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A MULTIMEDIA PEDESTRIAN SAFETY PROGRAM AND SCHOOL INFRASTRUCTURE: FINDING THE CONNECTION TO CHILD PEDESTRIAN RISK-TAKING ATTITUDES AND RISK PERCEPTIONS OF PEDESTRIAN BEHAVIOR

by

DIANA DAWN SCOTT
B.S. University of Central Florida, 2010

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Arts in Applied Learning and Instruction
in the School of Teaching, Learning and Leadership
in the College of Education and Human Performance
at the University of Central Florida
Orlando, Florida

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Major Professor: Bobby Hoffman

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ABSTRACT

Approximately 47,700 pedestrians were killed between the years of 2000 - 2009. School buses are one of the safest modes of transportation (National Highway Traffic Safety Administration, 2004). However, the Central Florida school district eliminated bus transportation within the 2-mile radius from schools just last year. Children must prepare for an alternative mode of transportation; walking and biking. The purpose of this research was two-fold. First to develop an online safety training program for elementary school children; and second, a self-report questionnaire was constructed and piloted to measure how safety training and school infrastructure affects students' pedestrian risk-taking attitudes and risk perceptions to avoid the dangers of walking and biking to and from school.

A 2x2 Factorial Multivariate Analysis of Variance (MANOVA) was used to test two categorical independent variables (safety awareness training, school infrastructure) for each of the two continuous dependent variables (pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior). Using data from the pilot study, the researcher developed, self-reported questionnaires demonstrated that there was a significant difference between schools. Those receiving the training had lower mean scores in risk-taking attitudes than those who did not receive the training. Regardless of intervention, School 2 (complete infrastructure) takes fewer risks than School 1(incomplete infrastructure). The mean difference between groups was not statistically significant.

This work is dedicated to my support team of family and friends, and to the elementary school children who participated in my research. Remember to follow life's rules, set boundaries, stay safe, but have fun!

"The purpose of government is to enable the people of a nation to live in safety and happiness…" – Thomas Jefferson

ACKNOWLEDGMENTS

Research is seldom accomplished by one person, it's a team effort! In my case, my team consisted of the participation of my UCF Thesis Committee; community leaders; FDOT; the local County School Board; the elementary school faculty, staff and students; friends; family; and God, who all played a major role in my success.

UCF - The support and guidance that I received throughout this process by my committee members, Dr. Bobby Hoffman (Chair), Dr. Robert Porter, and Dr. Stephen Sivo, were indeed welcomed. Your unique ways of support contributed to my understanding of research, methods and its development into an applied learning tool for the schools in Central Florida. To the professor at the UCF Castle Lab, Dr. Clark, thank you for your instruction and patience when working closely with me on my design. To the Writing Lab (Brandy) and the Graduate Studies Office, thank you all for your guidance and instruction; you are a valuable team, and an integral component to the success of my program

Community Leaders - Connections through the community and governmental agencies contributed to the direction of my topic. To the Executive Director of Lake~Sumter MPO, T.J. Fish and his team, thank you for your assistance in making those much needed contacts to the Florida Department of Transportation, the Lake County School Board, Costa DeVault and other community connections. To Michael Woods, MPO Transportation Planner, for the enlightenment of the transportation concerns of many parents and communities. Thank you for your support. To Senior Officer Mike Howard and his team at the Leesburg Police Department, thank you for your time and effort to "fit" the helmets for the children and support with both schools.

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Thank you to *Safe Access to Schools* for allowing this research to "piggy-back" onto your study of roadway infrastructure, and for allowing access to your website for my safety awareness program (i.e., Safety4Schools). A huge thanks to Christian Diamante, Wed and Interactive Director at Linda Costa Communication Group. Your patience and skills were beneficial to connecting the training to the website without too many of my self-created obstacles.

Friends - To Alex Bruno, Lake Sumter State College Spanish Professor, thank you for English to Spanish translation of the parental consent summary and your positive attitude and encouragement that helped motivate my tired, broken, and exhausted body. To Brenda Thompson, thank you for believing in me and for your words of encouragement when I was becoming overwhelmed with personal issues.

Family – Daughter Ashley, DJ, Shelby and Kyla, thanks for your hard work as my talented actors in the safety videos. To Mom, Dad, and my sister Suzie; thanks for your constant emotional support and love. Finally, to my husband Eric, thank you for your unconditional love, support, patience and encouragement. Thanks for allowing me to read my entire thesis to you. Eric, without you, attending college and taking my time enjoying every moment of this experience, would not have been possible. – I love you!

Not *my* will God, but ***Thy*** will be done.

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LIST OF ACRONYMS

BPAC - *Bicycle/Pedestrian Advisory Committee*: Advisory committee that examines alternative routes and forwards recommendations to Lake-Sumter MPO on bicycle and pedestrian issues.

DOT – *Department of Transportation*: Agency responsible for transportation at the local, state, and federal level.

FDOT – *Florida Department of Transportation*: State agency responsible for transportation issues in Florida.

FHWA - *Federal Highway Administration*: The Federal agency within the U.S. Department of Transportation responsible for administering the Federal-aid Highway Program.

GIS – *Geographic Information System*: A technology that integrates the collection, management and analysis of geographic data.

MAP-21- *Moving Ahead for Progress in the 21st Century*

MPO – *Metropolitan Planning Organization*: The forum for cooperative transportation decision-making; required for urbanized areas with populations over 50,000

SAFETEA-LU - *Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users*

SAPP - *Safe Access Priority Project*

SR2S - *Safe Routes to Schools*

TAP - *Transportation Alternatives Program*

LIST OF DEFINITIONS

- **Allocation**. An administrative distribution of funds for programs that do not have statutory distribution formulas.
- **Apportionment**. The distribution of funds as prescribed by a statutory formula.
- **Authorization Act**. Basic substantive legislation that establishes or continues Federal programs or agencies and establishes an upper limit on the amount of funds for the program(s). The current authorization act for surface transportation programs is the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).
- **Bicycle.** A vehicle propelled solely by human power or a motorized bicycle propelled by a combination of human power and an electric helper motor rated at 200 watts or less.
- **Bicyclist.** The driver of a bicycle. (A passenger on a bicycle is considered a vehicle passenger).
- **Bike Lane.** A portion of roadway which has been designated for the preferential or exclusive use by bicyclists.
- **Bikeway.** Any road, path, or route which in some manner is specifically designated for bicycle travel.
- **Budget Authority**. Empowerment by Congress that allows Federal agencies to incur obligations that will result in the outlay of funds. This empowerment is generally in the form of appropriations. However, for most of the highway programs, it is in the form of contract authority.

- **Chicane.** A traffic control measure that reduces the speed of vehicles by providing a narrowed vehicle travel path for a section of roadway.
- **Crosswalk.** Section 316.003 (6a) states - part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway, measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway. Section 316.003 (6b) - any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.
- **Driver.** The operator of a motor vehicle or bicycle.
- **Fatal Traffic Crash.** Traffic crashes that results in one or more fatalities within thirty days of occurrence (See also Traffic Fatality).
- **Fiscal Year (FY)**. The accounting period for the budget. The Federal fiscal year is from October 1 until September 30. The fiscal year is designated by the calendar year in which it ends. For example, FY 2006 runs from October 1, 2005, until September 30, 2006.
- **Harmful Events.** Identifies the first and subsequent harmful events for each vehicle in a traffic crash.
- **Injury.** Hurt, damage, or loss sustained by a person as a result of a traffic crash. Definitions for the various injury levels are as follows*:* Possible injury - No visible signs of injury but complaint of pain or momentary unconsciousness; Motor vehicle injury - any motorized vehicle not operating on rails; Traffic crash injury - a crash involving at least one motor vehicle on a roadway that is open to the public; Traffic fatality - the

death of a person as a direct result of a traffic crash within thirty days of the crash occurrence; vehicle and/or property- loss of all or part of an individual's vehicle and/or property damage.

- **Risk Perception.** “takes into consideration individual or situational differences in the way risks are perceived before labeling a particular choice or behavior as risk-seeking or risk-adverse”
- **Risk-Taking Attitude.** The degree to which an individual appears to avoid or seek out risky options or behaviors
- **Sidewalk.** 316.003 (47) The portion of a street between the curb line, or the lateral line.
- **State.** For the purposes of apportioning funds under sections 104, 105, 130, 144, and 206 of Title 23, United States Code, and section 1404 of SAFETEA-LU (relating to the Safe Routes to School program), the term “State” is defined by section 1120(c) of the SAFETEALU to mean any of the 50 States and the District of Columbia.
- **Traffic Calming.** The combination of design and policy measures that reduce traffic speed and volumes, alter driver behavior, improve conditions for pedestrians and bicyclists, and generally enhance the livability of an area.
- **Traffic Calming Measures.** The design elements in or along a street or intersections that advance traffic calming objectives to slow vehicular speeds or reduce cut through traffic, but not restrict access to a street (i.e., roundabouts, diverters, partial-diverters, chicanes, speed humps, or raised pedestrian crosswalks).

- **Traffic Control Devices.** Signs, signals, and markings designed to regulate, warn, guide and provide information for motorists.
- **Vehicle Occupants.** Drivers and passengers of automobiles, vans, trucks, buses, and motorhomes.

CHAPTER ONE: INTRODUCTION

Child pedestrian deaths are on the rise. The Florida Department of Transportation (FDOT) revealed that approximately 47,700 pedestrians were killed during 2000 - 2009. School busses are considered one of the safest modes of transportation (National Highway Traffic Safety Administration, 2004). Therefore, many parents rely on public school buses to safely transport their children to and from school (Federal Highway Administration). However, buses for high schools in the Central Florida area have been eliminated for those students who live within a 2-mile radius (i.e., parent responsibility zone) of the school. Middle and elementary schools in Central Florida have just lost their bus transportation within the zone 2013 (MPO Research). Therefore the need for connectivity of sidewalks and pathways within communities are increasing. In addition, bicycle and pedestrian safety training programs must be administered to the Central Florida area students before bus elimination to prepare the students for this new mode of transportation; walking and biking to school.

Some of the Central Florida area schools' infrastructures are not pedestrian ready. This means that children must walk to school on sidewalks that are broken or cross streets without crosswalks, traffic signals or crossing guards. Complete streets, which are streets that allow for all modes of transportation including; vehicles, bicycles, and pedestrians, are becoming necessary for children to safely walk or bike to school. The school district should complete the streets before enforcing this action of bus elimination. In 2001, 55% of children were transported via car to and from school; increasing the amount of traffic around the school; thus increasing the dangers for children traveling on foot (Wilson, Wilson, & Krizek, 2007). In order to develop a plan to address this alternative mode of transportation, the Safe Routes to School program through Safe Access to Schools has been proposed. The goals for the Safe Access Transportation Study are: 1) to analyze transportation access to schools and provide recommendations for improvement of sidewalks and roadways, 2) to encourage continued coordination of collaboration among agencies that impact students who walk or bicycle to and from school, and 3) to provide project ideas for future funding opportunities for improved sidewalks and roadways.

With the Central Florida area counties eliminating courtesy buses within the 2-mile radius (i.e. "Parent Responsibility Zone") from schools, children must embrace the idea of this alternative mode of transportation. However, the children must be prepared to undertake this task of walking 2 miles safely to and from school. Research indicates there are many factors that influence risky choices, who take these risks, and what decisions impact these choices. One such factor is gender; risk-taking is more evident in the male gender than female (Harris & Jenkins, 2006; Dohman, 2005). Height also has an impact on whether one is more risky in financial matters (Dohman, 2005). Dohman (2005) also found that ones' willingness to take risks are greater for younger people than those who are older. However, children who take greater risks are not weighing all the options before making a decision and ultimately must live with the consequences of those risks (Harbaugh, Krause & Vestelund, 2002).

This study focuses on pedestrian risk-taking attitude and risk perception of pedestrian behavior. Risk-taking attitude is the "degree to which an individual appears to avoid or seek out risky options or behaviors" (Weber, Blais, & Betz, 2002. p. 267) and risk perception "takes into consideration individual or situational differences in the way risks are perceived before labeling a particular choice or behavior as risk-seeking or risk-adverse" (Weber, Blais, & Betz, 2002. p. 267). These dangerous risks often result in pedestrian accidents. Therefore, it is important to discover if risk-taking attitudes and risk perceptions of pedestrian behavior could be influenced through an online multimedia safety awareness program for our younger generation.

Parent's education influences risk choices of children; the greater the education, the more likely the child will indulge in risky behavior (Dohman, 2005). This finding is positive for low income families; children of most low income households do not have parents who have attended college. Additionally, low income families have less vehicle ownership and rely on public transportation. Ewing, Schroeer and Greene (2004) found that lower income households are more likely to walk to school than middle or upper class income level families. Fifteen to eighteen percent of students from schools that are considered high minority schools (e.g. schools with a larger percent of minorities: African American, Hispanic, Asian, Indian, and mixed race), walk or bike to school, in contrast to only one percent of students from low minority schools (e.g. schools with a larger percent of majorities: Caucasian) (MPO Research). However, McDonald (2007) found that the decline for walking between 1977 and 2001 is higher for minorities.

Despite the abundance of research conducted that finds potential health benefits of walking to school (Boarnet, Day, Anderson, McMillan, & Alfonzo, 2005; McDonald, 2007; Timperio, Crawford, Telford, & Salmon, 2004), there is still a steady decline of this mode of transportation between both majority and minority students (McDonald, 2007). In other words, even the children from the ethnic minority population, who would most often walk or bike to school, are not inclined to do so. However, ethnic minority children often do not have alternative transportation, and are forced to walk whether they are prepared to make safe choices or not. There is also sufficient research on the convenience of parents who drive children to and from school (Ewing, Schroeer, & Greene, 2004). However, there is little research conducted with multimedia training and on whether the children's pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior influence their safety decisions while walking or biking to and from school.

Furthermore, roadways are complex environments and children are not educated on road safety in the same manner as motorists. However, we expect our children to watch out for traffic when walking across the street or when riding a bicycle. For instance, children must watch for turning vehicles and ride on the outside of the "door zone" of parked cars. Moreover, children must ride their bikes carefully and watch for debris, potholes, and utility covers. Crossing railroad tracks is a difficult task for young riders because they must cross at right angles while staying in the bike path or in the marked area of the road to avoid steering into traffic (FDOT, 2012). In order for children to predict what drivers, other pedestrians and bicyclists will do next, the children must obey the rules of the road by reading a plethora of traffic signs. Children are expected to quickly evaluate risk choice and understand traffic laws without pedestrian safety training.

There are a few pedestrian safety training programs in Central Florida that could prepare children to make safer pedestrian choices; one program is the Children's Safety Village of

Central Florida. This is an educational program best designed for school field trips, however there is a fee to attend and the children must travel by car or bus to arrive. Furthermore, there are an abundance of programs that promote pedestrian and bicycle safety through awareness campaigns, and infrastructure improvements (e.g., repairing crosswalks, sidewalks, street signs, etc.) such as: Bike/Walk Central Florida; FDOT Alert Today, Alive Tomorrow; Best Foot Forward; Safe Routes to Schools; Ped/Bike; Local Police Departments; and through the many Metropolitan Planning Organizations (MPO). Additionally, the Walking School Bus program coordinates with school and community officials to help develop safe routes for the children's journey to school. Additionally, one could order children's safety videos through Safe Access to Schools, or download presentations for parents and teachers, however, there is no "official" safety awareness program, and designed specifically for children to easily access independently that promotes positive pedestrian risk-taking attitudes and behavior. Through this research, a multimedia safety program, linked to Safe Access to Schools' website, was designed to increase pedestrian risk-taking attitudes and improve the children's risk perception of pedestrian behavior.

Objective

This study builds on Lake Sumter MPO's existing "Transportation Master Plan" study of Phase 2 (a Central Florida county), by developing a free online safety awareness program "Safety4School", in collaboration with Safe Access to Schools, that will enable the students to access a child-user friendly informational resource that will work in conjunction with Phase 4 (implementation) of the SR2S program. This pilot study on 4th and 5th grade elementary students will examine safety awareness effects of student pedestrian risk-taking attitudes and risk perception of pedestrian behavior, combined with school infrastructure, to avoid the dangers of walking and bicycling.

Research Questions and Hypotheses

This study is guided by two questions:

1) Does a bicycle and pedestrian safety awareness program positively influence pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior in children?
2) Does the schools' infrastructure promote positive outcomes in the children's pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior?

Under these guiding questions, this pilot research will attempt to answer these questions and test the following hypotheses:

- Hypothesis 1(a) posits that students who receive pedestrian safety awareness training will show lower mean scores in pedestrian risk-taking attitudes than those who do not receive the training.
- Hypothesis 1(b) posits that complete school infrastructure combined with the safety awareness training will produce the lowest mean score on the risk-taking attitude scale.
- Hypothesis 1(c) posits that incomplete school infrastructure and no safety awareness training will produce the highest mean scores on the risk-taking attitude scale.
- Hypothesis 2(a) posits that students who receive pedestrian safety awareness training will show higher mean scores in risk perceptions of pedestrian behavior than those who do not receive the training.

- Hypothesis 2(b) posits that complete school infrastructure combined with the safety awareness training will produce the highest mean scores in risk perception of pedestrian behavior scale.
- Hypothesis 2(c) posits incomplete school infrastructure and no safety awareness training will produce the lowest mean score on the risk perception of pedestrian behavior scale.

All data from individuals were aggregated during analysis and no individual information was disclosed. Only summary statistics were reported and discussed in the written report after aggregation. No individual information was distributed in the final report or thereafter.

Limitations and Delimitations

A chief advantage of survey questions is that they offer a direct measure of individual attitude and perceptions; avoiding the need to recover behavioral parameters by making general assumptions. Another advantage is measuring attitudes and perceptions at relatively low/no cost, because the questions are hypothetical and do not involve the act of the participants' adventures listed in the survey questions (Appendix A and B). A disadvantage of using hypothetical survey questions, however, is that they might not predict actual behavior of the participants.

Self-reporting through surveys is limited by the ability of the students forthcoming about perceptions and attitudes. In addition, quantitative data are often limited by the ability of the participants to articulate and expand their thoughts and feelings. Furthermore, quantitative research is limited by the questions asked and no discussions can be made on the responses given by the participants. The data in this study were gathered from a small sample of fourth and fifth grade children, and is limited to a selected geographic area of one county in Central Florida. No attempt was made to seek and segregate responses based on culture or socio-economic status. However, data was gathered from the school records indicating the culture as a whole for the school population.

Organization of the Thesis

This thesis is divided into five chapters. Chapter One is an overview of the study and the problems to be researched. Chapter Two provides a synopsis of relevant literature and research on pedestrian injuries, modes of travel and school placement, Safe Access to Schools, pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior, cognitive load theory as it relates to website design and multimedia learning. Chapter Three focuses on the design of the study and offers a description of the methodology used. Chapter Four details the analysis of the results. Finally, Chapter Five offers a discussion of the research and conclusions reached. Furthermore, recommendations are made for further research.

Summary

The elimination of school buses in Central Florida is beyond the control of students, parents, and even the schools. With this new legislative action being thrust upon thousands of students living within the 2-mile radius from their school, the students will be forced to walk or bike. Their safety depends on the schools and their families actions to prepare them. However, this safety awareness course, created for this pilot study, is an independent learning program that exposes the children to safe pedestrian procedures and promotes safety. While there are studies on pedestrian behavior, such as street crossing, risk-taking, and engineering measures for improving the infrastructure of the roadways, there are limited studies available on surrounding infrastructure and whether the children's pedestrian risk attitudes and risk perceptions of pedestrian behavior influence their safety decisions while walking or biking to and from school. Therefore, this study contributes to pedestrian safety by implementing the safety awareness online training course (Safety4Schools) within the Central Florida area to over 60 school campuses.

CHAPTER TWO: REVIEW OF LITERATURE

Renaud and Suissa (1989) avow that pedestrian safety involves three factors: 1) State laws; 2) Infrastructure (i.e., land use); and 3) Education of public safety. This review of literature investigates the aforementioned factors, thus beginning with the investigation of the many different travel modes for school-age children, school placement, and the statistics on pedestrian injuries, particularly in Central Florida; followed by an overview of State laws passed that promote two pedestrian safety programs: Safe Access to Schools and Safe Routes to School. Additionally, an investigation of the two participating schools' infrastructure was analyzed to define the terms "complete infrastructure" and "incomplete infrastructure" for the purpose of this pilot study. Additionally, this study will investigate pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior in children to include in the development of an online safety awareness program. Finally, this review will explore the cognitive science behind the development of a multimedia educational tool to promote pedestrian safety.

Travel Modes and School Location

Travel mode has shifted greatly over the years, from 1969 with nearly 50% of students walking or bicycling to fewer than 15% of children walking or bicycling to school today. School busses are considered one of the safest modes of transportation (National Highway Traffic Safety Administration, 2004) therefore; many parents rely on public school buses to safely transport their children to and from school with nearly one-fourth of children riding the bus (Federal Highway Administration). With the elimination of the 'courtesy" school busses from servicing children who live within a two mile radius of their school (Parent Responsibility Zone; see Figures 1 and 2 for clarification), safety concern for families living in Central Florida is great (Federal Highway Administration, 2004).

Figure 1: Parent Responsibility Zone (School 1)

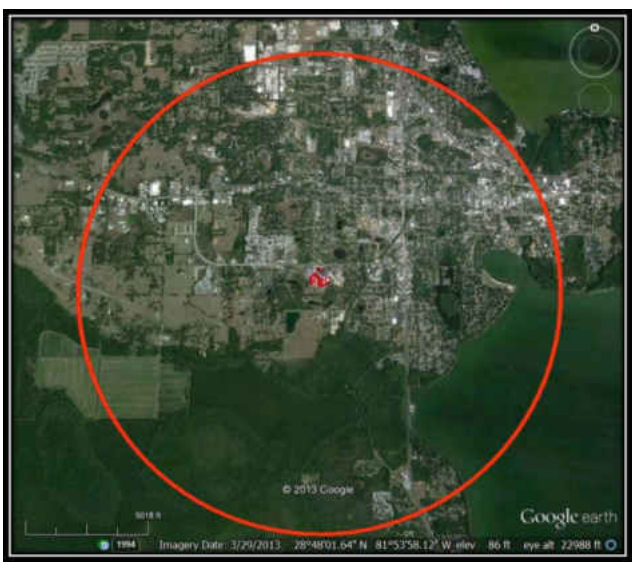


Figure 2: Parent Responsibility Zone (School 2)

Growth (i.e., urban sprawl and infrastructure) in recent years, along with school zoning and school site placement in Central Florida may have contributed to this dramatic change in children's travel mode. The Florida State School Board is an independent entity of the local government, therefore, can make financial decisions regarding the purchase of school sites without the input or permission from the local government (Boles, 2005). Often schools are built on properties donated by an individual or entity regardless of its location (see Figure 2) or connectivity (i.e., the completion of sidewalks and path ways) adding to the future need for additional school sites. The new additional schools built may alleviate the student population in the surrounding schools; however, the locations of these schools are often not strategically plotted for multimodal planning which may increase traffic and pedestrian safety concerns (i.e., bicyclists sharing the roadway with motorized vehicles without proper roadway construction).

Throughout the United States school sites are increasing in size each year (Weihs, 2003) with Florida's schools ranking amongst the largest in the nation as of 2000 (Florida Department of Education, 2000). Although allowing for some flexibility, many states generally follow a formula to determine an elementary school site size: Site =10 acres + 1 acre for every 100 students. However Florida's acreage minimums are relatively smaller, based on the national averages recommended by the Council for Educational Facilities Planners (CEFPI) (Weihs, 2003). The larger size school sites may add to pedestrian accidents by increasing the travel distance in which children must walk or bicycle (Weihs, 2003) and may eliminate the choice to walk or bike altogether (Wilson, Wilson, & Krizek, 2007).

McMillan et al., (2006) certify that children living within one mile from a school will most likely walk or bike. However, this does not seem to be the case on the outskirts of Central Florida where the streets are not designed for pedestrians. Burden (2002) conducted a study on street design throughout America. Burden found that street size regulation in residential areas should be approximately 26 feet in width with a curb and sidewalks at five feet in width. Several locations observed for this current research have sidewalks that are three feet wide with grass growing over the majority of the concrete leaving only two feet in some locations open for pedestrian use. Additionally, if infrastructure of streets were designed with trees, sidewalks and had shorter block lengths, then children are more inclined to walk (McMillan, 2003). A study in Norway found that adolescence in urban neighborhoods walked three times farther to school than those who lived in rural areas due to the presence of sidewalks (Sjolie & Thuen, 2002). Therefore, placing schools in pedestrian friendly, residential neighborhoods may be an effective way of promoting walking and bicycling to school and convince parents to allow this mode of transportation (Sjolie & Thuen, 2002).

With the student population almost doubling in Florida in the last thirty years (Boles, 2005) and the number of children walking and bicycling to school declining within the last twenty years (Killingsworth & Lambing, 2001; McDonald, 2007), there is valid concern for safe roadways. Traffic congestion plays another important factor on parent's decision to allow their children to walk to school (Steiner & Crider, 1999). There is concern that hazardous walking conditions (i.e. narrow sidewalks built too close to the roadway; broken concrete on sidewalks; no crosswalks; and even busy traffic on the route to school) also limit parents' decision, thus increasing the traffic congestion around the school during pick-up and drop-off times (Steiner & Crider, 1999). The term for this cycle of parents wanting to protect their children from pedestrian injuries and the increase of traffic congestion is: the "traffic threat multiplier effect" (see Figure 2.3) (Appleyard, 2003).

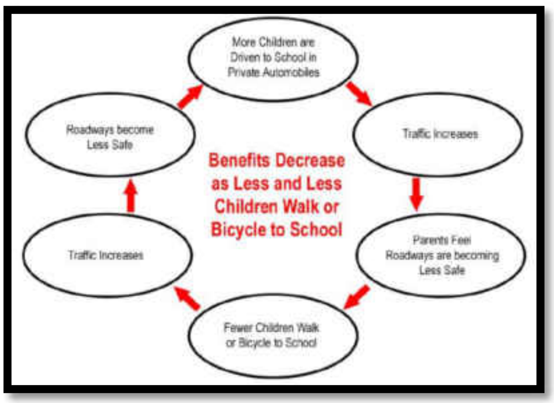


Figure 3: The Traffic Threat Multiplier Effect

Note. As the traffic near the schools increase, the feelings of pedestrian safety decreases and the parents of the students will most likely drive their children to school (Appleyard, 2003).

Pedestrian Injuries

Parents may have good reason to fear that their children may be involved in pedestrian accidents. During a span of ten years (2000 to 2009) in the United States, approximately 47,700 pedestrians were killed (FDOT, 2004). The Transportation for America report compares that to "a jumbo jet full of passengers crashing roughly every month," and 688,000 pedestrians injuries was compared as an "equivalent to a pedestrian being struck by a car or truck every 7 seconds" (Ernst, 2011. p.1). The analysis shown in Table 1 compares a one year (2007) national average of injuries in the United States.

Table 1
Non-traffic Crash Fatalities and Injuries in USA

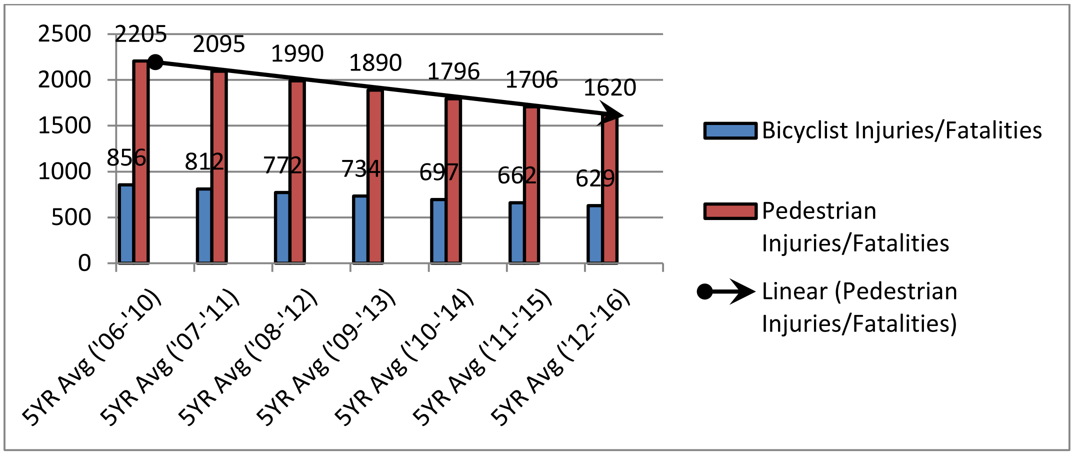
	Fatalities	Injuries
Non-occupant in Non-traffic Back over Crash	221	14,000
Other Non-occupant in Non-traffic Crash	393	20,000
Occupant in Non-traffic Single-Vehicle Crash	496	29,000
Occupant in Non-traffic Multiple-Vehicle Crash	49	35,000
Total	1,159	98,000

Source NiTS 2007

For non-traffic injuries, the National Highway Traffic Safety Administration (NHTSA) used information from three states in the United States that collected crash data. The NHTSA found the difference between the expected number of injuries and the actual number of injuries received to find the national estimates on non-traffic injuries. Table 1 indicates that 614 of 1,159 of the non-traffic crash fatalities and 34,000 of 98,000 of the non-traffic crash injuries involved non-occupants. In other words, pedestrians or bicyclists were the individuals who were injured and/or killed during these crashes. Non-occupant (pedestrians or bicyclists) in non-traffic back over crashes accounted for 19% of the fatalities and 14% of the injuries. This means that the pedestrians and bicyclists were ran over while the vehicles were backing up, possibly out of a driveway (FDOT, 2004). Recent research reports that in 2010 approximately 3,061 serious bicycle and pedestrian injuries or deaths occurred in central Florida (Florida DHSMV, 2012). According to Florida Strategic Highway Safety Plan (SHSP) (2012), this number should decrease over time by about 5% annually (Table 2). SHSP's study expects that the bicycle and pedestrian serious injuries and fatalities rate will drop to 2,249 by 2016 in Central Florida.

However, despite these predictions, FDOT reports that pedestrian injuries and fatalities are on the rise, increasing nearly 16% in 2012.

Table 2
Projections of Bicyclists and Pedestrian Serious Injuries and Fatalities



On average, minorities (Hispanics and African Americans) are more often pedestrians than any other group of people (Ernst, 2011). Walking may be their only means of transportation: only 20% of African American households and 14% of Hispanic households own a vehicle (Ernst, 2011). In 2009, Caucasians made 9.4% of trips on foot, while African Americans made 11.9% trips, and Hispanics made 14% of trips on foot (Ernst, 2011). From 2000 to 2007, the Center for Disease Control and Prevention (CDC) data on fatal injuries for pedestrians from vehicles found that Hispanics suffered pedestrian fatalities of nearly 62% higher, and African Americans were 73% higher, than for non-Hispanic whites (Ernst, 2011). Siddiqui, Abdel-Aty, and Choi (2012) found a significant positive correlation between low income areas and pedestrian crashes. Their study investigated pedestrian and bicycle crashes related to demographic and socio-economic factors (i.e. population per square mile, household income, number vehicles owned, education, retired citizens), roadway characteristics (i.e. number of intersections and speed limit) and neighborhood-related factors (i.e. urbanized area). Siddiqui, Abdel-Aty, and Choi (2012), used the terms “low income areas” and “minority populations” interchangeably, therefore for this study, one can infer that minority areas are low income areas (p. 387). Furthermore, approximately 40% more ethnic Hispanic children suffer from pedestrian fatalities than Caucasian children and African American children are two times higher than Caucasian children to suffer from fatalities (Ernst, 2011). In the Transportation of America report, Central Florida was unfortunately titled “the number one most dangerous metro area” for pedestrians (Ernst, 2011. p. 2). The schools of interest for this research are considered minority schools therefore; concern for pedestrian safety for these students are great.

Approximately one quarter of the students in Florida arrive to school in the safest mode of transportation: school busses (National Highway Traffic Safety Administration, 2004). However, courtesy busing has been eliminated from the PRZ. This affects approximately 4,000 students in the county studied for this research (FDOT Research Data, 2013). This large number of students changing their mode of transportation creates additional challenges for parents transporting their children, and may add to the “Traffic Threat Multiplier Effect” by an increase of family vehicles. Furthermore, with reports on minimal car ownership within minority households, there may be no alternative mode of transportation but on foot, thus increasing safety concerns for those walkers.

Promoting Safety

The seriousness of child pedestrian injuries is brought to light through the media. However, researchers need hard facts and evidence to back their promotion of safety. Therefore some researchers combat the media's anecdotal trend by conducting scientific studies on crossing guards. For example, LaChance-Price (2005) surveyed fifty-eight crossing guards in Hartford, CN to study the hazards of child pedestrian safety and crossing guard training. The findings showed that motorist speed through designated crossing area resulting in pedestrian accidents (e.g. 4 crossing guards and 10 children); and children, and well as adults, do not obey pedestrian rules, even when instructed. Furthermore, LaChance-Price (2005) reported that different crossing guard training programs were implemented within a single department. Eight guards read training manuals; eleven watched training videos, nineteen received training with a police officer, and twenty-two guards received classroom instruction, while forty received on the job training with another crossing guard. The participants rated the training on a scale of "very good, good, okay, or very poor" (LaChance-Price, 2005. p. 31-32). While just over half (55.2%) rated their training as "very good", there were twenty participants rating their training as "good", and five as "okay", while one reported their training as "very poor" (p. 32). These findings showed that there were "no federal standards for the training of crossing guards" (LaChance-Price, 2005. p. 52).

The Central Florida School Districts have a united plan of crossing guard safety training. Their training program's objective is to provide a standardized training program that promotes consistent and effective operations throughout the state ("Florida School Crossing Guard Training Program, 2013"). In 1992, the Florida legislature passed the "Ramon Turnquest School Crossing Guard Act" (now incorporated in Section 316.75, F.S.) which requires the training program, developed by the Florida Department of Transportation (FDOT), to use the Florida

School Crossing Guard Training Guidelines. The FDOT encourages all local governmental entities, along with private schools that have crossing guard programs to train their crossing guards according to these guidelines. Additionally, by introducing the students' parents and community to other safety programs such as Safe Access to Schools and Safe Routes to Schools, it may render the job of the crossing guards as more effective.

Safe Access to Schools/ Safe Routes to Schools

Safe Routes to School (SR2S) was established in 2005. SR2S programs are efforts coordinated by a team consisting of parents, schools, community leaders and local, state, and federal governments to promote healthy choices and activities of children by enabling them to walk and bicycle to school ("Safe Routes to School National Partnership, 2013"). Within the first five fiscal years, this program dedicated $612 million towards SR2S. These funds were allocated to states based on the number of students enrolled in school with all the states receiving at least $1 million in the first year. Florida received a total of $58,239,336 from 2005 – 2012 (Table 3). In July 2012, Congress passed a new transportation bill: Moving Ahead for Progress in the 21st Century (MAP-21). Furthermore, under MAP-21, a new program called Transportation Alternatives Plan (TAP) began in October of 2012. This allowed Safe Routes to School (SR2S) activities to compete for additional funding alongside other programs (i.e., the Transportation Enhancements and Recreational Trails). In other words, the SR2S program could have an even greater impact on the safety of our children by acquiring the funding to not only support infrastructure projects (i.e., roadway construction, sidewalk improvements and traffic calming countermeasures), but to also fund non-infrastructure projects which includes pedestrian safety education for bicyclists, pedestrians, and drivers. Receiving this funding could mean that the state could have further support to build a connected network of sidewalks, pathways and bike trails throughout the state with 10% of the funds allocated for educational training of pedestrian safety.

Table 3
State Apportionment for Florida

State	Actual 2005	Actual 2006	Actual 2007	Actual 2008	Actual 2009	Actual 2010	Actual 2011	Actual 2012	Total
Florida	$1,000,000	$4,494,278	$6,133,717	$7,763.038	$9,725,359	$9,725,359	$10,318,307	$9,079,278	$58,239,336

Each county allocates funds necessary for improvements in the district or community. While targeting the specific needs of the community, SR2S promotes what they call the 5E's: evaluation, engineering, enforcement, education and encouragement ("Safe Routes to Schools National Partnership, 2013"). These "E's" require a team of community partnerships to make improvements to the surrounding schools' infrastructure by mapping the hazardous areas, educating the public on pedestrian safety and creating community awareness (Appleyard, 2003; Twadell, 2004). SRTS programs are organized through the efforts of the individual school committees and advocates for safety (i.e., the Department of Transportation). The success of the program also depends on student and parent involvement (Staunton, Hubsmith & Kallins, 2003). Additionally, interest in the program must come from the school principals, elected officials in the community, school administrators and the county school board.

This team of safety advocates also ensures that funding remains constant to maintain the program. According to SR2S, to oversee that the SR2S program runs smoothly, the local police department, transportation and school board planners should be active advocates. Although some community members around the country find that the leadership of local government does not engage the community with improvement policies for pedestrian safety, and leaders may perceive the projects for children as “low priority” (Frattaroli, Defrancesco, Gielen, Bishai & Guyer, 2006. p. 382). However, many of the fifty states have made commitments to encourage safety programs through the collaboration of different networks (Twaddell, 2004). For example, some states (i.e., California) have made Safe Routes to School a success through teaching safety curriculum to the students, encouraging community involvement and improving hazardous walking conditions of the sidewalks and roadways (Da Silva & Askew, 2004). More specifically, Santa Ana, California, has a program called “Drive 25” that places additional speed limit signs near schools to force the drivers to slow down within the busy school zones (AHDCHP, 2003). Massachusetts promotes the Safe Routes program through media and special events to promote participation of this national safety campaign. Additionally, the town councils of Boston and Arlington are involved in the planning and promotion of safety. Whereas; the parents, students and teachers, in the Bronx, New York are a “hands-on” team of citizens who distribute surveys to possibly find the cause of pedestrian injuries in their town (i.e., mapping crash sites). Chicago’s Center for Disease Control and Prevention (CDC) started at the neighborhood level and organized approximately three thousand volunteers to establish a “Walking School Bus”.

The Walking School Bus (WSB) is a national program of volunteers that meet at designated areas every morning before school to begin their journey walking on foot, riding bicycles, or scooters towards participating school. Much like a school bus gathers the children for school; the WSB group grows into a long line of pedestrians collecting other children and parents along the route. There are instructional videos provided through FDOT and Safe Access' website for parents, teachers, school officials and other advocates to view that promote this pedestrian safety campaign. Additionally, the University of Central Florida's Center for Public and Nonprofit Management also organize campaigns in the Central Florida area (Zkotala, 2013). These team collaborations and structured campaigns are important to promote environments that support children walking and bicycling to school safely. As the group grows larger, safety increases; there is safety in numbers (Todd, 1992; Jacobsen, 2003). Todd (1992) reported that "motorists in the United States and abroad drive more slowly when they see many pedestrians in the street and faster when they see few" (p. 543). Additionally, Jacobsen (2003) concluded that pedestrian injury will reduce 66% when the numbers of pedestrians double in size (e.g. If a group of two pedestrians double to four pedestrians, the risk reduces 66%).

Although the Walking School Bus is one of the safest alternative programs for those who walk to school, unfortunately, research shows that even when walking in groups, children often do not follow the guidelines for safety. Mendoza, et al. (2012) conducted an analysis on children's behavior when walking to school and found that children were diligent at finding an intersection to cross the street, however, less likely to stop at the curb before stepping off the sidewalk. Charron, Festoc and Gueguén (2012) contribute this negative behavior to a sense of urgency in children as you will read in the section on risk-taking attitudes and risk perceptions of behavior. Furthermore, children do not pay attention to street crossing behaviors when with parents. Parents serve as role models to their children on safe pedestrian behaviors (Thomson et al., 1998; Zeedyk & Kelly, 2003), however, research suggests that parents do not take the opportunity to teach their young children by explaining why they choose certain behaviors or routes. (Zeedyk & Kelly, 2003). Rosenbloom, BenEliyahu, and Nemrodov (2008) examined the street crossing behavior of children between the ages 7 – 11 years old. This observational study took place near an elementary school. Of the 269 children observed, only 36% were accompanied by an adult, and of those, only 20 children held the hand of an adult. Of all the children observed, not looking before crossing the street was the most universal unsafe behavior, followed not looking and not stopping at the curb before crossing. Regardless of whether an adult was present, children committed acts of unsafe road crossing behavior (Mendoza, et al. 2012; Rosenbloom, BenEliyahu, & Nemrodov, 2008).

These "mixed results" suggest that further steps should be taken to ensure safety for those who walk to school (Jacobsen, 2003; Mendoza, et al., 2012). This begs the question: Does the schools' infrastructure impact children's pedestrian risk-taking attitudes and risk perceptions of behavior?

Defining Infrastructure

This section will attempt to convey the planned infrastructure improvements taken from the Safe Access to School's Transportation Study, define the term "school infrastructure" for the purpose of this study, and differentiate the schools' complete or incomplete infrastructure by the severity of improvements necessary.

Infrastructure is a broad term that has been used since 1927. Infrastructure refers to any substructure or underlying system or networks of roadways, bridges (Monrow, 2005; Thompson-

Hill, 2001), sidewalks and bikeways, (Garrett-Peltier, 2011; Swanson, 2012), railways, (Thompson-Hill, 2001), rail ports and railcars (Grigg, 2010), waterways, airfields, telecommunication networks, water supply systems, wastewater treatment plants (Musick, 2010), educational and health facilities, national parks structures (Kemp, 2009), and includes "anything else that connects parts of the vast United States, its utilities, and economies" (Thompson-Hill, 200. p. 147). However, to narrow the term; transportation infrastructure is defined as "any facility designed for transporting people and goods including, but not limited to, sidewalks, trails, bike lanes, highways, streets, bridges, tunnels, railroads, mass transportation, and parking systems" (City of Denver Public Works Department, 2011. p. 1). According to SR2S, there are five types of infrastructure projects funded: sidewalk improvements; traffic calming devices; traffic signal installation; pedestrian and bicycle crossing improvements; and bicycle path and facility construction. Therefore, these projects are included to define "school infrastructure" for this study. The author defines "School Infrastructure" as any facility designed for pedestrian and bicycle transportation within the Parent Responsibility Zone (PRZ) (Figures 1 and 2), which include sidewalks, crosswalks, trails, bike lanes, highways, streets, bridges, tunnels, railroad crossings, school structures, parking systems, traffic calming devices, and traffic signal installation.

Multimodal planning legislation supports programs (i.e., Safe Routes to Schools) for strategic planning of safe conditions (e.g., construction of new sidewalks and roadway improvements around the schools) for children's journey to school. Multimodal planning ensures that the new developments do not limit future infrastructure. New environmental designs will improve the quality of the sidewalks and bike routes for safe travel. Frattaroli et al. (2006) suggested that environmental modifications (i.e. traffic calming devises, signage, crosswalks and sidewalks) improve public safety. In addition, research on infrastructure present engineering features that improve conditions of the highways, roads, sidewalks and pathways will increase the safety level of pedestrians (Dougald, 2004; Campbell, Zegeer, Herman, Huang, & Cynecki, 2004). Boarnet, Day, Anderson, McMillan and Alfonzo (2005) conducted a study on Safe Routes to School (SR2S) in California which evaluated the infrastructure of the SR2S construction program of eleven projects around elementary schools: five sidewalk improvements; two traffic signal improvements; and four crosswalk/crosswalk signal improvements (Boarnet et al., 2005). Boarnet et al. found evidence of success for five of the projects. Three of the five sidewalk repairs significantly increased the number of children walking on those completed sidewalks. Both traffic signal improvements demonstrated evidence of success by an increase in pedestrian counts at the intersection. Although contributing to safety, in all four crosswalks and crosswalk signal projects, there was limited or no evidence of success. However, the criteria for success were limited to observable behavior (Boarnet et al., 2005). Additionally, the National Safe Kids Campaign (2004) found that visibly marked crosswalks, pedestrian flashing signals and signs will increase the visibility of pedestrians and bicyclists. Therefore understanding the importance of complete infrastructure within the PRZ is necessary to promote pedestrian safety.

In this current study, a Geographic Information System (GIS) tool was utilized to mark the Parent Responsibility Zone (PRZ) (Figures 1 and 2) to allow the reader to visualize the 2-mile distance around the two participating schools. A Project Improvement Plan (PIP) was provided by Safe Access to Schools for these participating campuses. Although both schools have PIPs and need infrastructural improvements; based on the PIP and evaluated number of repairs and improvements for School 1 when compared to School 2, School 1 is considered "incomplete infrastructure" and School 2 as "complete infrastructure". For the purpose of this study, the author defines "incomplete infrastructure" as any facility designed for pedestrian and bicycle transportation within the PRZ, which include sidewalks, crosswalks, trails, bike lanes, highways, streets, bridges, tunnels, railroad crossings, school structures, and parking systems that need construction, considerable repair or improvements; including the installation of traffic calming devices, and traffic signals. Complete infrastructure is defined as any facility designed for pedestrian and bicycle transportation within the PRZ, which include sidewalks, crosswalks, trails, bike lanes, highways, streets, bridges, tunnels, railroad crossings, school structures, and parking systems that need minimal construction, repair or improvements; including the replacement of or update to existing traffic calming devices, and traffic signals. Safe Access (2013) details the current infrastructure hazards and future infrastructure improvements around the two participating schools. These are displayed in Figures 4 – 8 and are explained in the following sections.

School 1

Safe Access Priority Project (SAPP) #1 the sidewalk ends at the corner of a main highway and demonstrates a lack of connectivity between the sidewalk and the crosswalk (Figure 4). The pedestrians must walk through the grass before reaching the crosswalk. Additionally, (SAPP) #2 and #4, the sidewalks are narrow or broken (Figure 4). They were built years ago and were adequate for use in the 1920's. However, today with a population of 8,800, the wear on the sidewalks pose dangerous walking and biking hazards. Safe Access to Schools' study recommends that the sidewalk maintain a five foot width pavement with a roadway buffer in residential areas which is consistent with Burden's (2002) research. Furthermore, at the recommendation of the SAPP #3, it is important to place high-visibility crosswalks, using Florida Department of Transportation (FDOT) standards, at the intersection near the school and across the school's entrance (Figure 4). This allows the children to identify a safe location for street crossing. Installation of pedestrian crossing signs will also alert the drivers of the possible presence of pedestrians. Safe Access to Schools study recommendation for SAPP #5 is to replace the school zone speed limit signs with new traffic calming devices with flashing beacons (Figure 5). Additionally, a speed limit of 25 MPH is too fast for safe crossing. Recommendations of SAPP #6 are to reduce the school zone speed limits to 20 MPH and to shift locations of flashing beacon approximately forty feet to the north to meet the minimum 200 feet distance from a crosswalk (Figure 5). The SAPP #7 reroutes the flow of traffic in the main parking lot to avoid the school bus line (Figure 5). There are recommendations to place traffic cones to prohibit vehicles from entering the parking space area from the school entrance. Suggestions to re-designate the bus loop exit as an entrance /exit will help late arriving faculty and parents avoid the busy bus line. The SAPP #8 found that during drop-off and pick-up, the main street in front of the school functions as a one-way roadway. The local police department will not allow the school to enforce a one-way road during arrival and dismissal times; therefore the recommendation to post informative signage will alert drivers of the arrival and dismissal traffic flow pattern (Figure 6). The final SAPP recommendation for School 1 is to replace the old bicycle racks that do not hold the bicycles in the upright position (Figure 6), with the new inverted "U" shape design. Because of the extensive construction needed, and the recommendations suggest; building new, installing, repairing and replacing existing infrastructure, this school is considered as incomplete infrastructure therefore confirming the author's definition of incomplete infrastructure.

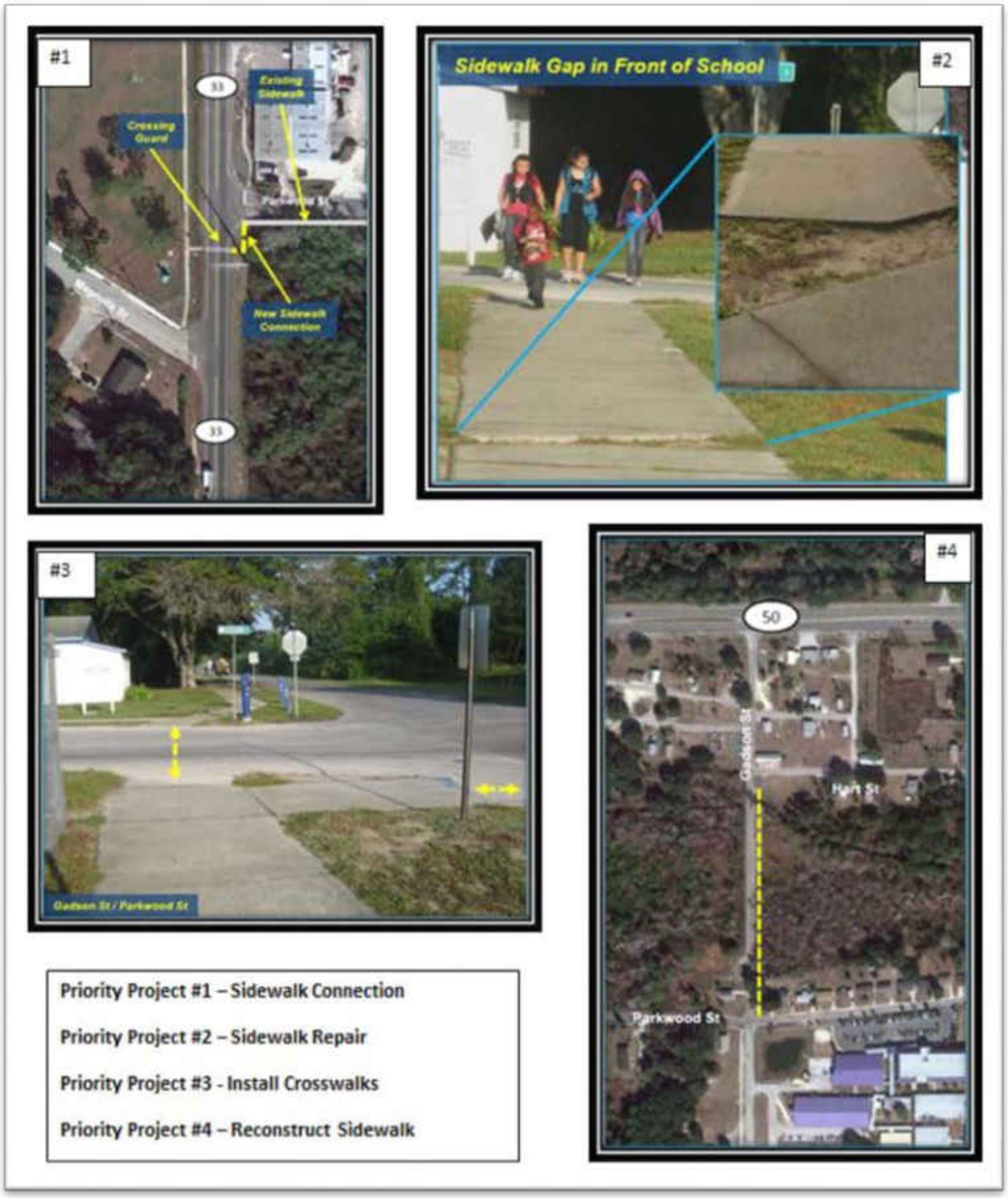


Figure 4: School 1 Priority Projects # 1- #4

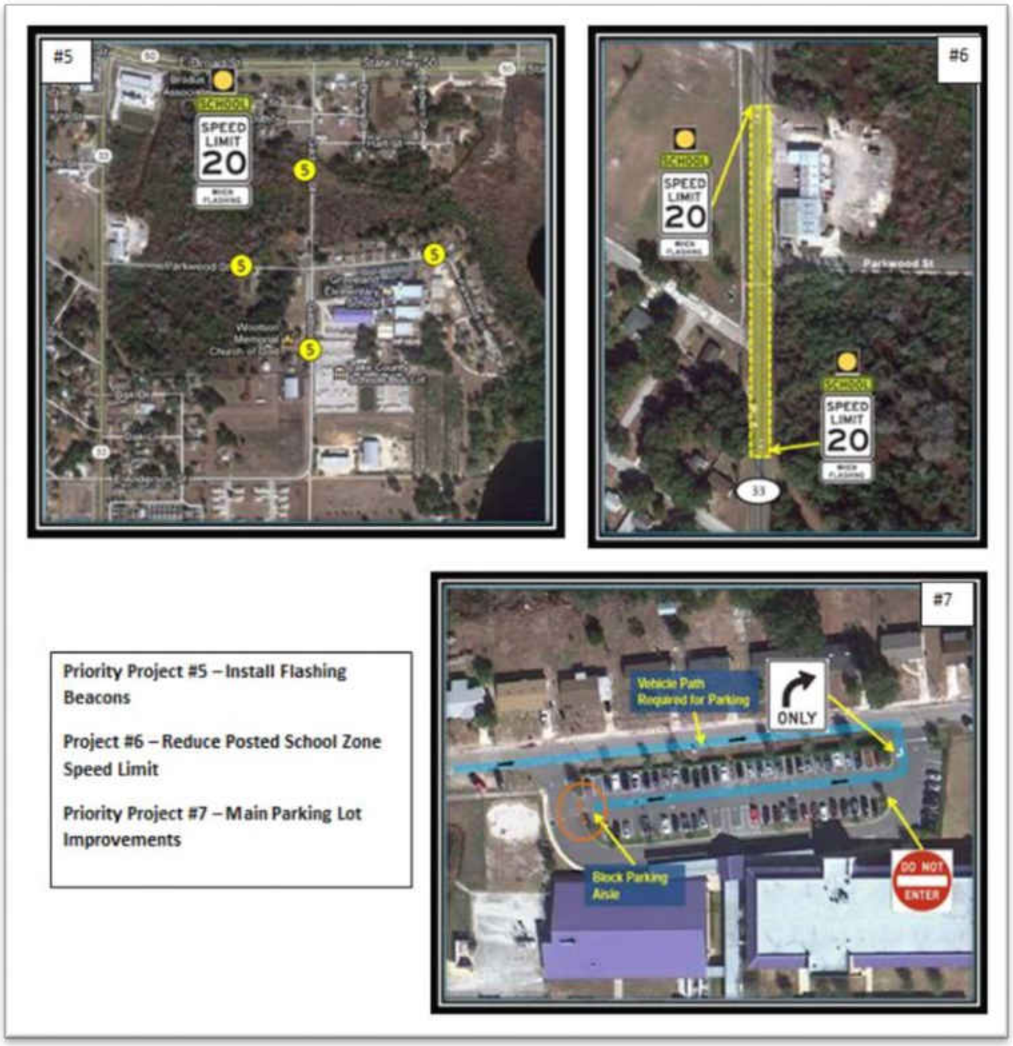
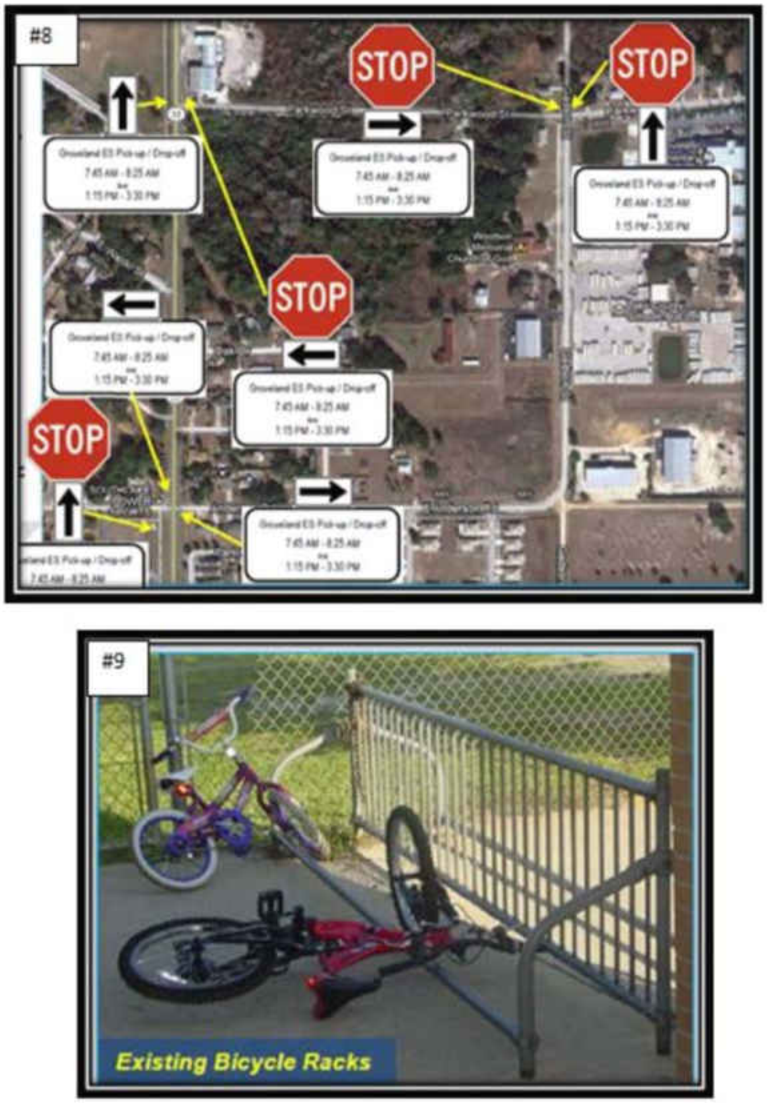


Figure 5: School 1 Priority Projects #5 - #7



Priority Project #8 – Arrival/ Dismissal Signage

Priority Project #9 – Improve Bicycle Parking

Figure 6: School 1 Priority Project #8 and #9

School 2

School 2's improvements have been completed or in the process of completion according to the Safe Access' Priority Projects (SAPPs). SAPP #1 (Figure 7) recommends an extension of 1,315 feet to the existing school speed-limit zone on the main highway (This project was completed in the summer of 2013). Recommendations of SAPP #2 are to relocate the crosswalk; to connect it with the entrance of the adjoining middle school. Additionally, to upgrade the crosswalk to a high visibility crosswalk and post two crossing guards at this location instead of one crossing guard (Figure 7) (note: the second guard was posted before this study began). Additional yield lines and yield to pedestrian signs at the new crosswalk are also warranted (Figure 7). SAPP #3 found that the pedestrian walk signal ran short on time therefore; extending the length of time on the existing flashing pedestrian beacon is needed. The second recommendation for SAPP #3 is to set the signal to recall pedestrian phases for the AM and PM times when the children are present (Figure 7). SAPP #4 was concerned with an existing 5-foot (width) sidewalk along a busy highway. The recommendation is to shift the sidewalk onto the school property and add three additional feet to the width increasing it to eight feet (Figure 8), thus staying within the highway guidelines according to infrastructural research (Burden, 2002). This shift will also allow for larger areas of grass that will serve as a safety buffer between the sidewalk and the highway. SAPP #5 recommendations are to restripe an existing crosswalk with high visibility marks and place appropriate pedestrian signs to notify drivers (Figure 8). SAPP #6 found that the school entrance is wide. By narrowing the entrance and placing a yellow stripe on the road indicating a one lane entrance and two lanes exit, this will alleviate traffic confusion

(Figure 8). Furthermore, at the recommendation of the SAPP #7 the construction of a median divided entrance to one of the school's parking lots will add to a more continuous traffic flow (Figure 8). The SAPP improvements suggest; revisions, improvements, or shifts in existing infrastructure, therefore confirming the author's definition of complete infrastructure.

Figure 7: Priority Projects #1 - #3

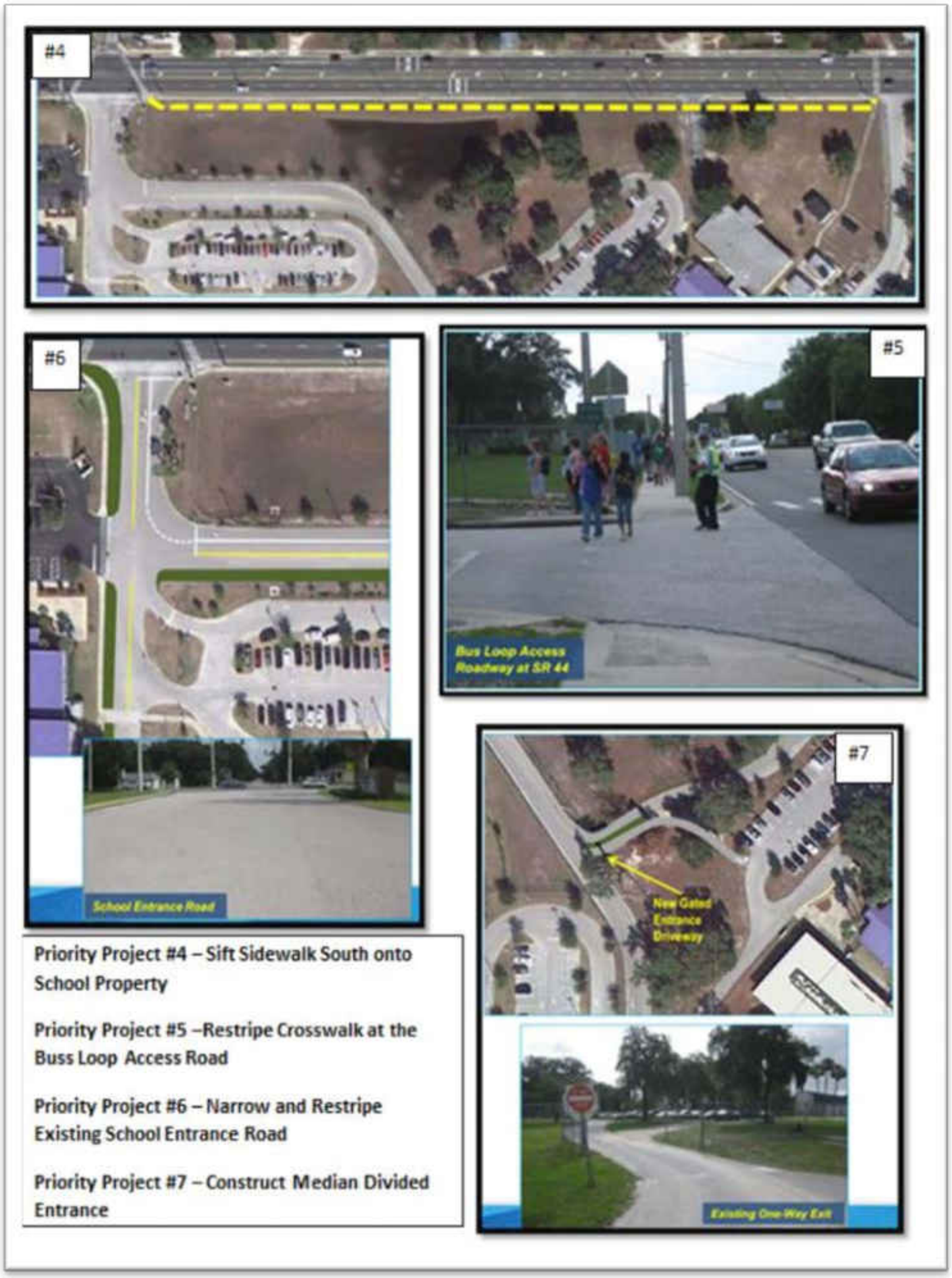


Figure 8: Priority Projects # 4 - #7

Risk-Taking Attitude and Risk Perception of Behavior

While studies show that pedestrian injuries and travel mode choice include factors such as traffic conditions (Hine & Russel, 1993), and infrastructure (Timperio, Crawford, Telford, & Salmon, 2004; Turner, Fitzpatric, Brewer, & Park, 2006; Rosenbloon & Pereg, 2012); some researchers argue that pedestrian injuries occur due to behavioral issues (Frattaroli et al., 2006). Behaviors of young drivers have been studied (Albery, 1996) and driver behavior such as: distractions of mobile phone use (Hatfield & Murphy, 2006) contribute to pedestrian accidents, although driver behavior is beyond the scope of this research. Furthermore, there is no equivalent research of child pedestrian safety to avoid injury (Charron, Festoc, & Gueguen, 2012). This research explores the effectiveness of an online pedestrian safety training course by developing a training program based on factors of pedestrian risk-taking attitude and risk perception of pedestrian behavior found in existing research. For example, Frattaroli, et al. (2006) conducted a survey study suggesting that child's behaviors of running in and around traffic, playing in the street, and other behaviors such as being fearless or careless of where they cross the street, along with hurrying to get to their destination, were the top causes of child pedestrian injuries. Therefore, factors considered for this research are: a false sense of security; the degree of urgency felt (Charron, Festoc, & Gueguen, 2012); alertness (e.g. listing to music with headphones or mobile phone use) (Hatfield & Murphy, 2006; Nasar, Hecht, & Wener, 2008; Stavrinos, Byington, & Schebel, 2008, 2011); and decreased awareness of the environment (Barton & Schwebel, 2007; Nasar, Hecht, & Wener, 2008). These variables are valuable when developing an educational tool of pedestrian safety for children and are therefore included in the development of this pilot study program.

A False Sense of Security

According to Chu (2003), people have a false sense of security when walking in a crosswalk. Chu (2003) tested four hypotheses, one of which was pedestrian street crossing behavior, by conducting surveys of real-life situations. The participants stood near the edge of the road and were asked to "state their crossing choice without actually crossing the street" (Chu, 2003. p. 2). The participants were given five location start and end points, for a total of twenty-five (start-end) combinations. Participants chose crosswalks that are marked, (e.g. zebra stripes) even though the crosswalks are without traffic calming devises (e.g. stop signs or traffic signals), as safe places to cross the street. The presence of the zebra stripes added to the "perceived level of safety" (p. 6).

The zebra stripes (e.g. the white stripes of the crosswalk) create an illusion to children that they are safe as long as they stay within the lines (FDOT Research). However, much of the research on street crossing, measures data on the location of crossing. For example, Zegeer, Esse, Stewart, Huang, and Lagerwey (2004) conducted a study using crash reports of 2,000 sites (1,000 marked crosswalks and 1,000 unmarked crosswalks) in 30 cities throughout the United States. Although the analysis did not include sites near schools, the 229 crosswalk/pedestrian crash reports are worth mentioning for this review. All of the sites in the study were at midblock and intersections without traffic calming devises. These findings conclude that marked crosswalks encourage children to cross at locations where it may not necessarily be safe to cross, thus supporting the claim of the illusion of safety. Although the report suggests that safety would increase by adding traffic calming devises to the locations (Zegeer, Esse, Stewart, Huang, & Lagerwey, 2004).

This false sense of security extends beyond the crosswalk; children often feel safe on sidewalks as well. Frattaroli, et al., (2006) conducted a qualitative analysis of open-ended, in-person interviews on the causes of child pedestrian injuries. Although the results are opinion based, they revealed that the most frequently reported reasons for child pedestrian injury were children playing along the roadways and standing too close to the edge of the sidewalk, thus falling into the path of oncoming traffic.

It is noteworthy to report controversy to this claim that marked crosswalks create a false sense of security. Knoblagh, Nitzburg and Seifert (2001) conducted a field study in four cities within the United States at eleven intersections without traffic calming devises. The study measured pedestrian behaviors and effects of marked crosswalks before and after the zebra stripes were installed. The report showed that the crosswalks acted as a guide for pedestrians crossing the street. There were no negative effects of the marked crosswalks, furthermore, no evidence to support the false sense of security claim. However, their report did not include children; therefore further research on child pedestrian behaviors within crosswalks should be conducted.

The Degree of Urgency Felt

Demetre, Lee, Pitcairn, Grieve, Thomson, and Ampofo-Boateng (1992) conducted a simulated experiment that measured traffic gaps such as “tight fits” (i.e. possible pedestrian and vehicle collision) and “missed opportunities” (i.e. rejected gaps) (P. 189). Evaluating only the third experiment in the article; the participants consisted of 25 children, ages 4-6 years old (16 boys and 9 girls) and 23 adults, ages 18 – 45 years old (14 males and 9 females). The participants were asked to stand behind a safety barrier next to the actual street and shout “Now” when they thought it was safe to cross. The results showed that the children had a higher number of “missed opportunities” then adults and no significant difference for “tight fits” between children and adults. This proved to be a factor of cautious behavior of young children rather than inability to make decision on whether the “gap size” was large enough to cross the street.

Other research on street crossing found that pedestrians will cross a busy street even when motorists are driving erratically (Himanen & Kulmala, 1988). If the perceived importance of a task is greater than the degree perceived as a risky choice; the pedestrian will take action and cross the street (Charron, Festoc, & Gueguen, 2012). Research on pedestrian safety includes evaluating ones perception of risky behavior before taking action. For example, Charron, Festoc, and Gueguen (2012) used 80 children (between the ages of 9 to 12 years) to conduct a road-simulated experiment on urgency and street crossing. This 3D audio-visual simulated environment creates real-life situations that the participants act out. A joystick allows the participants to move throughout the surroundings to complete their task of street crossing with simulated traffic. There were two objectives: walk to the mailbox and then to the theater, all in three minutes. There were two different routes available; the long route had a crosswalk, and the short route did not have a crosswalk available to cross the street. During the study, the participants were told not to take too long to complete the task; thus creating a sense of urgency.

The results concluded that the participants took more risks when there was a greater sense of urgency to complete the task (i.e. they took the shorter route without safe pedestrian crossings). Their empirical study found that the destination, along with exposure to road dangers and sense of urgency from a time constraint variable, will increase the number of risky actions taken while crossing a street. Surprisingly, the amount of time it took to complete the task was greater with a time condition variable (Charron, et al., 2012). In other words, the participants felt pressure to complete the task quickly, took longer, and did not use good risk judgment allowing greater risks to occur when crossing the "simulated" street.

Assessing Risk - Alertness/Awareness of Environment

Street crossing is exceptionally dangerous for young children. The Florida Department of Transportation (FDOT) suggests that children under the age of ten must be accompanied by an adult to cross busy intersections. Furthermore, one may worry that children are incapable of determining risk because of the complexity of interpreting risk (Barton, Ulrich & Lyday, 2010). Cognitive psychologists (Werner & Gray, 1998) argue that children as young as ten, possess adult capabilities in auditory processing, and others argue that children as young as nine years old have the capability to assess safety issues and road dangers (Ampofo-Boateng & Thompson, 1991; Underwood, Dillon, Farnsworth, & Twiner, 2007). While other researchers have determined that despite the children's age, auditory development, or their ability to assess risk, children as young as ten and eleven may voluntarily take risks when crossing streets (Charron, Festoc and Gueguen, 2012).

Hillier and Morrongiello (1998) examined children's perception of risk injuries. There were 120 participants (children between 6 to 10 years) with an even distribution of age (40 six year old children, 40 eight year old children, and 40 ten year old children) and an even distribution of gender (20 females and 20 males). The study measured risk perception by showing 12 pictures of 3 different situations. In each of the three situations (stair, bicycle, playground) there were four pictures of risk level (no risk, low risk, medium risk, and high risk). The participants were asked to view the pictures in "pairwise presentation" format and were asked to quickly point to the safest or riskiest photo (P. 231). Risk and perception of risk was measured using VAS (e.g. 160mm line from "not at all unsafe" to "extremely unsafe") (p. 232). The photos were presented again, one at a time, and the participants were asked to indicate how safe they thought each picture was, using the VAS measure. Presenting the "high risk" pictures to the participants, they were then asked to indicate the severity of potential injuries. The results showed that children were capable of determining risk across the three situations and between levels of risk, except in the playground situation, there were no perceived differences between the medium and high risk levels. The children were able to recognize that the risk of injuries increased as risk factors to injuries increased. There were no differences in age for risk appraisal; however there were differences in gender, with females rating the bicycle and playground situations riskier than the males rated. Peterson, Gillies, Cook, Snick and Little (1994) found that children judge risk by assessing personal safety differently (e.g. females ask "will I get hurt" and males ask "how hurt will I get" (as cited in Hillier and Morrongiello, 1998. p.235). Furthermore, age and gender showed no differences in the ability to select the safest and most dangerous situations. However, age did play a role in the perceived severity of injury with younger children (6-8 years) rating potential injuries to be more severe than older children (10 years old). In other words, older children felt less vulnerable to risk. The rate at which the younger children recognized risky situations was slower than older children. Thus inferring that younger children's reaction time in dangerous situation could result in injury (Hillier & Morrongiello, 1998).

Cognitive psychologists have found that underdeveloped cognitive skills (Zeedyk, Wallace, Carcary, Jones & Larter, 2001) and slower auditory perception (Barton et al., 2013) could decrease risk perception, increasing the dangers of walking to school. For example, Barton, Ulrich, and Lyday (2010) examined route selection and the roles that gender, age and cognitive development (visual search and efficiency) play. Sixty-five children, between the ages of 5-9 years participated. The participants were shown two pictures with nine subtle differences, and asked to identify as many differences as they could find. The total number of differences and speed were recorded to measure visual search. The participants were then given the Contingency Naming Test (CNT) of a series of four tests to identify 27 shapes and colors to measure selective attention and working memory. This measured the ability to ignore distractions. Next, the participants used a "static tabletop model proportional at a 1:36 ratio of real-life pedestrian setting" (p.282). There were three possible routes for the toy pedestrian to cross the street; crossing at a crosswalk, crossing at a right angle outside of the crosswalk, or crossing the street diagonally. The shorter the pedestrian route, the riskier the route to cross the street. The results showed that the children with lower scores of visual search and cognitive efficacy chose riskier routes. In addition, the children who found fewer numbers of differences in the CNT and less ability to ignore distractions along with lower capacity of working memory also selected riskier routes. Older children and girls chose safer routes to cross the street.

There are limited published studies on children's pedestrian risk perception; furthermore, of these studies, fewer that mention pedestrians' perception of sound. How children perceive, analyze and synthesize sound is important to include in research of pedestrian risk perception and risk-taking attitude. Barton et al., (2013) examined the differences in auditory development between adults and children's ability to detect the speed and direction of a vehicles' approach. Barton et al., (2013) sample population consisted of 35 adults and 50 children between the ages of 6 - 9 years old. The participants were presented with a prerecorded sound of a mid-sized car traveling at three speeds (e.g. 5 mph, 12 mph and 25 mph) and from two directions (e.g. from the left to the right, and vice versa). They were asked to indicate when they could hear the sound of the approaching vehicle through the headphones by pressing the down arrow key on a computer keyboard. Next, the participants were asked to press the right or left arrow key to indicate the direction from which they thought the vehicle was approaching, and last, press the up arrow when they perceived that the sound has reached their location. Barton et al., (2013) found that adults were significantly more accurate than children in determining when the vehicle approached their location with speeds of 5 mph and 12 mph. Moreover, older children (ages 8-9) performed better than younger children (ages 6-7) when the cars approached at a speed of 25 mph and when determining the direction of sound. The results concluded that children were able to detect sound approaching from the left more accurately then from behind or in front.

However, this research predicts that children will have further difficulty when detecting sound location in real-life traffic situations when noises are reflecting off surrounding buildings and other vehicles.

Pedestrian walking strides change when carrying heavy loads and should be considered for this review of perception and awareness of environment. Much has been written about the problems of children wearing heavy back packs (e.g. Chow, et al., 2007; Puckree et al., 2004), however, students today continue to carry heavy loads filled with books, school supplies, electronics, and often laptop computers. This may make the students more susceptible to pedestrian injuries. For example, Schwebel, Pitts and Stavrinos (2009) found that what pedestrians carry, alters their perception of risk in traffic congestion. Their study consisted of 96 colleges students between the ages of 18-22. They tested pedestrian behavior and the influence of wearing a backpack using a paired-sample t-test measuring the time it takes for participants to cross a street in a simulated environment without a backpack and with a backpack weighing 12% of the participants' body weight. Schwebel, Pitts, and Stavrinos (2009) found that students took smaller steps when carrying a large backpack, thus changing the stride of the walker (i.e. slowing them down). If an individual usually walks with a particular stride (the number of steps that he/she takes to cross a street) the walker does not acknowledge that the heavy backpack changes their stride. Additionally, due to the weight of the backpack, taking smaller steps create an uncertainty in the amount of time it will take to cross the street; thus misjudging the perception of oncoming traffic (Schwebel, Pitts & Stavrinos, 2009).

Pedestrian Safety Education

There is controversy as to whether pedestrian education prevents injury, increases children's traffic awareness, or improves risk attitudes or behavior (Duperrex, Bunn, & Roberts, 2002). For example, Zeedyk, Wallace, Carcary, Jones and Larter (2001) found that an "increase of knowledge did not result in improved traffic behavior" (p. 71) and "knowledge of pedestrian street-crossing law does not appear to influence where pedestrians would choose to cross a street" (Chu, 2003. p.7). While Duperrex, Bunn, and Roberts (2002) did not find any evidence to indicate that education directly decreases pedestrian injury, their systematic review of fifteen studies on the effectiveness of pedestrian educational programs did reflect positive outcomes of knowledge and behaviors. For instance, Boateng et al., (1993) and Thomson et al., (1992; 1997; 1998) discovered that when children are educated or trained in pedestrian safety, children's perception and attitudes of safe crossing locations increase. Furthermore, children's behaviors on road safety (Limbourg et al., 1981; Matson 1980; Nishioka et al., 1991), knowledge of road safety (Bouck, 1992; Downing et al., 1981; Singh 1979; Luria et al., 2000) a combination of behavior and knowledge of traffic safety (Miller et al., 1982), or attitude, behavior and knowledge (Renaud et al., 1989), increases. Despite the negative findings of Duperrex, Bunn, and Robert's (2002), their study was conducted on four and five year old children. Cognitive psychologists (Barton, Ulrich, & Lyday, 2010) could argue that these participants were too young to understand the risk of their actions.

Additionally, Barton, Schwebel and Morrongiello (2006) used a simple method of teaching children safe street-crossing by constructing a "pretend crosswalk" made of wood (p.

476). Participants were 85 children, ages 5-8 years; 17 five-year olds, 20 six-year olds, 16 seven-year olds, and 32 eight-year olds. The pretend crosswalk was placed perpendicular to a real two lane highway. Safety measures were used to prevent the children from walking onto the real street. The participants were taught safe pedestrian behaviors of: looking left-right-left, waiting for gaps in traffic, not running across the street, watching for traffic, and learning to scan the area for objects that could block their view or the view of oncoming traffic. The participants practiced this for up to 15 minutes. Then the children were observed at five different times with four levels of supervision (no supervision to parents crossing with the children), measuring 5 pedestrian behaviors: "wait time, attention to traffic, missed opportunities, gap size, and tight fits" (P. 477). The results concluded that four of the five pedestrian behavior measures were statistically significant. In other words, even a simple training designed to improve pedestrian behavior prove to be effective.

Research shows that group training is more cost-efficient (Schebel & McClure, 2010) and less labor intensive than individual training. Some research supports group training, and suggests to have a positive effect on teaching children safe pedestrian behavior, although did not have a lasting effect on behavior (Miller, 2004). While multimedia training (e.g. t.v., video, and computer software) uses individual learning, and could allow for transfer of knowledge to real life situations. For example, Schebel and McClure (2010) conducted a study on *Walk Smart*, a 40 minute computer course for pedestrian training. The 36 participants included 21 males and 15 females, ranging from kindergarten to third grade with one fourth grader included in the study. The *Walk Smart* program builds on 5 areas within each section of skills (i.e. traffic signals, direction of traffic, and distance of vehicles), as the participants navigate through the program. Next the participants watched a video on the computer and to answer questions pertaining to the skills taught. Once the program was completed, they participated in a simulated traffic intersection created in the parking lot outside. They were asked: "Are there any cars that could hit me if I cross the street now? Which cars?" (P. 439). The participants' responses were marked to measure behaviors. The results indicated that the skills learned on the *Walk Smart* program transferred to the simulated environment which successfully improved the "ability to discriminate dangerous vehicles in a variety of mock traffic intersections" (Schebel & McClure, 2010. p. 441).

Safety4Schools A Pedestrian Safety Awareness Program

There were no multimedia awareness programs found, after an extensive internet search, for children to access without parents and/or teacher assistance. The *Walk Smart* program is a CD rom that must be obtained from the Department of Transportation or one can purchase the program online and have it delivered. Thus, the program is not directly available for children. While the Walking School Bus (WSB) Program assists children with safe arrival to school and assists children with safer route selections, research shows that such "group" programs do not teach child pedestrian safety independence. Therefore, the development of a free online safety awareness program was necessary.

After consideration of the existing pedestrian research, there were several factors to include when creating the multimedia safety awareness program such as teaching children not stand next to the edge of the sidewalk. Frattaroli, et al., (2006) revealed that the most frequently reported reasons for child pedestrian injury were children playing along the roadways and standing too close to the edge of the sidewalk. Therefore a safety video that shows the dangers and consequences of standing too close to the edges of sidewalks (e.g. “Be Aware of the Edges”) was included in the online training program.

Cognitive load theory of web designs, and providing correct information regulated by the Florida Department of Transportation necessary to use to address concerns for the safety program to be regarded as a viable tool for the Central Florida area schools. Some important rules to any training program are to provide accurate information to the learner and utilize a basic structure format. For this pilot study, the safety information was taken from the Florida Department of Transportation (FDOT), and PedBike (Florida’s Pedestrian and Bicycle Safety Resource Center funded by FDOT). Previous research on pedestrian safety mentioned throughout this review was also utilized in the development, while cognitive load theory research was referenced for the structure and design.

Terminologies of many pedestrian safety programs are too advanced for young children to understand (Cattell & Lewis 1975; Sheppard, 1975; Vinje, 1981). However when difficult words (e.g. pedestrian or intersection) are accompanied by phonetic pronunciations, defined in terms designed for young children, partnered with a written example (e.g. pedestrian /pəˈdestrēən = A pedestrian is anyone who is walking on a sidewalk or a roadway. When you walk to school, **you** are a pedestrian) and later shown in a video, the learners are developing their cognitive schema. Schema is a term often used in reference to students’ prior knowledge. S*chema*, is defined for this research as, “any existing generalized knowledge” (Reiner, Slotta, Chi, & Resnick, 2000, p. 2). One goal of this safety awareness program is to add to the children's existing knowledge to develop their risk awareness and pedestrian behavior. However, it is important to maintain a balance of knowledge and fun throughout the learning environment without causing the learner to "overload" on information.

Cognitive Load Theory

Cognitive load theory is part of our mental processes: learning, memory and problem solving (Sweller, 1994). Cognitive Load Theory (CTL) is defined as "the amount of 'mental energy' required to possess a given amount of information" (Feinberg & Murphy, 2000, p. 354). People have a limited capacity of storage in working memory (i.e., it can hold about 7± pieces of information at a time) (Miller, 1956; Van Gerven et. al., 2003), thus when learning new complex material, a student should use their working memory efficiently (Van Gerven et. al., 2003). Researchers and instructional designers found that when developing a multimedia program, one should keep in mind that there is limited storage capacity, and should find a way to utilize this limited space in working memory (Cooper, 1998; Clark, 1999d). Furthermore, when developing safety awareness programs, the designer should know that the information processing system is made up of three types of memory: sensory, working and long term. Cognitive load theory seeks to explain how these types of memory interact with each other and what affects they have on the learning process.

Working memory processes new information coming in through our sensory memory and then combines the information with existing knowledge already stored in long term memory (schema theory) to create new knowledge; thus learning new information. Although working memory is where “learning takes place” (Feinberg & Murphy, 2000. p. 354), it has limitations. The constructs of cognitive load theory such as; intrinsic and extraneous cognitive load, could hinder working memory (Paas et al., 2003), thus negatively influencing the learning process. Intrinsic cognitive load is directly related to how difficult the “to-be-learned content” is and “cannot be modified by instructional design” (Feinberg & Murphy, 2000. p. 354). On the other hand, “extraneous cognitive load is defined as any cognitive activity engaged in because of the way the task is organized and presented, not because it is essential to attaining relevant goals” (Feinberg & Murphy, 2000. p. 354). However, it is possible that both intrinsic cognitive load and extraneous cognitive load be managed by the process of how information is presented (Feinberg & Murphy, 2000). In other words, if the material “to-be-learned” is organized into smaller sections, and by incorporating the sensory memory, one could retain more information. Sensory memory consists of visual, auditory, gustatory, olfactory or tactile senses. However for this study, Paivio’s (1986) dual-coding theory of the “dual-channel assumption” of visual and auditory senses was considered. For instance, using a video to explain the steps of street crossing consists of the visual/pictorial channel (watching the video) and auditory/verbal channel (listening to the instructions and music), using a melody could also attribute to the recall of certain memories (Crain, 2011). Crain (2011) exposes the “unity of the senses” (p. 105) by explaining how tones of a melody can provoke a range of feelings from joy and happiness to anger or depression. By using an upbeat rock –n- roll tune in “Walk it – Don’t Roll It” video in the safety awareness program, the tune could evoke a positive, “I can do it” attitude for the children. Thus, by using the children’s sensory memory to stimulate the brain to allow the information being processed into the long-term memory for later recall of the information for utilization (i.e. How to cross a street safely). However, some researchers (Mayer & Moreno, 2003) explain that adding background music to the instructional video could “increase incidental processing to the extent that the learner devotes some cognitive capacity to processing the music” (p. 45). Therefore, application of the music was limited to the introduction and conclusion of each video viewed by the learner. Like working memory, sensory memory is limited in space, and must be processed quickly by working memory, (i.e. visual information will cease in less than one second and audio information in about three seconds). If working memory is unavailable to process new information, then there are no resources left over to allow information processing (germane load). The information will be lost, and learning will not occur (Sweller et al., 1998). This effect is referred to as cognitive overload (Sweller, 1999). To prevent cognitive overload, the instructional designer could manage extraneous load, which reduces the ability of working memory to process incoming information. In other words, the instructional designer should be aware of how many learning activities are being presented to the learner and ensure that there are no unnecessary distractions that may interfere with schema acquisition (Sweller, 1999). Furthermore, based on Sweller’s (1999) model, the material in this current multimedia safety awareness program is kept at a slow pace. The student does not move to the next section until he/she is ready (independent learning), thereby allowing for deeper processing. Each new piece of information coming in through working and sensory memory will have to be processed into a schema concurrently, for learning to occur (Chandler & Sweller, 1991; Mayer et al., 2001).

Understanding working memory and sensory memory assists instructional designers (and other teachers) on how to place and retrieve information from long term memory. Things that we know such as: how to read, how to ride a bike or drive a car are stored in long term memory. Cognitive load theory, which typically uses schema theory to explain these functions of long term memory, is the prelude to knowing how to develop children's safe pedestrian behaviors. Research found that multimedia learning engages the student with the learning process such as paying attention to important information, organizing the material to be learned and then incorporate the new knowledge with the existing knowledge (Mayer, 2001), thus fostering "meaningful learning" (Mayer & Moreno, 2003. p. 43). "Meaningful learning is reflected by the ability to apply what was taught to new situations" (Mayer & Moreno, 2003. p. 43); in other words, the student learning the content from the safety awareness program can transfer the information learned online to real-life pedestrian situations. Much like how a young person learns the rules of the road in drivers education (e.g. which side of the road to drive, when to stop, yield, or go on green), a child could learn pedestrian safety rules.

Applying Pedestrian Research to the Program

When selecting information to include in Safety4Schools (i.e., this safety awareness training program), and to the Pedestrian Risk-Taking Attitude (PR-TA) and Risk Perception of Pedestrian Behavior (RPPB) Scales (Appendices A and B), one must consider the pedestrian research mentioned in this review. For instance, Todd (1992) and Jacobsen (2003) agree that numbers matter. Todd's (1992) research found evidence to support safety in numbers; therefore the situations in items number 1 and 2 of the PR-TA and RPPB scales are based on either choosing to walk alone or choosing to stay with friends (e.g. “My friends already left for school, and my parents cannot drive me. I will walk or ride my bike to school by myself;” and “My friends are waiting outside for me to walk to school with them. I will stay with them as I travel to school.”).

Item 3 uses the situation where the reader must choose a safe way to walk along the road (e.g. “The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk”). This corresponds with the literature of Barton (2006) who stated that pedestrians must find safe pedestrian choices by scanning the area.

Item 4 includes research on traffic gaps (e.g. “I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.”) Demetre, Lee, Pitcairn, Grieve, Thomson, and Ampofo-Boateng (1992) found that young children are cautious when crossing streets. However, when adding a time constraint, children will choose to make risky decisions (Charron, Festoc, & Gueguen, 2012).

Items 5, 6 and 8 use research on determining risk and perception of risk injury (e.g. “I left my bike helmet at my friend’s house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow;” “I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today;” and “It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.”). These items are also covered in training videos in the *Safety4Schools* safety awareness program. Children are capable of determining risk (Hillier & Morrongiello, 1998).

Item 7 places the reader within a scenario that deals with taking short cuts and a sense of urgency (e.g. “I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.”), Charron, et al., (2012) concluded that the participants took more risks when there was a greater sense of urgency to complete the task. Barton, Ulrich, and Lyday’s (2010) study on route selection, is also applied to item 7.

Item 9 also uses Charron, et al., (2012) research based on the sense of urgency felt (e.g. “I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street”). However, it also could reflect Chu’s (2003) research on “perceived level of safety”.

Item 10 (e.g. “I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.”), was developed from studies of risk assessment and injury (Hillier & Morrongiello, 1998; Peterson, Gillies, Cook, Snick & Little, 1994). FDOT’s research also teaches the bike rider to keep heavy backpacks off the handle bars which could alter the weight. Schwebel, Pitts and Stavrinos (2009), found that backpacks, when carried, changes stride of the walker and creates uncertainty in the amount of time it will take to cross the street. Therefore, biker rides could have the same effect. (See Table 6 for a summary of items).

Additional safety procedures were included in the training program (e.g. Look right-left right before crossing the street and learning to follow pedestrian rules of walking your bike across the street), however not mentioned in the PR-TA or RPPB Scales.

Summary

Research shows that child pedestrian injuries occur while children are on their journey to a specific location (Agran et al., 1994) and most often within a half-mile of the children's residence (Lightstone, Dhillon, Peek-Asa, & Kraus, 2001). About 60% of child pedestrian injuries or deaths occur while crossing the street at an intersection (DiMaggio & Durkin, 2002; Lightstone et al., 2001), and some children take deliberate risks to arrive at their destination early (Charron, Festoc, & Gueguen, 2012). However, pedestrian injuries and mortalities are preventable. Whether the injuries are caused by behavioral issues or environmental ones such as the infrastructure of the surrounding area of the schools, injury prevention for pedestrians are becoming prevalent. Although parents serve as role models to their children on safe pedestrian behaviors (Thomson et al., 1998; Zeedyk & Kelly, 2003) research suggests that parents do not explain why they choose certain behaviors or routes when crossing the street (Zeedyk & Kelly, 2003). The initiatives of the Safe Routes to School funding efforts and the Safe Access to School's awareness programs are beneficial to providing safety solutions.

Children often take shortcuts in route to school. The Walking School Bus program helps safety advocates determine the safest routes for children's journey to school. While the WSB program has adult supervision; research has found that additional measures need to be accompanied with adult supervision to encourage safe risk-taking attitudes and pedestrian behaviors (Mendoza et at. 2012). Pedestrian training combined with completed infrastructure of the surrounding schools could be the answer.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

Introduction

This research study took place at two different school locations; School 1 with incomplete infrastructure and School 2 with complete infrastructure as defined in the literature. The purpose of this study was to determine the extent to which an online safety awareness program influences pedestrian risk-taking attitudes and risk perceptions of pedestrian behavior of children and investigated whether the school's infrastructure contributed to these risks.

- Hypothesis 1(a) posits that students who receive pedestrian safety awareness training will show lower mean scores in pedestrian risk-taking attitudes than those who do not receive the training.
- Hypothesis 1(b) posits that complete school infrastructure combined with the safety awareness training will produce the lowest mean score on the risk-taking attitude scale.
- Hypothesis 1(c) posits that incomplete school infrastructure and no safety awareness training will produce the highest mean scores on the risk-taking attitude scale.
- Hypothesis 2(a) posits that students who receive pedestrian safety awareness training will show higher mean scores in risk perceptions of pedestrian behavior than those who do not receive the training.

- Hypothesis 2(b) posits that complete school infrastructure combined with the safety awareness training will produce the highest mean scores in risk perception of pedestrian behavior scale.
- Hypothesis 2(c) posits incomplete school infrastructure and no safety awareness training will produce the lowest mean score on the risk perception of pedestrian behavior scale.

Approval Process

The investigator conducted the study during the fall semester of 2013. Permission was requested and received from the Internal Review Board (IRB) of the University of Central Florida (Appendix C); and the school district (Appendix D). Because the IRB regulates contact with minors, a Parental Consent form with Student Assent (Appendix E) was signed and collected prior to research and survey distribution. The list below consists of all entities that were consulted for the approval of this research:

1. Institutional Review Board (IRB) for the college
2. The two suburban public schools in the Central Florida Area
3. District School Evaluation and Accountability Board of Florida
4. Florida Department of Transportation
5. Lake-Sumter Metropolitan Planning Organization
6. Safe Access to Schools (Pedestrian safety effort/study)
7. Costa Devault (management of website)
8. The County School Board representing the Central Florida district

School Selection

A review of the county school websites were used to compare the demographics (i.e. total number of students, student/teacher ratio, income level, gender and ethnicity of the student population) to find two schools relatively similar in each of these categories. For the purpose of this study, the ethnicity was considered as majority (Caucasian) or ethnic minority (African American, Hispanic, Asian or other) (McDonald, 2007). The status of the school infrastructures was also compared: one with incomplete infrastructure (School 1) and the other with complete infrastructure (School 2) as defined in the literature review. Table 4 shows the comparisons between the two selected schools' demographics. And Table 5 compares the infrastructure.

Table 4
School Demographics

School Year 2012-2013	**School 1 (Incomplete Infrastructure)**	**School 2 (Complete Infrastructure)**
Total # of Students	**831**	**908**
Student/Teacher Ratio	**14.8:1**	**14.9:1**
Gender	438 (52.7%) Male 393 (47.3%) Female	469 (51.7%) Male 439 (48.3$) Female
% Ethnic Majority (Caucasian)	**42.5%**	**43.1%**
% Ethnic Minority	**Total – 57.5%**	**Total – 56.9%**
% Hispanic	31.4% Hispanic	16.5% Hispanic
% African American	17.7% African American	33.8% African American
% Asian	5.2% Asian	2.2% Asian
% Mixed-2 or more ethnicities	3.0% Mixed	4.0% Mixed
% Indian	.2% Indian	.3% Indian
% Pacific Islander	0% Pacific Islander	.1% Pacific Islander
Economically Disadvantaged (% of Students on Free or Reduced Lunch)	50% 415 Students	66% 599 Students

Table 5
Summary of Safe Routes Priority Project School Comparison

SafeAccess Priority Project (SAPP)	**School 1** **Incomplete Infrastructure**	**School 2** **Complete Infrastructure**
#1	**Build** sidewalk connection	**Revise** limits of existing school zone
#2	**Repair** on sidewalk	**Move existing** midblock crossing to align with Middle School pedestrian entrance and enhance
#3	**Install** high-visibility crosswalks and pedestrian signage	**Change** pedestrian signal timing
#4	**Improve** sidewalks	**Shift** sidewalk further south onto school property
#5	**Install** speed limit signs with flashing beacons	**Restripe** OPMS bus loop access road crosswalk
#6	Further study to reduce posted speed limit to 20MPH; **relocate** flashing beacon	**Narrow and restripe** existing school entrance road
#7	**Reroute vehicle flow** in the parking lot to discourage remote drop-off/ pick-up	Construct median divided entrance to OPMS parking lot
#8	**Post new signs** adjacent to streets with school arrival/ dismissal traffic procedures	N/A
#9	**Replace** school bicycle rack	N/A

Classroom and Participant Selection

Participants were a purposeful sample of students currently enrolled in the 4th or 5th grade in two selected elementary schools located in the Central Florida area (noted for discretion in this study as School 1 and School 2). The subjects of this quantitative research include those students who live within the Parent Responsibility Zone (PRZ) (see Figures 1 and 2). These students were identified by the schools' records that contain travel modes (e.g. walk, bike, bus, family vehicle, and car pool) The school research coordinator identified the classrooms with the greatest number of students who walk or bike to school regularly. The students in these classrooms were given a parental consent form (Appendix E) to carry home to their parents/guardians to review and sign for permission to participate in this research. Other 4th and 5th grade teachers were given the consent form to pass along to their students as well.

Subjects

There were 26 participants in School 1; 12 students from the 4^{th} grade and 14 students from the 5^{th} grade. Of the 26 respondents that were included for analysis, 35% were male and 65% were female. The distribution of participants by ethnic group was either ethnic minority (African American, Hispanic, Asian, Pacific Islander, or other) or majority (Caucasian). Of these, 31% were majority and 69% minority. The experimental group consisted of six 4^{th} - graders (6 female, two majority, four minority), and seven 5^{th} - graders (3 female, one majority, two minority; 4 males, one majority, three minority). The control group consisted of six 4^{th} - fourth graders (4 female, one majority, three minority; 2 male, both minority) and seven 5^{th} - graders (4 female, two majority, two minority; 3 males, one majority, two minority). School 2 had 27 participants; 5 students from the 4^{th} grade and 22 students from the 5^{th} grade. Of the 27 respondents that were included for analysis, 48% were male and 52% were female. The distribution of participants by ethnic group was either ethnic minority (African American, Hispanic, Asian, Pacific Islander, or other) or majority (Caucasian). Of these, 52% were majority and 48% minority. The experimental group consisted of two 4^{th} - graders (1 female and 1 male, both were ethnic majority) and eleven 5th - graders (5 female, three majority, two minority; 6 males, three majority, three minority). The control group consisted of three 4th - graders (2 female, one majority, one minority; 1 ethnic minority male) and eleven 5th - graders (6 female, one majority, five minority; 5 males, four majority, one minority). The five nominal items were noted by the researcher on the survey to indicate the participants' gender, ethnicity, academic school grade level, whether they have taken the safety training course specifically designed for this research (e.g. the experimental group), and within which school they are enrolled. This was coded on the front of each student survey by marking the number "4" for the fourth grade, or "5" for the fifth grade and using a blue marker for male and a pink marker for female, "MN" for minority and "MA" for majority, along with an "E" for experimental group or "C" for the control group. A "1" or "2" will indicate the school location to reflect infrastructure; Elementary School 1 or Elementary School 2. For example: 5MN-E2 written in pink = fifth grade/minority/female/experimental group/within School 2 (complete infrastructure). These codes were marked on the survey as the student handed it in upon completion.

To know the proportion of students in this study who walked or biked to school a one-day travel tally survey (Appendix G) was conducted. The participants answered a question (by a show of hands), how they arrived to school (e.g., Raise your hand if you walked to school today). This determined how many children walked, biked, or were driven by car or by bus on the day of data collection. In School 1, there were two walkers, one biker, fifteen rode the bus, and eight were driven by a family member. In School 2 there were four walkers, three bikers, seventeen rode the bus, and three were driven by a family member. This transportation survey was only conducted with the students participating in this research.

Intervention

Safety4Schools (i.e., safety awareness program) was developed with input provided by safety experts from FDOT, injury prevention specialists, education directors, teachers, parents, and input from children. What differentiates this program from others is that children are able to access this free program on their home computers. There is no need for their parents to purchase a cd or have an adult navigate through a plethora of small fine print legal jargon. It is simple and geared for children.

Several steps were taken to create the Safey4Schools site. The Safe Access to Schools website team granted permission to allow the development of this information on their website: http://lakesumtersafeschool.com/ under the “Kids Corner” tab. The first step was to create a child-user friendly pedestrian and bicycle safety content program using WebPlus x6, a Serif software tool for exploring and sharing ideas on a virtual canvas. The children navigate through the educational program’s “Learning Links” to learn about safety when walking/bicycling to and from school (e.g. how to cross a busy intersection with a crossing guard; how to cross a busy intersection without a crossing guard but with an electronic pedestrian traffic signal; bicycle helmet safety; safety of walking in groups; street signs; and the dangers of strangers, etc.). The researcher and developer of Safety4Schools applied cognitive load theory to facilitate learning (Feinberg & Murphy, 2000). The content was simplified for the children to understand, following the intrinsic cognitive load theory (Sweller, Chandler, Tierney & Cooper, 1990).

Measures

The researcher-designed, self-reported questionnaires were specially designed for this pilot study to measure pedestrian risk-taking attitudes and risk perception of pedestrian behavior in children. The scope and range of the content for these surveys were developed using information from FDOT's pedestrian safety manuals and scenarios from the safety awareness website (e.g. Safe Access to Schools, Kid's Corner http://lakesumtersafeschool.com/). Suggestions and feedback from parents, teachers, and safety advocates throughout the community were also considered. The ten questions were composed after extensive review of pedestrian safety literature and inclusion of important constructs were considered based on past pedestrian safety research (see Table 6). Final approval was given after consultation with the Florida Department of Transportation's District 5 Bicycle and Pedestrian Coordinator, and Lake ~Sumter MPO's Executive Director. The Flesch-Kincaid reliability test grade level formula of: 0.39(total words/total sentences) + 11.8 (total syllables/total words) - 15.59 was used to manage the reading level of the PR-TA Scale and the RPPB Scale. Both scales reflect a 2.042 (second grade) reading level, keeping the "language […] simple, straightforward, and appropriate for the reading level of the scale's target population" (Clark & Watson, 1995. p. 7).

Table 6
PR-TA and RPPB Scales – Pedestrian Research

Item #	Construct	Reference
Item 1 and 2	Walk in groups	(Jacobsen, 2003; Todd, 1992)
Item 3	Route selection	(Barton, 2006)
Item 4	Traffic gaps/ sense of urgency	(Charron, Festoc, & Gueguen, 2012; Demetre, Lee, Pitcairn, Grieve, Thomson, & Ampofo-Boateng, 1992)
Items 5, 6 and 8	Risk and perception of injury	(Hillier & Morrongiello, 1998)
Item 7	Sense of urgency/ route selection	(Barton, Ulrich, & Lyday, 2010; Charron, et al., 2012)
Item 9	Sense of urgency/ perception of safety	(Charron, et al., 2012)
Item 10	Risk assessment, injury and walking strides	(Hillier & Morrongiello, 1998; Peterson, Gillies, Cook, Snick & Little, 1994; Schwebel, Pitts & Stavrinos, 2009)

Instrument I

A Pedestrian Risk-Taking Attitude (PR-TA) Scale (Appendix A) was used to measure pedestrian risk-taking attitudes of children in bicycle and pedestrian situations. This survey consisted of 10 questions or situations. This survey used a 7-point Likert-type scale from 1 (*extremely unlikely*) to 7(*extremely likely*) to measure the likelihood that the child would engage in the described activity or behavior. Item number 2 needed reverse coding.

Instrument II

A Risk Perception of Pedestrian Behavior (RPPB) Scale (Appendix B) was used to measure risk perception of pedestrian behavior of children. This survey consisted of 10 questions or situations. A 7-point Likert-type scale from 1 (*not at all risky*) to 7 (*extremely risky*) measured each child's individual perceived risk of a situation. Item number 2 needed reverse coding.

Validity and Reliability

The PR-TA Scale (Appendix A) and the RPPB Scale (Appendix B) were evaluated for face and content validity through a committee of individuals (e.g. Assistant Vice President of a local state college, Executive Director of transportation planning, a language professor within a local community college, and a curriculum resource teacher from a local elementary school). The committee members were asked to review the 10 items in the surveys to determine that they are clear and relevant to the domains of pedestrian risk-taking attitude and risk perception of pedestrian behavior by filling out a 7-point Likert-type validity scale (Appendix H). By using an odd number of response options (e.g. typically, 5, 7, or 9) eliminates the problem of forcing the respondent to "fall on one side of the fence or the other," (Clark & Watson, 1995. p. 9). A 7-point Likert-type numbering system, rather than a 9-point was used to help reduce the number of random responses (Clark & Watson, 1995).

The reviewers rated the face validity on a scale of 1(*extremely invalid*) to 7 (*extremely valid*). All the reviewers rated all of the items extremely valid. The reviewers rated the content validity by determining if each item was relevant by indicating on a 7-point Likert-type scale of 1 (*completely irrelevant*) to 7 (*extremely relevant*). The averages ranged from 5.75 to 7. Table 7 below; shows the average ratings for each item. Cronbach's alpha suggested that both the PR-TA Scale, r = .711, and the RPPB Scale, r = .818 showed good internal consistency (Nunnally & Bernstien, 1996). Tables 8 and 9 show inter-item correlations for each measure for each scale.

Table 7
Content Validity

Item #	**Average Rating**	**Situation Description (Scenario)**
1	6.75	My friends already left for school and my parents cannot drive me. I will walk or ride my bike to school by myself.
2	6.25	My friends are waiting outside for me to walk to school with them. I will stay with them as I travel to school.
3	6.75	The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.
4	6.75	I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.
5	6.50	I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.
6	5.75	I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.
7	6.75	I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.
8	7	It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.
9	7	I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.
10	6.50	I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it+ off and hold it on the handle bars of my bike.

Table 8
Inter-Item Correlation (PR-TA Scale)

	PRTA1	PRTA2	PRTA3	PRTA4	PRTA5	PRTA6	PRTA7	PRTA8	PRTA9	PRTA10
PRTA1	1.000	.061	-.279	.177	.146	.179	.197	.100	.081	.307
PRTA2	.061	1.000	.254	.005	.072	-.056	-.016	.072	.215	.142
PRTA3	-.279	.254	1.000	.121	.172	.080	.178	-.172	.347	.307
PRTA4	.177	.005	.121	1.000	.263	.236	.325	.400	.368	.083
PRTA5	.146	.072	.172	.263	1.00	.162	.565	.212	.111	.355
PRTA6	.179	-.056	.080	.236	.162	1.000	.364	.062	.305	.463
PRTA7	.197	-.016	.178	.325	.565	.364	1.000	.101	.215	.416
PRTA8	.100	.072	-.172	.400	.212	.062	.101	1.000	.083	.527
PRTA9	.081	.215	.347	.368	.111	.305	.215	.083	1.000	.262
PRTA10	.307	.142	.083	.355	.463	.416	.527	.262	.469	.469

Table 9
Inter-Item Correlation (RPPB Scale)

	PPB1	RPPB2	RPPB3	RPPB4	RPPB5	RPPB6	RPPB7	RPPB8	RPPB9	RPPB10
RPPB1	1.000	-.029	.234	.081	.134	.094	.019	.198	-.009	-.033
RPPB2	.234	1.000	.052	.458	.281	.072	.111	.607	.184	-.037
RPPB3	.081	.052	1.000	.433	.473	.410	.470	.316	.678	.461
RPPB4	.134	.458	.433	1.000	.388	.333	.461	.423	.562	.302
RPPB5	.094	.281	.473	.388	1.000	.171	.627	.322	.484	.522
RPPB6	.019	.072	.410	.333	.171	1.000	.322	.102	.315	.525
RPPB7	.198	.111	.470	.461	.627	.322	1.000	.296	.532	.533
RPPB8	-.009	.607	.316	.423	.322	.102	.296	1.000	.427	.043
RPPB9	-.003	.184	.678	.562	.484	.315	.532	.427	1.000	.477
RPPB10	-.029	-.037	.461	.302	.522	.525	.533	.043	.477	1.000

Procedures

School 1

Prior to my arrival, the participating students from the 4th grade were gathered in the media center (The fourth grade met at 9:05am and the fifth grade arrived at 10:00am). The media center teacher conducted the introductions (e.g. Welcome the graduate student attending the University of Central Florida for this research project). The teacher provided the previously signed parental consent forms (Appendix E) (see classroom and participant section of this report). Each student was asked if they wish to participate in this activity, thus collecting the assent of the participants (Appendix E). This allowed the students an opportunity to agree or decline in the research study. Those students who did not wish to participate were allowed to sit quietly and read a book in the media center.

All of the participants in the study were asked to participate in a "Travel Tally Survey" (Appendix G) to determine the child's travel habit. The participants answered a question (by a show of hands), how they arrived to school (i.e. raise your hand if you walked to school today). This determined how many children walked, biked, or were driven by car or by bus on the day of data collection. Students were randomly assigned (without replacement) to treatment and control groups by blindly drawing a colored straw from a basket. The students with blue straws were assigned to the experimental group and escorted to the computer lab CRC1 in the media center. The students with green straws were assigned to the control group and were sent to a separate room, to work on an assignment unrelated to this study. Each participant in the experimental group used an internet browser on a student computer connected to the internet to participate in the study. They logged onto the Safe Access to Schools website “Kids Corner” (Figure 9; http://lakesumtersafeschool.com/) to complete the 40-minute safety awareness program. Upon completion, groups were reconvened. The students were told not to speak to one another to enhance fidelity of the treatment. The students were told to take the survey seriously, as it is important for the completion of this degree. The seriousness was explained to the students as follows: “By a show of hands, how many of you study for tests? How many of you know the importance of tests? Well these surveys are my test. I need all of you to answer the questions honestly. There is not a right or wrong answer, so do not look at your neighbor’s answers. If you have a question, please raise your hand and I will come to you.” The students did not look around and completed the surveys in silence. All the participants took the 20-minute Pedestrian Risk-Taking Attitude (PR-TA) and Risk Perception of Pedestrian Behavior (RPPB) surveys. The instructions included an example question to ensure that the students followed the directions and completed the 7-point Likert-type Scale appropriately.

School 2

The participants of the 4th and 5th grade students were taken to the cafeteria where the principal of the school conducted the introduction (e.g. Here is the graduate student attending the University of Central Florida for the research project). The principal provided the previously signed parental consent forms (Appendix E) (see classroom and participant section of this report). Each student was asked if they wish to participate in this activity, thus collecting the assent of the participants (Appendix E). This allowed the students an opportunity to agree or decline in the research study. Those students who did not wish to participate were allowed to return to their homeroom.

All of the participants in the study were asked to fill out a “Travel Tally Survey” (Appendix G) to determine the child’s travel habit. The participants answered a question (by a show of hands), how they arrived to school (i.e. raise your hand if you walked to school today). This determined how many children walked, biked, or were driven by car or by bus on the day of data collection. Students were randomly assigned (without replacement) to treatment and control groups by blindly drawing a colored straw from a basket. The students with red straws were assigned to the experimental group and gathered in the computer lab. The students with purple straws were assigned to the control group and stayed in the cafeteria to participate in an activity unrelated to this research. Each participant in the experimental group used an internet browser on a student computer connected to the internet to participate in the study. They logged onto the Safe Access to Schools website “Kids Corner” (Figure 9; http//lakesumtersafeschool.com/) to complete the 40-minute safety awareness program. Upon completion, groups were reconvened. The students were told not to speak to one another to enhance fidelity of the treatment. The students were told to take the survey seriously, as it is important for the completion of this degree. The seriousness was explained to the students as follows: “By a show of hands, how many of you study for tests? How many of you know the importance of tests? Well these surveys are my test. I need all of you to answer the questions honestly. There is not a right or wrong answer, so do not look at your neighbor’s answers. If you have a question, please raise your hand and I will come to you.” The students did not look around and completed the surveys in silence. All the participants took the 20-minute Pedestrian Risk-Taking Attitude (PR-TA) and Risk Perception of Pedestrian Behavior (RPPB) surveys. The instructions included an example question to ensure that the students followed the directions and completed the 7-point Likert-type Scale appropriately.

The Safe Routes to School Program through the Florida Department of Transportation (FDOT) provided child safety helmets to all students participating in this research in both the control groups and the experimental groups and for each school. (Children not participating were encouraged to visit the Safe Access to Schools website to attain their own free helmet).

Figure 9: Safe Access to Schools Kids Corner – Safety Training Course

Design

A 2(complete vs. incomplete infrastructure) x 2 (experiment vs. control) factorial design was used to examine the differences in pedestrian risk-taking attitudes and risk perception of pedestrian behavior between schools and between groups. This study used 53 participants. The student population was divided into two groups within each of the two schools: Experimental Group 1 (n=13) and Control Group 1(n=13) were from the student population of Elementary School 1 (incomplete infrastructure); the Experimental Group 2 (n=13) and Control Group 2 (n=14) were from the student population of Elementary School 2 (complete infrastructure).

CHAPTER FOUR: DATA ANALYSIS AND FINDINGS

Introduction

A 2x2 Factorial Multivariate Analysis of Variance (MANOVA) was used to test two categorical independent variables (online safety awareness training, school infrastructure) for each of the two continuous dependent variables (pedestrian risk-taking attitudes, risk perceptions of pedestrian behavior).

Test of Statistical Assumptions

The data were analyzed by using the Statistical Package for the Social Sciences (SPSS). All tests of normality indicated that scores on pedestrian risk-taking attitudes were normally distributed, $SW(53) = .981$, $g_1 = .257$, $g_2 = -.330$, $p = .543$; however results were not as consistent for risk perception of pedestrian behavior. Although the Shapiro-Wilk's test indicated that the distribution were not normal $SW(53) = .943$, $p = .014$, the measure of skewness and kurtosis were small relative to their standard errors, $g_1 = -.450$, $ses = .327$, $g_2 = -.842$, $sek = .644$. While this may affect the validity of the results, ANOVAs tend to be robust against small violations of normality (Glass, Peckham & Sanders, 1972). Box's Test of Equality of Covariance Matrices (Box's M) suggested that the group variances and covariance of the dependent variances were not equal across groups, $M = 27.179$, $F(9,27030.792) = 2.796$, $p = .003$. Therefore Pillai's Trace is reported, which is more robust against this statistical violation.

Primary Data Analysis

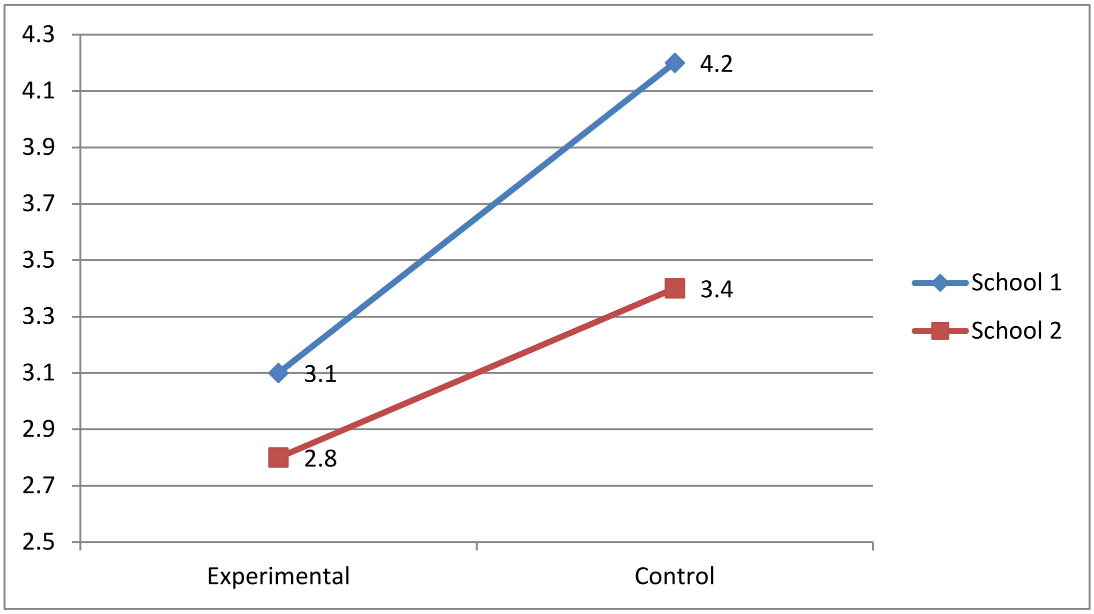
The factorial MANOVA indicated that there was a significant interaction between schools and groups suggesting that the effect of training depends on the infrastructure of the school, $V = .280$, $F(2,48) = 9.336$, $p < 001$. In other words, School 1 had a different outcome from the pedestrian training program than School 2 (see Table 9 and Table 10).

Pedestrian Risk-Taking Attitude

Hypothesis 1(a) posits that students who receive pedestrian safety awareness training will show lower mean scores in pedestrian risk-taking attitudes than those who do not receive the training. Hypothesis 1(b) posits that complete school infrastructure combined with the safety awareness training will produce the lowest mean score on the risk-taking attitude scale. Hypothesis 1(c) posits that incomplete school infrastructure and no safety awareness training will produce the highest mean scores on the risk-taking attitude scale.

Although school infrastructure did not moderate the treatment effect of pedestrian risk-taking attitude, $F(1,49) = 1.622$, $p = .209$, the intervention was effective for both schools, $F(1,49) = 17.651$, $d = 1.094$, $p < .001$ (Table 12). Those receiving the training had lower mean scores (M = 2.935, SD = .687) than those who did not receive the training (M = 3.785, SD = .858) (Tables 10 and 12), supporting Hypothesis 1(a). Furthermore, regardless of intervention, School 2 (complete infrastructure) participants reported takes fewer risks (M = 3.615, SD = .878) than School 1 participants (incomplete infrastructure; M = 3.104, SD = .821), $F(1,49) = 6.393$, $d = 0.601$, $p = .015$ supporting Hypotheses 1(b) and 1(c). Table 10 illustrates the rate of change between schools and between groups.

Table 10
Estimated Marginal Means of PRTA Scale



Risk Perception of Pedestrian Behavior

Hypothesis 2(a) posits that students who receive pedestrian safety awareness training will show higher mean scores in risk perceptions of pedestrian behavior than those who do not receive the training. Hypothesis 2(b) posits that complete school infrastructure combined with the safety awareness training will produce the highest mean scores in risk perception of pedestrian behavior scale. Hypothesis 2(c) posits incomplete school infrastructure and no safety awareness training will produce the lowest mean score on the risk perception of pedestrian behavior scale.

School infrastructure moderated the treatment effect of risk perception of pedestrian behavior, $F(1,49) = 17.280$, $p < .001$. Therefore the effect for School 1 is different than the effect for School 2 (Table 12). Separate t-tests were conducted for each school. There was a violation of homogeneity of variance, $F(1,24) = 6.865$, $p = .015$. Therefore equal variances were not assumed. An independent samples t-test indicated that the mean difference between groups was statistically significant, $t(17.937) = 11.639$, $d = 4.562$, $p < .001$. Those students who received the training (M= 5.292, SD = .290) showed higher mean scores for perception of risky behavior than those students who did not receive the training (M = 3.246, SD = .564) (Tables 11 and 12).

Levene's Test did not suggest that there was a violation of homogeneity of variances for School 2 F(1,25) = 1.745 p = .199. Furthermore, The mean difference between groups was not statistically significant between groups, $t(25) = 1.675$, $d = 0.650$, $p = .106$. While there was evidence supporting Hypothesis 2(c), Hypothesis 2(b) was not supported. Because of the interaction, the main effect for Hypothesis 2(a) was only evident for the school with incomplete infrastructure. No other significant effects were found. Table 11 illustrates the rate of change between schools and between groups.

Table 11
Estimated Marginal Means of RPPB Scale

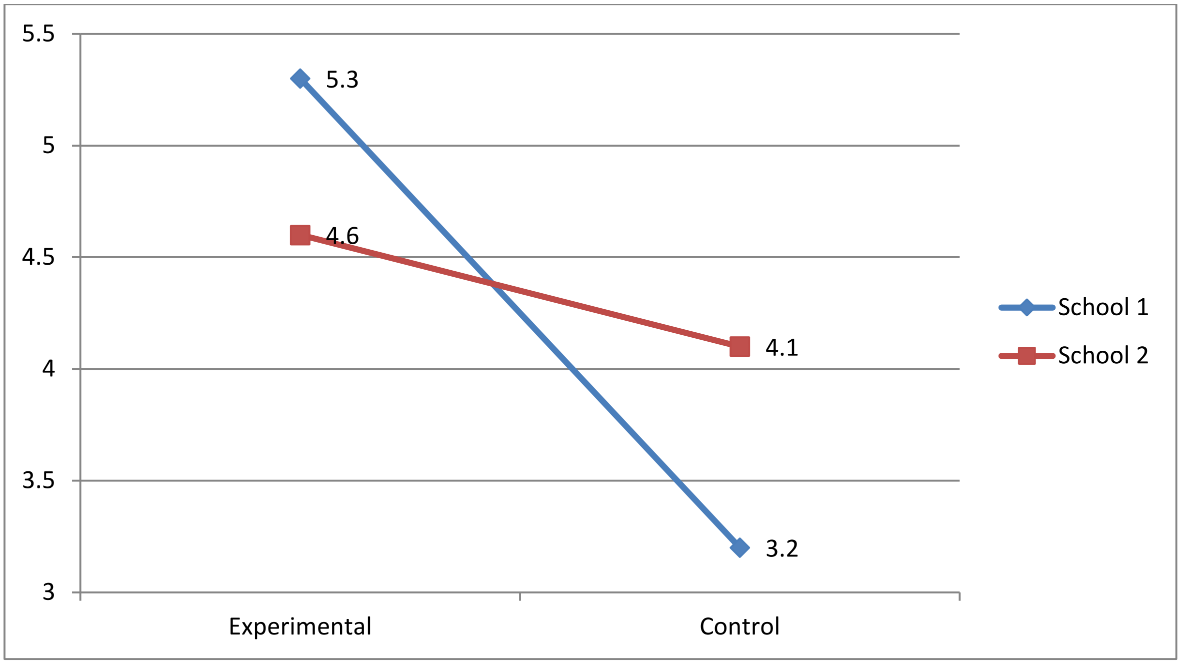
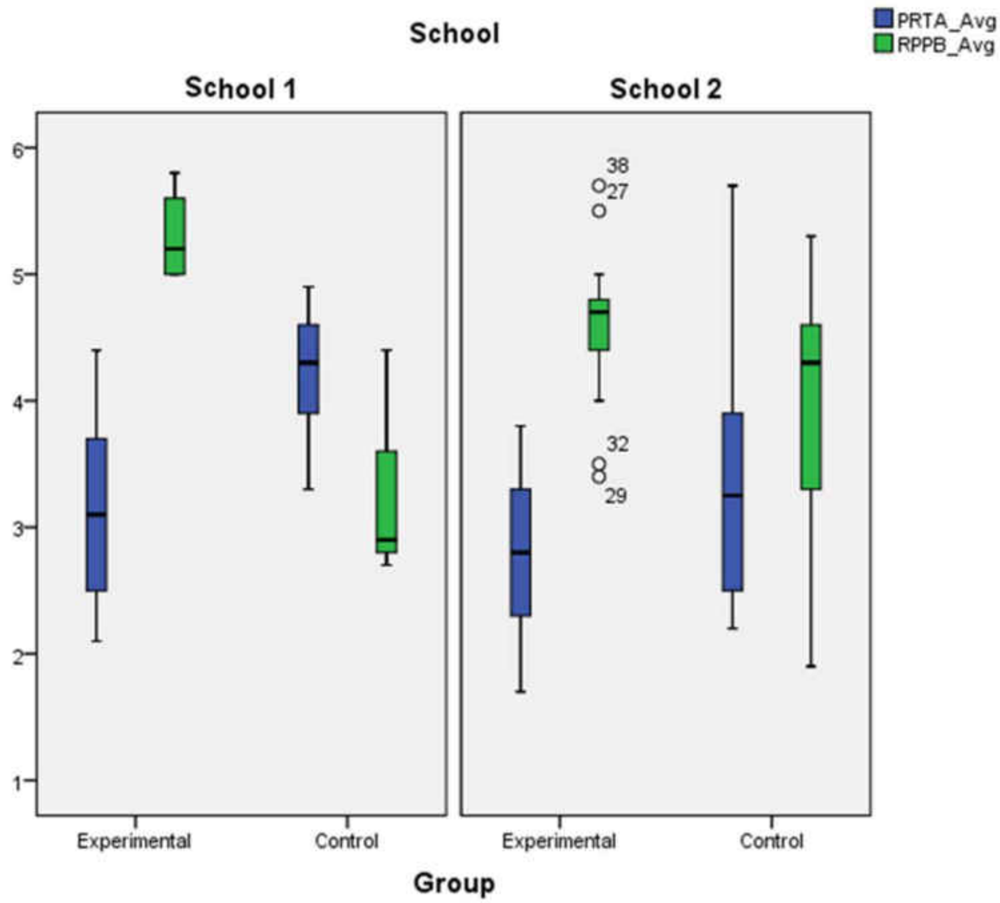


Table 12
Estimated Average Means between Schools and Groups



CHAPTER FIVE: DISCUSSION

Primary Objectives

The purpose of this study was to investigate existing pedestrian safety research and to determine if pedestrian training, combined with school infrastructure, effected pedestrian risking-attitude and risk perception of pedestrian behavior. There were two objectives of this pilot study. First, to develop a multimedia online pedestrian safety training program (i.e., Safety4Schools) for children's immediate access. Second, to investigate and test two hypotheses on the effect of the Safety4Schools program exploring the connection between school infrastructure and pedestrian risk-taking attitude and risk perception of pedestrian behavior. This chapter discusses the findings along with the interpretation of results. Limitations are examined. Conclusions including findings for future research of school infrastructure, pedestrian risk-taking attitude and risk perception of pedestrian behavior are presented.

Review of Study

Pedestrian Risk-Taking Attitude (PR-TA) Scale

For the PR-TA scale, measuring pedestrian risk-taking attitude, Hypothesis 1(a) posited that students who receive pedestrian safety training will show lower mean scores in pedestrian risk-taking attitudes than those who do not receive the training. Hypothesis 1(b) posited that complete school infrastructure combined with the pedestrian safety training will produce the lowest mean score on the risk-taking attitude scale. Hypothesis 1(c) posited that incomplete school infrastructure and no pedestrian safety training will produce the highest mean scores on the risk-taking attitude scale. Although school infrastructure did not moderate the treatment effect of pedestrian risk-taking attitude, the intervention was effective for both schools. In other words, those students receiving the training in both schools had lower mean scores, suggesting that the participants taking the pedestrian safety training were less likely to participate in risky activities than those who did not take the training. Furthermore, within both groups (experimental and control), the school with complete infrastructure had lower mean scores, suggesting that they were less likely to participate in risky pedestrian activities than those students in the school with incomplete infrastructure.

Past research states that knowledge of pedestrian law does not necessarily influence pedestrians' choice of street crossing locations (Chu, 2003). However this study supports research on risk-taking attitudes of safe pedestrian activities (Boateng et al., 1993; Thomson et al., 1992, 1997, 1998). Participants receiving the Safety4Schools pedestrian training indicated a lower likelihood of risky pedestrian activities. In other words, after taking the Safety4Schools pedestrian training, the PR-TA scale that measures pedestrian risk-take attitudes, indicated that children in both schools stated that they were more likely to walk in groups, wear a bicycle helmet when riding a bike, stay on the sidewalk or pathway, keep their hands free to steer their bicycle, to wait for the traffic light to signal the "all clear to cross", and wear appropriate clothing (e.g. bright colors) when walking or bicycling to school. Additionally, the results of the PR-TA scale showed that children are less likely to take shortcuts to school, to walk alone, and to take rides from strangers; which is consistent with Todd's (1992) study on the impact of staying safe by traveling in groups.

Item Results for the PR-TA Scale

Items 1 and 2 of the PR-TA scale suggested that students who took the training have a greater likelihood that they would walk in groups and not walk alone. Todd (1992) found that drivers are more cautious when they see people walking in groups, and Jacobsen (2003) stated that pedestrian risk injuries reduce when people walk in groups. Burton (2006) stated that route selection, measured in Item 3 of the PR-TA scale, is important to consider when making safe choices. The results indicated that the groups that took the Safety4Schools Training for both schools would walk on the sidewalk and not in the grass next to the street. However, School 2 showed lower mean scores, indicating that the school with complete infrastructure would take fewer risks. In Item 4 of the PR-TA scale; research on traffic gaps, suggest that young children would be more likely to miss an opportunity to cross a busy street, than to run out in front of a vehicle (Demetre et al., 1992). On the other hand, research states that children are most likely to make fatal mistakes when a sense of urgency is felt when crossing the street (Charron, Festoc, & Gueguen, 2012). Item 4 did not convey a high degree of urgency; the sentence, "I need to cross the street," did not imply that they need to cross right now. Therefore, supporting Demetre et al.'s (1992) study on traffic gaps, the results indicated that the students would be less likely to run across the street between cars. Items 5 and 6 are taken from the FDOT pedestrian safety rules of wearing a helmet when riding a bike and wearing bright color clothing as a pedestrian or bicyclist. The results indicated that both experimental groups would be more likely to follow these rules which are consistent with Hillier and Morrongiello's (1998) research examining children's perception of risk injury. The results of Item 7 are not consistent with Charron, Festoc and Gueguen's (2012) research on the sense of urgency felt. The question places the reader in a situation where they must decide to take a shortcut to get home before their favorite television show comes on. The results showed that the students from both schools in the experimental groups are less likely to take the shortcut, then those students who did not take the training, thus suggesting that training affects their attitude towards risk choice. Item 8 covers the question on stranger awareness which falls under the umbrella of risk injury for the purpose of this study. The mean score of students in the experimental groups for both schools showed that they were unlikely to take a ride with someone they do not know. Contrary to previous claims that the situation in Item 9 falls within the sense of urgency; the results indicated that after taking the training, the students in the both schools will wait for the traffic signal to change before crossing a busy intersection; regardless of how long the light takes to change, thus supporting research on the ability of children to asses risk (Ampofo-Boateng & Thompson, 1991; Underwood, Dillon, Farnsworth, & Twiner, 2007). Lastly, Item 10 supported Ampofo-Boateng and Thompson (1991) and Underwood, Dillon, Farnsworth, and Twiner's (2007) study of risk assessment and Hillier and Morrongiello's (1998) research on perception of injury; students' mean scores in the experimental groups of both schools indicated that they were less likely to place their back packs on the handle bars of their bicycle most likely because a section of the training focused on keeping your hands free to steer the bicycle.

Risk Perception of Behavior (RPPB) Scale

The RPPB scale measures perception of pedestrian behavior. Hypothesis 2(a) posited that students who receive pedestrian safety training will show higher mean scores in risk perceptions of pedestrian behavior than those who do not receive the training. Hypothesis 2(b) posited that complete school infrastructure combined with the safety training will produce the highest mean scores in risk perception of pedestrian behavior scale. Hypothesis 2(c) posited incomplete school infrastructure and no safety training will produce the lowest mean score on the risk perception of pedestrian behavior scale. The results cannot fully support or refute the hypotheses because of the interaction. School infrastructure moderated the treatment effect of risk perception of pedestrian behavior. Therefore the effect for School 1 is different than the effect for School 2. Separate t-tests were conducted for each school. The school with incomplete infrastructure had a violation of homogeneity of variance, therefore equal variances were not assumed. In other words, the rate of change was different for each school. An independent samples t-test indicated that the mean difference between groups was statistically significant, indicating that those who received the pedestrian safety training benefited more than those who did not receive the training.

Furthermore, the mean difference between the group that participated in the training and the group who did not participate was not statistically significant for School 2. While there was evidence supporting Hypothesis 2(c); the group in the school with incomplete infrastructure and without training reflected the lowest mean score, there was not a significant difference between the control group and the experimental group for the school with complete infrastructure. Hypothesis 2(b) was not supported. In fact, the school with incomplete infrastructure had the highest mean score. Because of the interaction, the main effect for Hypothesis 2(a) was only evident for the school with incomplete infrastructure. No other significant effects were found.

Therefore for School 1 (incomplete infrastructure), utilizing the RPPB scale that measures perception of pedestrian behavior, the students who did not complete the Safety4Schools training believed that unsafe behaviors such as; not wearing a bicycle helmet when riding a bike, not keeping their hands free to steer their bicycle, not wearing appropriate clothing (e.g. bright colors) when walking or bicycling to school, taking shortcuts to school, not using the pedestrian crosswalk light in intersections, walking alone, and taking rides from strangers, were not scored as risky behaviors. However for the school with complete infrastructure, the findings were inconclusive.

Past studies on pedestrian education (Zeedyk, Wallace, Carcary, Jones & Larter, 2001) indicate that knowledge of pedestrian rules do not improve pedestrian behavior. However, on the other hand, this study found that within a school with incomplete infrastructure, pedestrian education is beneficial to the perception of risky pedestrian behavior. Furthermore, literature suggests that children feel safe while using completed infrastructure areas (i.e. crosswalk with zebra stripes) to cross a street (Zegeer, Esse, Stewart, Huang, & Lagerwey, 2004). However, this study indicates that the students who completed the training and in the school with completed infrastructure, perceive a situation as less risky than those students who completed the training and attend a school with incomplete infrastructure (e.g., no crosswalks around the school or crosswalks that are not marked with zebra stripes). Although the area around the school had completed sidewalks and crosswalks in School 2, this did not necessarily infer that the children felt safe when crossing the street and walking to school. On the contrary, the results suggested that children would be more cautious when walking to school than those students who attend the school with incomplete infrastructure because of the results indicated that the students in School 2 found the situations to be less risky than those who attend School 1. For instance, Item 3 stated that the sidewalk is on the opposite side of the street; the question assesses how risky the student perceives crossing the street to walk on the sidewalk instead of traveling down the grass line. The students in the experimental group in School 1 indicated a riskier score about walking in the grass alongside the road, than students in School 2. In other words, the students who completed the training in the school with incomplete infrastructure found the situations for the RPPB Scale to be risky than those students in the school with complete infrastructure.

Implications

One area of interest in pedestrian safety is the relationship between school infrastructure and risk-taking attitudes and perception of behavior. The findings in this pilot study provide support of the Safe Access to School's completion of infrastructure around schools. The construction improvements on sidewalks, crosswalks and the addition of flashing beacons and pedestrian traffic signals lowered the likelihood of risk-taking pedestrian activities possibly because the students in the school with the completed infrastructure (School 2) have these safety measures readily available to them as opposed to the students who attend the school with incomplete infrastructure (School 1) who are not accustom to these safety measures. Such findings might aid transportation planners in locating the necessary project improvements to promote pedestrian street safety. Parents and teachers could assist the students in avoiding the dangerous areas and find alternative routes for the children who are walking to school.

The relationship between multimedia pedestrian safety training and risk-taking attitudes and perception of behavior is another area of interest in pedestrian safety. According to past research on pedestrian education and its impact on pedestrian risk-taking attitude and behavior, there is evidence explaining that pedestrian training is important to avoid pedestrian injury. The findings of this study contribute to the understanding that training, no matter how little, will improve children's risk-taking attitude regardless of the infrastructure around schools. However, the school that needed considerable repair to school infrastructure benefited the most from the training; it increased the awareness of risky pedestrian behaviors of those students in School 1. This may have been because the training enlightened to students that walking in the street and dodging traffic by running through gaps between cars is, by pedestrian law, considered risky behavior. Although, while infrastructure is under construction, students in School 1 will not have an option to utilize these important safety measures.

It is hoped that this pedestrian study will further promote the importance of pedestrian training for children and provide the necessary data for future pedestrian educational funding. Such funding might aid in bridging the gap that currently exists between pedestrian education in schools and children arriving safely to their destination. Steps should be taken to provide multimedia pedestrian safety training to elementary schools because this study suggests that training not only lowers the likelihood of pedestrian risk-taking activities, but also creates awareness of risky pedestrian behaviors.

Limitations and Strengths

Despite the contributions of this study, some limitations are noted. First, the sample size was limited, this suggests that covariates such as; age and gender in pedestrian safety research result in different outcomes for behavior (Barton, Ulrich, & Lyday, 2010; Hillier & Morrongiello, 1998), however these could not be reliably tested due to the small sample size (i.e., School 1 had 13 participants in the experimental group and 13 participants in the control group; School 2, had 13 participants in the experimental group, and 14 in the control group). However, in this study, a moderate effect size found for the intervention in School 2 (complete infrastructure) suggests that had there been a larger sample size, the treatment effect for risk perception of pedestrian behavior may have been statistically significant. The second limitation was the instrumentation used to test the variables. These surveys were developed for this study and had not been tested prior to this research. Furthermore, the surveys were developed through an investigation of literature, and may have been flawed. However, a strength for this study was that all evaluators for validity testing were experts and professionals in the fields of transportation, education or psychology; and found the surveys valid and appropriate. Additionally, Cronbach's alpha suggested that both the PR-TA, and the RPPB Scales showed good internal consistency (Nunnally & Bernstien, 1996). The variability was small, therefore there was strong correlation. In other words, the internal consistency reliability of these survey instruments was strong. Age was considered for the development of the Scales. The Flesch-Kincaid reliability test grade level formula of: 0.39(total words/total sentences) + 11.8 (total syllables/total words) - 15.59 was used to manage the reading level of the PR-TA Scale and the

RPPB Scale. Both scales reflect a 2.042 (second grade) reading level, thus “keeping the reading level simple” for the fourth and fifth grades to comprehend (Clark & Watson, 1995. p. 7).

Future Direction

Mendoza, et al (2012), suggested that the Walking School Bus would be a more effective pedestrian safety tool if it were combined with virtual training. Furthermore, Schebel and McClure (2010) found success when they investigated transfer of information learned from a multimedia pedestrian training program to a simulated traffic environment. This study discovered that the Safety4Schools program lowered the likelihood of pedestrian risk-taking activities and found that school infrastructure impacts these findings. However the Safety4Schools program did not have a significant effect on children’s perception of behavior, therefore modifications to the program should include simulated pedestrian exercises (e.g., constructing a mock traffic intersection in the classroom or parking lot; use duct tape or chalk to make the streets and edges of the sidewalk. Have the children act out the pedestrian safety activities found in the Safety4Schools program). This action could promote safe pedestrian behavior. Future research should examine online multimedia safety pedestrian training paired with simulated or real life situation training to measure pedestrian risk-taking attitude and risk perception of pedestrian behavior.

Conclusion

Children will most likely avoid risky situations if they are trained in pedestrian safety. School infrastructure also impacts the risk perception of children (i.e., how risky they believe a situation is). However this investigation failed to support Hypothesis 2(b) (i.e. complete school infrastructure and safety awareness will reflect the highest mean score in risk perception of pedestrian behavior scale). Actually, those who received pedestrian safety training in the school with incomplete infrastructure had the highest perception of risky behavior. These findings highlight the importance of pedestrian safety education, not merely to teach pedestrian law, but to examine the relationship between school infrastructure and children's pedestrian risk-taking attitude and risk perception of pedestrian behavior.

APPENDIX A:
PEDESTRIAN RISK-TAKING ATTITUDE (PR-TA) SCALE

Pedestrian Risk-Taking Attitude (PR-TA) Scale

For each of the following statements, please show the **likelihood** that you would engage in the described activity or behavior if you were to find yourself in that situation. Place a number of (1) *Extremely Unlikely* to (7) *Extremely Likely*, using the following scale:

1	2	3	4	5	6	7
Extremely Unlikely	Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Likely	Extremely Likely

1. _____ My friends already left for school, and my parents cannot drive me. I will walk or ride my bike to school by myself.

2. ____ My friends are waiting outside for me to walk to school with them. I will stay with them as I travel to school.

3. ____ The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.

4. ____ I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.

5. ____ I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.

6. ____ I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.

7. ____ I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.

8. ____ It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.

9. ____ I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.

10. ____ I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.

APPENDIX B:
RISK PERCEPTION OF PEDESTRIAN BEHAVIOR (RPPB) SCALE

Risk Perception of Pedestrian Behavior (RPPB) Scale

For each of the following statements, please indicate **how risky (dangerous chance) you perceive (look, consider or judge)** each situation. Place a number from (1) *Not at all Risky* to (7) *Extremely Risky*, using the following scale:

1	2	3	4	5	6	7
Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky

1. ____ My friends already left for school, and my parents cannot drive me. I will walk or ride my bike to school by myself.
2. ____ My friends are waiting outside for me to walk to school with them. I will stay in the group as I travel to school.
3. ____ The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.
4. ____ I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.
5. ____ I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.
6. ____ I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.
7. ____ I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.
8. ____ It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.
9. ____ I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.
10. ____ I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.

APPENDIX C: IRB APPROVAL FORM

University of Central Florida

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Diana D. Scott**

Date: **October 25, 2013**

Dear Researcher:

On 10/25/2013, the IRB approved the following minor modifications to human participant research until 03/12/2014 inclusive:

Type of Review:	IRB Addendum and Modification Request Form
Modification Type:	The study title has been changed to: A Multimedia Pedestrian Safety Program and School Infrastructure: Finding the Connection to Child Pedestrian Risk-Taking Attitudes and Risk Perceptions? (Original study title was: Risk attitudes, risk perception and expected benefits: Evidence of positive change pertaining to student safety.) An additional survey will be used in the study and has been uploaded in iRIS.
Project Title:	A Multimedia Pedestrian Safety Program and School Infrastructure: Finding the Connection to Child Pedestrian Risk-Taking and Risk Perceptions?
Investigator:	Diana D. Scott
IRB Number:	SBE-13-09090
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 03/12/2014, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Page 1 of 2

APPENDIX D: SCHOOL DISTRICT APPROVAL

LAKE COUNTY SCHOOLS

Leading our Students to Success

201 West Burleigh Boulevard · Tavares · FL 32778-2496
(352) 253-6500 · Fax: (352) 343-0198 · www.lake.k12.fl.us

Superintendent:
Susan Moxley, Ed.D.

School Board Members:
District 1
Bill Mathias
District 2
Rosanne Brandeburg
District 3
Tod Howard
District 4
Debbie Stivender
District 5
Kyleen Fischer

May 7, 2013

Ms. Diana Dawn Scott
16925 Alpha Avenue
Montverde, FL 34756

Dear Ms. Scott:

This letter serves as final approval to conduct your research study entitled, "Risk attitudes, risk perception and expected benefits: Evidence of positive change pertaining to student safety."

Per information submitted in your request, please note/adhere to the following:

- This research will be conducted to fulfill requirements for a master's degree through the University of Central Florida.
- Administrator and teacher participation in this study is voluntary.
- Student participation in this study is voluntary. The approved consent forms must be signed by parents of all student participants.
- All procedures set forth in the approved research request must be followed as revised and approved by Lake County Schools.
- The confidentiality of the district, schools, administrators, and teachers will be maintained at all times.
- The district will be identified as a "district in Central Florida" or a similar identifier.
- The schools will be identified as "elementary schools in Central Florida," or a similar identifier.
- Teacher and student participation in this study will create minimal or no disruption to the school and student learning.
- Each child participating in the study will receive a bicycle helmet as indicated in the submitted proposal.
- All Florida statutes and district policies and procedures must be followed at all times.
- A copy of the results of the research must be provided to the district upon completion.

Should you have additional questions, please do not hesitate to contact me at 352-483-9207. I wish you much success with this research project.

Yours truly,

Kathleen Farner Thomas, Ph.D.
Director of Evaluation and Accountability

C: Dr. Susan Moxley, Superintendent
Hugh Hattabaugh, Chief of Academics
Aurelia Cole, Chief of Administration and Safety
Ms. Kim Jarvis, Principal of Groveland Elementary School
Ms. Durenda McKinney, Principal of Leesburg Elementary School

"Equal Opportunity in Education and Employment"

APPENDIX E: PARENTAL CONSENT FORM

Risk Attitude, Risk Perception and Expected Benefits: Evidence of Positive Change Pertaining to Student Safety

Informed Consent

Principal Investigator(s): Diana Dawn Scott

Thesis Committee Member(s): Bobby Hoffman, PhD
Robert Porter, PhD
Stephen Sivo, PhD

Faculty Supervisor: Bobby Hoffman, PhD

Sponsor: University of Central Florida,
School of Teaching, Learning & Leadership

Investigational Site(s): [redacted] Elementary School

How to return this Consent Form: Please sign and return this consent form to your child's teacher either by allowing your child to carry it to school and personally handing it to your child's teacher, or by mailing the consent form to the school's address below:

[redacted]

Consent form is due back no later than <u>September 18, 2013</u>

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a research study which will include about 100 elementary school children in the fourth and fifth grades at [redacted] and [redacted] Elementary School. Your child is being invited to take part in this research study because he or she is a fourth or fifth grade student at [redacted] Elementary School.

The person doing this research is Diana Dawn Scott at the University of Central Florida, Applied Learning and Instruction M.A. department of Teaching, Learning, & Leadership. Because the researcher is a graduate student she is being guided by Dr. Bobby Hoffman, a UCF faculty supervisor in the Educational Psychology Department.

University of Central Florida IRB
IRB NUMBER: SBE-13-09090
IRB APPROVAL DATE: 8/15/2013
IRB EXPIRATION DATE: 3/12/2014

Permission to Take Part in a Human Research Study

What you should know about a research study:

- Someone will explain this research study to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should allow your child to take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you or your child.
- Feel free to ask all the questions you want before you decide.

Purpose of the research study: This project has been developed to examine whether an on-line pedestrian safety training program influences a child's overall safety risk attitude and risk perception. We will also examine if the degree of risk benefits to the child changes after learning about safety.

What your child will be asked to do in the study: All assessment and instruction will take place during your child's time at Groveland Elementary School. As part of this study your child will either be a member of a "control" group (This means that they will just need to complete a survey.) or an "experimental" group (This means that they will be part of the research by reading about safety through the on-line training website, take a short quiz, and then take the survey). All of the children participating in the study will be asked to help fill out a "Tally Survey" to find the child's travel habit. They will answer a question, (by a show of hands), how they arrived to school. This will determine how many children walked, biked, was driven by car or by bus.

- **Training:** *(Experimental Group)* The online training program is accessible through the Safe Access to School website: http://lakesumtersafeschool.com/ under the "Kids Corner" tab. The children will navigate through the educational program to learn about safety when walking to and from school (e.g. how to cross a busy intersection with a crossing guard; how to cross a busy intersection without a crossing guard but with an electronic pedestrian traffic signal; bicycle helmet safety; safety of walking in groups; "stranger danger" etc.).
- **On-line Quiz:** *(Experimental Group)* The on-line quiz will have a link to Survey Monkey, accessible through the Safe Access to School website: http://lakesumtersafeschool.com/ under the "Kids Corner" tab. The participants will take the short 10 question quiz after they complete the training portion of the safety training listed above. The quiz questions will be related to the information found on the training link and will be child user –friendly.
- **Survey:** *(Control Group and Experimental Group)* The Risk Attitude, Risk Perception and Expected Benefits Survey consist of 30 questions or situations. The same 30 situations are used in each of the three sections: about risk taking attitudes, risk perceptions and expected benefits from these risks. That make a total of 90 questions and the participants are asked to answer all the questions. A sample is listed below:

1. **Risk Taking**

For each of the following statements, please indicate the **likelihood** that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* (1) to *Extremely Likely* (7).

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2. **Risk Perception**

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in **your gut level assessment of how risky** each situation or behavior is.

For each of the following statements, please indicate **how risky you perceive** each situation. Provide a rating from *Not at all Risky* (1) to *Extremely Risky* (7).

3. **Expected Benefits**

For each of the following statements, please indicate **the benefits** you would obtain from each situation. Provide a rating from *No benefits at all* (1) to *Great benefits* (7).

The data collected will be obtained from the students. The students will be divided into four equal numbers of groups: Experimental Group 1 and Control Group 1 will be taken from the student population of [redacted] Elementary; the Experimental Group 2 and Control Group 2 will be taken from the student population of Leesburg Elementary. Participation or non-participation in the research portion of this study will not affect their grade in the class.

Prior to my arrival, the participating students from the 4th and 5th grades will be gathered into one location. The teacher will introduce me to the students as a graduate student attending the University of Central Florida (5 minutes). The teacher will then provide me with the signed parental consent forms that were collected earlier that week (5 minutes). I will quietly ask each student if they wish to participate in this activity and ensure them that a teacher will be with them at all times. This will allow the students an opportunity to agree or decline in the research study (10 minutes). Those students who do not wish to participate will be sent to the classroom to join the other students who did not provide a consent form.

I will talk briefly about safety when walking to and from school; this should take no longer than 5 minutes. I will ask the students who supplied the teacher with a signed parental consent form and who agree to the study, to line up at the door and to count off (This means that each student will say a number out loud starting at the front of the line, with number 1 until all the students have a number –this should take approximately 5 minutes). The students with odd numbers will be in the experimental group and will be escorted to the library or the learning center (an area where the children will have access to computers) by a teacher or school official. The students with even numbers will be considered the control group and will be asked to remain in the room provided for the purpose of this study to take the Risk Attitude, Risk Perception and Expected Benefits Survey which should not take any longer than 20 minutes. Before beginning the survey, I will explain the directions to the students on how to complete the survey. After the participating control group has completed the survey they will receive a free safety helmet and will be escorted back to their homeroom or appropriate classroom.

During the safety training, the experimental group will be monitored to ensure proper usage of the internet to minimize risks. The students will have 45 minutes to complete the training. (The students will have an opportunity to stand up and stretch before they sit down to complete the Risk Attitude, Risk Perception and Expected Benefits Survey (which should not take any longer than 20 minutes). After all the participating students complete the survey, they will receive a free safety helmet and will be escorted back to their homeroom or appropriate classroom.

All the students in grades K-5 will be encouraged to take the training online at home for additional information about pedestrian safety and to receive a free safety helmet through the online link to the Florida Department of Transportation. The development of the training program will be published by the Safe Access to School's nationally recognized program and utilized by all 60 schools in Lake and Sumter County.

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IRB APPROVAL DATE: 8/15/2013
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Permission to Take Part in a Human Research Study

Location: Surveys and training will be conducted during the regular school day at Groveland Elementary School. This activity is not required, therefore will be treated as a fun in-school field trip.

Time required: We expect that children in the **control group** will be in this research study for approximately 1 hour: 20 minutes will be used to take the survey and the remaining time will be used to provide the students with information about the study, answer their questions and divide into groups. The children in the **experimental group** will be in this research study for approximately 2 hours: 45 minutes to complete the online safety training, 10 minutes for stretching and getting out of their seats, 20 minutes will be used to take the survey and the remaining time will be used to provide the students with information about the study, answer their questions and divide into groups.

Risks: There are minimal risks associated to your child's participation in this study, such as discomfort from sitting in a chair at a computer for the duration of the online training and the survey (Between 20 – 65 minutes, depending on the group assigned). The students may develop a headache or eyestrain from looking at the computer screen for the duration of the online training (up to 45 minutes). However, children today use computers and other electronic devices on an average of 3 hours on Saturday. Therefore the discomforts may not apply and are not likely to occur for this short time period indicated for this study. The students in the experimental group will have an opportunity to stand up and stretch after the online training and before the Risk Attitude, Risk Perception and Expected Benefits Survey is administered to manage these potential risks.

The students will be monitored by a teacher and the researcher to ensure that proper usage of the internet is maintained to control psychological risks of logging onto a restricted adult site. The school computers also have restrictions and "parental controls" limits set on the computers to maintain safety as well.

Benefits: The experimental group of participants' knowledge of pedestrian safety awareness will increase; they will experience a positive change in perception and attitude towards safety.

Compensation or payment:
Your child will receive a free safety helmet from the Florida Department of Transportation.

Confidentiality: All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link your child to this study. All records will be stored in a locked facility at UCF or in the researcher's archives. All computer records will be password protected and only the researchers will know the password. After the storage time the information gathered will be destroyed or erased. We will limit your personal data collected in this study. Efforts will be made to limit your child's personal information to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of UCF.

Anonymous research: The survey and online training quiz portions of this study are anonymous. That means that no one, not even members of the research team, will know that the information your child gave came from him or her.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, or think the research has hurt your child talk to Diana Dawn Scott, Graduate Student, Applied Learning and Instruction Program, College of Educational Studies, (352) 242-8269 or Dr. Bobby Hoffman,

UCF University of Central Florida IRB
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IRB EXPIRATION DATE: 3/12/2014

Permission to Take Part in a Human Research Study

Faculty Supervisor, Department of Educational Psychology at (407) 823-1770 or by email at bobby.hoffman@ucf.edu.

IRB contact about you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901. You may also talk to them for any of the following:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You want to get information or provide input about this research.

Withdrawing from the study:
You can decide that your child will not take part in this study. Even if you agree that your child will take part in this study, you can change your mind at any time. If you decide that your child will not be in the study, there will be no penalty for you or your child from the teacher, your school, or the University of Central Florida. To withdraw your child from the study contact either of the researchers and they will withdraw your child from the study immediately

Your signature below indicates your permission for the child named below to take part in this research.

____
Name of participant

______________________________ ______________
Signature of parent or guardian Date

DO NOT SIGN THIS FORM AFTER THE IRB EXPIRATION DATE BELOW

- ❑ Parent
- ❑ Guardian (See note below)

____
Printed name of parent or guardian

Assent

❑

❑ Obtained

Note on permission by guardians: An individual may provide permission for a child only if that individual can provide a written document indicating that he or she is legally authorized to consent to the child's general medical care. Attach the documentation to the signed document.

UCF IRB Version Date: 01/2010

University of Central Florida IRB
IRB NUMBER: SBE-13-09090
IRB APPROVAL DATE: 8/15/2013
IRB EXPIRATION DATE: 3/12/2014

APPENDIX F: TRANSLATION OF PARENTAL CONSENT

Important Permission Slip Enclosed
Return to the school by September 18th, 2013

Summary of the attached form:

A Graduate student from the University of Central Florida is conducting a research study at Groveland Elementary School. By signing the last page of the "Informed Consent" you agree to let your 4th or 5th grader take part in her research. Your child will learn how to be safe around traffic and how to read traffic signs. Your child will also learn how to wear a safety helmet when riding a bike or skateboarding. Lastly, your child will answer questions about their perception of safety situations and their attitudes towards certain behaviors. They will also answer questions regarding their expected benefits of taking risks.

This research is confidential. Your child's name will not be used on the survey or in any of the training.

(Please see the attached consent form for further information regarding the research study.)

If you grant permission, on the last page, please print your child's full name and sign where it states "signature of parent or guardian" and print your name. Return the entire package to the school in the envelope provided.

Your child will receive a free helmet for participation in the research.

Permiso importante que se incluye
Favor de volverlo a la escuela para el 18 de septiembre 2013

Resumen de la forma adjunta:

Una estudiante graduado de la Universidad de Florida Central está llevando a cabo un estudio de investigación en la Escuela Primaria Groveland. Al firmar la última página del "consentimiento informado" que permite que su niño/a del cuarto o quinto grado participe en su investigación, su hijo/a aprenderá cómo estar seguro en función del tráfico y como leer las señales de tránsito. Su niño/a también aprenderá como usar un casco de seguridad al andar en bicicleta o patineta. Por último, su hijo/a responderá a las preguntas sobre su percepción de la situación de seguridad y sus actitudes hacia ciertos comportamientos. También su hijo/aresponderá a las preguntas con respecto a sus beneficios esperados de la toma de riesgos.

Esta investigación es confidencial. El nombre de su hijo/a no va a ser utilizado en el estudio o en cualquiera de la formación.

(Ver el formulario de consentimiento adjunto para obtener más información sobre el estudio de investigación.)

Si concede el permiso, en la última página, por favor, escriba el nombre completo de su hijo/a y firmar donde dice "Firma del padre o tutor" y escriba su nombre. Devuelva todo el paquete a la escuela en el sobre incluido.

Su hijo recibirá un casco gratis por su participación en la investigación.

APPENDIX G: TRAVEL TALLY

Safe Routes to School Students Arrival and Departure Tally Sheet

CAPITAL LETTERS ONLY – BLUE OR BLACK INK ONLY

School Name: ____________________ **Teacher's First Name:** __________ **Teacher's Last Name:** __________

Grade: (PK,K,1,2,3...) [ ][ ] (0 2)

Monday's Date (Week count was conducted) [ ][ ] [ ][ ] [ ][ ][ ][ ] (M M D D Y Y Y Y)

Number of Students Enrolled in Class: [ ][ ] (1 5)

- Please conduct these counts **on two of the following three days Tuesday, Wednesday, or Thursday. (Three days would provide better data if counted)**
- **Please do not conduct these counts on Mondays or Fridays.**
- Before asking your students to raise their hands, please read through all possible answer choices so they will know their choices. Each Student may only answer once.
- Ask your students as a group the question **"How did you arrive at school today?"**
- Then, reread each answer choice and record the number of students that raised their hands for each. **Place just one character or number in each box.**
- Follow the same procedure for the question **"How do you plan to leave for home after school?"**
- You can conduct the counts once per day but during the count please ask students both the school arrival and departure questions.
- Please conduct this count regardless of weather conditions (i.e., ask these questions on rainy days, too).

Step 1.
Fill in the weather conditions and number of students in each class

Step 2.
AM – **"How did you arrive at school today?"** Record the number of hands for each answer.
PM – **"How do you plan to leave for home after school?"** Record the number of hands for each answer.

Key	Weather	Student Tally	Walk	Bike	School Bus	Family Vehicle	Carpool	Transit	Other
	S= sunny R= rainy O=overcast SN=snow	Number in class when count made	–	–	–	Only with Children from your family	Riding with children from other families	City bus, subway, etc.	Skate-board, scooter, etc.
Sample AM	S N	2 0	2	3	6	3		3	1
Sample PM	R	1 9	3	3	8	1	2	2	
Tues. AM									
Tues. PM									
Wed. AM									
Wed. PM									
Thurs. AM									
Thurs. PM									

Please list any disruptions to these counts or any unusual travel conditions to/from the school on the days of the tally.

APPENDIX H: VALIDITY SCALE

The integrity of research depends on the accuracy of the measures used.

Face validity, also called representation validity or logical validity, is useful to provide important information about the operationalization of the questionnaire. In other words, in face validity, one would look at the operationalization and see whether "on its face" it seems like a good translation of the construct. For instance, does this survey (in general) measure the dependent variables (constructs) of risk-taking attitude and risk perception.

The questions were constructed for children using the Flesch-Kincaid reliability test grade level formula: 0.39(total words/total sentences) + 11.8 (total syllables/total words) - 15.59. The survey reflects the 2nd grade reading level.

Content validity helps assess whether the *content* is relevant to the constructs of risk-taking attitude and risk perception. In content validity, one essentially checks the operationalization against the relevant content domain for the construct. In other words, do the questions/statements of risk, stay in the relevant domain of pedestrian and bicycle safety?

Please fill out the questions below and continue through to the next few pages of this questionnaire.

Your Occupation: ________________

Your Title: ________________

Location of Occupation: ____

How long have you been in your current job?________________

How many years (total) have you been in this field or area of specialization? ______________

Highest degree or certificate earned in this field? ________________________

Thank you for your participation in the development of the survey that will be used for research. The information is valuable for the completion of my Master's Thesis. Please do not hesitate to contact me for further clarification.

Dawn Scott
Graduate Student
University of Central Florida
College of Education and Human Performance
School of Teaching, Learning and Leadership
Pd7@knights.ucf.edu (352) 242-8269 mobile

Face Validity: Please review the survey below to determine if the survey (in general) measures risk-taking attitudes. Please indicate your response by circling the number that corresponds to your selection.

1	2	3	4	5	6	7
Extremely Invalid	Invalid	Somewhat Invalid	Not Sure	Somewhat Valid	Valid	Extremely Valid

Risk-Taking Attitude towards Risky Pedestrian Behavior

Please do NOT answer these questions below. This is a copy of the survey for the elementary students.

For each of the following statements, please show the **likelihood** that you would engage in the described activity or behavior if you were to find yourself in that situation. Place a number of (1) *Extremely Unlikely* to (7) *Extremely Likely*, using the following scale:

1	2	3	4	5	6	7
Extremely Unlikely	Unlikely	Somewhat Unlikely	Not Sure	Somewhat Likely	Likely	Extremely Likely

1. _____ My friends already left for school, and my parents cannot drive me. I will walk or ride my bike to school by myself.
2. ____ My friends are waiting outside for me to walk to school with them. I will stay with them as I travel to school.
3. ____ The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.
4. ____ I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.
5. ____ I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.
6. ____ I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.
7. ____ I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.

8. ____ It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.
9. ____ I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.
10. ____ I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.

Face Validity: Please review the survey below to determine if the survey (in general) measures risk-perception. Please indicate your response by circling the number that corresponds to your selection.

1	2	3	4	5	6	7
Extremely Invalid	Invalid	Somewhat Invalid	Not Sure	Somewhat Valid	Valid	Extremely Valid

Please do NOT answer these questions below. This is a copy of the survey for the elementary students.

Perception of Pedestrian Risk

People often see some risk (dangerous chance) in situations that contain uncertainty (the state of being unsure of something) about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal notion, and we are interested in **your gut level assessment** of how risky each situation or behavior is.

For each of the following statements, please indicate **how risky you perceive (look, consider or judge)** each situation. Place a number from (1) *Not at all Risky* to (7) *Extremely Risky*, using the following scale:

1	2	3	4	5	6	7
Not at all Risky	Slightly Risky	Somewhat Risky	Moderately Risky	Risky	Very Risky	Extremely Risky

1. ____ My friends already left for school, and my parents cannot drive me. I will walk or ride my bike to school by myself.

2. ____ My friends are waiting outside for me to walk to school with them. I will stay in the group as I travel to school.

3. ____ The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.

4. ____ I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.

5. ____ I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.

6. ____ I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.

7. ____ I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.

8. ____ It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.

9. ____ I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.

10.____ I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.

Validation of Content Validity

Content Validity: For each of the following statements, please indicate the *relevancy* of each statement or situation as it pertains to *bicycle and/or pedestrian safety*. Use the additional space below for comments and to express any concerns that you may have. Please indicate which item that you are addressing by providing the number that corresponds to the statement.

Please provide a rating from ***Completely Irrelevant (1)*** to ***Completely Relevant (7)***, using the following scale:

1	2	3	4	5	6	7
Completely Irrelevant	Irrelevant	Moderately Irrelevant	Not Sure	Moderately Relevant	Relevant	Extremely Relevant

1. ____ My friends already left for school and my parents cannot drive me. I will walk or ride my bike to school by myself.
2. ____ My friends are waiting outside for me to walk to school with them. I will stay with them as I travel to school.
3. ____ The sidewalk is on the other side of the road. I will just walk in the grass next to the road instead of using the sidewalk.
4. ____ I need to cross the street. I will wait for a gap in the traffic and then run across before the cars come.
5. ____ I left my bike helmet at my friend's house, but I want to ride my bike to school today. I will ride my bike without a helmet today and get the helmet to wear for tomorrow.
6. ____ I am getting ready to walk to school. I will also walk home from school. The weather is nice and not too hot, so I will wear my new black shirt and dark jeans to school today.
7. ____ I am walking home from school and want to get home before my favorite TV show comes on. I decide to take a shortcut behind some buildings so that I can get home early.
8. ____ It is raining outside today and I am walking to school. A car pulls up next to me and a parent of another kid asks me if I want to get out of the rain. I decide to get into the car and take the ride.

9. ____ I am standing at an intersection of a street. I am waiting for the traffic sign to tell me that it is safe to cross, but it is taking too long. I do not see any cars coming my way, so I cross the street.

10.____ I am riding my bike to school today. I have my backpack on my back, but it is bothering me so I decide to take it off and hold it on the handle bars of my bike.

Comments and/or concerns:

APPENDIX I: COPYWRIGHT PERMISSION LETTER

16925 Alpha Avenue - Montverde - FL - 34756

February 25, 2014

Michael Woods
1616 South 14^{th} Street
Leesburg, FL 34748

Dear Mr. Woods:

This letter will confirm our recent telephone conversation. I am completing a master's degree at the University of Central Florida entitled "A Multimedia Safety Awareness Program and School Infrastructure: Finding the Connections to Pedestrian Risk-Taking Attitudes and Perception of Pedestrian Behavior." I would like your permission to reprint in my thesis excerpts from the following:

Safe Access (2013). Safe schools transportation study: Groveland elementary school. Retrieved from Safe Access to School:
http://lakesumtersafeschool.com/images/pdf/20130319152416Groveland-Elementary-School---Safe-Access-Study--Final-Report-.pdf

Safe Access (2013). Safe schools transportation study: Leesburg elementary school. Retrieved from Safe Access to School:
http://lakesumtersafeschool.com/images/pdf/20130319124625Leesburg-ES-Oak-Park-MS-Safe-Access-Study--full-report-.pdf

Each study shows pictures and descriptions of infrastructural improvement recommendations for an elementary school.

The excerpts to be reproduced are: The "priority project" pictures and summarized explanations of the proposed projects of the two schools listed above.

The requested permission extends to any future revisions and editions of my thesis, including non-exclusive world rights in all languages. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own or your company owns the copyright to the above-described material.

If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you for your attention in this matter.

Sincerely,
Diana Dawn Scott

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

By: ____________
Michael Woods

Date: March 4, 2014

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