation study

1. Introduction

Unintentional injuries are the leading cause of child death in the United States and much of the world (Centers for Disease Control and Prevention [CDC], 2009; Peden et al., 2008).

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Conflict of interest

The individual authors have no competing interests to declare.

Young children are particularly at risk. From 2000 to 2009, the death rate of children under 1 year of age due to injury actually increased in the United States (Gilchrist et al., 2012), notable since the rate for all other age cohorts decreased over the same time. Annually, more than 2000 American infants and toddlers ages 0–24 months die and nearly one million visit a hospital for medical treatment of unintentional injuries (CDC, 2009).

Motor vehicle crashes are often responsible for death and disability among infants and toddlers, representing more than half of all unintentional deaths of children over age one and approximately 7% of deaths of infants younger than one year (CDC, 2009). Proper installation and use of child safety seats can reduce fatal injuries for infants by up to 71% and for toddlers by up to 54% (National Highway Traffic Safety Administration [NHTSA], 2008), but as many as 85% of child safety seats are improperly installed and/or used in the United States (Gilchrist et al., 2012; Snowdon et al., 2009). Furthermore, recent surveys report that roughly 1 in 5 infant passengers ride in inappropriate child safety seats for their age (Boyle et al., 2009; Vick, 2010). Prevention programs targeting proper use of child safety seats are urgently needed.

Several strategies to improve proper parental use of child safety seats have been implemented. Most hospitals require proof that parents possess an infant child safety seat prior to discharging newborns (American Academy of Pediatrics [AAP] et al., 2010). However, those parents may lack appropriate knowledge about how to use the infant seat properly and when or how to transition their children to new seats as they grow. One recent survey of 4167 parents found that 90% were confident that they had installed and used a child safety seat correctly (NHTSA, 2012a), but when observed, most parents demonstrated limited knowledge about the appropriate child safety seat types, the correct transition between child safety seat types, and the benefits of using the correct safety device (Decina and Lococo, 2005). This may be due in part to the complexity of child safety seat installation and use; many child safety seats are too complex for many parents to master without expert instruction (Boyle et al., 2009; Decina et al., 2005; Lane et al., 2000; Vick, 2010).

Pediatricians offer an obvious approach for delivering child safety information to parents as their children grow. AAP physician recommendations for health supervision include expectations that physicians maintain a level of child safety seat safety knowledge adequate for counseling parents (Durbin and Committee on Injury Violence and Poison Prevention, 2011; Halfon et al., 2011), but the constraints of current medical practice (increased patient loads, reduced consultation time, large quantities of relevant information) greatly reduce the quality and quantity of patient counseling (Halfon et al., 2011). Alternative parental sources for child safety seat information include child safety seat inspection clinics, educational classes, and websites (AAP et al., 2010; NHTSA, 2012b; SafeKids, 2012; Seat Check, 2012). Existing research finds, however, that parents do not access such resources reliably due to barriers such as time and schedule constraints, transportation limitations, and childcare coverage (Axford et al., 2012).

Another option is to deliver child safety seat information to parents via in-depth parent training programs accessed at home or in other private settings. A recent Cochrane review

found that such programs can increase parents' injury prevention behaviors and lead to reductions in child injury rates (Kendrick et al., 2009). These programs can be delivered in a variety of settings and formats, including web and video-based approaches that appeal to American parents with hectic schedule demands. Such web and video-based approaches are used and promoted by numerous authorities (NHTSA, 2012b; SafeKids, 2012; United Nations Office on Drugs and Crime, 2009) and have proved successful in related injury prevention domains, including booster seat use for older children, safe medicine storage within the home, safe hot water temperatures, and fall prevention strategies (Kendrick et al., 2009; Snowdon et al., 2009).

This study evaluated *Keeping Baby Safe In and Around the Car*, a video-based DVD designed to improve child safety seat installation and use among parents of infants and toddlers (<http://www.orcasinc.com/products/baby-and-family-safety/>). The evaluation was conducted using a randomized controlled trial, pre-post, case vs. control research design with 195 parents of children aged 0–24 months. Effective child safety seat use was evaluated both pre- and post-intervention via two strategies: recall on a written knowledge quiz and recognition using a child safety seat installation simulation test. The intervention consisted of self-directed viewing of the Keeping Baby Safe DVD. We hypothesized participants would demonstrate increased child safety seat safety knowledge both post-intervention within the group exposed to the intervention and in comparison to the unexposed control group.

2. Methods

2.1. Research participants

Participants were recruited between January and April of 2008 from four Oregon communities (Eugene, Newberg, Lake Oswego, and Portland) via newspaper ads, daycare centers, and parenting web sites. A total of 195 parents participated in the study and attended evaluation events within the recruitment communities at local offices and community centers. Sample size was determined based on large effect sizes for knowledge (.34) yielded in the pilot study ($N = 44$). Participants were included if they (a) were age 18 or older; (b) were the parent or custodian of a child aged 24 months or younger; and (c) had no one in their immediate family who had experienced an injury resulting in an overnight stay in the hospital within the past two years. We restricted the sample to parents whose eldest child was less than 24 months ("novice parents"), as parents tend to be trained to the needs of their eldest child and require less training for younger children. Eligibility was assessed by project staff over the phone or on a walk-in basis as participants arrived at the evaluation site. The recruitment period ended when the recruitment goals were met for this study and a sufficient sample size had been reached. The sample was 80% female; 60% white and 26% African American; 63% were married, and 34% were single. Participants had children ages 0–12 months (66%), or 13–24 months (33%). Slightly more than half (58%) of the children were girls. The average number of children in the family was 2.2 ($SD = 1.5$) (see Table 1). All participants provided informed consent to participate in the study. The study protocol was approved by the Institutional Review Board at Oregon Center for Applied Science.

2.2. Procedures

2.2.1. Intervention program—*Keeping Baby Safe In and Around the Car* is part of the *Family Safety Toolkit: Keeping Baby Safe*, a 2-part DVD series (the other half of the series focuses on home safety). Based on behavior change theory and content from AAP recommendations for child vehicle safety (AAP, 1994), the DVD presents information in an engaging and interactive manner. Parents learn about safety hazards for young children in and around vehicles and proper methods to choose, install, and use child safety seats. The video-based DVD is intended for self-directed use at home or in other private settings.

2.2.2. Protocol—Participants were blocked into groups by child age (0–12 months or 13–24 months). Following informed consent procedures, all participants completed a pretest evaluation, which included two assessments matched to the child's age: a knowledge quiz about child safety seat use and a simulation test in which participants inspected actual child restraint systems and identified their perception of correct and incorrect use of the systems. All testing was conducted on an individual basis and not in a group setting.

Following the pretest, participants were randomly assigned to the treatment or the control condition using computer-generated allocation sequence randomization lists for two different age groups, 0–12 months, and 13–24 months. Families with more than one eligible child were grouped according to the age of their eldest child. Those in the treatment group viewed the *Keeping Baby Safe In and Around the Car* DVD, lasting approximately 45 min. Those in the control group viewed a portion of the *Keeping Baby Safe In and Around the Home* DVD, which provided comparable exposure to home safety-relevant content but no information about car safety. After watching the DVD, participants completed the posttest evaluation, which consisted of the same knowledge quiz and simulation assessment used in the pretest. Participants also completed a user satisfaction questionnaire at posttest.

2.3. Measures

2.3.1. Vehicle safety knowledge quiz—The knowledge quiz assessed participants' knowledge about child safety seats. The quiz contained 11 items answered using a multiple-choice format with 4 response options per question (see Appendix for the full list of questions and response options). Example items include: *What is the best safety seat to use with a child who is 15 months old and weighs 18 pounds?* [(a) combination seat installed rear facing; (b) convertible seat installed forward facing; (c) convertible seat installed rear facing; (d) infant-only seat installed forward facing]; *Child safety seats for babies less than 1 year old should be installed at what angle?* [(a) 90°; (b) 60°; (c) 45°; (d) They should be installed upright, so there is no angle]. The number of items answered correctly composed the knowledge score (range = 0–11, with higher scores indicating greater knowledge).

2.3.2. Child safety seat installation simulation test—For the child safety seat installation simulation test, participants inspected two child safety seat installations in the back seat of a vehicle. One safety seat installation was used for the younger age group (parents of children ages 0–12 months) and a different installation was used for the older age group (parents of children ages 13–24 months). In both cases, the simulations used a child-sized doll and were purposely arranged to include common installation errors (see Table 2

for a listing of the errors). Participants inspected each installation separately and reported errors they noticed to the researcher, who recorded participant responses using a dichotomous coding system of “correct” vs. “incorrect” for each item. Items included errors of both omission and commission. For example, in the test for children aged birth to 12 months, a blanket was positioned over the doll’s legs that did not interfere with the safety seat harness. If the subject did not mention the blanket as an error, this item was coded as correct. If the subject pointed out the blanket as an error, the item was coded as incorrect. Another item showed the top tether strap on the child safety seat installed too loosely. If subjects commented that this was an error, the item was coded as correct; if they did not note the error, the item was coded as incorrect. Possible scores on this measure ranged from 0 to 7, with higher scores reflecting greater knowledge.

2.3.3. User satisfaction—Participants in the treatment group rated their satisfaction with the program on a range of domains (e.g., range of injury prevention information, information specific to their child’s age and development, information specific to the parent’s situation, quality of the video) using a 5-point Likert scale. Additional open-ended questions allowed users to describe what they liked and/or disliked about the program, what they believed to be missing from the program, and other comments or suggestions.

3. Results

Chi-square (categorical variables) and grouped *t*-tests (continuous measures) indicated the treatment and control groups did not statistically differ ($p > .05$) on demographic characteristics or baseline outcome measures, suggesting randomization created initially similar groups (see Table 1).

Rates of missing data were 6% at pretest and 7% at posttest, with a total rate of 11% across both assessments (see CONSORT diagram in Fig. 1). All missing data were due to non-response. Participants who did not complete assessments failed to do so because they were unable to stay for the time required (approximately 2 h). Those who provided data on all study outcomes ($n = 173$, 89%) were compared to those who did not ($n = 22$, 11%) on all demographic and available baseline measures. Responders and non-responders did not differ ($p > .05$) on any measure, suggesting the missing-at-random assumption remained tenable. Therefore, sequential regression multiple imputation (SRMI; Van Buuren, 2007) was conducted to create a full data set. SRMI specifies a multivariate model by separate conditional models for each incomplete variable, allowing for imputation of variables with different distributional properties. In addition to the study outcomes, the imputation model also included study demographic variables as the inclusion of auxiliary variables can reduce bias and make the missing-at-random assumption more plausible (Allison, 2009; He et al., 2010; Rubin, 1996). For the current study, four models were specified: a normal linear regression model for continuous variables, a logistic regression model for binary variables, a Poisson model for count variables, and a generalized logistic regression model for variables with more than two categories.

Analyses of covariance (ANCOVA) models tested the primary hypotheses with the intent-to-treat sample. Differences in outcomes at posttest were examined with pretest scores entered

as a covariate and study condition as a predictor. For the knowledge measure, a 2-level categorical child age variable (1 = 0–12 months, 2 = 13–24 months) and the age by condition interaction effect were also included to assess possible moderation. Additionally, the 5-level parent education variable (see Table 1) and the education by condition interaction effect were included to assess possible moderation for the knowledge measures and the child safety seat installation simulation tests. Table 3 shows a descriptive summary of the study outcomes at pretest and posttest by study condition and results of the ANCOVA models. All posttest scores for the intervention condition were significantly higher than the control condition after adjusting for any baseline differences. No interaction effects were statistically significant in the models.

Among treatment condition parents who responded to user-satisfaction questions, 96.7% indicated that they agreed or strongly agreed the program was helpful to them, and 98.9% recommended the program to other parents. In response to the open-ended program use/satisfaction questions, several parents in the treatment group commented on the usefulness of viewing video of correct child safety seat installation. Several users made recommendations for distributing the DVD to appropriate target audiences, such as expectant and new parents.

4. Discussion

Results suggest that viewing the *Keeping Baby Safe In And Around The Car* DVD resulted in significant gains on both outcome measures, a traditional knowledge-based assessment and a live simulation of child safety seat installation designed to assess recognition of improper installation. The results were not influenced by children's age.

DVD programs such as *Keeping Baby Safe In and Around the Car* offer a promising format for learning about child safety seat safety (Axford et al., 2012; Metzler et al., 2012). Video-based programs are engaging, which likely translates to greater knowledge retention, changes in attitudes, and parent intentions to use the recommended injury prevention techniques (Metzler et al., 2012). They can teach, demonstrate, and facilitate desired behavior change by using behavior modeling and providing parents with visual examples and context for applying critical constructs (Sanders and Kirby, 2012). The format also accommodates parents' busy schedules, time constraints, and family obligations. When a parent owns such a program, it becomes a resource for repeated use and reinforcement of knowledge.

A significant challenge to public health advocates is dissemination of effective programs to the target populations. DVD programs such as *Keeping Baby Safe* can be disseminated through multiple means: existing parenting classes, public libraries, internet portals focused on parenting, schools, places of worship, and community centers. Parents can also view the DVD during well-baby visits at pediatricians' offices or when accessing services through WIC or other governmental agencies.

This study had several strengths. It used two outcome measures, including an ecologically valid recognition task via actual simulations of child safety seat installations with dolls

placed in vehicle child safety seats. Other strengths include the large and diverse sample and the pre-post case-control randomized design. The study also had limitations that provide some focus for future research. Although the simulation measure sampled parents' ability to discriminate errors in child safety seat installations, there were no real-life behavioral observation outcomes, and it is unknown whether the observed changes in skills demonstrated in the live simulation translated to actual behavior change in the participants' own vehicles. Also, because there was no follow-up assessment, it is unknown if these effects would maintain over time. Future research could examine maintenance of skills. Finally, our control program did not allow us to demonstrate that the *Keeping Baby Safe in and Around the Car* training program was more effective than other child safety seat safety training programs for parents. Subsequent studies might compare the DVD program to resources parents currently use to learn about child safety (e.g., physician counseling, child safety seat inspection clinics, educational classes, and child safety seat websites) or an alternative control intervention also designed to improve car safety.

Motor vehicle crashes continue to be responsible for a significant percentage of unintentional deaths of young children each year (CDC, 2009). A key tool for reducing child death and injury due to motor vehicle crashes is parent education. Our results suggest the *Keeping Baby Safe In and Around the Car* DVD offers a promising strategy for child safety seat safety training. The reach, accessibility, and engagement of video-based instruction effectively engage parents in relevant training (Metzler et al., 2012; United Nations Office on Drugs and Crime, 2009). Used in conjunction with other elements of effective injury prevention initiatives (education, engineering, and enforcement), the *Keeping Baby Safe In and Around the Car DVD* program can provide a scalable solution to a critical public health challenge (CDC, 2009).

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Appendix. Vehicle safety knowledge quiz

We would like to ask some questions about safety in and around the car.

Please mark the ONE response that best answers each of the following questions.

1. Most parents know that they should use a child safety seat. Studies have shown that:

1. About half of child safety seats are not installed correctly in the vehicle
 2. 4 out of 5 child safety seats are not installed correctly in the vehicle
 3. In the U.S., most 1 year-olds are too large for “infant-only” child safety seats
 4. The more expensive child safety seats are the safest ones
2. Vehicles have a “blind spot” behind them. What is the average length of that blind spot?
 1. 10 ft.
 2. 15 ft.
 3. 20 ft.
 4. 25 ft.
 3. On an 85-degree day, how long does it take for the temperature inside the car to reach 100 degree?
 1. 3–5 min
 2. 7–10 min
 3. 20 min
 4. 25 min
 4. What is the best safety seat to use with a child who is 15 months old and weighs 18 pounds?
 1. combination seat installed rear facing
 2. convertible seat installed forward facing
 3. infant-only seat installed forward facing
 4. infant-only seat installed rear facing
 5. What is the best safety seat to use with a child who is 24 pounds and 13 months old?
 1. combination seat installed rear facing
 2. convertible seat installed forward facing
 3. convertible seat installed rear facing
 4. infant-only seat installed forward facing
 6. What is the proper seat for a child who is 14 months old?
 1. combination seat installed rear facing
 2. convertible seat installed either forward or rear facing
 3. forward facing seat installed in the center of the back seat

4. there is not enough information about the child to identify the correct seat
7. Which of the following is true about used child safety seats?
 1. It's OK to use a used child safety seat if the seat is no older than 7 years old
 2. It's OK to use a used child safety seat if the seat is no older than 5 years old and you have it inspected
 3. You can use a used car seat if it fits your child
 4. It is OK to use a used safety seat just until you can get a new one
8. Child safety seats for babies less than 1 year old should be installed at what angle?
 1. 90°
 2. 60°
 3. 45°
 4. They should be installed upright, so there is no angle
9. Newer cars have the LATCH system for fastening a child safety seat. Of the statements below, which one is true about the LATCH system?
 1. The LATCH system should always be used with a rear-facing safety seat
 2. The LATCH should always be used with a forward-facing safety seat
 3. Whether you use the LATCH system or the seat belt to fasten your car seat into the car, each is equally safe
 4. Using the LATCH system to fasten your car seat into the car is safer than using the seat belt
10. The harness straps that hold the child in the safety seat should fit:
 1. snug, but with about 1 in. of slack
 2. snug, but with about 2 in. of slack
 3. snug, so you can "pinch an inch"
 4. snug, without any slack
11. How many children are injured or die each year in the U.S. due to car crashes?
 1. 13,000
 2. 24,000
 3. 30,000
 4. 47,000

References

- Allison, PD. Missing data. In: Jaydeu-Olivares, REMA., editor. The SAGE Handbook of Quantitative Methods in Psychology. Sage Publishing; New York, NY: 2009. p. 72-89.
- American Academy of Pediatrics. March of Dimes, & National Association of Neonatal Nurses; NICU Journal: A Parent's Journey. 2010. p. 61-76. Retrieved from: <http://www2.aap.org/sections/perinatal/pdf/NICUTab1.pdf>
- American Academy of Pediatrics (AAP). A guide to safety counseling in office practice. The Injury Prevention Program. 1994 3-69/rev0801.
- Axford N, Lehtonen M, Kaoukji D, Tobin K, Berry V. Engaging parents in parenting programs: lessons from research and practice. Children and Youth Services Review. 2012; 34(10):2061–2071. <http://dx.doi.org/10.1016/j.childyouth.2012.06.011>.
- Boyle, J., Lampkin, C., Schulman Ronca and Bucuvalas Inc.. 2007 Motor Vehicle Occupant Safety Survey, Child Safety Seat Report. Vol. 5. National Highway Traffic Safety Administration; Washington, DC: 2009.
- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). 2009. Retrieved from: <http://www.cdc.gov/injury/wisqars/index.html> (22.04.12)
- Decina LE, Lococo KH. Child restraint system use and misuse in six states. Accident Analysis and Prevention. 2005; 37(3):583–590. <http://dx.doi.org/10.1016/j.aap.2005.01.006>. [PubMed: 15784214]
- Decina, LE., Lococo, KH., Block, AW. Misuse of Child Restraints: Results of a Workshop to Review Field Data Results. National Highway Traffic Safety Administration, Office of Research and Technology; Washington DC: 2005. DOT HS 809 851 Retrieved from: http://www.nhtsa.gov/people/injury/research/tsf_misusechildrestraints/809851.html
- Durbin DR, Committee on Injury Violence and Poison Prevention. American Academy of Pediatrics policy statement – child passenger safety. Pediatrics. 2011; 127(4):788–793. <http://dx.doi.org/10.1542/peds.2011-0213>. [PubMed: 21422088]
- Gilchrist J, Ballesteros M, Parker E. Vital signs: unintentional injury deaths among persons aged 0–19 years – United States, 2000–2009. Morbidity and Mortality Weekly Report (MMWR). 2012; 61 Retrieved from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm61e0416a1.htm>.
- Halfon N, Stevens GD, Larson K, Olson LM. Duration of a well-child visit: association with content, family-centeredness, and satisfaction. Pediatrics. 2011; 128(4):657–664. <http://dx.doi.org/10.1542/peds.2011-0586>. [PubMed: 21930541]
- He Y, Zaslavsky AM, Landrum MB, Harrington DP, Catalano P. Multiple imputation in a large-scale complex survey: a practical guide. Statistical Methods in Medical Research. 2010; 19(6):653–670. <http://dx.doi.org/10.1177/0962280208101273>. [PubMed: 19654173]
- Kendrick, D., Barlow, J., Hampshire, A., Polnay, L., Stewart-Brown, S. Parenting Interventions for the Prevention of Unintentional Injuries in Childhood. 2009. Publication no. 10.1002/14651858.CD006020.pub2. (1465–1858) Retrieved from Wiley Online Library (03.09.12)
- Lane WG, Liu GC, Newlin E. The association between hands-on instruction and proper child safety seat installation. Pediatrics. 2000; 106(Suppl. 4):924–929. [PubMed: 11044145]
- Metzler CW, Sanders MR, Rusby JC, Crowley RN. Using consumer preference information to increase the reach and impact of media-based parenting interventions in a public health approach to parenting support. Behavior Therapy. 2012; 43(2):257–270. <http://dx.doi.org/10.1016/j.beth.2011.05.004>. [PubMed: 22440064]
- National Highway Traffic Safety Administration. Traffic Safety Facts 2007 Data. NHTSA's National Center for Statistics and Analysis; Washington DC: 2008. DOT HS 810 987 Retrieved from: <http://www-nrd.nhtsa.dot.gov/Pubs/810987.PDF>
- National Highway Traffic Safety Administration. National Child Restraint Use Special Study. 2012a. Retrieved from: <http://www-nrd.nhtsa.dot.gov/Pubs/811679.pdf> (01.10.12)
- National Highway Traffic Safety Administration. Traffic Safety Marketing. 2012b. Retrieved from: <http://www.trafficsafetymarketing.gov/CAMPAIGNS/Child+Safety/Campaign+Materials> (01.10.12)

- National Highway Traffic Safety Administration. U.S. DOT and Safe Kids Kick Off Child Passenger Safety Week with New Survey on Common Car Seat Mistakes. 2012c. Retrieved from: <http://www.nhtsa.gov/About+NHTSA/Press+Releases/2012/U.S.+DOT+and+Safe+Kids+Kick+%29ff+Child+Passenger+Safety+Week+With+New+Survey+on+Common+Car+Seat+Mistakes> (01.10.12) (September 17, 2012)
- Peden, M.Oyegbite, K.Ozanne-Smith, J.Hyder, AA.Branche, C., Fazlur Rahman, AKM., editors. World Report on Child Injury Prevention. World Health Organization; Geneva, Switzerland: 2008.
- Rubin DB. Multiple imputation after 18+ years. Journal of the American Statistical Association. 1996; 91(434):473–489.
- SafeKids. Safe Kids Worldwide. 2012. Retrieved from: <http://www.safekids.org> (01.11.12)
- Sanders MR, Kirby JN. Consumer engagement and the development, evaluation, and dissemination of evidence-based parenting programs. Behavior Therapy. 2012; 43(2):236–250. <http://dx.doi.org/10.1016/j.beth.2011.01.005>. [PubMed: 22440062]
- Seat Check. SeatCheck. 2012. Retrieved from: <http://www.seatcheck.org/> (01.11.12)
- Snowdon A, Hussein A, Purc-Stevenson R, Giovanna F, Ahmed E. A longitudinal study of the effectiveness of a multi-media intervention on parents' knowledge and use of vehicle safety systems for children. Accident Analysis and Prevention. 2009; 41(3):498–505. <http://dx.doi.org/10.1016/j.aap.2009.01.013>. [PubMed: 19393799]
- United Nations Office on Drugs and Crime. Compilation of Evidence-Based Family Skills Training Programmes. 2009. Retrieved from: http://www.unodc.org/docs/youthnet/Compilation/10-50018_Ebook.pdf (01.09 12)
- Van Buuren S. Multiple imputation of discrete and continuous data by fully conditional specification. Statistical Methods in Medical Research. 2007; 16(3):219–242. <http://dx.doi.org/10.1177/0962280206074463>. [PubMed: 17621469]
- Vick J. Securing the safety of our most precious cargo: safe kids. The American Journal of Maternal/ Child Nursing. 2010; 35(1):52–57. <http://dx.doi.org/10.1097/01.NMC.0000366811.59832.ba>.

Fig. 1.
CONSORT flow diagram.

Table 1

Demographic characteristics by study condition.

	Intervention (<i>n</i> = 101)		Control (<i>n</i> = 94)		Test of condition differences	
	<i>N</i>	%	<i>N</i>	%	χ^2 (df)	<i>p</i> -Value
Sex (% female)	79	79.8	74	80.4	0.01 (1191)	.912
Age					5.28 (4189)	.260
18–25 years	33	34.0	35	38.0		
26–30 years	23	23.7	23	25.0		
30–35 years	15	15.5	16	17.4		
36–40 years	18	18.6	7	7.6		
41 years or older	8	8.2	11	12.0		
Hispanic	10	10.4	6	6.9	0.71 (1183)	.399
Race					0.01 (1192) ^a	.942
Black	26	26.3	24	25.8		
White	62	62.6	54	58.1		
Multi-racial/other	11	11.1	15	16.2		
Relationship status					1.03 (1192) ^b	.310
Single	37	37.4	29	31.2		
Married/partner	59	59.6	63	66.7		
Divorced/widowed	3	3.0	2	2.2		
Level of education					7.06 (4194)	.132
Less than high school	11	11.0	9	9.6		
High school or GED	27	27.0	37	39.4		
Some college	40	40.0	24	25.5		
Bachelor's degree	13	13.0	10	10.6		
Graduate or professional degree	9	9.0	14	14.9		

^aDue to low cell counts, race was recoded into minority status for the chi-square test.^bDue to low cell counts, relationship status was recoded into married versus not for the chi-square test.

Table 2

Child safety seat simulation recognition test items.

	Safety Seat 1	Safety Seat 2
Age of Child		
Birth–12 months	The safety seat was not installed tightly enough	The doll was wearing puffy clothing underneath the safety seat harness
	The harness was not tight enough	The harness retainer clip was adjusted to the incorrect level
	The harness retainer clip was adjusted to the incorrect level	An after-market toy was attached to the safety seat
	An after-market headrest was used	The safety seat was installed forward facing
13–24 months	The safety seat not installed tightly enough	The doll was wearing puffy clothing underneath the safety seat harness
	The harness was not tight enough	The harness retainer clip was adjusted to the incorrect level
	The top tether strap was installed too loosely	An after-market toy was attached to the safety seat
	An after-market headrest was used	

Table 3

Descriptive statistics and ANCOVA model for study outcomes.

	Intervention (<i>n</i> = 101)				Control (<i>n</i> = 94)			
	Pretest		Posttest		Pretest		Posttest	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Knowledge	4.71	1.86	7.51	2.39	4.59	1.77	4.77	1.88
Child safety seat simulation recognition								
0–12 month old child	2.38	1.54	5.97	1.67	2.95	1.44	3.37	1.70
13–24 month old child	2.31	1.42	4.63	1.72	2.35	1.47	3.00	1.29

Posttest adjusted means ^a		Test statistics		
Intervention	Control	<i>F</i> -value	<i>p</i> -Value	η^2
Knowledge (<i>df</i> = 1,194)	7.48	4.81	103.71	<.001
Child safety seat simulation recognition				
0–12 month old child (<i>df</i> = 1,132)	6.11	3.26	112.90	<.001
13–24 month old child (<i>df</i> = 1,62)	4.64	2.99	25.65	<.001

^a Adjusted for pretest score.