FINAL REPORT
INTERACTIVE PROGRAM TO TEACH PEDESTRIAN SAFETY
(R43-HD3501801A1)

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PHASE II PROJECT AIMS

The objective of this project was to produce an interactive multimedia (IMM) program to teach pedestrian safety skills to children in grades K-3. Pedestrian/motor vehicle accidents are the most common cause of death from trauma for children between the ages of 5-9. The program was developed for use by classroom teachers as well as parents to teach children the key skills involved in being a safe pedestrian. The program includes instructional units on determining the safest place to walk, responding to traffic signals, and discriminating dangerous vehicles in intersections. Examples include both animated and video scenarios of traffic situations. The Phase I prototype resulted in a CD-ROM prototype that targeted one of the important pedestrian safety skills—street crossing. This program received a Telly award in 2002.

In Phase II we completed the comprehensive program targeting a range of pedestrian safety behaviors across urban, small town/suburban, and rural settings. The program, delivered for both Macintosh and PC computers on a CD-Rom, is designed for use in school and home settings. Print material for parents and teachers describing the content of the IMM program and suggesting ways that parents can reinforce safe pedestrian skills accompanies the program. The Phase II program was evaluated in a randomized control trial with a sample of 96 children in grades K-3.

SIGNIFICANCE OF THE PROJECT

Overview

Injuries are the leading cause of death in children in the United States (Center for Disease Control, 2004). More years of potential life are lost due to death from injuries than from any other cause, including congenital anomalies and all forms of disease (Sondik, 1999). Injuries are also the leading cause of head trauma in children in the United States (Harborview Injury Prevention and Research Center, 2004) and account for over 10 million emergency room visits and 300,000 hospitalizations annually (Children's Safety Network, 1996). The costs of childhood injury and disability are staggering: an estimated $347 billion each year (Danseco, Miller, & Spicer, 2002).

For children over 5, injuries from pedestrian/motor vehicle collisions (i.e., when children are walking along, playing in, or crossing the street) are the second most common cause of death from injury (CDC, 2004). In 2001, approximately 39,000 children age 5-9 were injured in pedestrian/motor vehicle collisions; 11,000 of these injuries were incapacitating (U.S Department of Transportation, National Highway Traffic Safety Administration [NHTSA], 1998). Although rates of unintentional injury and death from trauma have decreased over the past several decades (CDC, 2004), the prevention of childhood injuries, especially pedestrian/motor vehicle injuries, remains an important public health issue.

Mechanisms of Injury

Of children between the ages of birth and 19, the greatest proportion of injuries (43%) occurs on the roadway (National Pediatric Trauma Registry, 1993). Pedestrian/motor vehicle accidents are the most common cause of death from trauma for the 5-9 year old age group, and most often occur while the child is walking along, playing in, or crossing the street (National Pediatric Trauma Registry, 1993). In a re-analysis of data from the Pedestrian Injury Causation Study (National Highway Traffic Safety Administration, 1998) involving 1,035 pedestrian injuries to children and youth under age 20, Pitt and colleagues (Pitt, Guyer, Hsieh, & Malek, 1990) found that 45.3% of cases were children between 5 and 9 years old; and of the total cases, 39% were injured when darting out into the road, and 48% occurred on local streets in residential areas.

For children who survive pedestrian/motor vehicle accidents, traumatic brain injury is the most frequent diagnosis. Each year, 30,000 children are left with long-lasting alterations in social, behavioral, physical, and cognitive functioning as a result of brain injury (National Pediatric Trauma Registry, 1993). The costs of childhood injury and disability are staggering: total direct and indirect costs are estimated at $170 billion each year (National Safety Council, 1991).

Strategies for Decreasing Childhood Injury

Child pedestrian injuries, particularly those involving children between the ages of 5 to 9, have been identified as one of the major childhood health risks (Biehl, Older, & Griep, 1969; Ampofo-Boateng & Thomson, 1991; Scheidt, Harel, Trumble, et al., 1995; Smeed, 1968). The National Highway Traffic Safety Administration has recognized pedestrian injury as a major priority area, emphasizing the need for intervention strategies focused on specific injury events (Agran, Winn, & Anderson, 1994). Although the "best" solution to injury prevention has yet to have been identified, two basic prevention strategies have been advanced: injury control and safety education (Gielen, 1992).

Injury control measures. Injury control strategies involve the application of non-behavioral solutions to environmental variables in order to protect the individual from injury and minimize the need for individual behavior change (Gielen, 1992; Rivara, 1992). Common examples of injury control measures are: (a) traffic control signals with pedestrian crosswalks; and (b) sidewalk overpasses, which provide students with a means of safe passage across busy streets near schools or shopping centers. Injury control measures should be one component in a comprehensive injury prevention program (Durkin, Laraque, Lubman, & Barlow, 1999; Rivara, Booth, Bergman, Rogers, & Weiss, 1991; Tuchfarber, Zins, & Jason, 1997). However, such measures have been difficult to apply (Christoffel, Scholfer, Lavigne, et al., 1991) and have not been shown to significantly decrease injury rates (Herms, 1972; Lili, Mueller, & Rivara, 1988).

Safety education. There is evidence that the use of well-thought-out behavioral safety education interventions can be effective in promoting and maintaining behavioral change in children (Jones, Kazdin, & Haney, 1981; Peterson, 1984; Peterson & Schick, 1993; Rivara et al., 1991). However, one of the problems with past injury prevention educational efforts is that they are often characterized by brief persuasive messages (e.g., in brochures or from a pediatrician). Such approaches tend to be relatively ineffective (Peterson & Mori, 1985). The missing element in this approach is the attempt to teach children to "discriminate the embedded threat and correctly perform safe, rather than risky behaviors, even when the threat of injury is not obvious"

(Peterson & Schick, 1993, p. 451). Indeed, our evaluation of the Phase I program clearly demonstrated that children have trouble identifying dangerous vehicles in an intersection. On the outdoor evaluation pre-test, subjects identified only 27% of the cars that could hit them.

Traffic-related injury prevention programs for children have included both passive and active interventions. Passive interventions are often classroom based, and use book and lecture formats to teach safety rules (Ampofo-Boateng & Thomson, 1989; Singh, 1982) and general safety information (West, Sammons, & West, 1993; Division of Health Promotion and Education, 1990). While generally low in cost to administer, these methods lack measurable behavioral outcomes (Bureau of Curriculum Development, 1986). Less passive interventions that attempt to engage either the caregiver or the child include counseling the parent in safety rules (Bass, Mehta, & Ostrovsky, 1991), and health fairs (Bean & Hutchinson, 1996). Involving parents is important because they tend to overestimate children's knowledge of safe pedestrian behavior (Dunne, Asher, & Rivara, 1992; Rivara, Bergman, & Drake, 1989), and underestimate childrens' risk from motor vehicle crashes (Mulligan-Smith, Puranik, & Coffman, 1998). However, passive approaches such as these provide limited, if any, opportunity for the child to actually practice new safety behaviors.

Several attempts have been made to actively engage children in learning safe pedestrian behaviors through the use of instructional "packages." Training methods include: modeling combined with social reinforcement, descriptive feedback and prompts (Rivara et al. 1991; Yeaton & Bailey, 1978); practice in simulated traffic environments (Durkin et al. 1999); and training in the real traffic environment (Rivara et al. 1991;Young & Lee, 1987). Studies using methods such as these have demonstrated that by using active modalities, young children can indeed learn and implement safe street-crossing behaviors in real traffic situations (Rivara et al. 1991; Yeaton & Bailey, 1978).

<u>Limitations of traditional safety education effort</u>. Safe pedestrian behavior requires a much larger set of judgments and discriminations than most safety education interventions reflect (Peterson & Schick, 1993). For example, traditional street crossing training teaches the child to first make sure the light is green and then to look left, right, left, and to continue looking, for oncoming cars. However, such training is dangerously incomplete. Children also need to learn to make other critical discriminations, such as which cars might turn into their path from adjacent cross streets, to judge the distance of oncoming vehicles, and to disregard friends or other pedestrians who might be crossing unsafely (Peterson, personal communication, March, 1996).

Another limitation of previous safety education training efforts involves the lack of evaluation of the training's impact (Tuchfarber et al. 1997). Even those studies that have most carefully examined the degree to which safety behaviors are learned and applied have not demonstrated sustained change (Geddis & Pettengel, 1982).

Traffic safety education efforts, to have a significant public health impact (Glasgow, Vogt, & Boles, 1999), must not only have efficacy but also (a) be adopted, (b) be implemented, and (c) be maintained. Active teaching approaches are prohibitively expensive; while on-site instruction is more effective than passive approaches, it is staff intensive (Rivara et al. 1991), and therefore expensive. The expense increases even more when teachers attempt to make pedestrian safety training most relevant and interesting to students by tailoring their program to their community setting (e.g., urban, suburban, rural). However, as research supports the use of simulated training packages using real-life imagery (Woodward & Carnine, 1988) and as computer technology and Internet connections continue to become more and more accessible (Education and Libraries Networks Coalition, 1999), the potential for adoption, implementation, and maintenance of IMM programs increases. Moreover, the application of empirically-validated instructional design principles can ensure that instructional programs that take advantage of computer-based video training methods can effectively and efficiently teach these skills, and that the skills can be taught in ways which will promote their generalization and maintenance (Engelmann & Carnine, 1982; Horner, McDonnell & Bellamy, 1986; Rosenshine & Stevens, 1986; White, 1988).

Research in Instructional Design

There is a substantial body of research regarding effective instruction of academic and community living skills that can be drawn upon in designing effective safety education programs.

Analysis of instructional content. Central to effective curriculum design is a comprehensive analysis of the instructional content. The first step in this process involves identifying the component skills within the more complex skills being taught. Component skills should be pre-taught in a simpler context rather than within a more complex context (Rosenshine & Stevens, 1986). Next, it is most efficient to teach a strategy that the learner can apply independently across a range of examples, rather than requiring memorization of discrete skills or information (Carnine, Kameenui, & Woolfson, 1982; Darch, Carnine, & Gersten, 1984; Fielding, Kameenui & Gersten, 1983).

The manner in which teaching examples are selected is critical to the instructional design process. General case instruction involves selecting a range of teaching examples that efficiently sample the "instructional universe," so that students will learn to apply the skills across appropriate stimulus conditions and not apply the skills in inappropriate conditions (Dunlap, 1993; Engelmann & Carnine, 1982; Horner, Sprague, & Wilcox, 1982; Horner et al. 1986; Albin & Horner, 1988). The examples are then sequenced so that they build on prior learning and carefully teach the required discriminations.

In the context of safe pedestrian behavior, the component discriminations of judging traffic distance and taking into account traffic patterns at intersections can be considered pre-skills, which can be taught outside of the context of learning to cross the street. Once these pre-skills are mastered, a generic strategy (e.g., "Look all ways") can be taught using a range of examples that sample the entire range of intersections. Both relevant and irrelevant stimuli can be included in these examples.

Instructional presentation variables. A second set of instructional variables that contribute to positive learner outcomes involves the manner in which the instructional content is presented. Rapid instructional pacing is a factor, which has been shown to increase the acquisition rate of new material (Carnine, 1976; Darch & Gersten, 1985; Koegel, Dunlap & Dyer, 1980). Numerous studies have reported a strong correlation between maintaining high rates of learner success and increased acquisition and retention of newly learned information (Brophy & Evertson, 1976; Duncan, 1959; Falco, 1983; Gersten, White, Falco, & Carnine, 1982; Weeks & Gaylord-Ross, 1981). Carnine (1976) documented the importance of sufficient practice on new skills to ensure mastery at each step in the learning process. When learners make errors, it is important that they receive corrective feedback so that they can successfully complete the task when it is presented again (Carnine, 1980; Gersten, Carnine, & Williams 1982). Cumulative review of material ensures integration of new skills with previously learned information (Rosenshine & Stevens, 1986). Finally, it is critical to systematically evaluate whether students have learned the instructional content (Consortium, 1994). The implications of this research indicate that short (quick) vignettes with frequent acknowledgement of progress have the highest likelihood of successful acquisition and retention of the skills taught.

Advantages of Multimedia Presentations

Instructional value of animations. The use of animations to present situations related to street provides a means for removing irrelevant stimuli. The abstracted situations permit students to focus on critical details and respond to specific elements in the environment. By gradually replacing the animations with semi-abstracted examples (e.g., actual photographs of streets and intersections with animated cars, VRML models with photographic backgrounds, etc.), generalizations from the abstracted scenes to the complex and dynamic situations can be induced. Once the core rules have been firmly established, the next step is to present action video examples.

Instructional value of video materials. The use of video examples enables the effective teaching of fully generalizable pedestrian skills by presenting complex and dynamic real-life examples of pedestrian scenarios. By creating an instructional experience with relevant stimuli similar to those present in natural environments it is possible to achieve effective generalizations to a full range of real-world situations (Horner et al., 1986) without exposing children to dangerous environments. Thus, both the animations and the videos provide several advantages over more typical didactic presentations and printed materials, including a more controlled presentation of the material, increased audience interest in the material, and simplification of the tasks required of the classroom teacher.

Special contribution of interactive multimedia (IMM). One key advantage of IMM for use as an educational tool is the ability to engage the viewer actively. IMM requires the learner to attend carefully and respond overtly and frequently. These are behaviors which are related to increased performance in academic settings (Abramson & Kagan, 1975; Frase & Schwartz, 1975). The branching capabilities of interactive programs allow educational material to be tailored to user performance: the student can get immediate corrective feedback as needed, thereby increasing the efficacy of the program (Campbell, DeVellis, Strecher, et al. 1994; Skinner, Siegfried, Kegler, & Strecher, 1993). Importantly, the overall program can still appear “seamless,” despite the presence of numerous alternative branches.

Ease of use. A final advantage of the IMM format is that we can make it very simple to use. Users will need only minimal instruction in getting started with the program, and will be guided by the narrator on all aspects of program use. Even children with no computer or reading skills will be able to easily use the program, as was demonstrated in the evaluation of our prototype program.

SUMMARY OF PHASE II ACTIVITIES

The project was divided into 10 tasks:

1. Conduct meetings of the ORCAS Safety Education Advisory Panel (established for the Phase I project and composed of parents, educators, and safety officials) to provide input on content and format throughout the development process.
2. Conduct interviews with traffic and safety officials to ensure that all critical content is included.
3. Conduct focus groups with elementary curriculum coordinators, classroom teachers and parents to determine how to maximize the utility of the program for home and classroom use.
4. Conduct instructional analysis of content, and design teaching examples.
5. Design overall program (i.e., flowchart, storyboard, and script).
6. Produce and edit animation and video.
7. Develop control programs in Lingo and HTML/CGI.

8. Pilot test program; revise and re-test as needed.
9. Develop parent-teacher manual and videotape.
10. Evaluate program efficacy on a sample of 240 students in grades K-3.

Program Development (Tasks 1-9). Formative evaluation procedures (i.e., interviews and focus groups) were employed to (a) identify key content for the pedestrian safety program, (b) develop specific program objectives and (c) determine the acceptability (to parents and teachers) of using a multimedia approach for training pedestrian safety skills.

In Task 1, the Project Advisory Group was assembled to discuss the content and format of the program. The project advisory group was made up of parents, educators, state health and injury prevention specialists, and school district technology specialists. Advisory group discussions were audiotaped, transcribed, coded, and reviewed. Key concerns were listed and prioritized for integration into the multimedia program.

In Task 2, interviews with six traffic and safety officials were conducted. As with the advisory group meetings, interviews were audiotaped, transcribed, coded, and reviewed. Traffic and safety officials' concerns were listed and prioritized for use in modifying the priority listing created from the findings from Task 1.

Because the input needed for content refinement could be gathered individually, we did not conduct additional focus groups with educators and parents. Instead, for Task 3, we interviewed 4 educators, 2 principals, and six parents, each of whom represented different school and community contexts. Information from audiotaped transcriptions was integrated into program design.

In Task 4, the instructional analysis was completed and the teaching examples were designed. The instructional content, program examples, and instructional sequence were created to be consistent with the standards established by AAA and the National Traffic Safety Council.

In Task 5, video scripts and program flowcharts were designed based on the instructional content established in Task 4.

In Task 6, animations to teach core street-crossing skills were created. We worked with Moving Image Productions (MIP) to produce video-based teaching examples depicting real-life traffic situations. MIP also produced introductory, concluding, and transition video footage for the program.

In Task 7, the control program was developed in Director, using Lingo. The video and animation segments were incorporated into the program as Quicktime digital video movies.

In Task 8, 30 youngsters in the target age group viewed the program. Program revisions included adding additional teaching examples, refining remedial logic, and adding narration to clarify the instructional task. The program development process was one we have used previously, and is described in more detail elsewhere (Noell, Ary, & Duncan, 1997).

Parent and teacher materials were developed in Task 9. We created draft materials based on guidelines national and local pedestrian safety commissions, as well as safety experts on our consultant panel. Materials contained basic pedestrian safety information and rules. The materials were reviewed by a panel of local parents and teachers and evaluated for clarity, usefulness, and attractiveness. Final versions of the materials were placed on the CD-ROM in pdf format.

Program Evaluation (Task 10). A random control design was employed to evaluate the program with 96 children in grades 1-3. Students were randomly assigned to either the treatment condition (Walk Smart) or the control condition (a video on bike safety)**.** Both groups spent approximately 15 minutes viewing either the treatment or control program in the computer lab at their school. Pre and post-test measures involved the assessment of student ability to safely navigate six realistic street-crossing scenarios on the computer. When each scenario appeared on the computer screen, the students were asked to identify any dangerous cars that could hit them if they crossed the street. For each student the proportion of correctly identified dangerous vehicles was averaged across the five situations presented. Thus, each student received a percentage score for the proportion of correctly identified dangerous vehicles at pretest and post-test. In addition, all subjects were observed using the system and debriefing interviews were conducted to learn about satisfaction with program interface and design, and overall satisfaction with the program.

In order to ensure that any pre- to post-test differences were not due to enhanced keyboarding and mouse skill gained in using the program (i.e., knowing how to locate and depress the mouse; moving in the 3D environment), students were pre-trained in using the mouse and keyboard to navigate and indicate their responses through a computerized mouse training segment. First, using video examples, the student were taught to click the mouse button to move forward, press the control key to move backwards, turn the mouse left and right to navigate, and answer questions by pressing "Y" on the keyboard for yes and "N" for no. Then, the student navigated through a small 3D environment which required mastery of each of the mouse and keyboarding features to complete. The pretest followed directly after the mouse practice segment.

To determine the degree to which the skills learned in the simulated environment transfer to real-life traffic situations, we conducted post observations of a subset of students (10 treatment, and 10 control) in real-life traffic situations. Each student, accompanied by a research assistant (RA), was taken to a four-way intersection and observed three different traffic configurations, two with traffic signals and one with a stop sign. For each configuration, the RA indicated the direction that the student would pretend to cross. Students were asked to indicate when the light said it was their turn to cross. Then, the RA asked the student, “Are there any cars that could cross you path?” The RA indicated on the assessment protocol which vehicles the student identified as dangerous.

Each subject completed a social validation measure following the completion of the program. The RA asked them the following questions:

1. How did you like this program?
2. How important is the information in the program?
3. How easy was it to use this program?
4. Would you tell your sister/brother/friend to use this program?
5. Would you look at a program like this at home if you had it?
6. Would you look at a program like this at school if your teacher had it?

Subjects responded by pointing to a Likert type scale of “faces,” ranging from most or very much (smile) to least or not at all (sad face).

RESULTS

Development (Qualitative) Findings (Tasks 1 -3)

Qualitative findings from interviews, focus groups, and advisory group meetings focused on both content and presentation variables. Interviewees, advisory board members and focus group attendees thought that the proposed content, based on standards set by AAA and the National Traffic Safety Council, was appropriate. They agreed with our intent to show children *what* to look for (cars that can turn in an intersection) in addition to *how* to look for them (look left-right-left). In addition, they provided specific situations that should be included in the program to provide a sufficient range of examples (e.g., crossing mid-block, driveways, and parking lots). Interviews with early elementary educators and safety consultants helped guide navigation and language so that the program would be accessible to students in grades K-1.

In terms of presentation, traffic safety officials felt that many children are “frozen in fear” at intersections. The goal of the program should be to teach children that intersections can be safely crossed, if you understand how signals operate, and how cars can turn in front of you.

Program description. The Walk Smart program begins with an introductory segment by two young child narrators on the importance of learning street crossing skills. The young narrators introduce the student to the topics that will be covered in the program and the “under 10” rule (children under age 10 should be accompanied by an older person. The user is then introduced to two older, teenaged narrators who serve as the user's guides through the program. The user chooses which teenager they would like to have as their guide. The user is also introduced to the animated star shaped character named Bright who the user follows throughout the program. When they reach Bright safely in each environment, the user collects stardust and wins a prize. The prize is a carnival-like balloon popping game, which is designed to give the user a 30 second break between learning segments.

There are four major instructional units: stay on the sidewalk, signal practice, traffic direction, and skill integration. Each unit builds on the previous ones, reviewing key skills and providing practice and remediation within each unit. In the skill integration unit, the user is in a 3D environment from a first person perspective. They are asked to respond to a traffic situation by using all of the skills that have been taught: responding quickly to the traffic signal, identifying cars that are dangerous, looking left, right and left again, and indicating when it's safe to cross.

The program uses 3-D animated graphics to present the prerequisite component skills for each unit. Following the series of animated instructional examples, the user applies the skills that have been taught on test examples. Errors are analyzed by the computer (e.g., identified only one of two vehicles that present a danger to crossing), and the computer presents remedial instructional examples that are tailored to fit the user's errors.

Evaluation (Quantitative) Findings

Attrition analysis. Of the 96 students who participated in the pretest 85 (89%) returned for the posttest. Attrition analysis making use of chi-square and t-test were used to compare students who completed the program versus those who did not. The groups did not significantly differ on treatment condition, gender, grade, or total number of threats and non-threats correctly identified during the pretest. This evidence suggests the attrition from pretest to posttest does not have serious implications for the internal validity of this study.

Demographic characteristics. Sex and grade of the participants were collected during the study (see Table 1). As one would expect from randomization of intervention conditions the groups did not significantly differ on either characteristic. However, the control group had slightly more females than the intervention group (52.6% versus 47.8% respectively) and less third grade participants (31.9% versus 39.5% respectively).

Main analysis. A between-subject analysis of covariance (ANCOVA) was used to evaluate the effectiveness of the computer program in teaching participants to correctly identify dangerous and non-dangerous vehicles and safe intersections to cross. The primary outcome measures were the number of dangerous vehicles correctly identified (7 items), number of non-dangerous vehicles correctly identified (8 items), and number of intersections correctly identified as safe to cross (3 items). Within each ANCOVA model the pretest score for the outcome measure was treated as a covariate to ensure observed differences between intervention conditions at posttest were not the result of naturally occurring differences in baseline knowledge of pedestrian safety.

Table 2 shows the average number of dangerous vehicles, non-dangerous vehicles, and safe intersections correctly identified as a function of treatment condition. Average differences between experimental intervention conditions on the three outcome measures at pretest were examined. The largest difference between conditions was identifying non-dangerous vehicles. The control condition showed slightly higher average scores (Mean=6.1; SD=1.0) compared to the treatment condition (Mean=5.6, SD=1.6). At posttest the treatment condition scored significantly higher when identifying dangerous [f(2,84) = 25.0; p <.001] and non-dangerous vehicles [f(2,84) = 39.1; p <.001]. The observed differences correspond to a medium effect based on the eta-squared coefficient (Cohen, 1988). The two groups did not significantly differ on the number of intersections correctly identified as being safe to cross [f(2,84) = 3.21; p =.078], but there was a trend for the treatment condition to score higher at posttest.

Separate models were run for boys and girls on the three outcome measures. The pattern of significance (i.e., significant differences in correctly identifying vehicles but not intersections) did not differ by gender. However, based on the eta-squared coefficient as a measure of effect size the intervention appears to be twice as strong for girls compared to boys when identifying dangerous (.39 versus .14) and non-dangerous (.42 versus .22) vehicles.

Posttest measures obtained during the real-life simulation with 10 treatment and 10 control subjects were examined to determine the degree to which skills learned in the program generalized to actual traffic situations. Like the computer simulation, outcome measures were the number of dangerous vehicles correctly identified (5 items), number of non-dangerous vehicles correctly identified (3 items), and number of intersections correctly identified as safe to cross (2 items). Given the relatively low number of items assessed in the real-life situation compared to the computer simulation a total score was computed using all 10 real-life items (treatment mean = 8.9, SD = 0.8). The Pearson correlation coefficient for treatment participants between the 10-item real-life posttest score and the 18-item computer program posttest score (treatment mean = 15.4, SD = 2.5) was not significant at .12 indicating only a small relationship between the computer program posttest score and real-life posttest score.

Table 1.

	Treatment (N = 38)		Control (N = 46)			
	N	%	N	%	?2	p-value
Gender (% female)	22	47.8	20	52.6	0.19	.661
Grade					0.82	.665
First	16	42.1	20	42.6		
Second	7	18.4	12	25.5		
Third	15	39.5	15	31.9		

Table 2.

Outcome Measure	Pretest				Posttest				Test Statistic	
	Treatment		Control		Treatment		Control			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F-value (p-value)	η^2
Dangerous vehicles	4.9	2.0	4.6	1.9	6.4	1.0	4.6	2.0	25.0 (<.001)	.23
Non-dangerous vehicles	5.6	1.6	6.1	1.0	7.0	1.4	5.5	1.5	39.1 (<.001)	.32
Safe intersections	1.4	0.6	1.4	0.6	2.0	0.7	1.7	0.7	3.2 (.078)	.04

Notes. SD = standard deviation; η^2 = eta-squared.

DISCUSSION

The purpose of this evaluation was to determine if the use of the *Walk Smart* program led to increased knowledge and application of pedestrian safety skills – in particular, the ability to read traffic signals, walk in a safe place, and discriminate which cars could cross a path in an intersection. The results of the field tests indicate that students did learn the content areas. Most notably, students in the treatment group significantly improved in their ability to identify dangerous vehicles and discriminate non-threat vehicles in the computerized measures. The main limitation of our findings was that there was not a significant correlation between viewing the *Walk Smart* program and measures of traffic discrimination in a real-life intersection test. Given that only a small subset of participants (N=20) completed the real-life intersection test, this finding can be interpreted with caution. However, this may suggest that the *Walk Smart* program can form an important component of a pedestrian safety package that includes both skills based and experiential training.

The main criticism of available behaviorally-based safety education programs involves their staff intensive nature and related costs. The major advantage of a software program to teach pedestrian safety is the efficiency and cost. If students can be taught key pedestrian skills in a simulated environment, teachers can more efficiently translate these skills to examples in real environments. We believe this program is an improvement over other safety curricula given its success with teaching component pedestrian skills to mastery, and can form an important component of pedestrian safety training in the schools.

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