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Think First for Kids (TFFK): A Longitudinal Analysis of a School-Based Injury Prevention Curriculum

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THINK FIRST FOR KIDS (TFFK): A LONGITUDINAL ANALYSIS OF A SCHOOL-BASED INJURY PREVENTION CURRICULUM

by

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Abstract of the Dissertation

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Despite years of legislative and public health efforts, unintentional injury continues to be a serious public health problem and is identified as a major priority on the national health care agenda. The high incidence of unintentional injury in the middle childhood age group is of particular interest due to immaturity of the cognitive, psycho-social, and neurophysical dimensions of the child. The purpose of this study was to examine the effectiveness of a school-based curriculum on improving knowledge and self-reported safety behaviors over time among ethnically and socioeconomically diverse elementary school aged children.

The social, cultural, cognitive, and behavioral learning theory of Constructivism informed the study. The learning theories of Vygotsky, Bruner, and Piaget served as the theoretical frameworks for the constructivism theory and helped professionals understand how, why, and when children are cognitively, psychologically, socially, and developmentally at greatest risk for injury and most receptive to learning.

A three-year longitudinal, matched comparative, with repeated measures, cohort design was used to evaluate the effectiveness of TFFK intervention. The data to be analyzed were from a quasi-experimental research design. Culturally diverse elementary schools in high injury-risk areas from San Diego Unified and Cajon Valley during the 1999-2002 academic school years were recruited for the study. Ten schools participated, five schools were identified as intervention schools to receive TFFK and five schools that most closely matched the intervention schools on SES, school defined and grade specific reading scores, race/ethnicity composition, and school district were the controls, thus creating five pairs of matched schools. The original cohort of 1,762 students participating in the paired intervention/control study were followed over the three-year longitudinal study.

To determine the effectiveness of the TFFK program, a pre-/post-measure design was employed. The primary outcome was a change in total test score from the pre-test to the post-measure, with the post- measure being administered after the intervention. The analysis of the pre-existing data was conducted using the Statistical Package for the Social Sciences (SPSS) (Version 12.0) and included descriptive, univariate and General Linear Model (GLM), multivariate analysis of variance methods, to assess injury-related knowledge and safety behavior change among elementary school subjects receiving the Think First for Kids (TFFK) curriculum compared to control subjects. The overall effect of the curriculum was tested using a GLM repeated measures, analysis of variance procedure for each Cohort A, B, and C.

Data analysis of the posttest measure scores demonstrated that the TFFK curriculum led to a statistically significant increase in knowledge and self-reported safety behaviors. The overall trend was for greater improvement in intervention school students when compared to control school students.

It is important to recognize that schools not only have direct access to young children, but also have the unique capacity to affect the lives of staff, parents, and the entire community. This study provides empirical evidence that early school-based theory-driven injury prevention education has a positive effect on young children.

DEDICATION

In memory of my ThinkFirst colleagues Molly and Tara.

This study is dedicated to the Voices for Injury Prevention.

You make a difference every day

and inspire others to follow.

You are heroes of a special kind.

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CHAPTER I

INTRODUCTION

Despite years of legislative and public health efforts, unintentional injury continues to be a serious public health problem and is identified as a major priority on the national health care agenda (National Center for Injury Prevention and Control [NCIPC], 2000). Among children aged 1 to 14, unintentional injuries account for more deaths than the next five leading causes of cancer, congenital abnormalities, pneumonia, heart disease, or homicide. In addition, more than 1 million children seek medical care and between 40,000 to 50,000 children are permanently injured due to unintentional injury each year (National Safety Council, 2004a). It is widely recognized that injuries are responsible for more deaths and disability among young people than any other cause of death for children ages 1 to 14 (California Department of Health Services, 2000). Despite this knowledge, childhood injuries continue to occur. The question must be asked, why? Is it the lack of parental and child injury prevention education, peer group influence, normal developmental limitations regarding risk perceptions and decision-making, or other explanations?

Several interventions have been developed and implemented with school-based programs considered to be an ideal method, yet few of these programs have been rigorously evaluated over time (Faelker, Pickett, & Brison, 2000). One such program is

Think First for Kids (TFFK) an interactive, literacy based injury prevention curriculum, based upon the principles that exposure to similar messages repeated over time during the early years of education enhances learning and behavioral changes. Systematic evaluation of the effectiveness of interventions over time is required to make the public policy and resource allocation decisions needed to reduce injuries (Greene et al., 2001).

Prior research has found significant health disparities in the field of injury prevention for low income and minority populations (Faelker et al., 2000; Kennedy & Rodriguez, 1999). Although unintentional injury effects all populations, there is considerable variation in injury rates among children from different racial/ethnic groups and socioeconomic (SES) factors. For example, low-income neighborhoods have been found to be associated with an increased risk of injury (Durkin, Olsen, Barlow, Virella, & Connolly, 1998), and childhood mortality has been found to be higher among minority and low income children (Wise, Koyelchuck, Wilson, & Mills, 1985). Therefore, in order to develop culturally appropriate prevention strategies, it is imperative to examine these differences by including diverse populations. This TFFK study was conducted in a high injury-risk, culturally, and economically diverse population and provides an opportunity to examine these associations.

The purpose of this study was to examine the effectiveness of a school-based curriculum on improving knowledge and self-reported safety behaviors over time among ethnically and socioeconomically diverse elementary school aged children.

Overview of the Problem: Unintentional Injury

Unintentional injury is the leading cause of death in children from 1-21 years of age in the United States (NCIPC, 2003) (see Appendix A). In adolescents, ages 10-19, unintentional injury accounts for 60% of deaths whereas violence (homicide and suicide) accounts for 40% (NCIPC, 1999). Approximately 22 million children are injured in the United States each year (Synovitz, Mickalide, Bryn, & Gallagher, 2000), and according to the National Safety Council (2004), in 2001 the odds of dying from an unintentional injury were 1 in 2,808. In addition, millions of children are incapacitated by unintentional injuries, with many suffering lifelong disabilities.

For every childhood death caused by injury, there are approximately 34 hospitalizations, 1,000 emergency department visits, and many more visits to private clinics and injuries treated at home (National Safety Council, 2004a). The total number of emergency department visits in the United States in 2000-2001 was 110.2 million, of those 39.2 million were injury related.

The San Diego County Report Card (SDCRC) (2003) documented for the year 2001 a rate of 314.7/100,000 children 18 years old and younger hospitalized as a result of unintentional injuries, a decrease from the rate of 355.6 per 100,000 in 2000 (National Safety Council, 2004a). In the age group of 15 and under, there were 40 fatal unintentional injuries in 2000 and 36 in 1999; again stable numbers over the past 6 years. Indeed, injuries to children in this age group constitute a major public health concern, accounting for more deaths among children aged 1 to 14 than the next five most common causes of deaths. Each year, between 40,000 and 50,000 early and middle childhood children are permanently injured and more than 1 million seek medical care because of unintentional injury (Greensher, 2001). In comparison to general statistics for the state of California during 1998, San Diego County had a higher rate of unintentional injury. San Diego County data on injury and injury-related deaths by race/ethnicity reveal a higher rate among black youth compared to other races/ethnicities (Black – 471.2/100,000, White – 346.2/ 100,000, Hispanic – 340.4/100,000, and Asian/Other – 327.5/100,000) (SDCRC, 2003).

Coupled with the magnitude of human suffering and loss of life is the astronomical financial burden. Direct medical care, rehabilitation, and lost income are the major costs associated with injuries. By the late 1990s, injury costs were estimated at more than $224 billion annually, an increase of 42% over the 1980s (Watts & Eyster, 1992). It is estimated that 40% of the health care dollar spent is consumed by the direct or indirect medical cost of injury, amounting to $100 billion per year (Watts & Eyster). Similar to most health problems, the cost of prevention is far less than the cost of treatment. Benjamin (2004) states that "in the year 2000 alone, injury was responsible for 10% of health care expenditures — more that $117 billion, and it is the leading cause of death for Americans younger than 35 years" (p. 512) (see Appendix B). Yet, many American policymakers do not perceive injury as a public health problem. Benjamin goes on to state that policymakers still believe in the accident paradigm, in that injuries are an act of fate, and while it makes sense to be more careful, injuries will occur despite a person's best effort. However, injuries should not be considered "accidents," as this term implies randomness and lack of predictability. From an epidemiological perspective, injuries are similar to all diseases such that they have a specific causal model, which contains an interaction between a host, an agent or vector, and the environment (Gordis, 2000). In addition, economists are predicting a double-digit incline in health care expenditures, and people are looking for ways to address disparities in health care. Benjamin (2004) suggests, "that the solution is injury prevention" (p. 512).

Overview of the Problem: Middle Childhood or Primary Years (Ages 6-12)

The high incidence of unintentional injury in this middle childhood age group is of particular interest due to immaturity of the cognitive, psychosocial, and neurophysical dimensions of the child. Harris and Liebert (1984) define the years from 6 to 12 the years of middle childhood. According to Dixon and Stein (1992), middle childhood is characterized by "a time set aside, in all cultures for children to learn those skills that are necessary for survival and productive living" (p. 317). It is during the stages of middle childhood in which children of developing countries and primitive societies become competent in obtaining food, shelter, and clothing. Middle childhood could just as well be referred to as the elementary school years, because the years from 6 to 12 correspond fairly closely to the school grades first through sixth in the United States. In our complex society in the United States, children develop competence in reading, writing, and arithmetic. They acquire the basic knowledge necessary to master the demands of adult life, both within the home and in the community. The cognitive, social, and emotional growth seen during this period follows the near completing of central nervous system growth by the age of 7 years and precedes the rapid growth of the reproductive organs in early adolescence.

Although these are important years in a child's life, they are relatively calm ones. Behind is the period of rapid physical growth of infancy and toddlerhood; the period of rapid physical growth of early adolescence is still to come. The dramatic improvements in motor abilities and in language use and understanding are also in the past. But some very crucial changes occur during middle childhood. There is a striking increase in intellectual competence in the child's ability to make use of his/her brain. There is a similar increase in the fund or knowledge that the brain holds. And there is a significant change in the child's relationships with others. When a child enters middle childhood, he/she is dependent on his/her parents and on other adults, not just for nutrition and shelter, but also for emotional support and companionship. By the end of middle childhood, adults have become much less central in his/her lives. Social and emotional needs are filled to a large extent by friends and peer groups (Harris & Liebert, 1984).

Children enter middle childhood looking and acting much more similar to one another then they do when they leave it. Differences in size, shape, facial features, intellectual ability, talents, and inclinations are not as evident in the early school years as in the later ones. It is really in middle childhood, more than at any time since birth, that the child becomes a unique individual (Harris & Liebert, 1984). Due to the child's physical, social, and psychological changes and the development of independent decision making, it is necessary to implement school based injury prevention education programs.

Injury prevention has become a major public health goal in the United States (Department of Health & Human Services, 2000), and school-based programs are considered to be an ideal method for the prevention of injuries, few programs are rigorously evaluated (Davidson et al., 1994). Techniques to evaluate community health improvement methods need to be refined and disseminated so that other communities can learn from and duplicate successful strategies (Schall, 1994). In addressing this need, this study employed rigorous evaluation techniques to assess the TFFK injury prevention program. This rigorous evaluation yielded evidence to support recommendations for changes in policy regarding injury prevention, with the intent of decreasing injury occurrence and thus decreasing the financial burden of injuries.

This investigation addressed the primary prevention of injury through participation in the TFFK injury prevention program. Think First for Kids promotes injury-related knowledge and behavior change among elementary school-aged children in San Diego, CA, and follows the CDC and Committee on Comprehensive School Health recommendation that students receive sequential, comprehensive, and evaluated school health programs (Gielen, 1992; National Commission on the Role of the School, 1990).

Think First National Injury Prevention Foundation

Think First has its roots in two regional injury prevention programs developed by neurosurgeons in Missouri and Florida in 1979. The programs, called Heads Up Missouri (1979) and Feet First First Time (1986), promoted brain and spinal cord injury prevention for high school students. By 1986, a national effort to expand these programs was underway, sponsored by the American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons (CNS). Between 1986 and 1990, 100 programs became active under the auspices the National Head and Spinal Cord Injury Prevention Program working in partnership with neurosurgeons throughout the country in response to the high incidence of traumatic brain and spinal cord injuries and subsequent disabilities among ages 10-24. In 1990, the name "Think First National Injury Prevention

Foundation" was adopted and a separate charitable foundation was formed (Think First National Injury Prevention Foundation, 2005).

The mission of the Think First National Injury Prevention Foundation is to prevent brain, spinal cord, and other traumatic injuries through the education of individuals, community leaders, and creators of public policy. The foundation provides leadership for approximately 260 Think First Chapters across the country and 40 chapters abroad that work with schools and community groups in their local areas to educate youth about injury prevention. One of its programs, Think First for Teens, comprises a peer-led presentation that has been found to increase knowledge of the risks of brain and spinal cord injury and safety measures that can reduce the occurrence of injury (Avolio, Ramsey, & Neuwelt, 1973; Eyster & Watts 1992; Neuwelt, Coe, Wilkinson, & Avolio, 1989).

Think First for Kids

It has been shown that adolescents rarely change their behavioral practices, such as seat belt use, without long-term education and/or enforceable legislation (Gielen, 1992; Nichols, 1994). With this in mind, in 1994 the Think First Foundation created a task force to search nationwide for early intervention injury prevention programs targeting elementary school students. After an exhaustive literature review and program search, the foundation contracted with a curriculum specialist to assist in the development of a teacher-taught, parent-involved, integrated injury prevention program to educate children in grades 1-3 about the risks of traumatic brain and spinal cord injuries and the importance of good safety habits.

Think First for Kids (TFFK), developed in 1996, is an interactive, literacy-based injury prevention curriculum. Think First for Kids is based on the principles that early education helps increase understanding and awareness, repetition over time leads to behavior change, and involvement of student-teacher-parents increases success. The curriculum is grounded in applied learning and behavioral theories, which suggest that varied messages delivered over time increase understanding, knowledge retention, and sustained behavior. The TFFK curriculum integrates math, literacy, science, and health objectives. In addition, safety components were developed to enhance interest, learning, and acceptance of safety measures. Accordingly, the TFFK curriculum has been organized into six safety behavior units taught in one lesson a week over a 6-week span. Learning strategies include role-playing, hands-on activities, reading, math, visual reinforcement, and discussion (Think First National Injury Prevention Foundation, 2005).

Theoretical Framework

To understand the relationship between the literature related to childhood injuries and prevention, the relationship between child development and injury incidence, and to develop appropriate interventions to address one of the major gaps in the literature, the theory of child development was used. Theories of child development have traditionally provided a foundation for pedagogy in early childhood education and early intervention and are known to be extremely practical (Peltzman, 1998) because knowledge and cognitive processing are critical to healthy development (Bruner, 1960). Child development theory is an integrated collection of beliefs about the maturation process of children's perception, thinking, decision-making, and actions. There are several distinct sets of beliefs, or theories, about how children grow and develop. One theory holds that children simply mature as they grow older (Gesell, 1933), another posits the environment shapes what children become (Bandura, 1989); while others put forth genetics and environment interact to influence learning and behavior (Peltzman, 1998). Trawick-Smith (2000) points out that no single, universally accepted theory of child development exists.

For the purpose of this study, the social, cultural, cognitive, and behavioral learning theory of constructivism served as the framework (Piaget, 1952). The learning theories of Vygotsky (1965), Bruner (1960), and Piaget (1952) were the guiding principles of this theory to assist professionals in understanding how, why, and when children are at greatest risk for injury and most receptive to learning. Constructivism has been selected for this analysis because it is an epistemology, a philosophical explanation about the nature of knowledge, describing how one attains, develops, and uses cognitive processes. It offers a bridge between cognition, learning, and behavior. Constructivist theory is a general framework for instruction based upon the study of cognition. Much of the theory is linked to child development research, especially that of Piaget. Many regard constructivism as a metatheory, in that it encompasses a number of cognitive and other theories of learning. Multiple theories, such as those of Piaget and Vygotsky, have been proposed to explain the cognitive processes that are involved in constructing knowledge. Constructivism is based on the fundamental assumption that people create knowledge from the interaction between their existing knowledge or beliefs and the new ideas or situation they encounter (Bruner, 1960). In this sense, most constructivists support the need to foster interactions between students' existing knowledge and new experiences.

Constructivist educational approaches are primarily used within the middle childhood years (Bruner, 1960).

In summary, although the child becomes more independent of parental influence in middle childhood, critical thinking skills are in an early stage of development (Crain, 1980). It is possible that this paucity of critical thinking skills coupled with increased independence from parents results in a higher frequency and severity of unintentional injury than among younger children.

Significance of the Study

Although injury prevention has become a major public health goal in the United States (U.S. Department of Health & Human Services, 2000) and school-based programs are considered to be an ideal method for the prevention of injuries, few programs have been rigorously evaluated (Davidson et al., 1994). Techniques to evaluate community health improvement methods need to be refined and disseminated so that other communities can learn from and duplicate successful strategies (Schall, 1994). In addition, epidemiologic studies have reported a greater risk of both fatal and nonfatal injuries observed in children and have been associated with lower socioeconomic factors, young age, and minority status (Faelker et al., 2000; Kennedy & Rodriguez, 1999).

There is limited research on examining program effectiveness by SES, age, and race/ethnicity. In this study, in an attempt to fill this gap, the relationship of the program, effectiveness by SES, age, and race/ethnicity was examined.

Purpose of the Study

The overall purpose of this study was to evaluate the effectiveness of the elementary school injury prevention curriculum called Think First for Kids (TFFK) in San Diego County on improving knowledge and self-reported safety behaviors over time among ethnically and economically diverse elementary school-aged children. This study employed rigorous evaluation techniques to assess the TFFK injury prevention program over time which yielded evidence to support recommendations for changes in policy regarding injury prevention, with the intent of decreasing injury occurrence and thus decreasing the financial burden of injuries.

Hypotheses

The null hypotheses of this study were: (a) students participating in the TFFK curriculum do not show a significant increase in self-reported knowledge and safety behaviors compared to students who do not receive the curriculum; and (b) students who receive the curriculum repeatedly do not show a significant difference in retention of knowledge over time with repeated curriculum interventions in the time period of years 2000-2002.

Implications for Nursing

It is important to recognize that schools not only have direct access to young children, but also have the unique capacity to affect the lives of staff, parents, and the entire community. The increasing awareness of childhood injuries as an important public health problem in the U.S. and around the world has important implications for nurses in community, clinical practice, and research settings. In clinical practice, injury prevention strategies focus on sociocultural issues and behavioral change in counseling with children and families. School-based education of children may help to broaden and reinforce counseling of children.

The collaborative research in this study provides avenues for nurses, community educators, and practitioners who may have unrecognized opportunities to join in a community effort to reduce morbidity and mortality. These opportunities include developing nursing interventions, conducting evaluative research, and creating injury surveillance systems.

The focus of Healthy People 2010 on the prevention of injury and targeting health promotion is central to nursing practice. Linkages with community hospitals, nurse researchers, clinical acute care nurses, community nurses, trauma nurses and physicians, neurosurgeons, school nurses and health educators can be used to mount a unified approach to injury prevention strategies and research, including legislation, leading to declines in injury related morbidity and mortality (U.S. Department of Health & Human Services, 2000).

Results from this study will contribute to the science of nursing and injury prevention by providing support for the effectiveness of the TFFK curriculum in improving injury prevention knowledge among school-aged children. Furthermore, this study will advance nursing science by identifying a platform for nursing participation in community based injury prevention research, thereby providing additional insight into early prevention education and nurse centered community intervention strategies.

CHAPTER II

LITERATURE REVIEW

Although unintentional injury has been documented as a serious and pervasive health and social problem, scholarly inquiry regarding the phenomenon of injury prevention is relatively new. The Educational Resources Information Center (ERIC), Education Full Text, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) computer searches were performed using the descriptors: injury, injury prevention, school-based learning, learning theory, teaching methods, middle childhood learning, school health education and growth and development. Numerous articles and studies were found addressing growth and development of the middle childhood learner. However, empirical evidence directly related to elementary school based injury prevention in grades 1, 2 and 3 was limited. This literature review includes six sections: learning and social, cognitive, and behavioral maturation theories, review of the problem, childhood injuries, injury prevention for low income and/or minority populations, injury prevention and school health education, and nonschool based childhood injury prevention programs from such disciplines as nursing, pediatrics, psychology, epidemiology, and education.

Learning and Social, Cognitive, and Behavioral Maturation

School-based injury prevention programs are built upon the framework of constructivism theory. A major theme in Bruner's (1966) theoretical framework is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to go beyond the information given. As far as instruction is concerned, the teacher should try to encourage students to discover principles by themselves. Bruner believed that teachers and students should engage in an active dialog. He viewed the primary position of the teacher was to present information to be learned to match the learner's current state of understanding. Bruner's theory has its foundation in Piaget's cognitive development theory (1952), Vygotsky's sociocultural theory, and Erikson's developmental theory (1968).

Jean Piaget's Child Development Theory

Swiss biologist and psychologist Jean Piaget (1896-1980) is renowned for theorizing a highly influential model of child development and learning. Piaget's (1952) theory is based on the idea that the developing child builds cognitive structures or networked concepts for understanding and responding to physical experiences within his or her environment. Piaget further asserts that a child's cognitive structure increases in sophistication with development, moving from a few innate reflexes to highly complex mental activities (Furth & Wachs, 1975).

Piaget's theory identifies four developmental stages and the processes by which children progress through them. The four stages are: (a) sensorimotor stage (birth to 2 years old); the child, through physical interaction with his or her environment, builds a set of concepts about reality and how it works; (b) preoperational stage (ages 2-7); the child is not yet able to conceptualize abstractly and needs concrete physical situations; (c) concrete operations (ages 7-11); as physical experience accumulates, the child starts to conceptualize, creating logical structures that explain his or her physical experiences; and (d) formal operations (beginning at ages 11-15); by this point, the child's cognitive structures are like those of an adult and include conceptual reasoning (Maier, 1969).

The term constructivism most probably is derived from Piaget's reference to his views as "constructivist" (Gruber & Voneche, 1977), as well as from Bruner's (1966) description of discovery learning as "constructivist." Other terms are also used to refer to constructivist views of learning, including: generative learning; situated learning and authentic instruction (Brown, Collins, & Duguid, 1989), postmodern curricula (Hlynka, 1991); and education semiotic (Cunningham & Cunningham, 1992). Even though constructivists cannot be adequately represented by a single voice or an entirely universal point of view, there is a conception of learner and learning that is unmistakable in its central tenets and in its divergence from an objective tradition of learning theory based on either behaviorism (associated models of learning) or cognitivism (the cognitive science of information processing representations of learning). Waite-Stupiansky (1977) points out Piaget's constructivism theory synthesizes cognitive, behavioral, and environmental explanations for learning and behavioral changes.

Middle childhood, from 6 to 12 years of age, is a crucial stage in development when children begin to have continuous encounters with different institutions and contexts outside of their families and to navigate their own way through societal structures. It is during this period that children develop a sense of competence, forming ideas about their abilities, accomplishments they value, and the likelihood that they will do well in differing situations. In particular, a child's academic self-perceptions emerge and consolidate in middle childhood, contributing to academic attainment in middle school and beyond. Thus, during middle childhood the development of positive attitudes toward safety, injury prevention, at risk activities, school, academic achievement, and aspirations for the future can have major implications for children's success as adults.

Vygotsky's Sociocultural Theory

Vygotsky is best known for being an educational psychologist with a sociocultural theory. This theory suggests that social interaction leads to continuous step-by-step changes in children's thought and behavior that can vary greatly from culture to culture (Woolfolk, 1998). Basically Vygotsky's theory suggests that development depends on interaction with people and the tools that the culture provides to help form their own view for the world. A cultural tool can be passed from one individual to another in three ways. First is imitative learning, where one person tries to imitate or copy another. The second way is by instructed learning, which involves remembering the instructions of the teacher and then using these instructions to self-regulate. The final way that cultural tools are passed to others is through collaborative learning, which involves a group of peers who strive to understand each other and work together to learn a specific skill (Tomasello, Savage-Rumbaugh, & Krueger, 1993). His theory combines the social environment and cognition. More specifically, children will acquire the ways of thinking and behaving that make up a culture by interacting with a more knowledgeable person. Vygotsky (1962) believed that social interaction would lead to ongoing changes in a child's thought and behavior. These thoughts and behaviors would vary between cultures (Berk, 1994). Given this theoretical perspective, one could deduce that the middle school-aged child would be at an increased risk of unintentional injury.

Vygotsky's ideas and theories are often compared to Jean Piaget, especially Vygotsky's cognitive-developmental theory. They both put forth that development concepts should not be taught until children are in the appropriate developmental stage. However, Piaget posited the most important source of cognition is the children themselves in contrast to Vygotsky who argued that the social environment could help the child's cognitive development. The social environment is an important factor that helps the child culturally adapt to new situations when needed (Berk, 1994).

Both Vygotsky and Piaget had the common goal of finding out how children master ideas and then translate them into speech. Piaget found that children act independently on the physical world to discover what it has to offer. Vygotsky, on the other hand, wrote that human mental activity in thought and language is the result of social learning. Piaget emphasized universal cognitive change in contrast to Vygotsky's theory which leads us to expect highly variable development, depending on the child's cultural experiences to the environment. Lastly, Piaget's theory emphasized the natural line, while Vygotsky favored the cultural line of development (Woolfolk, 1998).

Erikson's Psychoanalytic Theory

The psychoanalytic theory varies from other child development perspectives in that it focuses exclusively on the formation of personality (Erikson, 1968). Psychoanalysts contend that children's emotional health stems from an ability to resolve key conflicts between their internal desires and impulses and pressures from the outside world (Trawick-Smith, 2000). From a psychoanalytic perspective, a healthy child is one who learns to walk a fine line between immediate need fulfillment and the control of urges. Tarwick-Smith goes on to assert that parents and teachers play a critical role in the process. They must provide the right amount of nurturance. If they allow too little or too much gratification, according to the psychoanalytic theory, a child may fail too mature emotionally.

Erik Erikson was a psychoanalyst who elaborated on and extended Freud's theory. He proposed eight ages through which humans must pass from birth to adulthood if they are to feel competent and self-fulfilled (Erikson, 1968). The middle childhood age group is identified by Erikson as children ages 6 to 12 years and is entitled, industry vs. inferiority. Erikson suggests that children in this age group must come to feel competent in skills valued by society. They need to feel successful in relation to peers and in the eyes of significant adults. If they experience failure too often, they will come to feel inferior (Trawick-Smith, 2000).

Erikson proposed that healthy personality growth is characterized by a resolution of inner conflicts. Each stage of emotional development, from Erikson's view, involves a struggle between two opposing emotional states — one positive, the other negative. These polar states push and pull at the individual, creating tension and posing unique interpersonal problems (Harris & Liebert, 1984). For Erikson, the individual's primary psychological work at a particular stage is to resolve this emotional conflict in a positive direction. The role of the teachers and parents in this process is to assist children in striving toward positive emotional states, which are critical to their particular stage of development (Harris & Liebert, 1984). Based upon Erickson's psychoanalytic theory, a child's emotional health and their ability in middle childhood to make good decisions between their internal desires and impulses and outside pressures can play a major role in the child's ability to navigate environmental obstacles that put them at high risk for injury.

According to Freud, not much is happening in middle childhood; the important aspects of personality development have already occurred. But Erikson (1968) regards this period as a socially decisive stage, because middle childhood children have accepted the fact that their future lies in the world outside their home. In his view, industry versus inferiority is the central issue of this stage (Maier, 1969). The danger in this stage, according to Erikson, is that the child may feel himself/herself to be less able than his/her peers to carry out the work society assigns him/her, or less able to win their respect and friendship. Consequently, he/she may develop a sense of inferiority that interferes with his/her ability to apply himself/herself to his/her work. Inferiority versus industry is the central issue of Erikson's fourth stage. Therefore, personality development and school achievement are closely related (Thomas, 1985). Erikson's view, unlike Freud's, recognizes that the parents are not the only ones involved in the child's adaptation to society. By middle childhood, a variety of socializing forces have started to exert an influence. Aside from parents, many other people, siblings, other children, teachers, and other adults all have major influences on a child's social development (Harris & Liebert, 1984).

A growing number of concerns have been raised about the psychoanalytic theory and its usefulness in teaching and parenting. The most commonly cited weakness is that it does not explain development of the child, but only a narrow range of emotional stages (Thomas, 1992). How can a psychoanalytic perspective inform the teaching of early literacy or mathematics in the classroom? What implications does it hold for enhancing motor development and its relationship to injury? The theory does not seem to appreciate the interrelatedness of intellectual, physical, social, and emotional growth.

Kohlberg's Moral Development Theory

Piaget (1952) believed that young children become less egocentric; they acquire an early sense of morality. In other words, they begin to understand and adhere to rules and develop a concern for justice. Piaget argued that, in the primary years, many children exhibit a sense of moral realism. At this stage, moral decisions and games are based on fixed rules. In fact, children of this age are quite rule-bound (Trawick-Smith, 2000).

One of the outstanding examples of research in the Piagetian tradition is the work of Lawrence Kohlberg. Kohlberg (1984) focused on moral development and proposed a stage theory of moral thinking, which goes well beyond Piaget's initial formulations (Crain, 1980). Elaborating on Piaget's stages, Kohlberg (1984) identified three levels of moral development; preconventional, conventional, and postconventional, each containing two stages. Kohlberg believed and was able to demonstrate through his studies that people progress in their moral reasoning through this series of stages (Dixon & Stein, 1992). The first level of moral thinking is evidenced in elementary school. At this level, people behave according to socially acceptable norms because they are told to do so by some authority figure (e.g., parent, teacher, school nurse, doctor). This obedience is compelled by the threat or application of punishment. The second stage of this level is characterized by a view that right behavior means acting in one's own best interests (Thomas, 1985). The middle school-aged child progresses greatly in their level of independence from first to third grade. Applying Kohlberg's theory would put a child at greater risk to injury as they progress through the grades. As the child increases his/her level of independence, his/her obedience to authority will decrease, therefore raising the risk of injury.

Although Kohlberg's theory has been supported by an extensive body of research (Walker, 1984), a number of criticisms have been raised about his work. Some believe that Kohlberg's theory does not adequately emphasize the connections between moral thinking and moral behavior (Eisenberg et al., 1996). Multicultural and feminist scholars have argued that Kohlberg's work reflects the values, social relationships, and interpersonal characteristics of Euro-American males. Gilligan (1982) has suggested that a high rating on Kohlberg's moral dilemma scale requires a male-oriented approach to solving problems. Others argue that Kohlberg's stages of moral development reflect primarily Western values (Reid, 1984). Kohlberg's theory of moral development traces the steps by which children grow toward making truly moral judgments. Kohlberg (1984) believes that all children start at level 1; most children below the age of 9 are at this level. Kohlberg also believes that the levels are always reached in the same order; no skipping, and no backward steps are allowed.

As one looks for relationships between these developmental theorists' perspectives, and the incidence of unintentional injuries and/or the success of educational intervention programs, the following conclusions can be drawn: (a) the prevalence of unintentional injury in middle childhood can be explained by the child's developmental stage, that is, s/he is only beginning to conceptualize and understand cause/effect relationships, including those related to safety; (b) the higher frequency of unintentional injury among lower income and ethnic minority populations may be explained by a difference in world view based on their sociocultural background; (c) likewise, differences in responsiveness to injury prevention programs among ethnic and SES lines may also be explained by sociocultural background; (d) the overall success of injury prevention programs in increasing knowledge and changing behaviors among middle childhood populations can be explained developmentally by the internal desire of the child to be obedient (embracing the concepts taught or advocated in the lessons), and the child's desire for competence within their peer group; and (e) the success of injury prevention programs can further be explained socially as they acquire knowledge and change behavior by interacting with a more knowledgeable person, the teacher.

Literature Review of the Problem

More persons aged 1 to 34 die as a result of unintentional injuries than any other cause of death (U.S. Dept. of Health & Human Services, 2000). In 1996, more than 13,000 children and adolescents under age 20 died from unintentional injuries nationwide (Grossman, 2000). These deaths are primarily a result of motor vehicle crashes, falls, and burns, but specifically exclude suicide and homicide (Grossman). Death from injury is the most traumatic outcome, but not the most common. Between 1987 and 1994, approximately 21 million nonfatal injuries occurred annually among youths 21 years of age and younger (Grossman). Millions of persons suffer lifelong disabilities from unintentional injuries. In 1995, 29 million persons visited emergency departments as a result of unintentional injuries. The majority of these events occurred among the young and elderly. In 1992, children 15 years of age and younger in the United States made an estimated 8.7 million emergency department (ED) visits for injuries, accounting for 39% of all ED visits for this age group (Grossman).

Over the past several decades, rates of unintentional injury deaths among children have gradually declined for most mechanisms. This reduction has primarily been a result of a concerted public health effort to educate the public on risk factors and prevention strategies. Even with the decline of injury deaths, the current rates of injuries are startling. An additional concern is the considerable variation in injury rates among children of different racial/ethnic groups, family incomes, and/or other socioeconomic classifications. Childhood mortality from respiratory disease, fire, and homicide was higher among Black children compared to White children and had a strong inverse relationship to income (Wise et al., 1985). A retrospective analysis of fatal childhood pedestrian injury in South Ameria demonstrated that low-income neighborhoods were associated with an increased risk of injury (Durkin et al., 1998). Thus, to develop culturally appropriate prevention strategies, it is imperative to investigate these differences by targeting these populations.

Injury is the leading cause of death among middle childhood or primary-grade children. Each year, 30,000 children are permanently disabled due to injuries. Further, 600,000 children are hospitalized annually with injuries; many more visit an emergency room or urgent appointment clinics (Trawick-Smith, 2000). In the United States, children in poverty, particularly those who live in dangerous urban neighborhoods suffer more injuries (Rivara & Barber, 1985). Injuries are also more prevalent among children of some historically underrepresented groups. Hispanic children, for example, are more likely to be injured on the playground or in the street (Olson et al., 1990).

Vigilant parents and teachers can safeguard children. Poor supervision has been identified as a major reason for preventable incidents involving children (Garbarino, Dubrow, Kostelny, & Pardo, 1992). Risk of injury is highest in single-parent homes, in those in which parents are very young, and in those in which drugs or alcohol are abused (Rivera & Mueller, 1987).

How much supervision is required to keep children safe from injury? Peterson, Farmer, and Mori (1987) posed this question to mothers, child protection service workers, and health care providers. The consensus among these groups was that preschool age children should receive constant supervision; that is, they should never be out of the sight of an adult. Early elementary age children should receive near constant supervision, no more than 5 minutes without supervision. However, study participants agreed that when children were playing in "high risk" areas, where busy roads or urban hazards are a threat, even primary age children should have constant supervision.

Childhood Injuries

Prevalence and descriptive studies provided the most common empirical research related to childhood injuries. Grossman (2000) reported children 15 years of age and younger in the United States made an estimated 8.7 million emergency department (ED) visits for injuries, accounting for 39% of all ED visits for this age group in 1992. According to the CDC (2005a), unintentional injuries accounted for the top five leading causes of nonfatal injuries treated in hospital emergency departments in the United States in 2003 (see Appendix C). Other prevalence studies focused on the discrepancy in injury rates among children of different racial/ethnic groups, family incomes, and/or other socioeconomic classifications. For example, childhood mortality has been found to be higher among Black children and low-income children when compared to Caucasian children in the mid to high income bracket (Chen, Matthews, & Boyce, 2002; Durkin et al., 1998; Marcin, Schembri, He, & Romano, 2003). Injuries were also more prevalent among children of some historically underrepresented groups. Hispanic children, for example, are more likely than Caucasian children to be injured on the playground or in the street based upon an analysis of 35,277 children and adolescents hospitalized and 1,934 deaths (Agran, Winn, Anderson, & Del Valle, 1996; Baker, Braver, Chen, Pantula, & Massie, 1998).

Adult supervision by vigilant parents and teachers has been investigated as a means to prevent injury among children. Conversely, poor supervision has been identified as a major reason for preventable incidents involving children (Garbarino et al., 1992). Risk of injury is highest in single-parent homes, in those in which parents are very young, and in those in which drugs or alcohol are abused (Macgregor, 2003).

How much supervision is required to keep children safe from injury? Only one study was found that addressed this phenomenon where this question was asked of mothers, child protection service workers, and health care providers (Peterson et al., 1987). The consensus among these groups was that preschool age children should receive constant supervision; that is, they should never be out of the sight of an adult. Early elementary age children should receive near constant supervision or no more than 5 minutes without supervision. However, study participants agreed that when children were playing in "high risk" areas, where busy roads or urban hazards are a threat, even primary age children should have constant supervision.

While the literature has described prevalence, outcome, and cause of unintentional injury among a middle childhood population, there have been few empirical studies that go beyond description to determine risk factors for differences in injury rates among same age populations.

Injury Prevention for Low Income and/or Minority Populations

Davidson et al. (1994) assessed the impact of a neighborhood injury prevention program in Harlem over a 3-year time period. Reviewing pediatric injury deaths and hospital admissions demonstrated an incidence of 60.0/100,000/year. The intervention included playground renovations, supervised activities for children, injury and violence education, and the provision of safety equipment (bicycle helmets). Study findings revealed a statistically significant reduction in targeted injury rates in the intervention group. However, in the comparison group, a reduction in all injuries was found. Further analysis revealed that this reduction was largely due to the reduction in non-targeted injuries. The authors concluded that although a decline was observed in both groups, the substantial decrease of targeted injuries in the intervention group supports the notion that the intervention was effective.

O'Campo, Rao, Gielen, Royalty, and Wilson (2000) sought to determine whether and how selected neighborhood economic and physical characteristics within low-income communities are related to differences in risk of events with injury-producing potential among infants and young children. The sample was composed of 288 parents and guardians of infants and young children from three low-income communities in Baltimore City, Maryland, who responded to a random household survey. Information on respondent (age, employment, and length of residence in the neighborhood) and neighborhood characteristics (average per capita income, rate of housing violations, and crime rate) characteristics were collected. Although all three communities were considered low income, considerable variation in neighborhood characteristics such as average per capita income, rate of housing violations, and crime rate, and 1-month prevalence rates of events with injury-producing potential were observed. Younger age of respondent and higher rates of housing violations were significantly associated with increased risk of a child under 5 years old in the household experiencing an event with injury-producing potential. In conclusion, information on community characteristics is an important component in understanding the risks for injuries and could be used to develop community-based prevention interventions.

Agran et al. (1996) conducted a study to examine the effect of family, social, and cultural factors on the rate of pedestrian injury in a population of Hispanic children in the southwestern U.S. The study design was a case-control study of pedestrian injuries among Hispanic children. The sample consisted of 98 children 0-14 years of age hospitalized as a result of a pedestrian injury, and 144 randomly selected neighborhood controls matched to the case by city, age, gender, and ethnicity. The following family and cultural variables were associated with an increased risk of injury: household crowding (Odds Ratio [OR] = 2.8), one or more family moves within the past year (OR = 2.2), poverty (OR = 1.9), and inability of mother (OR = 3.6) or father (OR = 5.6) to read well. However, children in single parent households and children whose parents did not drive a car, had less education, or were of rural origin, did not have an increased rate of injury based upon a case control study of pedestrian injuries among Hispanic children. These results have implications for childhood pedestrian prevention efforts for low income, non-English speaking Hispanic populations, and perhaps for other immigrant and high risk groups. The authors conclude that prevention programs and materials need to be not only culturally sensitive but also designed for those with limited reading skills.

It is critical to obtain more injury-related information on minority populations in order to develop culturally appropriate injury prevention strategies. Further investigation of socioeconomic factors in relation to injury occurrence must be conducted in order to prevent injuries and the overwhelming emotional and financial burden associated with injuries.

Injury Prevention and School Health Education

Leaders in health and education have identified the school as the setting to teach children how to manage their health and risky behavior, including injury prevention (Schall, 1994). The American Medical Association and the National Association of State Boards of Education believe that risks children face each day, such as risk of injury, are interconnected with other risks and decision-making skills (National Commission on the Role of the School and the Community, 1990). The Centers for Disease Control and Prevention (CDC), Healthy People 2010, and the Institute of Medicine Committee on Comprehensive School Health Programs K-12 recommend school-based programs that: (a) are sequential during all grade levels of elementary school, (b) are evaluated, (c) include activities that help young persons develop skills to avoid risky behaviors, and

(d) are taught by trained professionals (Gielen, 1992; Institute of Medicine, 1997; U.S. Dept. of Health and Human Services, 1995). In 1990, the school health education system was encouraged by the CDC to establish documented, planned, and sequential programs of health education for students in kindergarten through grade 12. Since this call to action, several programs have been developed and outcome research has been conducted.

Morrongiello, Miron, and Reutz (1998) conducted an interactive activity-based elementary-school program titled Gearing Everyone To Act Healthy Each Day (GET AHEAD) to prevent pediatric acquired brain injury by improving children's knowledge, attitudes, and behaviors regarding injury prevention. This teacher-facilitated program involved children 8 to 10 years of age from four schools. Although the study sample included children of lower and middle socioeconomic status (SES) families, the control group was selected from the same schools as the intervention group. Because children interact with children from other classrooms within schools, the program may have indirectly affected the control group. Evaluation consisted of a pre-/posttest design. However, due to financial restraints, the control group was only posttested. These limitations hindered the study from achieving external validity and proving significant conclusions. With these limitations in mind, the intervention group showed increases in knowledge, self-reported changes in behavior, and favorable shifts in attitudes about vulnerability to injury. The control group responded similarly to the intervention group's pretest responses, indicating a lack of injury-related knowledge and positive safety behaviors. Unfortunately, there was no analysis that adjusted for SES factors. The study disregarded the opportunity to evaluate their data rigorously and contribute to research on SES as it relates to injury prevention.

Cross et al. (2000) evaluated the efficacy of a comprehensive school, home, and community education program titled Child Pedestrian Injury Prevention Project (CPIPP) to improve 6-year-old children's road safety behaviors and improve the road environment in Australia. This 3-year quasi experimental trial involved three metropolitan communities, resulting in a cohort of 1,603 children followed from age 6 to 9 years. Two communities received an intervention of either high or moderate levels, and a third acted as a comparison receiving the usual road safety education. Children in the high and moderate intervention groups were significantly more likely to cross the road with adult supervision ($p = 0.013$) and play away from the road ($p < 0.001$) than the comparison group. No differences were detected in children's pedestrian safety knowledge between the intervention and comparison groups. However, the three study communities could not be randomly assigned to conditions and loss to follow-up yielded an attrition rate of 32%. Students lost to follow-up were more likely to walk and/or cross the road unaccompanied by an adult than were cohort students. Also, those lost to follow-up had significantly lower pedestrian safety knowledge. The lack of rigorous research design and significant attrition rate compromise the results of this study.

Other studies have shown positive results from school-based intervention programs aimed at those in middle childhood. Frederick, Bixby, Orzel, Stewart-Brown, and Willett (2000) evaluated the effectiveness of the Injury Minimization Programme for Schools (IMPS) in Oxford, UK. The program targeted 12,000 children ages 10 and 11 with the injury prevention program taught in the school and hospital environments. Students were educated on risks, skills, and knowledge in relation to road safety, injuries in the home, fire, electricity, poisons, and waterways. Intervention students were compared to control students (who attended schools without the IMPS) on quizzes given prior to intervention and 5 months after the intervention. The IMPS students demonstrated statistically significant increases in knowledge and behaviors compared to the control students. This study was a simple comparative pre-/posttest design that did not conduct subanalyses by race/ethnicity or SES.

Embry, Flannery, Vazsonyi, Powell, and Atha (1996) established an elementary school-based violence prevention program, PeaceBuilders, to promote prosocial behavior. The program was multi-faceted such that it involved teachers, community volunteers, parents, and students. The theoretical motivation for the program was based on two concepts: (a) early intervention can alter future violent behavior, and (b) the effectiveness of the program will result from weaving the components into the student's everyday routine to establish a PeaceBuilding "way of life." Although the study has not published the evaluation results, the comparative design was based upon intervention schools that were matched to control schools on geographical location. Surveys were completed on 2,736 children over a 2-year period.

Grossman and associates (1997) implemented a randomized controlled trial of a violence prevention curriculum among 790 second and third grade elementary school children. Main outcome measures included aggressive and prosocial behavior changes measured 2 weeks and 6 months after participation in the curriculum by parent and teacher reports and by observation of a random subsample. Schools were chosen as the unit of randomization to minimize the possibility that control classrooms and teachers might be exposed to the curriculum. Schools were paired according to school district, the proportion of students receiving free or reduced-cost school lunch, and the proportion of minority student enrollment. After matching, schools in each pair were randomly assigned to intervention or control groups. The generalized estimation equation (GEE) regression method was used to adjust for individual level co-variates under cluster randomization. The results of the observational component of the study found a significant decrease in aggressive behavior and increase in prosocial behavior among intervention schools. This study exemplifies an ideal methodology for conducting a school-based injury prevention study.

Wesner (2003) conducted a study to identify youth behavior with regards to injury prevention, to assess the awareness of severity and susceptibility to brain and spinal cord injury, and to evaluate the impact of the Think First Saskatchewan school visit program in Canada (participants, 1,257 6^{th} and 7^{th} grade students, self-administered a questionnaire, pre- and postintervention). Descriptive statistics and chi-square analysis was used. Study results suggested Saskatchewan youth participated in activities that put them at risk for brain and spinal cord injury. The Think First Saskatchewan school visit program statistically improved self-reported knowledge of the students receiving the Think First message. This evaluation of Think First Saskatchewan demonstrated statistically significant alterations in self-reported knowledge of the students receiving the Think First message. Although changes in knowledge do not always effect changes in behavior, it is an important first step in primary prevention of educating youth and working towards improved attitudes and behavior that will prevent injury. A limitation of this study is the need for further evaluation of the Think First program over time. This would enable a better perspective of the true alteration of knowledge and behavior long term.

Hall-Long, Schell, and Corrigan (2001) conducted a pilot injury prevention case study design in the spring of 1999 of age appropriate developmental and education concepts, using the TFFK curriculum as the primary educational guide. Partners for the program included an urban elementary school, a school of nursing, a SafeKids Coalition, a regional trauma center, and pediatric, community, and critical care nurses. A convenience sample consisted of 140 second grade students from an urban public elementary school in the mid-Atlantic region. The students participated in a 1 hour a week injury prevention class, once a week for the course of 6 weeks. At the conclusion of the study, knowledge test scores increased an average of 35% over pretest measures. Faculty, staff nurses, student nurses, children, and parents suggested a sense of positive overall value of the program and verbalized their support for continuing the use of the curriculum. Limitations of this study would include, but are not limited to, the use of one school, a convenience sample, and the small sample size.

Gatheridge, Miltenberger, Huneke, and Satterlund (2004) compared two programs teaching firearm injury prevention skill to 45 children that were 6 and 7 years in age. A posttest only, control group design with two treatment groups were used to evaluate the efficacy of the Eddie Eagle GunSafe Program. The children were randomly assigned to one of the two treatment groups or a control group. The efficacy of the Eddie Eagle GunSafe Program was evaluated. The criterion firearm safety behaviors included both motor and verbal responses assessed in a naturalistic setting and then assigned a numerical value based on a 0 to 3 scale. Both programs were effective in teaching children to verbalize the safety skills message. However, children who received behavioral skills training were significantly more likely to demonstrate the desired safety skills in role-playing assessments. The results of this study support the need for injury prevention education to incorporate active learning approaches to enhance the program efficacy.

Greene et al. (2002) examined the efficacy of the TFFK curriculum using a three-phase, nonrandom, controlled study design from years 1995 to 1997. The objectives of the study were: (a) to design an appropriate testing instrument for measuring student comprehension of the concepts presented in the Think First for Kids curriculum (grades 1-3), in Year one —1995; (b) year two conduct a pilot study in order to assess the instrument's reliability and validity; Year two — 1996; and (c) conduct a large-scale evaluation to measure the effectiveness of the Think First for Kids curriculum, Year three — 1997. A valid and reliable pretest posttest instrument was developed by the conclusion of Year two. The results from the study of 870 students, completed in Year three of the three phase evaluation, indicated that the 6-week TFFK curriculum significantly increased ($p < 0.01$) student knowledge of injury prevention in all three grades (1, 2, and 3) at the treatment school in comparison to the control schools, after the implementation of the curriculum. Treatment and control schools were matched by SES. A limitation of this study was that the pre- and posttest data was collected at one point in time; therefore, a longitudinal effect could not be determined.

Although many injury prevention programs are beginning to see positive behavioral changes among younger children, many lack formal evaluations. Because middle childhood-age children learn from a combination of existing knowledge combined with new ideas or situations presented, research must assess improvements in injury-related knowledge and behavior, as well as statistically adjust for confounding factors such as race/ethnicity, SES, and reading levels. Unfortunately, few research studies targeting the outcomes of injury prevention education for a middle childhood population utilize rigorous scientific investigation methodology, and few analyze differences within populations. School-based injury prevention programs that are scientifically based and employ rigorous evaluation techniques generate the most success.

Nonschool-Based Childhood Injury Prevention Programs

It is important to examine nonschool based childhood injury prevention programs to determine if settings other than schools are successful at modifying injury-related knowledge and behavior. Rivara et al. (1994) investigated helmet use and the incidence of bicycle-related head injury during a community bicycle helmet campaign. The researchers sought to increase parental awareness of bicycle safety, as well as increase the use of helmets. This campaign resulted in an increase in the use of helmets and a decrease in bicycling related head injury in the target population of children — 1,718 individuals who were helmeted riders in a crash were queried on helmet fit and position. A sample of 28 children 2 to 14 years of age who sustained head injury while wearing a bicycle helmet were compared to 98 individuals who were helmeted of the same age and were treated in the same hospital for injuries other than to the head. This success can be attributed to the coordinated community-wide effort to address a specific injury problem.

Durkin et al. (1998) evaluated the impact of a nonspecific injury prevention program on urban pediatric neurological trauma. The goal of the program was to describe the incidence and causes of pediatric head, spinal cord, and peripheral nerve injuries in an urban setting. Rates before the implementation of a nonspecific injury prevention program were compared with rates after the implementation, and rates for the target population were compared to rates for the control population. Rates were analyzed on the basis of the cause of injury, as well as the age, gender, and neighborhood income level of the injured. Among children admitted to surveillance system hospitals, pedestrian motor-vehicle incidents/collisions were most common in late childhood. Residence in a low-income neighborhood was associated with an increased risk of injury based upon review of pediatric deaths and hospital admissions. Although injury incidence rates fell in both the control and intervention cohorts during implementation of the nonspecific injury prevention program, targeted age and population groups demonstrated greater relative reductions in injuries than nontargeted ones, suggesting a positive effect.

Although many nonschool-based childhood injury prevention programs are effective, it is not as easy to establish comprehensive and continuous programs outside of the school system. These programs are advantageous to the cause, but lack some of the criteria for injury prevention programs as requested by the CDC.

Synthesis of Literature

The field of education has undergone a significant shift in thinking about the nature of human learning and conditions that best promote the varied dimensions of human learning. As in psychology, there has been a paradigm shift in designed instruction; from behaviorism to cognitivism and now to constructivism (Cooper, 1993).

Certainly, one of the most influential views of learning during the last two decades of the 20th century is the perspective known as constructivism. Although by no means an entirely new conceptualization of learner and the process of learner (roots can be traced to John Dewey and other progressive educators, to Piaget and Vygotsky and to Jerome Bruner and discovery learning), constructivist perspectives on learning have become increasingly influential in the past 20 years and can be said to represent a paradigm shift in the epistemology of knowledge and theory of learning for children.

Based upon this review, there is strong evidence that constructivism is an appropriate and accepted framework for curriculum design. School health education may be one of the most important ways to address enduring public health problems, such as injury (Institute of Medicine, 1997; Polivka & Ryan-Wenger, 1999). Therefore, designing health education curricula rooted in learning and social, cognitive, and behavioral maturation theory has the potential to enhance learning as well as change behaviors of our children.

Of the 22 million children injured in the United States annually, 10 to 25% of injuries to children, or between 2 and 5 million per year, occur on school property during middle childhood school age groups (Synovitz et al., 2000). Playground incidents are the leading cause of injury among children ages 5-14 (Synovitz et al.). School bus pedestrian incidents, however, account for the highest number of fatalities each year (Synovitz et al.). Because of the number of school-related injuries, schools should be an important site for the study of injury prevention. The American School Health Association National Injury and Violence Prevention Task Force recommends that schools be a primary source for injury prevention education, resource information, policy making, and data collection (Synovitz et al.).

Several curricular interventions have been successful in influencing behaviors, such as reducing rates of tobacco and alcohol use among youth and decreasing unintentional pregnancies (Vincent, Clearie, & Schluchter, 1987). Schall (1994) suggests that school-based education that starts early and continues through several grades provides considerable and sustained effects on overall health knowledge, attitudes, and practices. Targeting young children and including curriculum activities beyond the classroom has also been effective in decreasing sexual risk-taking behaviors in adolescents (Krug, Brener, Dahlberg, Ryan, & Powell, 1997: Main et al., 1994).

Several studies have targeted young children and behavior change. Walter (1989) initiated the Know Your Baby project in New York in 1975 that was developed in response to the empirically validated suggestion that the primary prevention of chronic disease should begin in childhood. The program was classroom-based and teacher delivered and after 6 years appeared to be associated with favorable changes in levels of knowledge, as well as rate of initiation of cigarette smoking.

Potts, Martinez, and Dedmon (1994) examined several measure of physical risk-taking and sensation-seeking among children aged 6 to 9. These variables were targeted as potential predictors of unintentional injury. Among the important findings, risk taking, whether measured by self-report or knowledgeable informants, was indicative of physical injury.

Rivara et al. (1994) described the impact of a community bicycle helmet campaign on helmet use and the incidence of bicycle-related head injury. The community-wide bicycle helmet campaign sought to promote use of helmets and increase parental awareness of the need for helmets. An increased use of helmets and a decrease in bicycle-related head injury in the target population of children suggest that a concerted and coordinated community-wide effort encountering a specific injury problem with an identified intervention can be effective.

Gresham et al. (2001) conducted a randomized pretest and posttest comparative design to evaluate the outcome of implementing TFFK, an injury prevention program for children grades 1, 2, and 3, among intervention and control schools. The study showed that children often lack basic knowledge regarding safety and do not recognize behaviors considered high risk for injury. By using multivariate analysis, the intervention children had a significantly greater increase in safety knowledge retention and self-reported safety behaviors to prevent traumatic injury. Gresham goes on to identify the lack of literature review pertaining to the implementation and evaluation of grade-specific injury prevention curricula.

The rigorous scientific randomized pre-/posttest comparative design of the Gresham et al. (2001) study is rare in the annals of injury prevention research. Almost without exception, studies are either descriptive or limited to a simple comparison design. The lack of scientific published research in the field is a hindrance to the advancement of public health. It is also limiting the identification and recognition of evaluated evidence-based programs that could be used in the classroom right now. Secondly, the lack of research on this phenomenon by U.S. researchers was surprising. Most of the salient research has been conducted in Australia and the United Kingdom.

Through a complete review of the literature, it is overwhelmingly evident that school nurses, nurse researchers, trauma nurses, and rehabilitation nurses are absent on the front of combating the leading cause of death to our children. The increasing awareness of childhood injuries as an important public health problem in the U.S. and around the world has important implications for nurses in clinical practice, community settings, and nursing research. In clinical practice, injury prevention strategies focus on sociocultural issues and behavioral change in counseling with children and families. School-based education of children may help to broaden and reinforce counseling efforts (Lavin, Shapiro, & Weill, 1992).

A review of the literature on childhood injury and middle childhood development reveals a significant body of knowledge about causes and outcomes of childhood injury as well as theory on middle childhood development and how children learn. However, there is limited scientific research linking injury prevention school-based curricula and what is known about middle childhood learning to increase injury prevention knowledge. The purpose of this study was to evaluate the effectiveness of the elementary school injury prevention curriculum called Think First for Kids (TFFK) on improving knowledge and self-reported safety behaviors over time among ethnically and economically diverse elementary school-aged children. This study employed rigorous evaluation techniques to assess the TFFK injury prevention program which yielded evidence to support recommendations for changes in school approved curricula policy regarding injury prevention, with the intent of decreasing injury occurrence and thus decreasing the financial burden of injuries.

CHAPTER III

METHODOLOGY

The purpose of this study was to examine the effectiveness of an elementary school injury prevention curriculum, Think First For Kids (TFFK), on self-reported knowledge and safety behaviors among a sample of ethnically diverse youth ages 6 to 9. This chapter provides a detailed description of the research design, sample and sampling, instrumentation, data collection, and management. Data analytic techniques are also included. Lastly, issues related to protection of human subjects are presented.

Hypotheses

The null hypotheses were that (a) there is no significant difference in self-reported knowledge and safety behaviors between students participating in the TFFK curriculum and those who do not receive the curriculum; (b) there is no significant difference in retention of knowledge over time with repeated curriculum interventions in the time period of years 2000-2002 between students who receive the curriculum and those who do not.

Study Design

A longitudinal, matched comparative, with repeated measures, cohort design was used to evaluate the effectiveness of TFFK intervention. The data to be analyzed is from a quasi-experimental research design used because in real world settings it was not possible to randomize students to intervention (treatment) conditions (Creswell, 2003; DePoy & Gitlin, 1998). Students attending schools where the TFFK curriculum was implemented could not be randomly assigned to different treatment groups because the curriculum would affect everyone in the school. Therefore, to ensure that those students in the control group were not exposed to the TFFK curriculum, schools with similar student profiles (reading levels, race/ethnicity, SES) and not receiving the curriculum were selected as the control. While quasi-experimental designs lack the rigor inherent in true experiments, Creswell (2003) argues the use of a matched comparison cohort compensates for the absence of randomization.

Sample and Sampling

Culturally diverse elementary schools in high injury-risk areas from San Diego Unified and Cajon Valley during the 1999-2002 academic school years were recruited for the study. Ten schools participated, five schools were identified as intervention schools to receive TFFK and five schools that most closely matched the intervention schools on SES, school defined and grade specific reading scores, race/ethnicity composition, and school district were the controls, thus creating five pairs of matched schools. Two pairs of schools were from the San Diego Unified School District, one pair from Lakeside, and one pair from the Cajon Valley School District. The sample size was dependent upon classroom size at each of the participating schools. The original cohort of 1,762 students participated in the paired intervention/control study were followed over the 3-year longitudinal study (as shown in Table 1).

Table 1

Participating Paired Intervention and Control Schools

Intervention school	Control school
Cajon Valley District (participated 2000-2002)	
CV1A (*N* = 1,001) API = 635 May 2000-June 2002	CV1B (*N* = 1,007) API = 646 May 2000-June 2002
Lakeside Union District (participated 2001-2002)	
LUD1A (*N* = 224) API = 702 May 2001-June 2002	LUD1B (*N* = 203) API = 688 May 2001-June 2002
San Diego Unified District (participated 2000-2002)	
SD1A (*N* = 587) API = 615 May 2000-May 2002	SD1B (*N* = 521) API = 602 June 2000-May 2002
SD2A (*N* = 251) API = 524 May 2000-July 2002	SD2B (*N* = 398) API = 476 June 2000-July 2002

Note. School names were coded to maintain confidentiality.

There are a number of basic assumptions that must be recognized, including: (a) students who participate in the TFFK intervention are representative of the general population of students; (b) students who serve as controls are representative of the general population as well as the intervention students; (c) participants will accurately report injury-related behaviors; (d) instruction of the TFFK curriculum will be conducted in a similar manner for all intervention schools; (e) absenteeism rates are low, thus children who complete a pre-measure also complete a post-measure; (f) children remain in the same elementary school for the duration of first through fourth grade; and (g) attrition does not seriously bias the estimated effect of the intervention; and (h) the data are accurately and completely entered into the database.

Sample attrition is a potential source of bias in experimental, as well as nonexperimental program evaluation. Attrition could lead to loss of information, thus affecting the analysis of study results (Grasdal, 2001). This study relied on the teachers' willingness to co-operate and comply with the protocol as either a control or an intervention school. Strategies used to minimize attrition and noncompliance of schools and classes over the 3 years included: Periodic phone calls to the teachers to remind them of the pre-post measure timelines, offer to pick up the completed pre-post measures from each teacher and school, pre-paid postage for the return of pre-post measures, offer of incentives, offer of assistance from health educators to answer any questions on content or longitudinal study protocol, and annual discussions with principles of the schools to reinforce importance of the study.

Think First for Kids Curriculum Intervention

Think First for Kids is a comprehensive brain and spinal cord injury prevention curriculum developed by the American Association of Neurological Surgeons and the Congress of Neurological Surgeons (1996). Think First for Kids was developed to increase knowledge about the risks of brain and spinal cord injury and modify safety habits among 6-8 year-old (grades 1-3) children (Think First National Injury Prevention Foundation, 1996a, 1996b). This program has been constructed to fulfill the CDC criteria of planned, sequential, and evaluated comprehensive school-based health programs to promote childhood injury prevention. The curriculum was based on the principles of applied learning and behavioral theories which state that messages delivered over time increase understanding, knowledge retention, and sustained behavior (Bandura, 1977).

Think First for Kids integrates math, science, reading, and language skills into an injury prevention curriculum. There are three curricula were developed from the constructivist perspective incorporating the theories of maturation and learning of Piaget, Erikson, Kohlberg, and Vygotsky. All six modules of the three curricula have a similar construct which includes the following: (a) anatomy and function of the brain and spinal cord; (b) vehicular safety; (c) bicycle safety; (d) safety around weapons and creative problem solving; (e) playground, recreation, and sports safety; and (f) water safety. The objectives and delivery timeline for each module are shown in Table 2.

The six modules were taught sequentially, one lesson plan per week. Each module required approximately 35 to 40 minutes. Learning strategies include role-playing, hands-on activities, reading, math, visual reinforcement, and discussion. The TFFK comic strips and Streetsmart video were provided to each intervention school. The comic strips made visual references to six lessons that incorporated critical thinking ability as the child worked his/her way through the storyline dealing with injury prevention behavior. The *Streetsmart* video is an entertaining presentation that models injury prevention behavior. Multiethnic elementary school-aged animated characters were depicted in real-life situation and demonstrated critical thinking requirements to avoid common and everyday injuries faced by young children.

Table 2

Think First for Kids Objectives and Delivery Timeline

Week	Content objectives	Activities
Week 0	Teacher/school nurse	Administer pretest
Week 1 Safety/Anatomy and Physiology	Introduction to preventing brain and spinal cord injury. Assess the student's knowledge of safety and safety habits to prevent injury. Introduce simple facts related to the anatomy and functions of the brain, spinal cord, and related structures. Increase the student's ability to incorporate the concepts of brain and spinal cord injury prevention and protection into their daily activities. Increase parents' knowledge of awareness of brain and spinal cord injuries and prevention measures.	Play "Simon Says" point out need for brain and spinal cord to play this game. Show TFFK video. "Street Smart a Think First Adventure". Read story and assist students with decisions re: injury prevention. Meet with a young injury survivor. Voice for Injury Prevention (VIP) – Provided by San Diego Think First Chapter. Homework assignment
Week 2 Vehicular Safety	Assess the student's knowledge of the dangers of cars and other vehicles, and good vehicle safety habits. Introduce the importance of safety belts in protecting people from injury. Enhance the concept of safety and correct safety belt use as everyone's responsibility. Increase the student's knowledge about safety belts. Increase the student's knowledge and awareness of vehicle and pedestrian safety and injury prevention measures.	Ask youth to demonstrate proper seat belt use. Practice looking left, right, left before crossing the street. Use pencil and yarn to demonstrate "10 foot rule The safety zone around the bus". Review vehicular safety worksheet as a group. Safety belt word find and picture assignment Safety belt math problems Homework assignment
Week 3 Bicycle Safety	Increase the student's knowledge of bicycle safety and the importance of bicycle helmets in protecting the brain from injury. Increase the student's knowledge and skills in collecting and reporting information. Provide visual reinforcement and hands-on experience with bicycle helmets.	Survey class on their bike and helmet use. Provide a "hands-on" helmet session. Demonstrate proper helmet fit. Reinforce need for helmet through demonstration – egg drop or melon drop exercise. Homework assignment

(*table continues*)

Table 2

Continued

Week	Content objectives	Activities
Week 4 Violence	Safety around weapons, and creative problem solving. Assess the student's knowledge about the dangers of firearms and knives, and safety habits around weapons. Assess the student's current practices of problem resolution. Increase the student's knowledge of how to behave around firearms and knives.	Discuss and role play gun safety. Reinforce classroom safety rules. Facilitate problem solving and conflict resolution skills through group activity. Invite local law enforcement to meet with students. Homework assignment
Week 5 Sports and Recreational Safety	Playground, recreation, and sports safety. Assess the student's knowledge of hazards while on playgrounds and playing sports. Increase the student's knowledge of safety as an individual, family, and community responsibility.	Ask youth if they know anyone who has been hurt on the playground. Ask youth to suggest ways to avoid injuries on the playground. Recreational sports math assignment. Recreation word find and counting game. Homework assignment
Week 6 Water Safety	Assess the student's knowledge of the hazards of brain and spinal cord injury and drowning in different bodies of water. Increase knowledge of water safety rules. Increase knowledge and awareness of how to prevent water-related injuries and drowning. Increase awareness that preventing injuries is the responsibility of individuals, family and community.	Discuss youth water experiences. Reinforce need for adult supervision, following pool rules and safety in boats. Complete water safety word puzzle. Demonstrate water finding activity – fill clear fishbowl with sand – obstacles in the sand and color water with food color. Have students put their hands into the fishbowl to find the items. Homework assignment
Week 7	Teacher/school nurse	Administer posttest

Classroom activities and homework assignments include songs, poems, mathematics, and problem solving. Additional materials such as videos, posters, and progressive comic strips were supplemental to the classroom instruction. These materials portrayed multiethnic elementary school-aged animated characters in common high injury-risk situations which paralleled the six modules. Upon viewing these materials, students were required to use high-order critical thinking skills in order to solve problems and follow storylines. During the intervention, a spinal cord injured speaker, VIP (Voices for Injury Prevention), presented information on injury prevention and disability awareness.

A typical module, such as water safety, would have three objectives taught by the classroom educator (school nurse/teacher). These objectives would emphasize water safety rules, knowledge of water-related injury prevention, and safety as an individual, family, and community responsibility. Materials such as posters and videos would reinforce the module objectives. During class, students would discuss scenarios of water-related injuries and would comment on solutions for safer actions. Homework assignments relating to water safety would consist of counting the number of life jackets in each illustrated boat, finding hidden safety words in a puzzle, and fill-in-the-blank questions.

The modules were taught by trained personnel that included school nurses, schoolteachers, and life-skills educators. Each teacher attended an hour training session at their school conducted by the Think First San Diego Chapter Director. The Think First National Directors/Teacher Training Guide (Appendix D) was used to facilitate the training session. All teachers were advised during the training of the theoretical framework used in the development of the three curricula. Each teacher received a curriculum manual, one set of classroom posters, one set of comic strips per student, and one *StreetSmart* video (Think First National Injury Prevention Foundation, 1996a), and copies of the pre and posttests. Twenty bicycle helmets and one bicycle were donated to each school to be raffled upon completion of the TFFK program. During the training session, TFFK staff was available to assist with questions and concerns. The teachers were instructed to return the pre-/posttests without scoring them. The control school teachers received copies of the pre- and posttests along with a schedule of dates in which the pre- and posttests were to be given.

Operational Definitions

Absenteeism Rate: The number of excused and unexcused absences per school year compared to the total number of students enrolled in the school.

Behavior: The way a person acts or behaves in relationship to his/her physical, mental, or social well-being with consideration for the individual's psychosocial, development, and cultural background.

Elementary School Children: A student, 6 through 8 years of age, enrolled in grades 1, 2, 3, or 4, and in the early-school age developmental stage.

High Injury-Risk Behavior: To expose oneself to the chance of injury. Activities or behaviors which increase the likelihood of unfavorable physical, psychological, social, or other health outcomes.

Injury-Related Knowledge: Retention of information attained through educational health programs that promote the prevention of fatal or nonfatal events.

Safety-Behavior: Activities or behaviors which decrease the likelihood of unfavorable physical, psychological, social, or other health outcomes.

Think First for Kids Curriculum: A sequential and ordered educational program, designed to provide a positive influence on the early school aged child's health knowledge and practices in relationship to injury-related activities and behaviors.

Measures

The TFFK Injury Prevention measure (Greene et al., 2001) was used to assess knowledge and behaviors related to regarding brain and spinal cord injury. This grade-specific measure consists of questions of a forced choice format, multiple-choice, and sequencing questions relating to knowledge or concepts presented in the TFFK curriculum. Each grade has a unique measure, consisting of multiple choice, matching and yes/no questions appropriate to the developmental stage and grade-specific reading level. The first grade measure includes 22 questions, second grade 24 questions, and third grade 26 questions (Appendices E and F).

The TFFK Injury Prevention measure was developed by a multi-disciplinary team of Think First staff, a clinical psychologist, a health curriculum specialist, and an elementary school teacher. Questions were designed to measure the effectiveness of the curriculum and were knowledge-based and self-reported behavior questions. The team defined inclusion/exclusion criteria for these items as follows: The inclusion criteria for items were: (a) forced-choice format (true/false, multiple choice, and sequencing); (b) direct relationship of item content to knowledge or concepts presented in the Think First for Kids curriculum (content validity); (c) developmentally appropriate for age and grade level (separate questions were written for each grade level); (e) response rates between 20% and 85% (questions that were answered correctly by at least 20% of students and not by more than 85% of students, since questions below 20% accuracy were considered problematic, and questions above 85% were considered too easy and within the students' general, pre-intervention knowledge-base); and (f) demonstrated improvement in accurate response-rate from pre- to posttest (i.e., the questions needed to be sensitive to changes in student knowledge related to curriculum exposure). Because the correct response rate for many items was greater than 85%, more difficult and challenging questions, such as matching and sequencing types, were created to augment the true/false and multiple choice items (Greene et al., 2001).

Two drafts of the measure were developed, tested, modified, and re-administered with students in grades 1-3 in rural, suburban, and urban schools. The final draft was administered to 870 students in five schools, in both the experimental and control schools. To control for literacy, the pencil-and-paper measure was read aloud to the students and took approximately 15 minutes to complete. Grade-specific measures developmentally appropriate to each grade were finalized to assess knowledge and behaviors regarding brain and spinal cord injury. The measure is presented in a pre/post measure format. Reliability and validity testing of these measures were conducted by the Oregon Health Science University and the Oregon State Health Division (Greene et al., 2001). The Cronbach alpha test was not performed on this instrument.

The fourth grade test assessed basic injury prevention knowledge and self-report safety behaviors in students who had no intervention at the 4th grade level. The test was exactly the same as the third grade posttest (Appendix F).

Data Collection Procedures

This researcher was given permission to use the Access database by Sharp Health-care (Appendix G). The researcher analyzed precollected data that contain no subject identifiers, and subjects cannot be identified, directly or through identifiers linked to the subjects. The data were collected within the classroom setting for both the intervention and control schools.

Data collection occurred between 2000-2002 within the classroom setting for both the intervention and control schools at three points in time using a student self-report pre-/posttest as previously discussed. A measure consisting of questions of a forced choice format, multiple- choice, and sequencing questions relating to knowledge or concepts presented in the TFFK curriculum was administered by the classroom teachers. The TFFK program was taught each Spring for 3 years and classroom teachers administered pre- and posttests within 10 days of implementation and within 10 days of completion of the TFFK 6-week curriculum. Control group participants completed the pre- and postquestionnaire during the same time frame. The fourth grade students, who received no intervention, were given the 4^{th} grade questionnaire during the same time period as the pretest for grades 1-3. Community Health Educators (CHE) and school nurses helped to arrange the scheduling of the pre-/posttests with the classroom teachers. The Intervention and Control students participating in this study were followed through time as Cohorts (Table 3) as they progressed from one grade to another during academic years 1999-2002.

Table 3

Matrix of Longitudinal Student Cohort Progression (Intervention/Control)

	School semester/year		
Cohort	Spring 2000	Spring 2001	Spring 2002
A	Grade 1	Grade 2	Grade 3
B	Grade 2	Grade 3	Grade 4
C	Grade 3	Grade 4	
D	Grade 4		

Each pre- and posttest measure was labeled with the name of the school. The first page contained questions to elicit grade level, age, and racial/ethnic group. The teacher read one-by-one each question aloud and asked the students to circle the best answer. The answers were anonymous and completely confidential; no identification was recorded or utilized in any way. Completed measures were collected by the teacher and placed them in a box. Data from all participants were analyzed and reported collectively, no person or school was individually identified.

Data Management: Upon completion of each wave of data collection all surveys were numbered and entered into a Microsoft Access database. There were approximately three data entry personnel who coordinated their efforts to complete the data entry. All data were edited, coded, and entered by project staff. Appropriate range and consistency checks were applied with the software to ensure data integrity. For example, descriptive statistics of all variables were analyzed to screen for errors, perform logical checks, and detect outliers. Data entry errors were resolved by examining the original data source, the survey (Huck, 2000).

Data Analysis

To determine the effectiveness of the TFFK program, a pre-/post-measure design was employed. The primary outcome was a change in total test score from the pretest to the post-measure, with the postmeasure being administered after the intervention. The analysis of the preexisting data was conducted using the Statistical Package for the Social Sciences (SPSS) (Version 12.0) and included descriptive, univariate, and General Linear Model (GLM), multivariate analysis of variance methods, to assess injury-related knowledge and safety behavior change among elementary school subjects receiving the TFFK curriculum compared to control subjects (George & Mallery, 2004).

Descriptive Statistics

Demographic data were analyzed using frequencies by year of participation, grade level, and district, as well as the general demographics of the student participants by gender and racial/ethnic group (Hinkle et al., 2003). For grades 1 through 3, it was assumed that the students in the pretest group were also in the posttest group. To verify this assumption, general frequencies of gender and race/ethnicity for the posttest group were examined. Since few differences were observed, the final descriptive analysis was conducted and reported on the pretest group. Pre- and post-questionnaires were not matched per student. There were two datasets for each grade: pre-measure data and post-measure data. On both the pre-measure and the post-measure, students were asked to report their gender and race/ethnicity. Since students in grade 4 were only tested once, there was only one group of students per grade from which to obtain descriptive data.

Pre-/Post-Measures

The primary outcome was a change in total test score from the pre-test to the post-measure. In order to obtain a change in score, separate scores for pre-measure and post-measure were calculated. Each question was assigned a single point value for the correct answer and a total score was assigned for each test. Since each school was designated as a control or intervention school, summary score differences of pre- and post-measures were calculated per grade and school.

In order to examine the mean change in score from pre-measure to post-measure for each school, gender, and race/ethnic group, it was imperative to match the pre- and post-measure scores by a character profile which included these factors. Once pre- and post-measure scores were calculated, post-measure scores were selected for each character profile and imported into a database with pre-measure scores of the same character profile. For missing pre- or posttest scores, the mean test score for that character profile was imputed in order to conserve power with the small sample sizes. To verify that this process was not affecting the results, an analysis of the data with only pairs of matched test scores (no imputed pairs) was conducted. Since this analysis revealed similar mean score differences per school, gender, and race/ethnicity, the imputed pairs were included in the final analysis to conserve power.

Cohorts

Cohorts A, B, C, and D were followed for 3 years (2000-2002) and given a pre- and post-measure for grades 1-3. Cohort D, grade 4, completed a pre-measure (no intervention for grade 4-cohort D). Cohort A was surveyed as they progressed from

Grade 1 to Grade 2 to Grade 3. Cohort B was surveyed as they progressed from Grade 2 to 3 to 4. Cohort C was surveyed as they progressed from Grade 3 to 4. Cohort D was surveyed one time in Grade 4.

For example, when Cohort A intervention students progressed to grade 2, they had already had 1 year of the TFFK program. Trends in scores were plotted over time to measure and describe the overall impact of the TFFK program, as well as measure the concept of retention of knowledge and behavior over time, from one grade to another.

Univariate

Ninety-five percent confidence intervals were constructed around the changes in test scores (Hinkle et al., 2003). Stratification of confounding factors allowed for an examination of gender, grade, district, and race/ethnicity. Due to small sample sizes of some race/ethnicity categories, the variable race was collapsed into four categories: Caucasian, Hispanic, African-American, and Other (included all other races). For each grade, comparisons of 95% confidence intervals around the mean change in score were used to determine statistical significance in the univariate analyses. Graphs depicting 95% Confidence Intervals for each of the cohorts by grade and intervention status were constructed (see Table 5).

Multivariate

In utilizing pre- and posttests, this study is considered to be a repeated measures design (Creswell, 2003). Multivariate analyses were performed to assess the change in mean scores while controlling for covariates such as gender, race/ethnicity, and Academic Performance Index (API). The API is a score on a scale of 200 to 1000 that annually measures the academic performance and progress of individual schools in California. Students in the same school tend to have similar characteristics, thereby acting as a cluster. Therefore, to account for within-cluster correlation, the GLM method was used to reduce the potential for biased standard errors and conclusions about the statistical significance (a bias that can occur in either direction, but usually leads to false-positive treatment effects) (George & Mallery, 2004). This within-cluster correlation was adjusted by using the GLM.

To estimate the overall effect of the curriculum, a GLM repeated measures of analysis of variance procedure was used to test the global null hypothesis and determine the effects of between-subject factors (year and intervention or control); covariates (gender, race/ethnicity and API); and within subject factors (pre- and posttest scores). The GLM procedure was used to adjust for the covariates gender, race/ethnicity and API to determine if the TFFK intervention was a predictor of improved performance. The results were plotted on graphs to show the progression of the cohorts over time.

Protection of Human Subjects

Approval of the study was obtained from University of San Diego's Institutional Review Board (Appendix H). This research falls into the exempt category based upon federal law 45 CFR 46.010 B specifically, as applies to #4, research involving the collection or study of existing data. This researcher analyzed precollected data that contained no subject identifiers, and subjects can not be identified, directly or through identifiers linked to the subjects. The researcher was given permission to use an Access database by Sharp Healthcare, San Diego.

CHAPTER IV

RESULTS

The purpose of this research study was to analyze an existing intervention data set collected to assess the effectiveness of an elementary school injury prevention curriculum called Think First for Kids (TFFK). This intervention was delivered in a sequential manner over a 1 to 3 year period to 1,762 children, ages 6 to 9 to help them improve and retain knowledge and self-reported safety behaviors. This is an intent to treat analysis which means all the intervention children were included regardless of whether they moved or stayed in the school system. The results and interpretation of findings are provided in this chapter. Descriptive statistics describing the sample population are presented first, followed by univariate and multivariate analysis of the effect of the curriculum by individual cohort, A, B, and C.

Characteristics of the Sample

Seventeen hundred sixty-two children participated in the study. One thousand ninety-nine children were in the intervention group and 663 were in the control group (see Table 4). The sample was diverse with the following racial/ethnic composition: 32.4% White, 8.5% Black, 26.2% Hispanic, and 32.8% Other, which includes those that did not self identify race/ethnicity. See Appendices I, J, and K for characteristics of the sample by Cohort.

Table 4

Students by Grade Level, Group, and Year

		Year			
Group	Grade level	2000	2001	2002	Total
Intervention	1	496	0	0	496
	2	479	407	0	886
	3	124	350	350	824
	4	0	110	320	430
Total		1,099	867	670	2,636
Control	1	226	0	0	226
	2	208	194	0	402
	3	229	161	165	555
	4	0	185	188	373
Total		663	540	353	1,556
Grand total – intervention and control		1,762	1,407	1,023	4,192

Findings Related to Hypotheses

The null hypotheses are that (a) there is no significant difference in self-reported knowledge and safety behaviors between students participating in the TFFK curriculum and those who do not receive the curriculum; (b) there is no significant difference in retention of knowledge over time with repeated curriculum interventions in the time period of years 2000-2002 between students who receive the curriculum and those who do not.

The primary outcome was a change in total test score from the pretest to the posttest, with the posttest being administered after the intervention. In order to obtain a change in score, separate scores for pretests and posttests were calculated. Each question was assigned a single point value for the correct answer and a total score was assigned for each test. For each grade and year, 95% confidence intervals (CIs) were constructed around the mean change in score, and comparisons were made of the CIs for action and control schools to detect statistically significant differences. This analysis was then performed by the self-identified racial/ethnic breakdown of White, Black, and Hispanic participants.

Hypothesis 1 was tested using summary mean scores and constructing confidence intervals around those scores by intervention for each grade and cohort. The summary table (Table 5) provides a side-by-side look at the intervention and control school performance over the 3-year longitudinal study. The schools receiving the TFFK intervention consistently scored higher on the posttest than children receiving no intervention. The intervention schools among all Cohorts at all grade levels had significantly higher posttest scores when compared to control schools as demonstrated by nonoverlapping confidence intervals.

In Cohorts A, B, and C the improvement in score (change in score) for the intervention schools was significantly greater than the control schools for each year of participation. For example, in Cohort A the confidence intervals around the mean scores at pretest for Grade 1 intervention schools were (CI = 17.2-17.3) compared to control schools (CI = 17.2-18.2) for controls. The confidence intervals around the mean scores at posttest for Grade 1 intervention schools were (CI = 21.7-22.2) compared to control school (CI = 18.9-19.6). Among Cohort B, the intervention schools improved by 4.4 points in 2000 and 4.0 in 2001. This increase in score was significantly higher than

Table 5

Mean Scores by Cohort and 95% Confidence Intervals, Group and Year: TFFK Survey, 2000-2002

		Intervention			Control		
		2000	2001	2002	2000	2001	2002
Cohort	Mean scores	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
A	Pretest	17.4 (17.2-17.3)	16.3 (16.0-16.6)	15.5 (15.0-16.0)	17.7 (17.2-18.2)	15.2 (14.7-15.6)	13.6 (13.0-14.2)
	Posttest	21.9 (21.7-22.2)	19.6 (19.3-19.9)	19.6 (19.2-20.1)	19.3 (18.9-19.6)	17.0 (16.5-17.5)	14.5 (13.9-15.0)
		Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4
B	Pretest	15.2 (14.9-15.5)	16.4 (16.0-16.9)		15.9 (15.4-16.4)	15.1 (14.4-15.7)	
	Posttest	19.6 (19.3-19.9)	20.4 (20.0-20.7)	18.9 (18.5-19.2)	16.6 (16.2-17.0)	16.7 (16.1-17.2)	14.3 (13.6-14.9)
		Grade 3	Grade 4		Grade 3	Grade 4	
C	Pretest	15.3 (14.7-15.8)			13.7 (13.2-14.2)		
	Posttest	20.7 (20.1-21.4)	19.0 (18.4-19.7)		16.2 (15.8-16.6)	15.8 (15.2-16.3)	
		Grade 4			Grade 4		
D	Posttest	16.1 (15.6-16.6)			15.2 (14.6-15.6)		

among the corresponding control schools that improved by 0.7 points in 2000, 1.6 points in 2001.

In theory, if retention of knowledge and self-reported behavior is occurring, the cohort of students who have received TFFK should do better on their pretest than a cohort who has not had the intervention. So Cohort A grade 2 should perform better than Cohort B grade 2. The data show the pretest score for grade 2 intervention schools with 1 year of TFFK was significantly higher than for grade 2 control with no prior TFFK intervention (Cohort A grade 2, 95% CI 16.0-16.6 compared to Cohort B grade 2, 95% CI 14.9-15.5). Cohort B grade 3 should outperform Cohort C grade 3 on the pretest and that was supported as reflected in the CIs (Cohort B grade 3, 95% CI 16.0-16.9 compared to Cohort C grade 3, 95% CI 14.7-15.8).

Although the pretest baseline scores were similar for Grade 1 for both the intervention and control schools, when Cohort A progressed to grade 2 the intervention students that had already had 1 year of the TFFK program scored a higher baseline on the Grade 2 pretest than the control students who had not been exposed to the TFFK program. Similarly, when Cohort A progressed to Grade 3 the gap between the pretest scores for students who had already had 2 years of the TFFK program and the control students was even larger — the intervention students scoring higher. Observing this trend addresses the concept of retention of knowledge over time, from one grade to another.

Data were then stratified by racial/ethnic group and is shown in Tables 6, 7 and 8. Some cells are empty due to no subjects within that stratification. White students in Cohort A, grades 1 and 3 and Cohorts B and C, grade 1, the improvement in score (change in score) for the intervention schools was significantly greater than the control

Table 6

Mean Scores for White Students, Cohorts, A, B, and C by Group: TFFK Survey, 2000-2002

		Intervention			Control		
		2000	2001	2002	2000	2001	2002
Cohort	Mean scores	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
A	Pretest	18.35 (17.8-18.9)	17.2 (16.8-17.7)	17.7 (17.1-18.3)	19.3 (18.4-20.2)	15.5 (14.4-16.6)	15.8 (14.0-17.6)
	Posttest	22.4 (22.0-22.7)	20.3 (19.9-20.7)	21.4 (20.6-22.1)	20.0 (19.3-20.7)	17.0 (16.0-18.0)	15.0 (13.2-16.8)
	Change	4.1 (3.6-4.6)	3.1 (2.5-3.7)	3.8 (3.1-4.4)	.67 (-.1-1.4)	1.5 (.1-2.9)	-.8 (-2.4-.9)
		Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4
B	Pretest	15.9 (5.4-16.3)	17.6 (16.9-18.2)		16.8 (16.0-17.6)	15.7 (14.4-17.1)	
	Posttest	20.3 (20.0-20.7)	20.2 (19.7-20.7)	19.3 (18.7-19.8)	16.6 (16.2-17.0)	18.0 (16.9-19.0)	17.0 (15.1-18.8)
	Change	4.5 (4.0-5.1)	2.6 (1.8-3.4)		0.7 (0.2-1.3)	2.2 (0.6-3.8)	
		Grade 3	Grade 4	Grade 5	Grade 3	Grade 4	Grade 5
C	Pretest	15.4 (14.3-16.6)			15.8 (15.1-16.6)		
	Posttest	21.0 (20.2-21.9)	19.0 (18.2-19.9)	17.1 (15.8-18.5)	18.7 (18.1-19.2)	18.1 (16.8-19.4)	14.3 (13.2-15.5)
	Change	5.6 (4.4-6.8)			2.8 (2.0-3.7)		

Table 7

Mean Scores for Black Students, Cohorts, A, B, and C by Intervention: TFFK Survey, 2000-2002

		Intervention			Control		
		2000	2001	2002	2000	2001	2002
Cohort	Mean scores	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
A	Pretest	17.23 (16.5-18.0)	15.8 (14.8-16.8)	12.3 (10.5-14.0)	16.8 (15.2-18.3)	14.6 (13.7-15.6)	12.0 (9.0-15.0)
	Posttest	21.7 (21.1-22.2)	19.2 (18.4-20.0)	17.3 (15.8-18.9)	20.0 (18.8-22.3)	16.2 (15.0-17.4)	14.3 (12.2-16.4)
	Change	4.5 (3.8-5.1)	3.4 (2.2-4.5)	5.0 (3.1-7.0)	3.3 (2.0-4.5)	1.5 (-.1-3.2)	2.3 (-.5-5.1)
		Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4
B	Pretest	14.0 (13.4-14.5)	14.9 (13.8-16.0)		15.4 (13.3-17.5)	14.9 (13.0-16.9)	
	Posttest	19.2 (18.5-20.0)	20.3 (19.4-21.2)	19.5 (18.3-20.7)	16.3 (14.3-18.2)	14.8 (13.2-16.4)	13.8 (12.2-15.5)
	Change	5.3 (4.5-6.1)	5.1 (4.2-6.7)		0.8 (-2.7-4.3)	-.1 (-2.5-2.3)	
		Grade 3	Grade 4	Grade 5	Grade 3	Grade 4	Grade 5
C	Pretest				22.8 (11.5-14.1)		
	Posttest			17.5 (11.1-23.9)	16.7 (15.6-17.8)	15.3 (14.0-16.6)	15.3 (14.1-16.6)
	Change				3.9 (2.6-5.1)		

Table 8

Mean Scores for Hispanic Students, Cohorts, A, B, and C by Group: TFFK Survey, 2000-2002

		Intervention			Control		
		2000	2001	2002	2000	2001	2002
Cohort	Mean scores	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
A	Pretest	17.2 (16.7-17.7)	15.8 (15.2-16.4)	14.2 (13.3-15.0)	17.3 (16.6-18.0)	14.6 (14.4-15.2)	14.1 (13.4-14.9)
	Posttest	22.4 (22.0-23.0)	19.1 (18.4-19.7)	17.5 (16.6-18.4)	18.8 (18.4-19.3)	17.1 (16.3-18.0)	14.1 (13.3-14.9)
	Change	5.2 (4.8-5.7)	3.2 (2.5-40)	3.3 (2.6-4.1)	1.5 (.9-2.2)	2.6 (1.7-3.5)	.02 (-.79-.8)
		Grade 2	Grade 3	Grade 4	Grade 2	Grade 3	Grade 4
B	Pretest	14.0 (13.2-14.7)	14.4 (13.4-15.4)		16.1 (15.1-17.1)	15.8 (14.7-16.8)	
	Posttest	19.5 (18.8-20.2)	20.9 (20.1-21.8)	18.3 (17.5-19.0)	16.8 (16.0-17.6)	16.4 (15.4-17.5)	13.8 (13.0-14.7)
	Change	5.5 (4.4-6.6)	6.5 (5.1-8.0)		0.7 (-0.3-1.7)	.68 (-.5-1.9)	
		Grade 3	Grade 4	Grade 5	Grade 3	Grade 4	Grade 5
C	Pretest	14.33 (10.5-18.1)			13.20 (12.5-13.9)		
	Posttest	19.8 (15.2-24.4)	20.7 (18.3-23.1)	13.4 (4.3-22.6)	15.6 (15.2-16.1)	15.9 (15.2-16.6)	16.7 (16.0-17.4)
	Change	5.4 (2.2-8.7)			2.5 (1.7-3.2)		

schools for each year of participation. Among Black students in Cohort B grades 1 and 2, the improvement in score (change in score) for the intervention schools was significantly greater than the control schools for each year of participation. Hispanic students showed consistently high absolute improvements in score. In Cohort A, grades 1 and 3 and Cohorts B grades 1 and 2, the improvement in score (change in score) for the intervention schools was significantly greater than the control schools for each year of participation.

Racial/Ethnic Findings

Overall, several observations can be made when referring to performance by racial/ethnic group. White students attained the highest scores on the pretests (baseline), but Hispanics and then Blacks attained the greatest increase from the pre- to posttest scores. Although Hispanics and Blacks had lower baseline scores, they were able to achieve high results after the curriculum. The intervention schools outperformed the control schools. For Cohorts A and B, Hispanics had a significantly higher posttest score in all grades when compared to the control schools. For Cohort B, Blacks had a significantly higher posttest score in all grades when compared to the control schools.

Fourth Grade

Overall scores for fourth grade students reflect a lack of injury-related knowledge and positive safety behaviors. Grade 4 students scored about 60% on the third grade test, indicating a major need for injury prevention education. In grade 4, the score distributions were similar for intervention and control schools. This is a logical finding considering that there was not an intervention for fourth grade students.

The most important conclusion regarding fourth grade students was generated in the comparison to third grade students. Third and fourth grade students have a similar baseline level of injury-related knowledge. And, third grade students who participate in the TFFK curriculum surpass the fourth grade level of injury-related knowledge. These findings support the view that fourth grade students, although having matured for one full year past third grade, are still lacking important injury prevention knowledge.

For students in Cohort B who progressed from Grade 2 to Grade 4, the intervention schools had a greater increase in posttest scores than control counterparts. Again, intervention schools that progressed to Grade 3 (and had already had grade 2 of TFFK) scored higher on their pretests than the control schools. It should be noted that Grade 4 posttest scores were significantly higher among the intervention schools when compared to the control schools — despite the fact that Grade 4 had no educational intervention. The only difference being that the intervention schools in Cohort B had 2 years of TFFK before getting to grade 4, whereas the control schools had no intervention. The Grade 4 test grade was similar to the Grade 3 posttest (again showing retention of information). For students in Cohort C, recall they progressed from Grade 3 through Grade 4 over the course of the study. Intervention school posttests were higher than control schools for Grades 3 and 4. In control schools, the grade 4 posttest was barely higher than the Grade 3 pretest, and was almost equal that of the Grade 3 posttest.

General Linear Model Repeated Measures Analysis

Hypothesis 2 was tested by estimating the overall effect of the curriculum, using a GLM repeated measures, analysis of variance procedure for each Cohort and determine the effects of between-subject factors (year and intervention or control); covariates (gender, race/ethnicity, and API); and within subject factors (pre- and posttest scores). The GLM procedure was used to adjust for the covariates to determine if the TFFK intervention was a predictor of improved performance. The results were plotted on graphs to show the progression of the cohorts over time.

Retrospective Power Analysis

Power analysis can determine whether there is a sufficient chance of rejecting the null hypothesis when it is false. In other words, power is the ability to detect an effect if there is one. The approach to statistical power analysis is based on the F statistic for testing statistical hypothesis in the GLM (Murphy & Myors, 2004). In this analysis, the overall question is whether there are significant differences in mean change scores among the groups (i.e., intervention and control) by cohort and by year adjusting for gender, race/ethnicity and API. In SPSS, appropriate statistics are accepted as input data and power computations are produced as part of the GLM repeated measures procedure output. The power for the multivariate test of the 2-way COHORT * GROUP interaction effect is 100%. The power for the multivariate test of the 3-way COHORT * GROUP * YEAR interaction effect is also 100% or more than adequate.

Cohort A

The Within-Subjects Factors

A within-subjects factor is any factor that distinguishes measurements made on the same subject or case rather than distinguishing different subjects or cases. In this analysis, the factor "prepost" is a within-subjects factor because it distinguishes the two measurements of test scores for each of the subjects. There are two levels of the within-subjects factor called prepost. The dependent variables that make up the two levels of prepost are the pretest and posttest scores (George & Mallery, 2004).

Of note, the within-subjects effect is analyzed in GLM by first transforming the original variables into single degree of freedom (*df*) tests of the null hypothesis. In this analysis, the prepost within-subjects effect has a single degree of freedom, so there is only one single degree of freedom estimate of the prepost effect. GLM will create two transformed scores, one for the average of the repeated measures variables, pretest and posttest, and one for the prepost main effect. The between-subjects effects will be analyzed using the transformed score, average (George & Mallery, 2004).

The Between-Subjects Factors

A between-subjects factor is any factor that divides the sample of subjects or cases into discrete subgroups. In this analysis, the factors Group (1 = intervention, 2 = control) and year (1 = 2000, 2 = 2001, 3 = 2002) are between-subjects factors. Table 9 shows the two levels for the between-subjects factor group along with the numbers for the two cells, and the three levels of the other between-subjects factor year along with the numbers for the three cells (George & Mallery, 2004).

Covariates

In this analysis, gender, race/ethnicity, and API are included as constant covariates whose values remain the same at each within-subjects (prepost) level (i.e., their values do not change from pre- to posttest).

Table 9

Between-Subjects Factors for Cohort A

Group and year	Value label	*N*
Group		
1	Intervention	1,179
2	Control	414
Year		
1	2000	624
2	2001	537
3	2002	432

The between-subjects effects are adjusted for covariates. Differences between groups are tested controlling for gender, race/ethnicity, and API.

Descriptive Statistics

Descriptive statistics for the two variables, pretest and posttest, are shown in Table 10. The means in the rows labeled "Total" are weighted means.

Multivariate Tests

When the within-subjects tests are single degree of freedom tests, as in this analysis, then the multivariate *F*s will be identical to the univariate *F*s shown in Table 11.

Tests of Within-Subjects Effects

There are several significant within-subjects effects (Table 12). The results of the tests of the within-subjects effects indicate significant effects for the prepost main effect ($F = 28.722$, p value < 0.0005), the prepost by group interaction ($F = 191.376$, p value < 0.0005), and the prepost by group by year interaction ($F = 10.659$, p value < 0.0005).

Table 10

Descriptive Statistics for Cohort A

Test	Group	Year	Mean	Standard deviation	*N*
Pretest	Intervention	2000	17.46	3.283	466
		2001	16.34	3.030	399
		2002	15.55	4.382	314
		Total	16.57	3.615	1,179
	Control	2000	18.78	3.252	158
		2001	14.92	3.038	138
		2002	13.81	3.913	118
		Total	16.08	4.015	414
	Total	2000	17.80	3.322	624
		2001	15.97	3.092	537
		2002	15.08	4.325	432
		Total	16.44	3.728	1,593
Posttest	Intervention	2000	21.87	2.718	466
		2001	19.58	2.934	399
		2002	19.55	4.125	314
		Total	20.48	3.408	1,179
	Control	2000	19.48	2.558	158
		2001	16.62	3.324	138
		2002	14.60	3.286	118
		Total	17.13	3.640	414
	Total	2000	21.26	2.871	624
		2001	18.81	3.300	537
		2002	18.20	4.492	432
		Total	19.61	3.766	1,593

Table 11

Tests of Within-Subjects Effects for Cohort A

Effect	Test	Value	*F*	Hypothesis *df*	Error *df*	Significance
Prepost	Pillai's Trace	.018	28.722[a]	1.000	1584.000	.000
Prepost * gender	Pillai's Trace	.000	.524[a]	1.000	1584.000	.469
Prepost * race_eth	Pillai's Trace	.001	2.055[a]	1.000	1584.000	.152
Prepost * api	Pillai's Trace	.006	9.875[a]	1.000	1584.000	.002
Prepost * intrvntn	Pillai's Trace	1.08	191.376[a]	1.000	1584.000	.000
Prepost * yr	Pillai's Trace	.000	.223[a]	2.000	1584.000	.800
Prepost * intrvntn * yr	Pillai's Trace	.013	10.659[a]	2.000	1584.000	.000

Note. Design: Intercept+gender+race_eth+api+group+yr+group * yr Within Subjects Design: prepost.
[a]Exact statistic.

Table 12

Tests of Within-Subjects Effects for Cohort A: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	184.012	1	184.012	28.722	.000
Prepost * gender	Sphericity assumed	3.356	1	3.356	.524	4.69
Prepost * race_eth	Sphericity assumed	13.167	1	13.167	2.055	.152
Prepost * api	Sphericity assumed	63.266	1	63.266	9.875	.002
Prepost * group	Sphericity assumed	1226.064	1	1266.046	191.376	.000
Prepost * yr	Sphericity assumed	2.857	2	1.429	.223	.800
Prepost * group * yr	Sphericity assumed	136.574	2	68.287	10.659	.000
Error (prepost)	Sphericity assumed	10148.013	1584	6.407		

The general approach to interpreting analysis of variance (ANOVA) effects is to begin with the highest order interaction. In this analysis, it is the three-way interaction, prepost by group by year. As noted in Table 12, there is a significant three-way interaction between group, year, and prepost (see profile plots for interpretation of significant interactions).

Of note, when there is interaction, there would be less interest in the main effects but instead one would examine one factor's effect at each level of the other factor(s). In other words, when there is significant interaction, main effects are not normally interpreted.

Tests of Between-Subjects Effects

As explained above, there is a significant three-way interaction between group, year, and prepost. The estimated marginal means for the three-way interaction are shown in the Table 13. It is, however, difficult to see what is happening in the three-way interaction by just looking at Table 16 of means. The profile plots are more helpful.

Profile Plots

Plots provide the clearest visualization of the mean scores of the Cohorts as they progressed throughout the study, 2000-2002. As noted above, there is a significant three-way interaction between group, year, and prepost. The essence of a three-way interaction is that the two-way interaction is not the same at each level of the 3rd factor. There are several possibilities here but we could examine group by prepost at each level of year (Figure 1), or year by prepost interaction within each level of group (Figure 2), or prepost by group interaction within each level of year (Figure 3).

Table 13

*Group * Year * Prepost for Cohort A: Measure and Score*

Group	Year	Prepost	Mean	Std. error	95% confidence interval Lower bound	95% confidence interval Upper bound
Interaction	2000	1	17.342[a]	.155	17.039	17.646
		2	21.789[a]	.144	21.507	22.071
	2001	1	16.084[a]	.169	15.752	16.416
		2	19.428[a]	.157	19.119	19.736
	2002	1	15.199[a]	.193	14.822	15.577
		2	19.344[a]	.179	18.994	19.695
Control	2000	1	19.274[a]	.275	18.734	19.814
		2	19.751[a]	.255	19.250	20.252
	2001	1	15.530[a]	.289	14.964	16.096
		2	17.009[a]	.268	16.484	17.534
	2002	1	14.702[a]	.319	14.077	15.327
		2	15.143[a]	.296	14.563	15.723

[a]Covariates appearing in the model are evaluated at the following values: Gender = 1.47, Race/Ethnicity = 2.48, API = 684.39.

These profile plots were created by selecting year as the horizontal axis variable, prepost as the separate lines variable, and group as the separate plots variable. Plotting group as separate plots focuses attention on the year by prepost interaction within each level of group. The relevant main effects are year and prepost, the two-way interaction factors.

- For both the intervention and control groups, mean pretest scores decreased significantly from 2000 to 2002.
- For the intervention group, mean posttest scores decreased significantly from 2000 to 2001. The slight increase in mean posttest scores from 2001 to 2002, however, was not statistically significant.

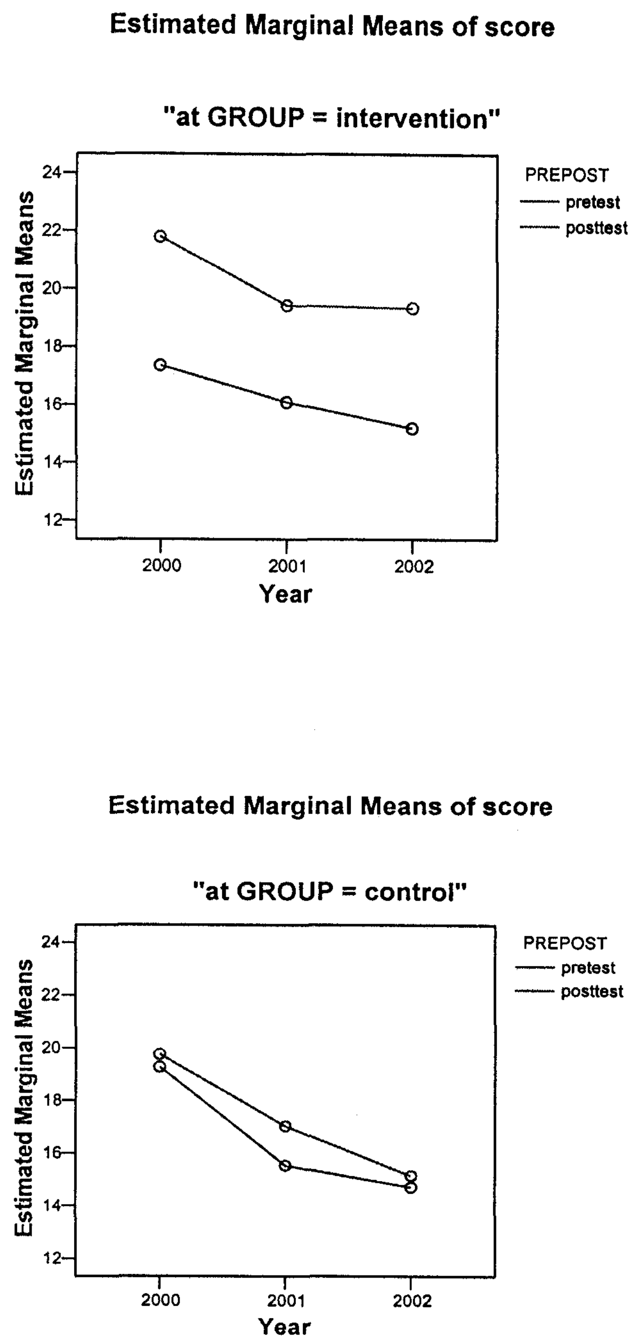
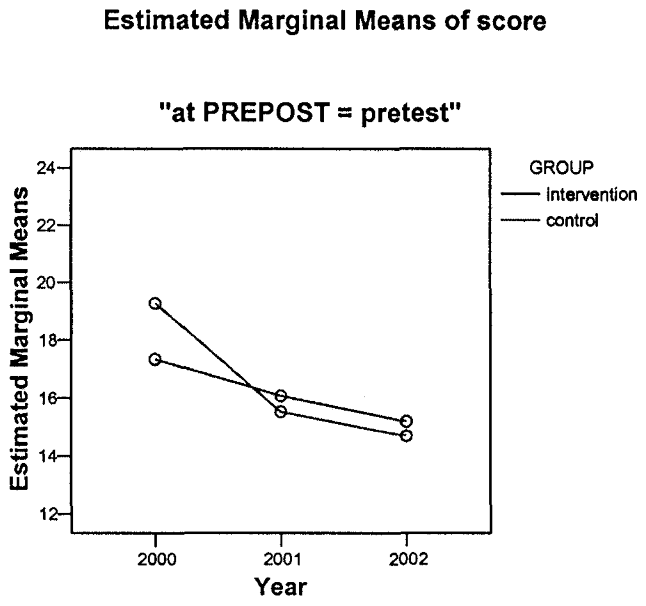


Figure 1. Cohort A's profile plots of the year by prepost by group interaction means.



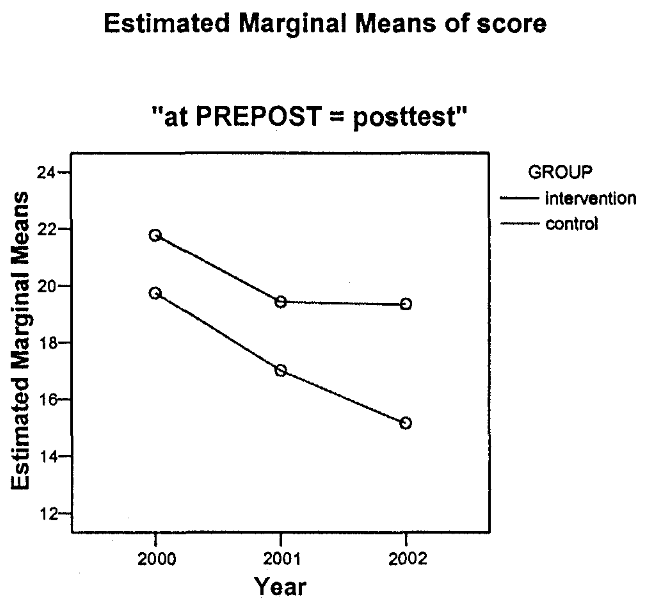
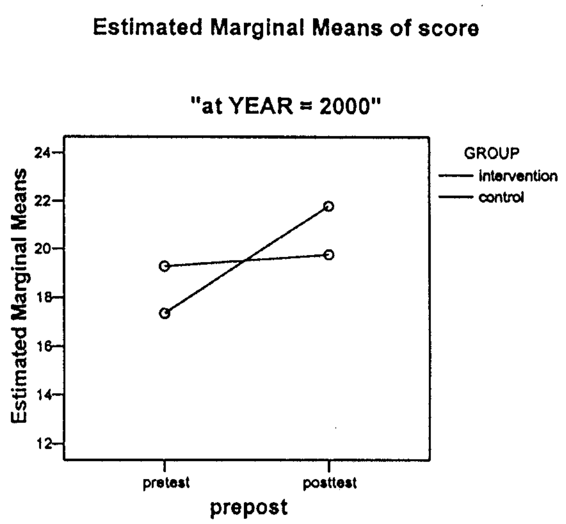
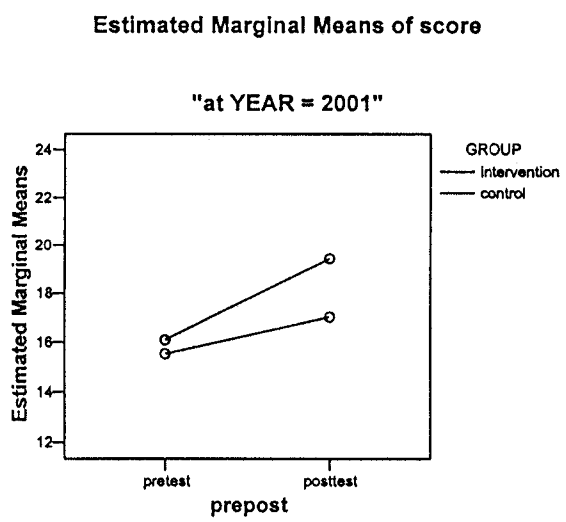


Figure 2. Cohort A's profile plots of the year by group by prepost interaction means.





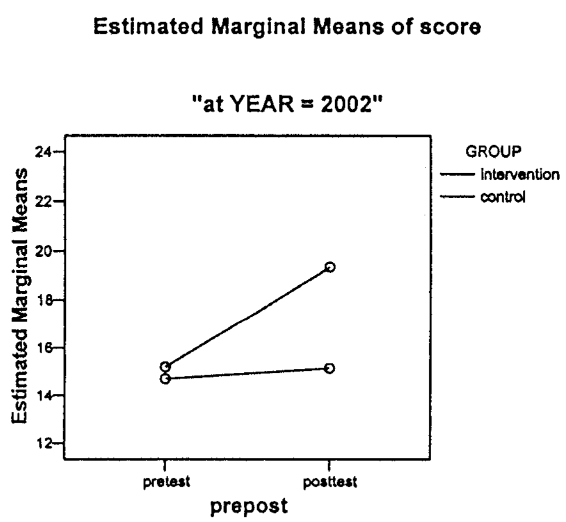


Figure 3. Cohort A's profile plots of the prepost by group by year interaction means.

- For the control group, mean posttest scores decreased significantly from 2000 to 2002.
- For the intervention group, differences between mean pre- and posttests were statistically significant within each year.
- For the control group, mean scores increased slightly from pre- to posttest by 0.477 and 0.441 points in 2000 and 2002, respectively. In 2001, however, mean scores increased significantly by 1.479 points from pre- to posttest.

These profile plots use year as the horizontal axis, group as the separate lines variable, prepost as the separate plots variable. Plotting the pre- and posttest scores as separate plots focuses attention on the group by year interaction. The relevant simple main effects are year, and group the two-way interaction factors.

- For both the intervention and control groups, mean pretest scores decreased significantly from 2000 to 2002.
- In 2000, mean pretest score was significantly higher among the control group than the intervention group. In 2001 and 2002, however, mean pretest scores of the two groups were not significantly different.
- For the intervention group, mean posttest scores decreased significantly from 2000 to 2001, but there was very little change in mean posttest scores from 2001 to 2002.
- For the control group, mean posttest scores decreased significantly from 2000 to 2002.

- Within each year, mean posttest scores were significantly higher for the intervention group than the control group, with the largest difference occurring in 2002.

Plotting the year as separate plots (Figure 4) focuses attention on the prepost by group interaction. The relevant simple main effects are prepost, and group the two-way interaction factors. The interpretation of these three prepost by group interactions within year is possible but the previous two ways is optimal.

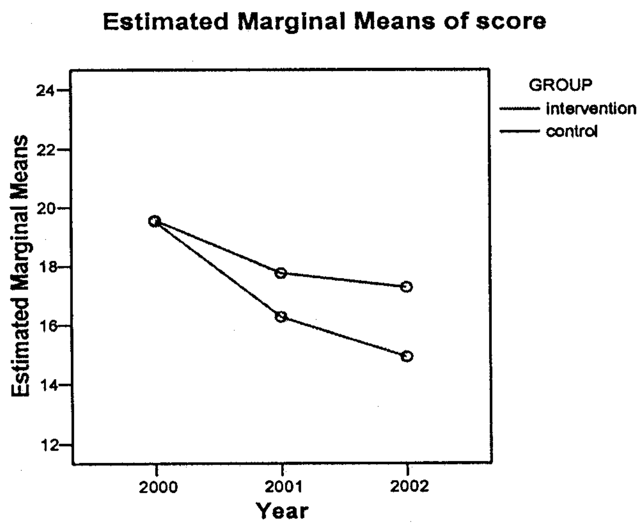


Figure 4. Cohort A's overall group by year interaction plot.

Cohort B

The Within-Subjects Factors

There are two levels of the within-subjects factor called prepost. The dependent variables that make up the two levels of prepost are the pretest (pretest_Cohort_B) and posttest.

The Between-Subjects Factors

Table 14 shows the two levels for the between-subjects factor group along with the numbers for the two cells, and the three levels of the other between-subjects factor year along with the numbers for the three cells.

Table 14

Between-Subject Factors for Cohort A

Group and year	Value label	*N*
Group		
1	Intervention	1,092
2	Control	528
Year		
1	2000	661
2	2001	501
3	2002	458

Covariates

In this analysis, gender, race/ethnicity, and API are included as constant covariates whose values remain the same at each within-subjects (prepost) level (i.e., their values do not change from pre- to posttest).

Of note, the between-subjects effects are adjusted for covariates. Differences between groups are tested controlling for gender, race/ethnicity. and API.

Descriptive Statistics

Descriptive statistics for the two variables, pretest (pretest_Cohort_B) and posttest, are shown in Table 15. The means in the rows labeled "Total" are weighted means.

Table 15

Descriptive Statistics for Cohort B

Test	Group	Year	Mean	Standard deviation	*N*
Pretest	Intervention	2000	15.29	3.150	453
		2001	16.45	3.941	342
		2002	18.86	3.258	297
		Total	16.62	3.735	1,092
	Control	2000	15.90	3.394	208
		2001	15.08	4.069	159
		2002	14.39	4.569	161
		Total	15.19	4.028	528
	Total	2000	15.48	3.239	661
		2001	16.01	4.029	501
		2002	17.29	4.329	458
		Total	16.16	3.890	1,620
Posttest	Intervention	2000	19.56	3.017	453
		2001	20.35	3.132	342
		2002	18.86	3.258	297
		Total	19.62	3.169	1,092
	Control	2000	16.64	3.011	208
		2001	16.68	3.640	159
		2002	14.39	4.569	161
		Total	15.96	3.868	528
	Total	2000	18.64	3.305	661
		2001	19.18	3.716	501
		2002	17.29	4.329	458
		Total	18.42	3.817	1,620

Multivariate Tests

When the within-subjects tests are single degree of freedom tests, as in this analysis, then the multivariate *F*s will be identical to the univariate *F*s shown in Table 16.

Table 16

Tests of Within-Subjects Effects for Cohort B: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	163.922	1	163.922	24.270	.000
Prepost * gender	Sphericity assumed	.598	1	.598	.089	.766
Prepost * race_eth	Sphericity assumed	7.094	1	7.094	1.050	.306
Prepost * api	Sphericity assumed	75.991	1	75.991	11.251	.001
Prepost * group	Sphericity assumed	646.438	1	646.438	95.710	.000
Prepost * yr	Sphericity assumed	1026.025	2	513.012	75.956	.000
Prepost * group * yr	Sphericity assumed	316.080	2	158.040	23.399	.000
Error (prepost)	Sphericity assumed	10880.868	1611	6.754		

Tests of Within-Subjects Effects

There are several significant within-subjects effects. The results of the tests of the within-subjects effects indicate significant effects for the prepost main effect ($F = 24.270$, p value < 0.0005), the prepost by group interaction ($F = 95.710, p$ value < 0.0005), the prepost by year interaction ($F = 75.956, p$ value < 0.0005), and the three-way prepost by group by year interaction ($F = 23.399, p$ value < 0.0005).

In this analysis, it is the three-way interaction, prepost by group by year. As noted above, there is a significant three-way interaction between group, year, and prepost (see estimated marginal means and profile plots for interpretation of significant interactions).

Tests of Between-Subjects Effects

Univariate tests of the main effects of group and year (between-subjects factors) are shown in Table 17. Recall that the between-subjects effects are tested by the transformed variable called average.

Table 17

Tests of Between-Subjects Effects for Cohort B: Measure and Score

Source	Type III sum of squares	*df*	Mean square	*F*	Significance
Intercept	5352.599	1	5352.599	316.762	.000
Gender	68.074	1	68.074	4.029	.045
Race_eth	289.019	1	289.019	17.104	.000
Api	469.797	1	469.797	27.802	.000
Group	1698.875	1	1698.875	100.538	.000
Year	78.504	2	39.252	2.323	.098
Group * year	1056.434	2	528.217	31.259	.000
Error	27222.448	1611	16.898		

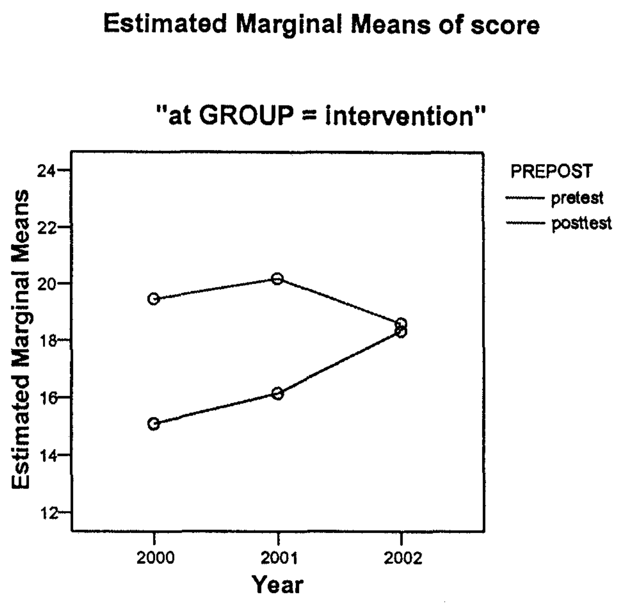
Note. Covariates appearing in the model are evaluated at the following values: Gender = 1.47, Race/Ethnicity = 2.61, API = 694.60.

Profile Plots

As noted above, there is a significant three-way interaction between, group, year, and prepost. The essence of a three-way interaction is that the two-way interaction is not the same at each level of the 3rd factor. There are several possibilities here, but we could examine group by prepost at each level of year (Figure 5), or year by prepost interaction within each level of group (Figure 6), or prepost by group interaction within each level of year (Figure 7).

These profile plots were created by selecting year as the horizontal axis variable, prepost as the separate lines variable, and group as the separate plots variable. Plotting group as separate plots focuses attention on the year by prepost interaction within each level of group. The relevant main effects are year and prepost, the two-way interaction factors. Note: In 2002, 4^{th} grade students were tested one time using the posttest survey; therefore, 2002 pretest = 2002 posttest.

- For the intervention group, mean pretest scores increased significantly from 2000 to 2002. Mean posttest scores increased significantly from 2000 to 2001. From 2001 to 2002, however, mean posttest scores decreased significantly in this group.
- For the control group, mean pre- and posttest scores decreased significantly from 2000 to 2002.
- Among the intervention group, differences in mean pre- and posttest scores were statistically significant in 2000 and 2001.
- Among the control group, differences in mean pre- and posttest scores were statistically significant in 2001 but not in 2000.
- The changes in mean scores from pre- to posttest were significantly greater in the intervention group (4.376 and 4.046 points in 2000 and 2001, respectively)



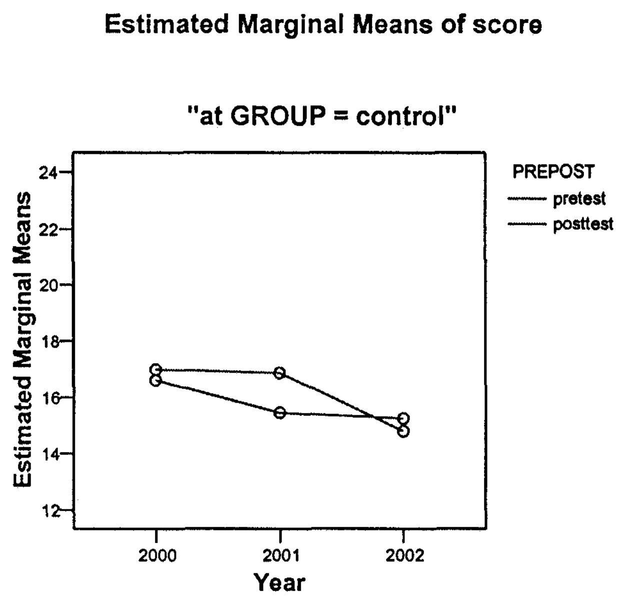


Figure 5. Cohort B's profile plots of the year by prepost by group interaction means.

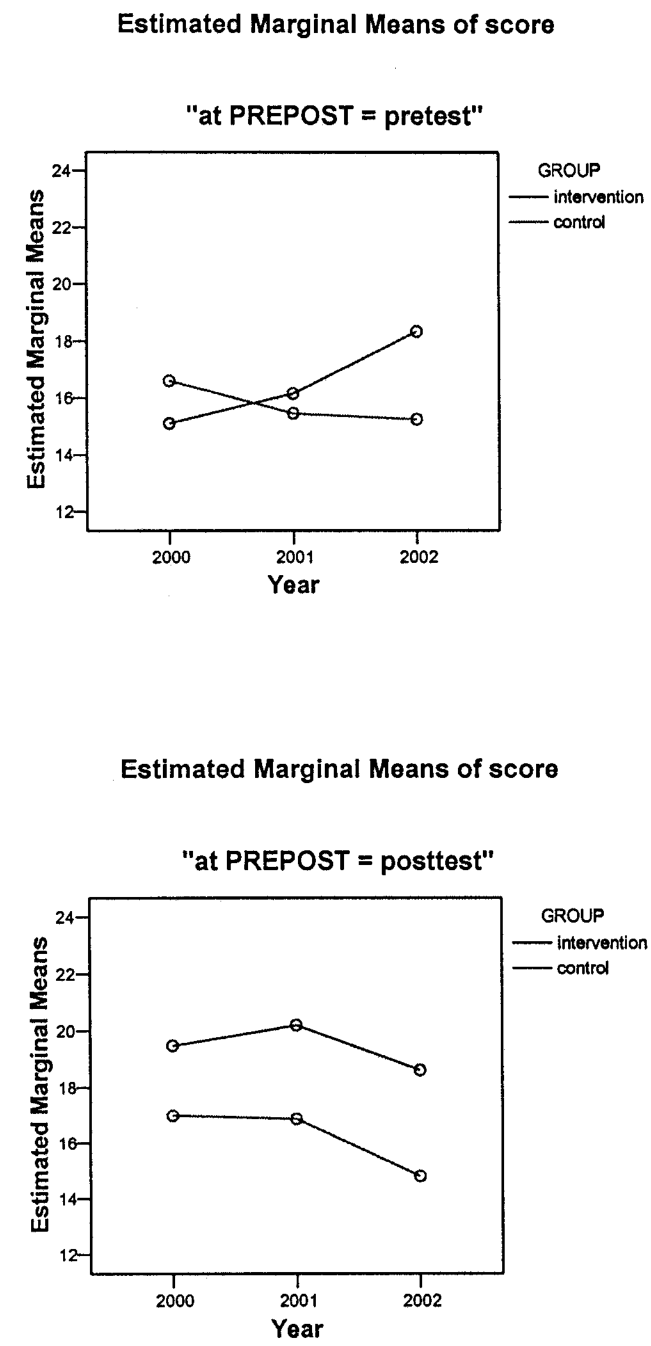
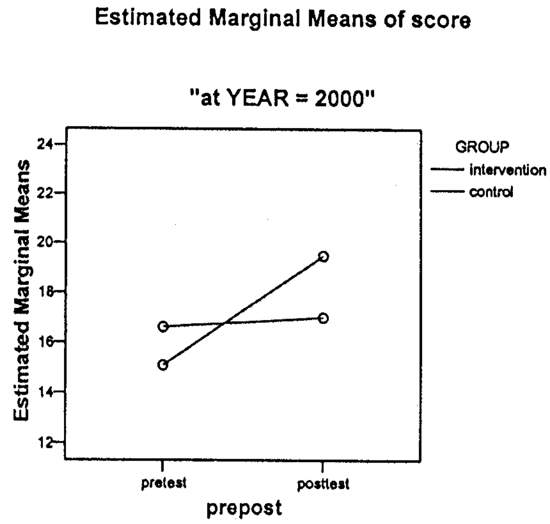
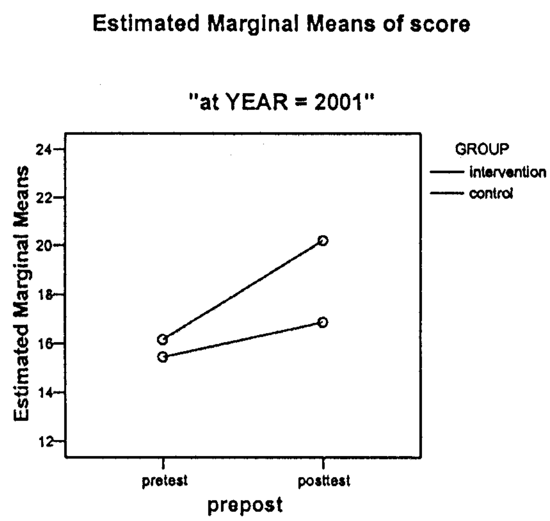


Figure 6. Cohort B's profile plots of the year by group by prepost interaction means.





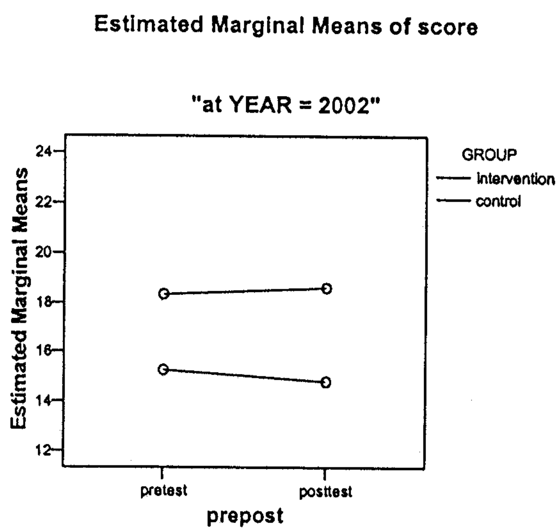


Figure 7. Cohort B's profile plots of the prepost by group by year interaction means.

than the control group (0.381 and 1.412 points in 2000 and 2001, respectively).

These profile plots use year as the horizontal axis, group as the separate lines variable, prepost as the separate plots variable. Plotting the pre- and posttest scores as separate plots focuses attention on the group by year interaction. The relevant simple, simple main effects are year and group, the two-way interaction factors. Note: In 2002, 4th grade students were tested one time using the posttest survey; therefore, 2002 pretest = 2002 posttest.

- Mean pretest scores for the intervention group increased significantly from 2000 to 2002.
- For the control group, mean pretest scores decreased significantly from 2000 to 2001 but there was very little change in mean pretest scores from 2001 to 2002.
- In 2000, mean pretest score for the intervention group was significantly lower than mean pretest score for the control group. The difference in mean pretest scores of the two groups was not statistically significant in 2001. In 2002, however, mean pretest score was significantly higher for the intervention group than the control group.
- For the intervention group, mean posttest scores increased significantly from 2000 to 2001 but decreased significantly in 2002.
- Among the control group, there was a statistically significant decrease in mean posttest scores from 2000 to 2002.

- Mean posttest scores were significantly higher for the intervention group than the control group with the largest difference occurring in 2002.

Plotting the year as separate plots (Figure 8) focuses attention on the prepost by group interaction. The relevant simple main effects are prepost and group, the two-way interaction factors. The interpretation of these three prepost by group interactions within year is possible but the above two ways are optimal.

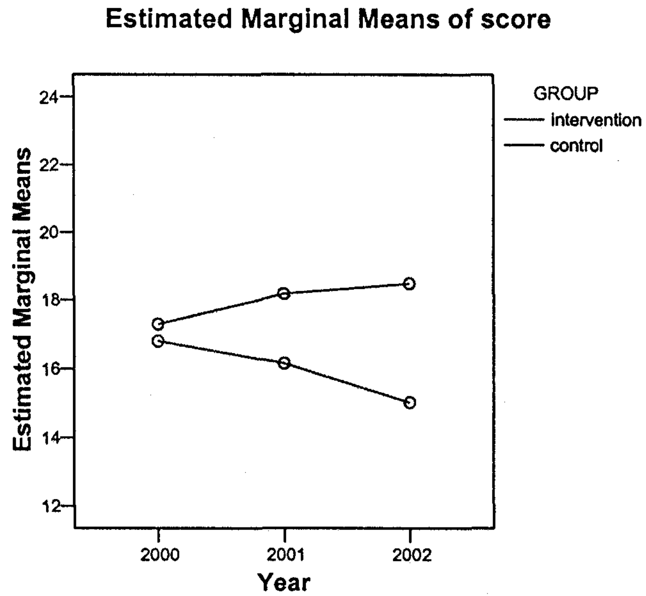


Figure 8. Cohort B's overall group by year interaction profile plot.

Cohort C

The Within-Subjects Factors

As with the prior cohorts, there are two levels of the within-subjects factor called prepost. The dependent variables that make up the two levels of prepost are pretest (pretest_Cohort_C) and posttest.

The Between-Subjects Factors

Table 18 shows the two levels for the between-subjects factor group along with the numbers for the two cells, and the three levels of the other between-subjects factor year along with the numbers for the three cells.

Table 18

Between-Subject Factors for Cohort C

Group and year	Value label	*N*
Group		
1	Intervention	232
2	Control	306
Year		
1	2000	310
2	2001	228

Covariates

In this analysis, gender, race/ethnicity, and API are included as constant covariates whose values remain the same at each within-subjects (prepost) level (i.e., their values do not change from pre- to posttest). Of note, the between-subjects effects are adjusted for covariates. Differences between groups are tested controlling for gender, race/ethnicity and API.

Descriptive Statistics

Descriptive statistics for the two variables, pretest (pretest_Cohort_C) and posttest, are shown in Table 19. The means in the rows labeled "Total" are weighted means.

Table 19

Descriptive Statistics for Cohort C

Test	Group	Year	Mean	Standard deviation	*N*
Pretest	Intervention	2000	15.26	3.033	122
		2001	19.05	3.348	110
		Total	17.06	3.703	232
	Control	2000	13.84	3.550	188
		2001	16.29	3.562	118
		Total	14.78	3.744	306
	Total	2000	14.40	3.423	310
		2001	17.62	3.720	228
		Total	15.77	3.890	538
Posttest	Intervention	2000	20.72	3.489	122
		2001	19.05	3.348	110
		Total	19.93	3.516	232
	Control	2000	16.10	2.794	188
		2001	16.29	3.562	118
		Total	16.17	3.108	306
	Total	2000	17.92	3.823	310
		2001	17.62	3.720	228
		Total	17.79	3.779	538

Multivariate Tests

When the within-subjects tests are single degree of freedom tests, as in this analysis, then the multivariate *F*s will be identical to the univariate Fs shown in Table 20.

Tests of Within-Subjects Effects

There are several significant within-subjects effects. The results of the tests of the within-subjects effects indicate significant effects for the prepost by year interaction

($F = 227.369$, p value < 0.0005), and the prepost by group by year interaction ($F = 40.793$, p value < 0.0005).

In this analysis, it is the three-way interaction, prepost by group by year. As noted above, there is a significant three-way interaction between group, year and prepost (Table 21).

Table 20

Tests of Within-Subjects Effects for Cohort C: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	11.757	1	11.757	2.780	.096
Prepost * gender	Sphericity assumed	2.756	1	2.756	.652	.420
Prepost * race_eth	Sphericity assumed	2.400	1	2.400	.567	.452
Prepost * api	Sphericity assumed	36.540	1	36.540	8.639	.003
Prepost * group	Sphericity assumed	5.709	1	5.709	1.350	.246
Prepost * yr	Sphericity assumed	961.709	1	961.709	227.369	.000
Prepost * group * yr	Sphericity assumed	172.542	1	172.542	40.793	.000
Error (prepost)	Sphericity assumed	2245.981	531	4.230		

Table 21

*Group * Year * Prepost for Cohort C: Measure and Score*

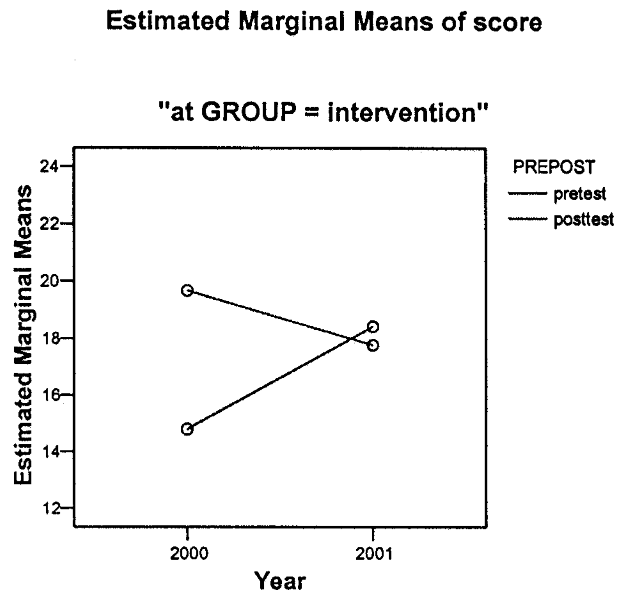
					95% confidence interval	
Group	Year	Prepost	Mean	Std. error	Lower bound	Upper bound
Interaction	2000	1	14.769[a]	.388	14.034	15.557
		2	19.671[a]	.358	18.968	20.375
	2001	1	18.412[a]	.398	17.631	19.193
		2	17.763[a]	.367	17.041	18.484
Control	2000	1	14.233[a]	.302	13.639	14.827
		2	16.945[a]	.279	16.396	17.494
	2001	1	16.743[a]	.359	16.038	17.448
		2	17.227[a]	.332	16.576	17.879

[a]Covariates appearing in the model are evaluated at the following values: Gender = 1.50, Race/Ethnicity = 2.55, API = 661.85.

Profile Plots

As noted above, there is a significant three-way interaction between group, year, and prepost. For this three-way interaction there are three main effects of group, year, and prepost. The essence of a three-way interaction is that the two-way interaction is not the same at each level of the 3rd factor. There are several possibilities here but we could examine intervention by prepost at each level of year (Figure 9), or year by prepost interaction within each level of group (Figure 10), or prepost by group interaction within each level of year (Figure 11).

These profile plots were created by selecting year as the horizontal axis variable, prepost as the separate lines variable, and group as the separate plots variable. Plotting group as separate plots focuses attention on the year by prepost interaction within each level of group. The relevant main effects are year and prepost, the two-way interaction



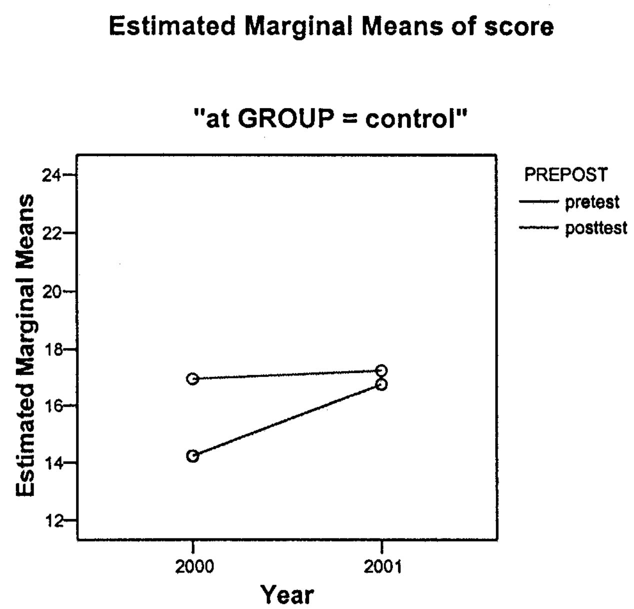
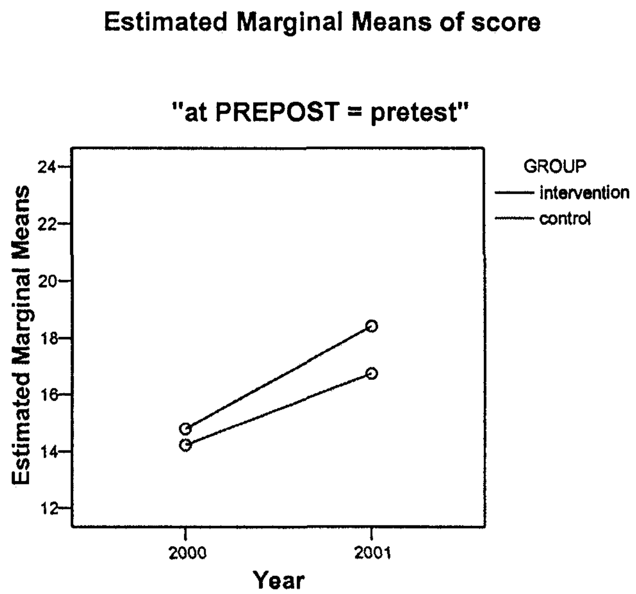


Figure 9. Cohort C's profile plots of the year by prepost by group interaction means.



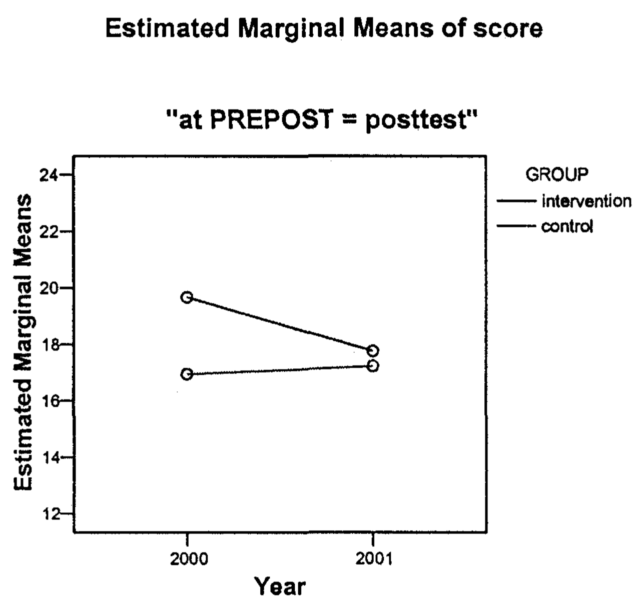
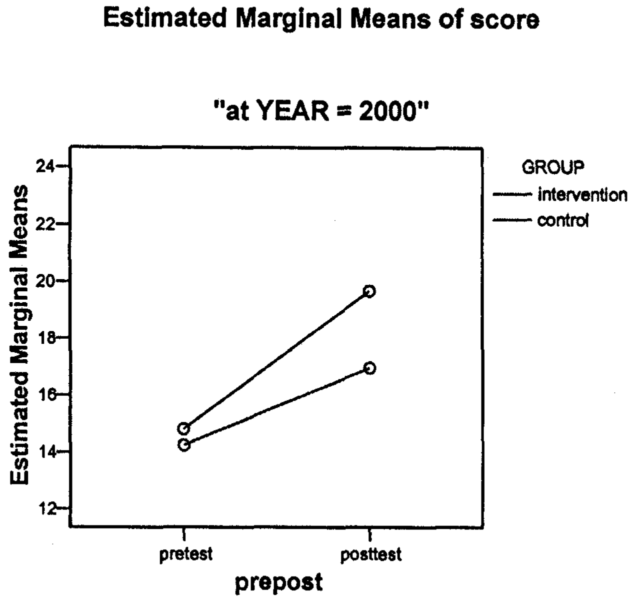


Figure 10. Cohort C's profile plots of the year by group by prepost interaction means.



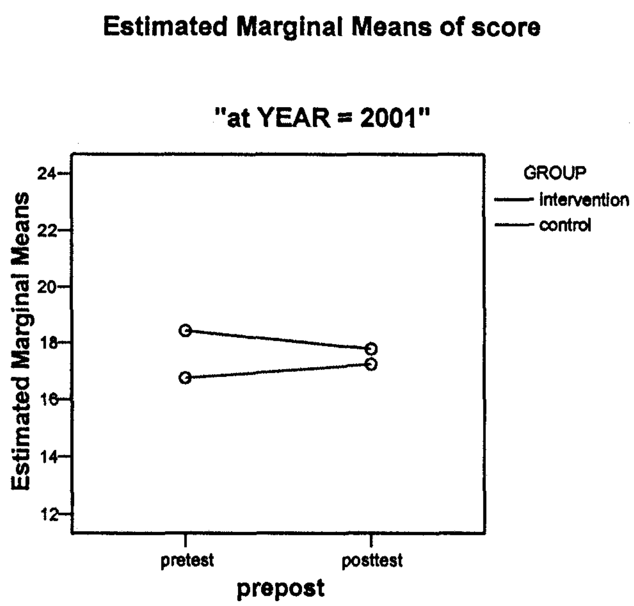


Figure 11. Cohort C's profile plots of the prepost by group by year interaction means.

factors. Note: In 2001, 4th grade students were tested one time using the posttest survey; therefore, 2001 pretest = 2001 posttest.

- For the intervention group, mean pretest scores increased significantly from 2000 to 2001. Mean posttest scores, however, decreased significantly from 2000 to 2001.
- For the control group, mean pretest scores increased significantly from 2000 to 2001. The decrease in mean posttest scores from 2000 to 2001, however, was not statistically significant.
- In 2000, changes between mean pre- and posttest scores were statistically significant for both the intervention and control groups. Changes were, however, significantly greater for the intervention group (4.876 points) than the control group (2.712 points).

These profile plots use year as the horizontal axis, group as the separate lines variable, prepost as the separate plots variable. Plotting the pre- and posttest scores as separate plots focuses attention on the group by year interaction. The relevant simple main effects are year and group, the two-way interaction factors. Note: In 2001, 4th grade students were tested one time using the posttest survey; therefore, 2001 pretest = 2001 posttest.

- For both the intervention and control groups, mean pretest scores increased significantly from 2000 to 2001. The changes in mean pretest scores, however, were not significantly greater for the intervention group (3.616 points) than the control group (2.510 points).

- In 2000, mean pretest score for the intervention group was not significantly higher than mean pretest score for the control group. In 2001, however, mean score for the intervention group was significantly higher than mean score for the control group.
- For the intervention group, the decrease in mean posttest scores from 2000 to 2001 was statistically significant at 0.05 level.
- For the control group, the slight increase in mean posttest scores from 2000 to 2001 was not statistically significant.
- In 2000, mean posttest score for the intervention group was significantly higher than mean posttest score for the control group. In 2001, however, the difference in mean scores of the two groups was not statistically significant.

Plotting the year as separate plots (Figure 12) focuses attention on the prepost by group interaction. The relevant simple main effects are prepost and group, the two-way interaction factors. The interpretation of these three prepost by group interactions within year is possible but the previous two ways are better options.

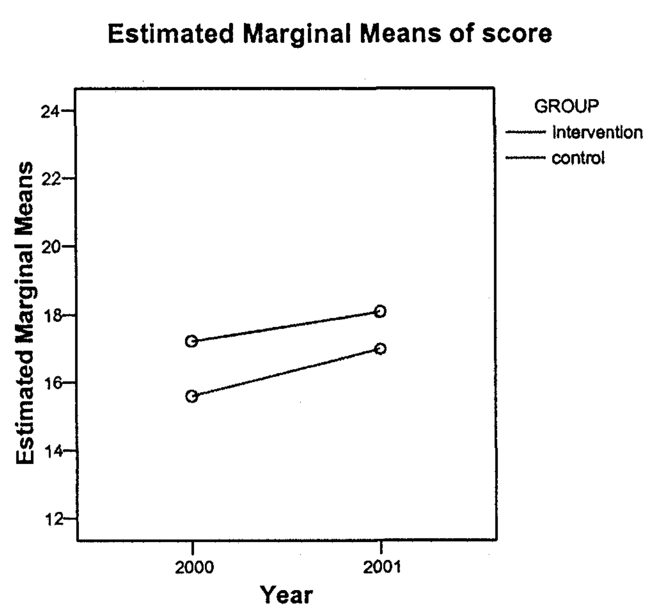


Figure 12. Cohort C's overall group by year interaction profile plot.

Behavior

Summary Behavioral Mean Scores by Cohort

A limited number of questions regarding injury-related behavior were asked on the pre- and posttests. As examples, first grade students were asked if they "always check to see that no one is in the way before swinging a baseball bat or a tennis racket"; second grade students were asked if they ever "dart into the street when playing near the road and a ball goes into the street"; and second and third grade students were asked if they ever "did tricks like hanging by the legs or one arm on the monkey bars." Due to the small scores (small number of items related to behavior), the overall behavior score was used to compare cohort performance.

Only in Cohort A (receiving 3 years of TFFK) is a consistent increase in mean behavior scores from pre- to posttest that were statistically significant within each year seen. In Cohort B among the intervention and control groups, mean behavior pre- and posttest scores decreased significantly from 2000 to 2002. In Cohort C among the intervention and control groups a significant increase in mean behavior scores from pre- to posttest is seen.

The inability to reach statistical significance may be hampered by a power problem, due to the small number of questions on behavior as noted in the original TFFK pilot study. Despite small scores and relative change, many of the control schools scored lower than the intervention schools, even when comparing control schools at a full grade level above the intervention schools. Exceptions were noted: in Cohort A the Grade 1 posttest score for intervention schools was very similar to the Grade 2 for control schools, and in Cohort C, the Grade 4 posttest was significantly lower than the Grade 3 posttest.

Behavior Cohort A

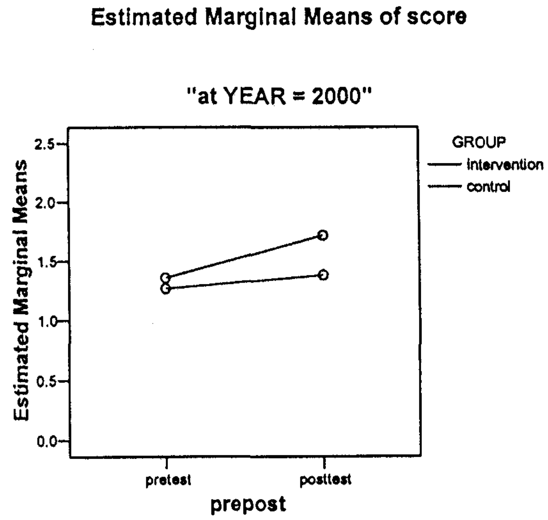
The results of the tests for the within-subjects effects indicate significant effects for the prepost by group interaction ($F = 6.821$, p value = 0.009) seen in Table 22. The three-way interaction, prepost by group by year, however, is not of statistical significance.

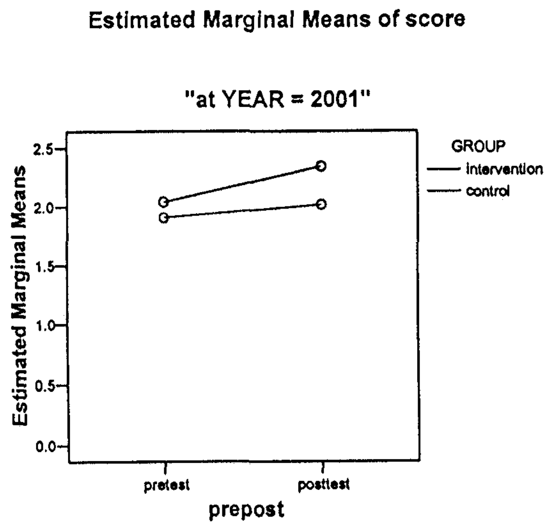
- In both groups, mean behavior pre- and posttest scores increased significantly from 2000 to 2001 (see Figure 13).
- From 2001 to 2002, however, mean behavior pre- and posttest scores decreased significantly in both groups.

Table 22

Tests of Within-Subjects Effects for Behavior Cohort A: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	.078	1	.078	.176	675
Prepost * gender	Sphericity assumed	.191	1	.191	.434	.510
Prepost * race_eth	Sphericity assumed	.049	1	.049	.112	.738
Prepost * api	Sphericity assumed	.017	1	.017	.038	.845
Prepost * group	Sphericity assumed	3.004	1	3.004	6.821	.009
Prepost * yr	Sphericity assumed	.536	2	.268	.608	.544
Prepost * group * yr	Sphericity assumed	1.142	2	.571	1.297	.274
Error (prepost)	Sphericity assumed	697.463	1584	.440		





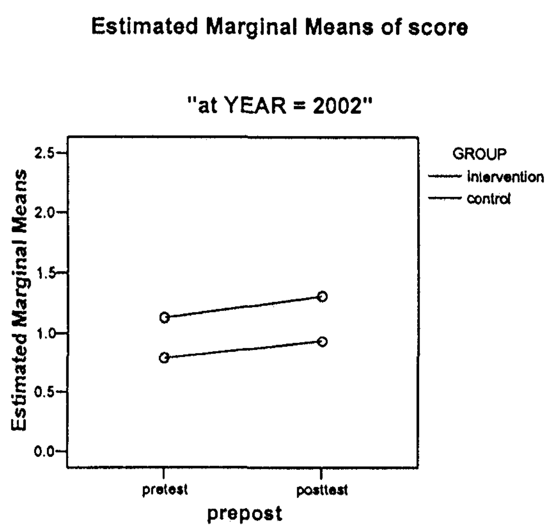


Figure 13. Cohort A's behavioral scores — profile plots of the prepost by group by year interaction means.

- Among the intervention group, increases in mean behavior scores from pre- to posttest were statistically significant within each year.
- Among the control group, however, the slight increases in mean behavior scores from pre- to posttest were not statistically significant within each year.
- For both the intervention and control groups, increases in mean behavior scores from pre- to posttest were statistically significant at 0.05 level.
- For both groups, mean behavior pre- and posttest scores increased significantly from 2000 to 2001 and then decreased significantly from 2001 to 2002.
- In 2000 and 2001, mean behavior pretest scores of the intervention group were not significantly higher than the control group.
- In 2002, however, mean behavior pretest score of the intervention group was significantly higher than the control group.
- Within each year, mean behavior posttest scores were significantly higher among the intervention group than the control group.

Behavior Cohort B

There are several significant within-subjects effects seen in Table 23. The results of the tests of the within-subjects effects indicate significant effects for the prepost main effect ($F = 8.085$, p value = 0.005), the prepost by group interaction ($F = 21.662$, p value < 0.0005), the prepost by year interaction ($F = 19.433$, p value < 0.0005) and the prepost by group by year interaction ($F = 7.159$, p value = 0.001). Recall that in 2002, 4th grade students were tested one time only using the posttest survey; therefore, 2002 pretest = 2002 posttest.

Table 23

Tests of Within-Subjects Effects for Behavior Cohort B: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	2.989	1	2.989	8.085	.005
Prepost * gender	Sphericity assumed	.144	1	.144	.389	.533
Prepost * race_eth	Sphericity assumed	.594	1	.594	1.606	.205
Prepost * api	Sphericity assumed	1.288	1	1.288	3.484	.062
Prepost * group	Sphericity assumed	8.007	1	8.007	21.662	.000
Prepost * yr	Sphericity assumed	14.366	2	7.183	19.433	.000
Prepost * group * yr	Sphericity assumed	5.293	2	2.646	7.159	.001
Error (prepost)	Sphericity assumed	595.477	1611	.370		

- Among the intervention group, mean behavior pre- and post-test scores decreased significantly from 2000 to 2002. The decrease in mean behavior posttest scores from 2001 to 2002 was statistically significant. The slight increase in mean behavior pretest scores from 2001 to 2002, however, was not of statistical significance. In 2000 and 2001, the increases in mean behavior scores from pre- to posttest were statistically significant (see Figure 14).

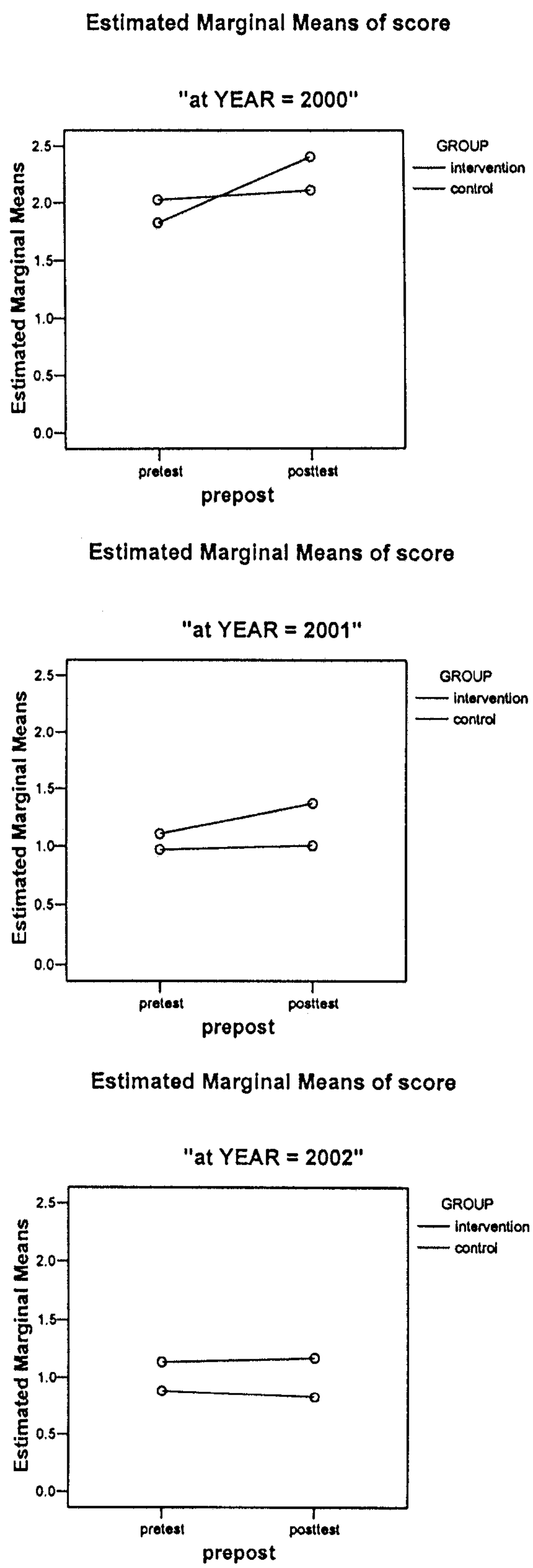


Figure 14. Cohort B's behavioral scores — profile plots of the prepost by group by year interaction means.

- Among the control group, mean behavior pre- and posttest scores decreased significantly from 2000 to 2002. The slight decreases in mean behavior pretest and posttest scores from 2001 to 2002 were not statistically significant. For this group, differences in mean behavior scores from pre- to posttest were not statistically significant within each year.
- For both the intervention and control groups, mean behavior pretest scores decreased significantly from 2000 to 2002. The slight changes in mean behavior pretest scores from 2001 to 2002 were not statistically significant.
- In 2000, mean behavior pretest score of the control group was significantly higher than the intervention group. In 2001 and 2002, however, there were no significant differences between mean behavior pretest scores of the two groups.
- For both the intervention and control groups, mean behavior posttest scores decreased significantly from 2000 to 2002.
- For the intervention group, the decrease in mean behavior posttest scores from 2001 to 2002 was statistically significant. For the control group, however, the slight decrease in mean behavior posttest scores from 2001 to 2002 was not of statistical significance.
- Within each year, mean behavior posttest scores were significantly higher among the intervention group than the control group.
- For the control group, changes in mean behavior scores from pre- to posttest were not statistically significant in 2000 and 2001 (NA in 2002).

- For the intervention group, however, mean behavior scores increased significantly from pre- to posttest in 2000 and 2001 (NA in 2002).
- In 2000, mean behavior pretest score of the intervention group was significantly lower than the control group. In 2001, however, there were no significant differences between mean behavior pretest scores of the two groups.
- In 2002, mean behavior score of the intervention group was significantly higher than the control group.
- Within each year, mean behavior posttest scores were significantly higher among the intervention group than the control group.

Behavior Cohort C

The results of the tests for the within-subjects effects indicate significant effects for the prepost by year interaction ($F = 38.903$, p value < 0.0005) as seen in Table 24. The three-way interaction, prepost by group by year, however, is not of statistical significance. Recall that in 2001, 4^{th} grade students were tested one time only using the posttest survey; therefore, 2001 pretest = 2001 posttest.

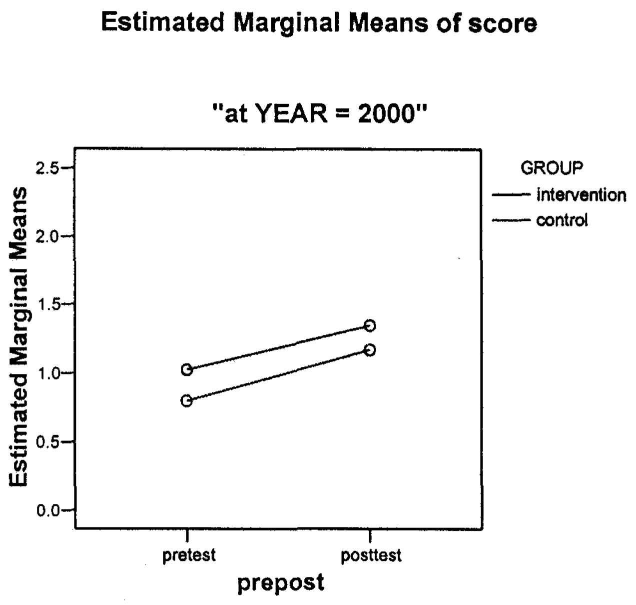
- In 2000, the increase in mean behavior scores from pre- to posttest was statistically significant. In 2001, however, the slight decrease in mean behavior scores from pre- to posttest was not of statistical significance (see Figure 15).

Table 24

Tests of Within-Subjects Effects for Behavior Cohort C: Measure and Score

Source	Test	Type III sum of squares	*df*	Mean square	*F*	Significance
Prepost	Sphericity assumed	.127	1	.127	.621	.431
Prepost * gender	Sphericity assumed	.048	1	.048	.235	.628
Prepost * race_eth	Sphericity assumed	.083	1	.083	.402	.526
Prepost * api	Sphericity assumed	.262	1	.262	1.275	.259
Prepost * group	Sphericity assumed	.104	1	.104	.505	.477
Prepost * yr	Sphericity assumed	7.988	1	7.988	38.903	.000
Prepost * group * yr	Sphericity assumed	.018	1	.018	.086	.769
Error (prepost)	Sphericity assumed	109.027	531	.205		

- Among the intervention group, the slight decrease in mean behavior pretest scores from 2000 to 2001 was not of statistical significance. The decrease in mean behavior posttest scores, however, was statistically significant. In 2000, the increase in mean behavior scores from pre- to posttest was statistically significant.
- Among the control group, the increase in mean behavior pretest scores from 2000 to 2001 was statistically significant. The slight increase in mean behavior posttest scores, however, was not of statistical significance. In 2000, the increase in mean behavior scores from pre- to posttest was statistically significant.



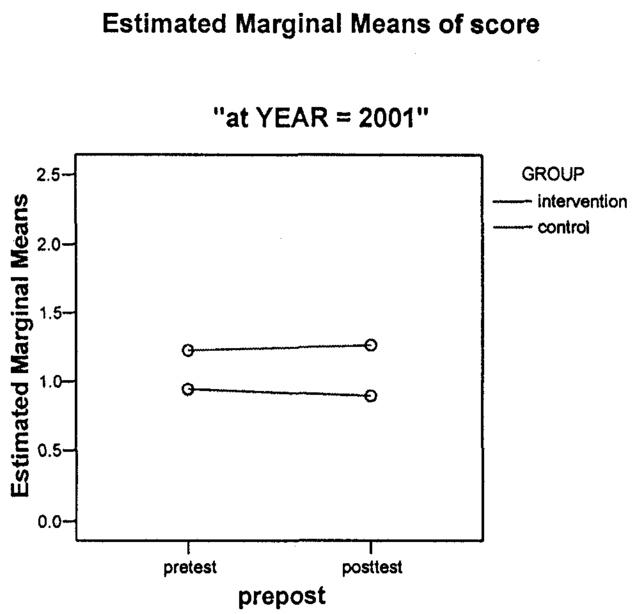


Figure 15. Cohort C's behavioral scores — profile plots of the prepost by group by year interaction means.

- For the intervention group, the slight decrease in mean behavior pretest scores from 2000 to 2001 was not of statistical significance. For the control group, however, the increase in mean behavior pretest scores from 2000 to 2001 was statistically significant.
- In 2000, mean behavior pretest score of the intervention group was significantly higher than mean behavior pretest score of the control group. In 2001,
- however, mean behavior score of the intervention group was significantly lower than mean behavior score of the control group.
- Among the intervention group, there was a significant decrease in mean behavior posttest scores from 2000 to 2001. The slight increase in mean behavior posttest scores of the control group, however, was not of statistical significance.
- In 2000, mean behavior posttest score of the control group was not significantly lower than the intervention group. In 2001, however, mean behavior score of the control group was significantly higher than mean behavior score of the intervention group.

Summary

The purpose of this study was to evaluate the effectiveness of the elementary school injury prevention curriculum called Think First for Kids (TFFK) on improving self-reported safety behaviors and knowledge over time. In order to accomplish this, hypotheses were derived specifically to test with a sample of ethnically and economically diverse elementary school children.

The null hypotheses of this study were: (a) students participating in the TFFK curriculum do not show a significant increase in self-reported knowledge and safety behaviors compared to students who do not receive the curriculum; and (b) students who receive the curriculum repeatedly do not show a significant difference in retention of knowledge over time with repeated curriculum interventions in the time period of years 2000-2002.

The descriptive statistics indicate this is a cohesive sample in both intervention and control groups based on gender, age, and race/ethnicity. Hypothesis 1 revealed there were significant differences in self reported knowledge and safety behaviors between intervention and control groups. The intervention group consistently showed greater improvement from pre- to post-measure than did the control group. Hypothesis 2 was also refuted. Univariate and multivariate analyses revealed a significant difference in retention of knowledge between intervention and control groups in this longitudinal study. In following the cohort of students over time, the TFFK curriculum was a significant predictor of improvement in test scores for grades 1, 2, and 3 controlling for gender, age, and race/ethnicity.

In conclusion, through testing the study hypotheses, some relationships between the variables in the explanation of improved learning and retention were shown to exist. The following chapter presents the conclusions, limitations, implications, and recommendations for nursing research, practice, and theory.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to evaluate the effectiveness of an elementary school injury prevention curriculum Think First for Kids (TFFK). The intervention was implemented cross a time continuum of 1 to 3 years depending on the cohort to which the subjects belonged. The curriculum, based on constructivist theory, was designed to improve the children's knowledge about risky behaviors and the safety behaviors supplementary practiced. The subjects were a socioeconomically, ethnically, and geographically diverse student body from San Diego County, CA. The descriptive and multivariate statistical analysis of the data collected during this intervention was completed to determine whether or not sequential TFFK interventions made a difference in the immediate and long-term knowledge and safety practices of the children involved in the intervention. This study expanded on a pilot study conducted of the TFFK program between 1997-1998 (Gresham et al., 2001).

The social, cultural, cognitive, and behavioral learning theory of constructivism informed the study. The learning theories of Vygotsky (1962), Bruner (1966), and Piaget (1952) served as the theoretical frameworks for the constructivism theory and helped professionals understand how, why, and when children are cognitively, psychologically, socially, and developmentally at greatest risk for injury and most receptive to learning. From this theoretical framework, hypotheses were derived to test the TFFK curriculum with elementary school- aged children in San Diego County, California.

Conclusions

The demographic analysis of the study population showed a racially diverse population with a fairly even distribution of males to females. The sample of students was 32.4% White, 26.2% Hispanic, 8.5% Black, and 33% other which includes students who did not self-report.

The baseline data (pre-measure) from grades 1 through 4 supports the view that students lacked sufficient knowledge about risky behaviors to prevent them from being the victim of unintentional injuries. These data also revealed that all grades were engaging in unsafe behaviors (such as not wearing a helmet, not looking left, right, left when crossing the street). These behaviors are known to be highly correlated with childhood injuries. Such activities support the developmental perspectives of such theorists as Piaget (1952), Erikson (1968), Kohlberg (1984), and Freud when they discuss the physical, neurological, cognitive, moral, and interpersonal developmental processes of children. Middle school-age is a time in which the child is caught between being the baby and becoming the adolescent. There is still the need for adult supervision; however, there is the child's struggle for independence in a mind and a body that is not ready for such freedom. Without adequate information about life, about making good choices, and about protecting one's self, the middle school-age child does not have the necessary resources to examine a situation, make the correct decision, or take the necessary actions that can protect him or her from injury.

The TFFK intervention was a longitudinal repeated measures design that compared pre- and post-measures among intervention and control schools over a 3-year period. To decrease the effect of potential confounding variables between the intervention and control schools, matching of the schools was done on the variables as SES, Academic Performance Index (API), and race/ethnicity. These variables have been shown to have a relationship to knowledge and behavior (Bowman, 2005). Gender, race/ethnicity, and API were used as covariates in the multivariate analysis of variance (Hinkle et al., 2003). Multivariate analysis shows that students receiving the TFFK intervention had significantly greater improvements in posttest scores, controlling for gender, race/ethnicity, and API.

The TFFK goes beyond previously successful community health education programs managed by local hospitals and sponsored by community organizations (Liller, Smorynski, McDermott, Crane, Weilbley, 1995) by directly involving elementary schools. The Institute of Medicine (1997) has posited school health education could be one of the most effective avenues to impact the burden of the most serious health problems in the United States, such as injury, because of the ability to apply sequential health curricula to a large number of students. Peterson and Roberts (1992) have further reflected on the general consensus in addition to the focus on children, behavioral interventions with parents are a promising avenue of childhood injury prevention because of the ability to reinforce messages taught in the school.

Data analysis of the posttest measure scores demonstrated that the TFFK curriculum led to a statistically significant increase in knowledge and self-reported safety behaviors. Though there were improved scores on the post-measure, in no school or any grade level was a 100% score achieved. This may be explained by several factors: (a) lack of complete understanding of the questions being asked; (b) variations in developmental maturation of the students within the grade levels; and (c) lack of basic knowledge about safety and safe behaviors. The intervention improved scores, but further injury-related education is needed.

Among the intervention schools, the largest absolute increase in test scores were seen among Hispanics, followed by African American students. Hispanics had the lowest baseline score, followed by African Americans, and Whites. These findings support the call for injury prevention specifically targeting minority students, and such an intervention can successfully narrow the gap between knowledge and behavior among diverse groups. Based upon these findings, questions arise regarding why the Hispanic and African-American children had lower pretest scores but higher posttest scores than Caucasian kids. For example, could the change in these scores be related to the lack of parental knowledge on this subject with subsequent lack of parenting instruction to the kids when they were younger? Could it be that the strong sense of family unit in these populations made parents and family members more vigilant of their children, thus interfering with their instructions to the children about making safe choices? Were the Caucasian kids so inundated with safety information from their parents that they tuned out further information coming from school? Our data do not allow for such exploration, thus the need for further research in this area.

The intervention groups, progressing from one grade to the next and continuing to receive the TFFK safety program across the 3 years, demonstrated retention of knowledge about safety that was statistically significantly different than the control group. This finding supports the constructivism theory about the effect of repetition of information and retention of knowledge. This was evidenced when the children in Cohort A moved from first to second to third grade, their pretest scores remained consistently higher than children in the control group. Though the control groups, at each grade level, had improved pretest scores regarding safety and risky behaviors, the intervention group was statistically significantly better. Thus, developmental maturation alone is not enough to help children learn how to protect themselves; educational instruction about making wise choices and understanding consequences about choices is paramount to protecting children.

The overall effect of the curriculum was tested using a GLM repeated measures, analysis of variance procedure for each Cohort. The GLM procedure was used to adjust for the covariates (gender, race/ethnicity and API) to determine if the TFFK intervention was a predictor of improved performance. The results were plotted on graphs to show the progression of the cohorts over time. The overall trend was for greater improvement in intervention school students when compared to control school students. For Cohort A, students receiving TFFK in grades 1, 2, and 3 within each year, mean posttest scores were significantly higher for the intervention group than the control group with the largest difference occurring in grade 3. This may be due to the sequential application of TFFK in grades 1 and 2.

For Cohort B, students receiving TFFK in grades 2 and 3, the changes in mean scores from pre- to postsurvey were significantly greater in the intervention group (4.376 and 4.046 points in grades 2 and 3, respectively) than the control group. For the intervention group, mean post-measure scores increased significantly for grades 2 and 3 but decreased significantly for grade 4 which received not intervention. Among the control group, there was a statistically significant decrease in mean posttest scores for grades 2, 3, and 4.

For Cohort C, students receiving TFFK in grade 3, changes between mean pre- and post-measure scores were statistically significant for both the intervention and control groups. Changes were, however, significantly greater for the intervention group than the control group. For the intervention group, the decrease in mean post-measure scores from grades 3 to 4 was statistically significantly. This variability may be due to cognitive maturity, increased reading comprehension levels, increased test taking skills, an increase in environmental exposures, and experience.

Intervention research often confronts the methodological issue of having to account for correlation among subjects clustered within sampling units (in this case, schools) to reduce the potential of biased standard errors. The standard errors will be biased usually in a direction that exaggerates the significance of the intervention effect (Norton, Bieler, Ennett, & Zarkin, 1996). This study used the GLM procedure to address intracluster correlation since students clustered within schools may be more similar to each other in experiences, neighborhood, and social environment. The potential for confounding of effects was reduced by controlling for variables likely to impact knowledge and behavior (gender, race/ethnicity and API).

Limitations of the Study

Limitations of the study design include the self-report nature of the survey, the age of the children, and the inability to control all causes of internal or external validity. Community activities, media coverage, or family events may have occurred during the implementation period but are not thought to have occurred differentially among schools. Many surveys were missing self-identified racial/ethnic group so that interpretation of this variable should be made with caution.

Another limitation of this type of study was that a post-measure was delivered at the end of the six-module intervention, thereby potentially giving rise to higher scores for more recently completed material; however, the data did not support this supposition. There may have been variability among teachers in their instructional styles and time of day in which the curriculum was taught.

Interpretation of the data on self-reported safety behaviors should be cautiously interpreted due to the limited number of questions asked on each pre- and post-measure, averaging only two behavioral questions per measure.

Based upon limited financial resources, this study did not capture data from 3rd grade students, who had received the curriculum for 3 full years entering 4th grade. Such data would have been important to obtain in lieu of the fact that a control group of 4th graders was surveyed.

Implications

It is important to recognize that schools not only have direct access to young children, but also have the unique capacity to affect the lives of staff, parents, and the entire community (Lavin et al., 1992). This study provides empirical evidence that early school-based theory-driven injury prevention education has a positive effect on young children. This study also shows that sustained and sequential curriculum-based education among culturally diverse populations leads to increased retention of knowledge about injury and safety behaviors across culturally diverse populations.

The TFFK program complements the national goal of conducting and evaluating comprehensive school health programs. There is clearly a need for robust and ecological approaches to injury prevention that include a school-based curriculum approach with parental involvement, and the need to supplement it with other environmental modifications and legislation if communities are to achieve a significant sustainable injury reduction. Raising a generation of children "schooled" in injury prevention can only help achieve that goal.

Implications to Nurses

The increasing awareness of childhood injuries as an important public health problem in the U.S. and around the world has important implications for nurses in clinical practice and research settings. In clinical practice, injury prevention strategies focus on sociocultural issues and behavioral change in counseling with children and families. School-based education of children may help to broaden and reinforce counseling of children. Nurses can serve as advocates for the initiation of such programs in their schools and communities.

The collaborative research in this study provides avenues for nurses, community educators, and practitioners who may have unrecognized opportunities to join in a community effort to reduce morbidity and mortality. These opportunities include developing nursing interventions, conducting evaluative research, and creating injury surveillance systems.

The focus of HP2010 on the prevention of injury and targeting health promotion is central to nursing practice. Linkages with community hospitals, nurse researchers, neurosurgeons, and health educators can be used to pose a unified approach to injury prevention strategies, including legislation, leading to declines in injury related morbidity and mortality. Hospital nurses can begin dialogue with school nurse and school administrators to get permission to conduct the TFFK intervention and evaluation in neighborhood elementary schools (U.S. Department of Health & Human Services, 2000).

Recommendations

The complex public health problem of injury prevention will require a collaborative response involving the efforts of clinicians, educators, engineers, and society at large. Think First for Kids studies, including this one, have found that the TFFK program significantly increases injury-related knowledge and behaviors among elementary school children. Importantly, this study adds to the literature by showing the ability of children to retain knowledge and behavior over time. This type of research will aid in the future refinement of the TFFK curriculum, as well as acting as a potential model that combines literacy-based curriculum with important health-related subject matter impacting this age group. Leading causes of death and disability among children of various races and socioeconomic backgrounds especially surrounding issues such as obesity and violence could benefit from this model of prevention. Teachers should be aware of the unique combination of constructivism learning theory and literacy-based health education when choosing curriculum across the nation to help children lead a healthy lifestyle.

This study demonstrated that children in grades 1, 2, and 3 often lack basic knowledge about safety and do not recognize behaviors considered high risk for injury. Defining baseline profiles of knowledge and recognition, which varied by race/ethnic group, will help programs to become efficient in the use of prevention resources.

The epidemic of childhood injuries affects the entire nation, and thus requires a national response. Think First for Kids serves as an example of a viable childhood injury prevention solution which has the potential to be implemented throughout all elementary school systems in California. Think First For Kids was specifically designed to meet the CDC criteria for injury prevention programs. Through multiple year exposure to the TFFK elementary school curriculum, children will enter into adolescence with a deeper understanding of injury risks and the safety behaviors to avoid those risks. Future research is needed to examine the sustainability of knowledge over time into adolescence.

Schools are pressured to focus on literacy and standardized testing preparation, and are often reluctant to support new health programs. Think First for Kids serves as an example of how to successfully integrate public health efforts into the school system. The TFFK curriculum provides teachers with a curriculum that promotes literacy and teaches basic math, spelling, reading, and problem-solving skills. This program has the potential to be used as a national example of a successful school-based health-related program.

The results of this study indicate that elementary school students improve knowledge and increase self-reported safety behavior after having exposure to a comprehensive, sequential TFFK intervention. The results also indicate that students retain knowledge and, with repetition of the intervention of the 3-year study, behaviors. Data collection on behavior should be enhanced to include more inquiries and expansion beyond self-report where feasible. School districts nationwide must make a coordinated effort to integrate injury prevention curricula into the elementary schools. These programs must also incorporate a rigorous evaluation of the program's effectiveness, using analyses to adjust for possible confounders. As with any injury prevention program, diverse student populations should have the opportunity to participate. Think First for Kids has been a leader in providing injury education to diverse populations, and should continue to do so.

There are complimentary components that may be helpful to the current TFFK curriculum. There may be a need for parent participation in a survey to assess their child's behavior. In addition, a need for a parent/guardian educational component in the TFFK program may be useful. Families are extremely influential on children's lives, and should have the opportunity to formulate injury prevention lifestyles. There may be environmental or engineering considerations regarding safety that would compliment a child's knowledge and skills. This is particularly relevant to San Diego with a high pedestrian/pedalcycle injury rate.

The TFFK program has proven to be an effective injury prevention curriculum (Gresham et al., 2001). These recommendations would purely serve as additions to a well-established and successful program that already addresses the key elements of successful community-based approaches.

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APPENDIX A

LEADING CAUSES OF INJURY DEATH BY

AGE GROUP — UNINTENTIONAL, 2001

10 Leading Causes of Injury Death by Age Group – 2001
Highlighting Unintentional Injury Deaths

Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
	Age Groups										
1	Unintentional Suffocation 614	Unintentional MV Traffic 558	Unintentional MV Traffic 660	Unintentional MV Traffic 884	Unintentional MV Traffic 10,513	Unintentional MV Traffic 6,759	Unintentional MV Traffic 6,891	Unintentional MV Traffic 5,422	Unintentional MV Traffic 3,328	Unintentional Fall 11,623	Unintentional MV Traffic 42,443
2	Unintentional MV Traffic 139	Unintentional Drowning 458	Unintentional Drowning 168	Unintentional Drowning 165	Homicide Firearm 4,200	Homicide Firearm 3,308	Unintentional Poisoning 5,036	Unintentional Poisoning 3,547	Suicide Firearm 2,083	Unintentional MV Traffic 7,256	Suicide Firearm 16,869
3	Homicide Other Spec., Class. 117	Unintentional Fire/burn 230	Unintentional Fire/burn 164	Suicide Suffocation 163	Suicide Firearm 2,130	Suicide Firearm 2,564	Suicide Firearm 3,030	Suicide Firearm 3,023	Unintentional Fall 1,004	Unintentional Unspecified 5,866	Unintentional Fall 15,019
4	Homicide Unspecified 107	Homicide Unspecified 146	Homicide Firearm 59	Homicide Firearm 121	Unintentional Poisoning 1,362	Unintentional Poisoning 2,507	Homicide Firearm 1,978	Suicide Poisoning 1,439	Unintentional Poisoning 798	Suicide Firearm 3,943	Unintentional Poisoning 14,078
5	Unintentional Drowning 68	Unintentional Suffocation 138	Unintentional Other Land Transport 48	Suicide Firearm 90	Suicide Suffocation 1,235	Suicide Suffocation 1,373	Suicide Poisoning 1,541	Unintentional Fall 1,024	Suicide Poisoning 578	Unintentional Suffocation 3,204	Homicide Firearm 11,348
6	Unintentional Fire/burn 50	Unintentional Pedestrian, Other 81	Unintentional Suffocation 44	Unintentional Fire/burn 88	Unintentional Drowning 596	Homicide Transportation-Related 842	Suicide Suffocation 1,534	Suicide Suffocation 952	Unintentional Fire/burn 395	Adverse Effects 1,995	Unintentional Unspecified 7,216
7	Undetermined Suffocation 47	Homicide Other Spec., Class. 80	Unintentional Fall 33	Unintentional Other Land Transport 83	Homicide Cut/pierce 481	Suicide Poisoning 753	Undetermined Poisoning 1,121	Homicide Firearm 934	Suicide Suffocation 392	Unintentional Fire/burn 1,147	Suicide Suffocation 6,198
8	Homicide Suffocation 40	Homicide Firearm 55	Unintentional Pedestrian, Other 26	Unintentional Suffocation 68	Suicide Poisoning 337	Undetermined Poisoning 549	Homicide Transportation-Related 1,061	Undetermined Poisoning 761	Unintentional Unspecified 385	Unintentional Poisoning 722	Unintentional Suffocation 5,555
9	Adverse Effects 26	Homicide Other Spec., NEC 49	Unintentional Struck by or Against 25	Unintentional Firearm 39	Unintentional Fall 256	Homicide Cut/pierce 472	Unintentional Fall 647	Homicide Transportation-Related 644	Adverse Effects 384	Unintentional Natural/Env. 621	Suicide Poisoning 5,191
10	Unintentional Fall 23	Unintentional Natural/Env. 42	Unintentional Other Transport 22	Unintentional Pedestrian, Other 38	Unintentional Other Land Transport 250	Unintentional Drowning 374	Unintentional Drowning 462	Unintentional Suffocation 461	Unintentional Suffocation 381	Unintentional Other Spec., NEC 578	Unintentional Fire/burn 3,423

Note: Homicide and suicide counts include terrorism deaths associated with the events of September 11, 2001, that occurred in New York City, Pennsylvania, and Virginia. Atotal of 2,926 U.S. residents lost their lives in these acts of terrorism in 2001, of which 2,922 were classified as (transportation-related) homicides and 4 were classified as suicides.

Source: National Center for Health Statistics, (NCHS) Vital Statistics Systems.

Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.

APPENDIX B

LEADING CAUSES OF DEATH BY

AGE GROUP — 2001

10 Leading Causes of Death by Age Group – 2001

Rank	Age Groups										
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Congenital Anomalies 5,513	Unintentional Injury 1,714	Unintentional Injury 1,283	Unintentional Injury 1,553	Unintentional Injury 14,411	Unintentional Injury 11,839	Malignant Neoplasms 16,569	Malignant Neoplasms 49,562	Malignant Neoplasms 90,223	Heart Disease 582,730	Heart Disease 700,142
2	Short Gestation 4,410	Congenital Anomalies 557	Malignant Neoplasms 493	Malignant Neoplasms 515	Homicide 5,297	Homicide 5,204	Unintentional Injury 15,945	Heart Disease 36,399	Heart Disease 62,486	Malignant Neoplasms 390,214	Malignant Neoplasms 553,768
3	SIDS 2,234	Malignant Neoplasms 420	Congenital Anomalies 182	Suicide 272	Suicide 3,971	Suicide 5,070	Heart Disease 13,326	Unintentional Injury 13,344	Chronic Low. Respiratory Disease 11,166	Cerebro-vascular 144,486	Cerebro-vascular 163,538
4	Maternal Pregnancy Comp. 1,499	Homicide 415	Homicide 137	Congenital Anomalies 194	Malignant Neoplasms 1,704	Malignant Neoplasms 3,994	Suicide 6,635	Liver Disease 7,259	Cerebro-vascular 9,608	Chronic Low. Respiratory Disease 106,904	Chronic Low. Respiratory Disease 123,013
5	Placenta Cord Membranes 1,018	Heart Disease 225	Heart Disease 98	Homicide 189	Heart Disease 999	Heart Disease 3,160	HIV 5,867	Suicide 5,942	Diabetes Mellitus 9,570	Influenza & Pneumonia 55,518	Unintentional Injury 101,537
6	Respiratory Distress 1,011	Influenza & Pneumonia 112	Benign Neoplasms 52	Heart Disease 174	Congenital Anomalies 505	HIV 2,101	Homicide 4,268	Cerebro-vascular 5,910	Unintentional Injury 7,658	Diabetes Mellitus 53,707	Diabetes Mellitus 71,372
7	Unintentional Injury 976	Septicemia 108	Influenza & Pneumonia 46	Chronic Low. Respiratory Disease 62	HIV 225	Cerebro-vascular 601	Liver Disease 3,336	Diabetes Mellitus 5,343	Liver Disease 5,750	Alzheimer's Disease 53,245	Influenza & Pneumonia 62,034
8	Bacterial Sepsis 696	Perinatal Period 72	Chronic Low. Respiratory Disease 42	Benign Neoplasms 53	Cerebro-vascular 196	Diabetes Mellitus 595	Cerebro-vascular 2,491	HIV 4,120	Suicide 3,317	Nephritis 33,121	Alzheimer's Disease 53,852
9	Circulatory System Disease 622	Benign Neoplasms 58	Cerebro-vascular 38	Influenza & Pneumonia 46	Influenza & Pneumonia 181	Congenital Anomalies 458	Diabetes Mellitus 1,958	Chronic Low. Respiratory Disease 3,324	Nephritis 3,284	Unintentional Injury 32,694	Nephritis 39,480
10	Intrauterine Hypoxia 534	Cerebro-vascular 54	Septicemia 29	Cerebro-vascular 42	Chronic Low. Respiratory Disease 171	Liver Disease 387	Influenza & Pneumonia 983	Homicide 2,467	Septicemia 3,111	Septicemia 25,418	Septicemia 32,238

Note: Homicide and suicide counts include terrorism deaths associated with the events of September 11, 2001, that occurred in New York City, Pennsylvania, and Virginia. Atotal of 2,926 U.S. residents lost their lives in these acts of terrorism in 2001, of which 2,922 were classified as (transportation-related) homicides and 4 were classified as suicides.

Source: National Center for Health Statistics, (NCHS) Vital Statistics Systems.

Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC.

APPENDIX C

NATIONAL ESTIMATES OF THE 10 LEADING CAUSES OF NONFATAL INJURIES TREATED IN HOSPITAL EMERGENCY DEPARTMENTS, UNITED STATES, 2002

National Estimates of the 10 Leading Causes of Nonfatal Injuries Treated in Hospital Emergency Departments, United States, 2002

Rank	Age Groups										
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Unintentional Fall 126,459	Unintentional Fall 870,950	Unintentional Fall 676,444	Unintentional Fall 659,923	Unintentional Struck by/Against 951,581	Unintentional Fall 702,946	Unintentional Fall 765,275	Unintentional Fall 684,042	Unintentional Fall 490,737	Unintentional Fall 1,638,883	Unintentional Fall 7,410,159
2	Unintentional Struck by/Against 33,023	Unintentional Struck by/Against 390,945	Unintentional Struck by/Against 449,222	Unintentional Struck by/Against 622,615	Unintentional MV-Occupant 902,186	Unintentional Overexertion 701,783	Unintentional Overexertion 656,122	Unintentional Overexertion 393,539	Unintentional Struck by/Against 185,922	Unintentional MV-Occupant 193,068	Unintentional Struck by/Against 4,490,051
3	Unintentional Fire/Burn 13,193	Unintentional Other Bite/Sting 126,710	Unintentional Cut/Pierce 135,098	Unintentional Overexertion 288,074	Unintentional Fall 794,288	Unintentional Struck by/Against 671,811	Unintentional Struck by/Against 609,021	Unintentional Struck by/Against 385,139	Unintentional MV-Occupant 179,527	Unintentional Struck by/Against 190,501	Unintentional Overexertion 3,286,856
4	Unintentional Other Bite/Sting 10,926	Unintentional Foreign Body 106,331	Unintentional Pedal Cyclist 118,046	Unintentional Cut/Pierce 170,062	Unintentional Overexertion 758,312	Unintentional MV-Occupant 609,636	Unintentional MV-Occupant 515,768	Unintentional MV-Occupant 332,260	Unintentional Overexertion 175,009	Unintentional Overexertion 156,231	Unintentional MV-Occupant 2,988,064
5	Unintentional MV-Occupant 9,336	Unintentional Cut/Pierce 87,836	Unintentional Other Bite/ Sting 96,330	Unintentional Pedal Cyclist 142,085	Unintentional Cut/Pierce 492,172	Unintentional Cut/Pierce 461,058	Unintentional Cut/Pierce 394,133	Unintentional Cut/Pierce 272,953	Unintentional Cut/Pierce 142,911	Unintentional Cut/Pierce 115,708	Unintentional Cut/Pierce 2,278,105
6	Unintentional Poisoning 8,814	Unintentional Poisoning 78,828	Unintentional MV-Occupant 79,531	Unintentional Unk./Unspecified 129,388	Other Assault^ Struck by/Against 445,965	Other Assault^ Struck by/Against 271,774	Other Assault^ Struck by/Against 228,208	Other Assault^ Struck by/Against 102,941	Unintentional Other Bite/Sting 57,805	Unintentional Other Bite/Sting 70,093	Other Assault^ Struck by/Against 1,270,224
7	Unintentional Foreign Body 8,776	Unintentional Overexertion 74,530	Unintentional Overexertion 76,811	Unintentional MV-Occupant 115,920	Unintentional Unk./Unspecified 174,572	Unintentional Other Bite/Sting 121,398	Unintentional Other Specified 129,831	Unintentional Other Bite/Sting 94,895	Unintentional Other Specified 37,399	Unintentional Unk./Unspecified 47,825	Unintentional Other Bite/Sting 880,910
8	Unintentional Unk./Unspecified 6,916	Unintentional Fire/Burn 62,073	Unintentional Foreign Body 54,164	Other Assault^ Struck by/Against 114,891	Unintentional Other Bite/Sting 126,498	Unintentional Other Specified 110,163	Unintentional Other Bite/Sting 115,409	Unintentional Other Specified 93,356	Unintentional Other Transport 34,315	Unintentional Other Transport 44,759	Unintentional Unk./Unspecified 742,188
9	Unintentional Inhalation/Suff. 6,452	Unintentional MV-Occupant 50,331	Unintentional Dog Bite 51,882	Unintentional Other Transport 65,375	Unintentional Other Transport 125,085	Unintentional Unk./Unspecified 109,749	Unintentional Poisoning 97,480	Unintentional Poisoning 74,802	Unintentional Unk./Unspecified 28,358	Unintentional Poisoning 31,073	Unintentional Other Transport 594,127
10	Unintentional Overexertion 6,336	Unintentional Unk./Unspecified 48,293	Unintentional Unk./Unspecified 48,079	Unintentional Other Bite/Sting 60,780	Unintentional Other Specified 111,000	Unintentional Other Transport 95,680	Unintentional Unk./Unspecified 92,403	Unintentional Foreign Body 57,803	Other Assault^ Struck by/Against 26,969	Unintentional Foreign Body 28,723	Unintentional Foreign Body 577,622

^ The 'Other Assault' category includes all assaults that are **not** classified as sexual assault. It represents the majority of assaults.
Data Source: National Electronic Injury Surveillance System All Injury Program operated by the Consumer Product Safety Commission
Chart developed by the National Center for Injury Prevention and Control, CDC

APPENDIX D

THINK FIRST FOR KIDS: DIRECTORS/EDUCATORS

TRAINING GUIDE

ThinkFirst For Kids

INTRODUCTION

Injury is a major health problem in the United States. The number of deaths, long-term effects, and high costs to individuals and society, are greater than other leading causes of death and disability. Traumatic brain and spinal cord injuries are the most devastating injuries because of their lifetime consequences and associated costs.

With the control of infectious disease, injury has now become the major threat to the lives and development of children. Injury is the leading cause of death among children 15 years and under; a large proportion suffer traumatic brain and spinal cord injuries. The physical, emotional, psychological, and learning problems that affect injured children make injuries a high priority for health and safety advocates throughout the nation.

Research and clinical reports emphasize the importance of primary prevention of injuries. The most comprehensive document promoting health is *Healthy People 2000: Objectives for the Nation*, which supports *educational and community based programs* to promote health and prevent disease. Several objectives in the document seek to reduce weapon-related deaths and nonfatal brain and spinal cord injuries for all ages and to increase the use of occupant protection systems (safety belts, car seats, etc.) and helmets. Other objectives include violence prevention and conflict resolution skills, and the provision of academic instruction on injury prevention and control.

The public and private sectors are working together to reduce the numbers and severity of injuries, particularly traumatic brain and spinal cord injuries. The **Think**First for Kids program represents a collaborative effort of educators, the **Think**First Foundation, the National Highway Traffic Safety Administration (NHTSA), and the American Academy of Pediatrics, the Peace Education Foundation, and professionals from the fields of psychology and psychiatry. The goal of the program is to increase knowledge of brain and spinal cord injury, injury prevention measures, and the use of safety habits.

Purpose of the ThinkFirst for Kids Chapter Director's Guide

The purpose of the guide is twofold: to assist **Think**First Chapter Directors in planning teachers' implementation of the program to the extent possible; and to use as a reference for encouraging schools' use of the program. The guide is divided into two sections: 1) **Think**First for Kids development and implementation, and 2) how to market the program. The content of Section 1 includes an introduction, the background and prevention of traumatic brain and spinal cord injuries, the background, purpose and goals of the program, the development and description of the curriculum, and a step-by-step outline of how to implement the program which includes a sample presentation for a teachers' workshop. A glossary, bibliography, presentation slides, and relevant journal abstracts are also included.

Background

Epidemiology of Injury and Traumatic Brain and Spinal Cord Injuries

Motor vehicle crashes, falls, and violence are the leading causes of injury death. An average of 110 people die each day from motor vehicle crashes, or one every 13 minutes. Falls are the leading cause of nonfatal injuries; one of out ten persons treated in emergency departments incurred a fall. Firearms account for one fifth of all injury deaths, second only to motor vehicle as a cause of **fatal** injury. Drowning is the third most common cause of death and ranks second for persons aged 5 to 44 years.

Traumatic brain and spinal cord injuries are the most devastating of injuries in terms of physical and psychological damage, costs, and years of lost productivity and disability. Each year, about 1.3 million people suffer brain injuries (70,000 to 90,000 sustain moderate to severe traumatic brain injuries), and 10,000 to 20,000 people reportedly sustain spinal cord injuries. Persons 15-24 are at highest risk for these injuries. Ten percent of new brain injury cases each year do not survive, which means that the majority of persons survive with a mild to severe condition. Half of all spinal cord injuries result in quadriplegia. The proportion of people with quadriplegia who have neurologically incomplete lesions and retain some motor control, however, increased from 38% in 1973 to 54% in 1983 (Disability in America). Disabilities associated with traumatic brain and spinal cord injury, as well as developmental defects and chronic disease, contribute to additional injuries and secondary conditions.

Overall, the majority of brain and spinal cord injuries occur when children are riding in vehicles, walking, bicycling, playing or engaged in sports, and swimming or playing near water.

Each year, about 10,000 children under age 15 years die from injury, 340,000 are hospitalized, and an estimated 10 million are treated in emergency departments. Traumatic brain injuries account for the majority of injuries:

- Approximately 150,000 children sustain traumatic brain injuries each year
- Nearly 7,000 children die each year from traumatic brain injury
- Approximately 30% of all childhood deaths result from brain injury
- 40% of all brain injuries occur in persons less than 16 years
- Sports and recreation account for more than 40% of all brain injuries in children
- Nearly one half of all ATV-related brain injuries occur in children 5-14 years
- Unintentional shootings between children are the fifth leading cause of death for persons under 14 years
- The majority of the annual 21,000 BB gun and other non powder firearm injuries occur in children

Spinal cord injury is less common among children than adults because of flexibility of their body tissues; they are at risk, however, in activities such as sliding into base and striking another player when playing baseball or softball. It has been estimated that 1,200 children under 20 years of age sustain spinal cord injury with neurological deficits each year. The main causes of injury are jumping or falling, but motor vehicle crashes cause more permanent impairment. About 1,000 diving-related spinal cord injuries occur each year among all age groups in the United States. Diving accounts for 10% of all spinal cord injuries, and 60-65% of all recreational spinal cord injuries.

Persons who incur brain or spinal cord injuries often have multiple injuries which lead to additional long-term effects. More than 80% of persons with brain injury also incur fractures or abdominal injuries, and 10% have spinal cord injuries. Also, 10% of persons with spinal cord injuries incur a brain injury. Persons with moderate/severe brain or spinal cord injuries often require a lifetime of rehabilitation. The estimated annual cost of acute care for spinal cord injures is $4 Billion; estimated costs of acute hospital care for traumatic brain injury is $12.5 Billion.

Prevention of Traumatic Brain and Spinal Cord Injuries

The primary prevention of traumatic brain and spinal cord involves education, technology, and legislation. In this guide, the educational methods and strategies to prevent these injuries are categorized by the injury areas addressed in the curriculum; preventing traumatic brain and spinal cord injury; vehicle safety; bicycle safety; safety around weapons and creative problem solving; playground, recreation, and sports safety; and water safety. (For detailed prevention strategies/activities, refer to information in the curriculum lessons).

Susceptibility to traumatic brain and spinal cord injury relates to the total environment. The types and causes of injuries suffered by people in the United States are related to common hazards of motor vehicles and roadways, bicycle use, recreation and sports, water, and the availability of weapons. The goal to increase knowledge and awareness of the causes, consequences, and prevention of injuries, as well as behaviors that help reduce the risk of injury is the basis for prevention strategies and programs. The overall strategies used to prevent injuries for each are as follows:

Vehicle Safety. Continued progress in designing safer vehicle passenger compartments, establishing agencies to set standards for vehicles, and legislating traffic control and injury protection measures (safety restraint systems), has helped to decrease the frequency and severity of injuries. Education and behavior change programs support these strategies and accomplish further reductions through psychosocial and cultural approaches. Establishing rules and laws specific to roadways and individual behavior (pedestrians and vehicle drivers) has increased people's knowledge and awareness of risks.

Bicycle Safety. Bicyclists' vulnerability to injury requires a set of strategies focused on the rider, other vehicle drivers, community roadway/traffic control systems and the interaction of these factors. Ordinances and education to assure that the bicyclist rides a safe bicycle of the right size, wears a helmet, and knows and follows riding and traffic safety rules are effective preventive methods. Equally important are the education of vehicle drivers to acknowledge they must share the road with bicyclists, roadway maintenance, and the presence of traffic signals that help protect the rider.

Playground, recreation, and sports safety. Play area injuries may be prevented by building safe and strong equipment, having soft surface areas under swings and monkey bars, and supervising children according to their stage of development. Overall strategies to prevent sport injury focus on the use of appropriate protective equipment, adherence to rules and laws governing the sport, and physical examinations to assure a person is physically and developmentally able to play the sport.

Safety around weapons and creative problem solving. Strategies to prevent weapon injuries center on education for gun owners to secure the firearms and ammunition so that persons – particularly children – cannot fire the weapon, the legal control of gun availability, and education and restrictions of other weapons such as knives. Education of children and adults to make guns and other weapons inaccessible are current strategies to prevent injury. At the same time, teaching creative problem solving and conflict resolution skills in schools and communities are measures to reduce intentional injuries.

Water safety. The suddenness and silence of drowning or near-drowning make prevention a real challenge. Prevention strategies for natural bodies of water focus on using caution in entering the water, wearing life jackets, and using seasonal life guards. Latching gates, 4-sided fences, and draining pools when out of season are the main strategies used for pools. Suggested water safety measures include: adult supervision of children, availability of rescue equipment, learning water survival techniques (including swimming), safe diving practices, and swimming with a buddy.

ThinkFirst for Kids Program Background

The **Think**First for Kids Program was developed by the **Think**First Foundation to increase awareness and knowledge among children 6-8 years of age about the risks of brain and spinal cord injury, and the use of good safety habits. The program was designed to enhance students' interest and learning by using four interactive components. The four components of the program include: 1) a brain and spinal cord injury prevention curriculum with six subject-integrated lessons, 2) an animated cartoon video that provides and overview of brain and spinal cord injury and safety topics, 3) a set of five comic sheets (one per safety topic), and 4) a set of five full-color classroom posters that reinforce key messages presented during classroom instruction. All components feature Street Smart, the safety messenger who enthusiastically teaches his friends how to have fun and be safe. Several teaching strategies that inspire creativity and learning (e.g., role-play, stories, visual enforcement, hands-on, reading, sharing ideas, etc.) were used in developing the curriculum.

ThinkFirst Chapter Directors who participated in the pilot study attended a training workshop in late 1994 to learn the concepts and content of the **Think**First for Kids program, and the strategies that could be used in introducing the program in elementary schools. *Note. A description of the* **Think**First *for Kids Chapter Director Workshop is provided at the end of this document.*

The program was piloted in 21 schools at 11 sites in the United States during January to June, 1995. An assessment was made to determine if the program accomplished what was intended, what changes should be made to help students learn, and to enhance educator acceptance of the program. Questionnaires completed by teachers and the Chapter Directors were used in refining the curriculum and program. Preliminary results of pre- and post-tests of students taking both tests showed a slight increase in some knowledge items.

Purpose and Rationale

The **Think**First for Kids program was developed to increase knowledge and awareness among elementary school children (Grades 1-3) about the causes and consequences of brain and spinal cord injury, injury prevention, and safety habits that reduce the risk of injury. The curriculum, augmented by the video, comics, and posters was designed to: 1) help students learn safety messages in relation to subjects, 2) help teachers implement the program without "teaching something extra", and 3) help students form safety habits for life which will ultimately reduce the number and/or severity of traumatic brain and spinal cord injuries.

Elementary school-aged children are at an impressionable stage of development, enjoy learning new responsibilities and decision-making skills, and attempt to influence their family members and peers. Teachings directed to this age group will likely increase safety behaviors that are maintained through the high-risk adolescent years and become life-long habits. It is anticipated that students, families, teachers, and communities will benefit from participating in the **Think**First for Kids program.

Goals

1. To help elementary school educators teach the curriculum and other program components within the subject material of their lesson plans.
2. To use the combined efforts of elementary school teachers, **Think**First for Kids Chapter Directors, and school staff to increase knowledge and awareness of brain and spinal cord injuries, how these injuries can be prevented, and the importance of lifelong safety habits to prevent injury.

Development of the Curriculum

Basis of Learning and Behavior Theory

The curricula are based on learning and behavioral theories stating that repeated and varied messages, given over time, will increase students' understanding, knowledge retention, and safety behavior. Theories of learning suggest that motivation, attention, and the ability to relate new and existing knowledge will determine what is learned. Behaviorists place special emphasis on environmental stimuli and observable responses. Observational learning involves four elements: attention, retention, production, and motivation or reinforcement. Observational learning can teach new behaviors, encourage learned behaviors, strengthen or weaken inhibitions, direct attention, and arouse emotion.

There is common agreement across behavioral theories that an individual's personality, environment (physical, socio-cultural, socialization), and heredity help shape development. The development tasks accomplished during middle childhood (6-12 years) described by Coleman (in Theory and Practice in Health Education) include:

1. Gaining wider knowledge and understanding of the physical and social world;
2. Building wholesome attitudes toward self;
3. Learning appropriate social roles;
4. Developing conscience, morality, and a scale of values;
5. Learning to read, write, calculate, and other intellectual skills;
6. Learning physical skills; and
7. Learning to give and take and to share responsibility.

Since children this age tend to change their behavior because of a desire to emulate role models (parents, teachers), education programs should include parents and other potential models. The elementary school environment provides the opportunity to teach injury prevention messages over time, in different contexts, and accommodates the many teaching strategies: role-play, brain storming, discussion, etc. Programmed instruction offers a systematic application of behavioral learning principles, allows for self-pacing, and breaks lessons into small steps.

It is not unusual for people to demonstrate a gain in some knowledge items after a lesson/presentation, but change in attitude and behavior requires acceptance of the message as meaningful enough to put into operation. Adolescents are particularly resistant to messages that imply vulnerability and the need for changed behavior. On the other hand, children aged 6-12 years seek new knowledge and are more amenable to change than adolescents. Six lessons spaced over time will aid in knowledge retention and prolonged awareness. In addition, the visual and auditory messages provided by the video, posters, and comic strips will enhance associative learning.

Experience and Lessons for ThinkFirst for Kids

The experience gained in developing and implementing the Oklahoma Elementary School Injury Prevention Education Program/Curriculum (OESIPEP), **Think**First and other single-presentation programs was used in crafting the **Think**First for Kids program. Many programs have reported minimal change in knowledge, attitudes, and behavior of the targeted population, with one or few exposures to the learning material (presentations, lessons, etc.).

Oklahoma Elementary School Injury Prevention Education Curriculum/Program (OESIPE)

The lessons learned in the two-year development, implementation, and evaluation of the OESIPE were used in crafting the **Think**First for Kids program and Chapter Director's guide, and planning the pilot program. Specifically, the experience was useful in: 1) anticipating the needs of teachers, principals, and schools were **Think**First for Kids was piloted; 2) increasing the acceptance of teachers by incorporating injury prevention messages within subject material; and 3) finding out how best to work with teachers who have stressful, busy days dealing with students, parents, testing times, and other events during the school year. Factors unique to the elementary school environment were recognized during the two-year implementation phase of the OESIPE. Teachers used their own set of methods and style in teaching children and maintaining a safe, supportive classroom and school. Overall, the teachers appreciated: 1) having the injury prevention messages integrated into the subject material, 2) using a curriculum which easily fit into their lesson plan where they do not have to teach "something extra", and 3) learning about the injury problem through the information provided in each lesson.

Piloting the ThinkFirst *for Kids program.*

Piloting the program in varied metropolitan, rural, and suburban settings provided Chapter Directors the opportunity to experience positive and negative feedback, and note strengths and weaknesses in their methods of introducing the program into elementary schools. Preliminary findings were shared with other Chapter Directors during the annual meeting in April, 1995. An interim report was given to the Task Force. This information was used as a basis to make final revisions to curriculum content and recommendations for the implementation process. It was generally agreed that piloting the program was a good experience and indicated how the final program could be improved. *Note: A brief schedule of the pilot program may be found at the end of this document.*

The ThinkFirst for Kids Curricula

The curricula were designed to fit easily into teachers' weekly lesson plans. (Teachers may elect to teach two lessons in one week but they should be spaced over three to six months). The 30-45 minute lessons were written for integration into subject material. Each grade-specific curriculum includes:

1. A table of contents, foreword, introduction, curriculum guide for teachers, and pictures of *Street Smart* and his friends to introduce to students;
2. Six lessons including an introduction to traumatic brain and spinal cord injury and five injury prevention topic areas;
3. Each lesson includes: a lesson plan/schedule, testing objectives met in the lesson, information related to the particular injury problem, two to four subject-integrated exercises (mathematics, language, science, etc.);
4. Suggested resources to augment the program (i.e., videos, monographs, books, and agencies);
5. A glossary of terms used in the curriculum; and an exercise key.

Each curriculum is accompanied by a duplicate set of camera-ready exercises and parent letters for photocopying.

The content areas include: traumatic brain and spinal cord injury; vehicle safety; bicycle safety; safety around weapons and creative problem solving; playground, recreation, and sports safety; and water safety. Numerous additional activities involving the students, school, and community are described in the lesson plan for teachers' consideration. The content describes the injury problem and emphasizes prevention through the recognition of hazards, the use of protective measures, and following safety rules. The lessons encourage student creativity, decision-making, and responsibility for injury prevention themselves, their friends and family, and the community.

ThinkFirst for Kids Program

Chapter Director Responsibilities

1. Promote **Think**First for Kids to local elementary schools. Each Chapter Director will have one complete set of program materials to use for promotional purposes. The set will include three curricula, a set of five classroom posters, two sets of comic strips, one color and one black and white, one copy of the video, Street Smart: A **Think**First Adventure, three PSA's, and 100 brochures. (A marketing plan is included in the next section of this guide)
2. Assist primary school contact person(s) in developing a plan for program implementation. Conduct a teacher orientation workshop. (A sample presentation is included at the end of this document)
3. Conduct a teacher orientation workshop. (A sample presentation is included at the end of this document)
4. Serve as an ongoing resource to schools.

5. Maintain data for process evaluation (refer to **Think**First for Kids standards)
6. Conduct outcome evaluations (optional). **Think**First will have two types of evaluations available to Chapter Directors who wish to use them.

Program Plan

The Chapter Director can initially approach the school district superintendent, principal, PTA or other community representative. The understanding and approval of the school's principal is required. Principals are usually careful not to burden the teachers. The final decision about outside programs is usually left to the teacher's discretion. In order to ensure that lessons will be taught to the students, teachers must understand the program and agree to teach the lessons.

The methods used to interest educators in implementing the program will vary according to the Chapter Director and the environment of the schools and community. Selling points may include:

1. The legitimacy and goals of **Think**First;
2. The recognition that teachers are called upon to teach many topics not related to the required subjects; therefore, the curriculum was written to have injury prevention messages integrated into mathematics, language, science, etc.;
3. All materials (video, comic sheets, posters, and curricula) interrelate and the cost is relatively low;
4. Only 30-45 minutes are required for each lesson. Exercises and activities from the curriculum can be used during "free-time" periods at the discretion of the teacher;
5. Many hands-on and class activities are included in the lessons.
6. Costs of injuries. The Chapter Director may wish to supplement with data on local injuries and related costs. May meet required safety education standards (this will vary from state to state).

It is understood that schools will vary considerably in the amount of assistance that they would like from the Chapter Director. Once the school has agreed to teach the program, however, the Chapter Director should offer to:

1. Conduct an orientation workshop with participating teachers and other involved school personnel.
2. Teach the first class – Brain and Spinal Cord Injury.
3. Assist with contacting community educators/organizations and providing information on other community resources. Some examples might include police officers, traffic safety or Red Cross educators and bicycle clubs.

4. Assist with pre/post testing.
5. Serve as an ongoing injury prevention resource.

Program Preparation

In preparing to facilitate teachers' implementation of the program, utilize the information and materials from the Chapter Director guide. Important points to remember are:

1. Research the community and know key people;
2. Select one teacher to be your contact person;
3. Know the program thoroughly – the objectives, the various components, and the interrelationship of the components in reinforcing the injury prevention messages;
4. Respect the teachers and their donation, the staff, and the school environment (including rules);
5. Maintain a positive attitude;
6. Communicate as needed; take opportunities to provide additional information and answer teachers' questions, and listen to comments.

Teacher Program Orientation Workshop

Purpose

The workshop:

1. Establishes the **Think**First for Kids program as part of the overall curriculum taught by Grades 1-3 teachers in those schools which agree to implement the program.
2. Provides the time and environment to talk with the group of teachers of each grade to clarify the responsibilities of both sides, and set the stage for mutual respect, cooperation, and collaboration during the program implementation phase.
3. Initiates/expands teachers' awareness and knowledge of the magnitude of traumatic brain and spinal cord injury, their causes, and the importance of injury prevention.
4. Provides the opportunity to emphasize the unique features of the program, review the curriculum together, and relate injury prevention strategies to the lesson content.
5. Allows for setting up a flexible system of contact and discussing/finalizing school projects (PTA meet-

Although the workshop will accomplish all of the above, most time should be spent on going through the curriculum with the teachers, answering their questions, getting feedback, and establishing rapport.

The following steps are suggested for the workshop.

1. Work with the principal and teachers involved in scheduling a time for the workshop. *(Ask the principal if he/she will be attending).* The time for orientation will be important since the sessions are short and you will be asking for 50-60 minutes. You may ask if there are parents or interns who could stay in the classroom. Usually teachers do not want lunch time schedules to be disrupted.
2. Make sure that all teachers have their books, sheets packet, comics, and posters in their hands before the meeting. (Always send individual notes with materials). You may offer to make copies of the first parent letter or exercise. Do bring some of the exercises on colored paper (light colors) to show how neat they look.
3. The main "incentive" for the teachers is their willingness to teach the curriculum. If you decide to give any rewards for students, the rewards MUST be available on the day expected.
4. Arrive about 15 minutes ahead of time to set up, check AV equipment, etc.
5. When teachers gather, record their names if you haven't already done so make sure they know who you are and the organization you represent, and state briefly how the workshop will proceed. Begin on time.
6. Describe the goals, rationale, and key features of the program.
7. Review the curricula. Go over the schedule of teacher-Chapter Director meetings/special events times you have established with the school.

__Teacher Workshop__

The **Think**First for Kids program is designed to be implemented by classroom teachers of elementary grade levels 1-3. The ideal format would be to have a classroom teacher who is trained by a **Think**First Chapter Director, present the material and reinforce the lessons throughout the school year, with ongoing support services from the **Think**First Chapter Director when necessary. In reality, however, it must be understood that each school district may choose to implement the program differently. In some school districts school health nurses have expressed an interest in program implementation, while in others this responsibility might be handed off to physical education/health instructors. In each case, the **Think**First Chapter Director must carefully evaluate the needs of the audience and custom design the training to be of interest to that particular group. The following training module is a guide for presenting the components and rationale for **Think**First for Kids, and can be adapted to meeting the needs of the training group to which it is being presented. It is strongly suggested that the **Think**First Chapter Director research the injury statistics for their particular state and county to be of value to their audience.

I. Introduction and Background of ThinkFirst

Unintentional injury is the leading killer of young people in America today, with motor vehicle crashes accounting for approximately 20% of these deaths. Unintentional injuries can also result in traumatic brain and spinal cord injuries, which can lead to death or permanent disabilities for a young person. **Think**First, a national organization whose mission is to reduce these injuries through education, reinforcement activities, public policy initiatives, and community awareness programs, is actively involved in the development and implementation of educational programs for the prevention of brain and spinal cord injuries.

ThinkFirst was jointly founded by The American Association of Neurological Surgeons and the Congress of Neurological Surgeons. Since 1986, the national **Think**First network of over 200 local chapters has reached 4.1 million students with brain and spinal cord injury prevention education. Each program is coordinated by a health professional, many of whom are injury prevention specialists, registered nurses, occupational and physical therapists and neurosurgeons. Each **Think**First chapter is required to have a sponsoring physician and each program Chapter Director receives training from the national **Think**First program at model site centers.

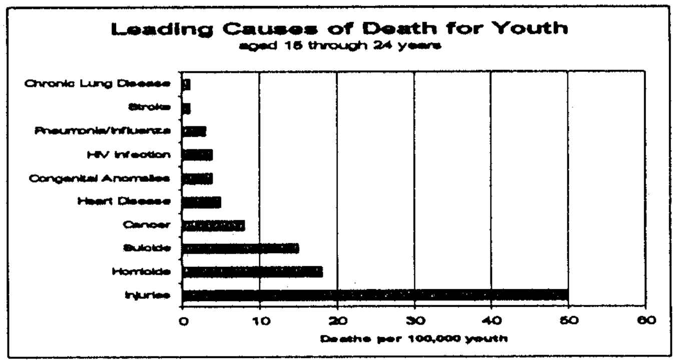
The original educational presentation was targeted to high school students at highest risk for brain and spinal cord injuries because of peer pressure and their inherent belief that they are invincible. The **Think**First educational program presented to middle and high school students includes a presentation by a health care professional regarding the anatomy and physiology of the brain and spinal cord ; an action-packed video in which young people who have sustained brain or spinal cord injuries talk about how their injuries occurred and the changes in their lifestyle, and a presentation by a young person who has sustained a brain or spinal cord injury who shares their experience and answers questions from the group.

ThinkFirst for Kids was developed in response to needs voiced around the country for injury prevention programs appropriate for elementary students. A national task force was formed in 1994 to review existing materials regarding brain and spinal cord injury prevention appropriate for children between the ages of 6 and 8 and to develop a curriculum to meet this need. The task force included elementary education teachers, a child psychologist, a child psychiatrist, curriculum specialists, local program Chapter Directors and a neurosurgeon. When all of the elements of **Think**First for Kids were completed, the program was pilot-tested at elementary schools around the country and received favorable comments from teachers and students alike. Based upon the recommendations from teachings participating in the pilot test, **Think**First for Kids was revised and the final product is now ready for implementation.

II. The Magnitude of Injury in the Youth Population

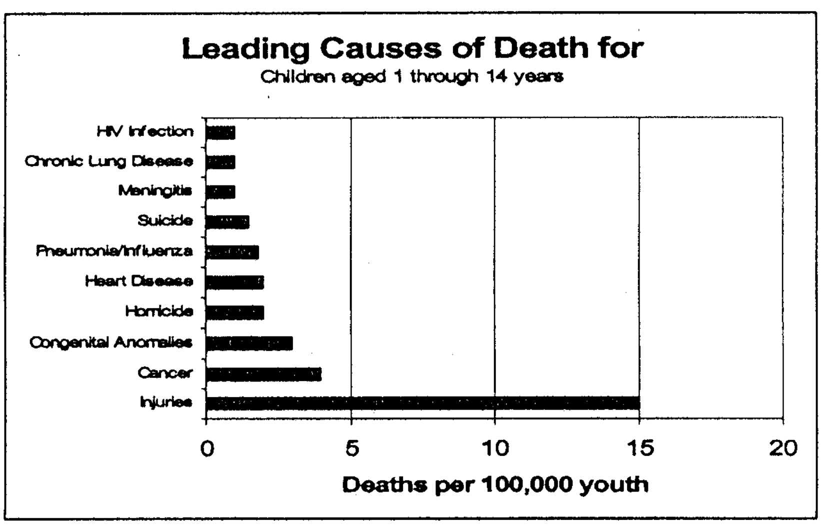
A. The Leading Causes of Injury for Ages 15-25 (overhead #1)

ThinkFirst has primarily focused on this age group with its educational programs in the past, but research shows us that this group is less likely to be influenced to change their behavior as compared to the younger, elementary aged children. Overhead #1



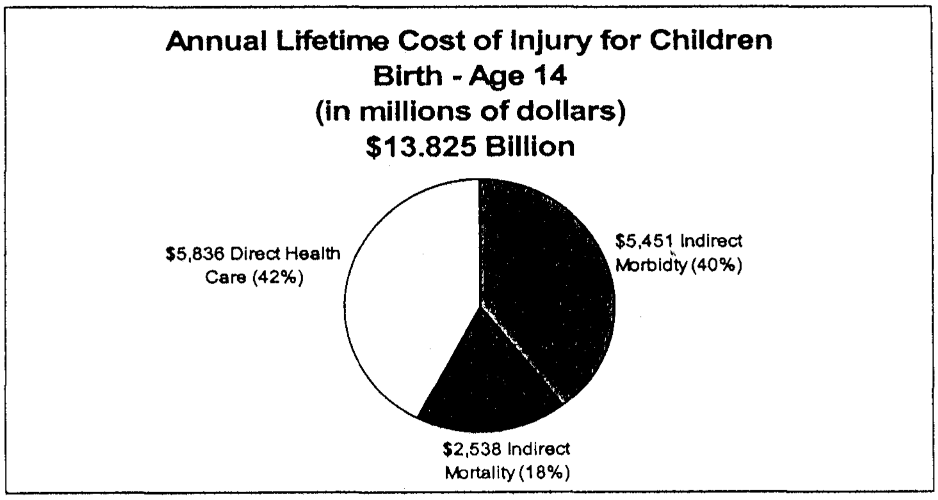
B. The Leading Causes of Injury for Ages 1-14 (overhead #2)

Unintentional injury still is the leading cause of death for this age group, and it is vital that the strategies for prevention of these injuries be taught now and repeated often if behavior is to be effected.



C. The Cost of Injury (overhead #3)

The costs of brain and spinal cord injuries are astronomical and include hospitalizations, rehabilitation care, home care and in the case of a young person the "years of productive life lost" (YPLL).



D. The Frequency of Brain Injuries (overhead #4)

A traumatic brain injury is certainly the most expensive form of injury, and it can easily result from a simple fall off a bicycle to an un-helmeted child.

Estimated Annual Brain Injury Frequency for 1990

75,000
Deaths*

336,000 Hospitalized**

1,975,000 Medically Attended***

Estimates extrapolated to 1990, based on data sources below:
* Based on brain injury mortality rate of 30/100,000/yr for 250 million U.S. Population
** Source: National Center for Health Statistics (NCHS) National Hospital Discharge Survey, 1988.
*** Source: NCHS National Health Interview Survey, 1988.

E. The Frequency of Spinal Cord Injuries (overhead #5)

While this figure is not as high as that of traumatic brain injury, it is still of grave consequences when one considers the impact which a spinal cord injury will have upon a young person.

Estimated Annual Traumatic Spinal Cord Injury

10,000
Injuries*

4,830
Deaths
(3,464 fatal at scene)

1,290
Quadriplegia complete

1,290
Quadriplegia incomplete

1,290
Paraplegia complete

1,290
Paraplegia incomplete

*Based on 10,000 as the lowest estimate of traumatic spinal cord injuries each year (10,000-20,000).

III. The Rationale for Injury Prevention in an Educational Setting

According to Healthy *People 2000: Objectives for the Nation*, the attainment of health goals for America will depend substantially on educational and community-based programs to promote health and prevent disease. Several objectives in this document seek to reduce weapon-related deaths and non-fatal brain injuries for all ages. Other injury-related objectives include increasing the proportion of elementary and secondary schools which teach non-violent conflict resolution skills and the provision of academic instruction on injury prevention and control.

In developing **Think**First for Kids, the task force looked at the leading causes for injuries among children and researched methods of presenting strategies which could be taught in a classroom setting to prevent these injuries and have a positive effect on behavior change. One need which was identified was that of conflict resolution and weapons safety. **Think**First conferred with experts in these areas such as The Peace Education Foundation who provided information on introducing conflict resolution to young children. The National Highway Traffic Safety Administration provided state of the art information on safety restraints and their uses and bicycle safety, while the American Red Cross conferred on water safety materials and safe depths for diving.

The Secretary of Education made the comment that, "injury prevention should be considered on the basics of education." Indeed, it only makes sense that safety behavior is something that must be learned and the classroom setting provides that opportunity. Teachers are important adult role models to the elementary students. Learning strategies which may prevent traumatic brain and spinal cord injuries in early years can be reinforced with prevention messages when these students reach the "high-risk" population in their teen years.

ThinkFirst for Kids was designed to be a "teacher-friendly" product, in that it can be effectively integrated in the classroom with a minimum of valuable classroom time being consumed. The follow-up activities can be easily incorporated into ongoing math, science, or even art classes to reinforce the safety lessons being taught. The program covers motor vehicle safety, bicycle safety, weapons safety, recreational safety and water safety. Therefore, instead of having to take valuable class time to cover each of these areas which well-meaning community groups might offer, teachers can have control over when these areas are covered and how they are integrated with the annual curriculum schedule for their class.

IV. Safety Behaviors Among Students and the Costs of Injury (overhead #6)

> **When the doors of the classroom are closed,**
> **it is the teacher who most influences**
> **what the children will learn.**
>
> LJ Cronbach

Think about your particular school and the behavior which you observe on a daily basis?

Do most of the students who are driven to school wear safety belts?

Do most of the students who ride bicycles to school wear helmets?

Is the playground equipment in good repair and is there a soft surface under that equipment?

Is there a problem with violent behavior in the classroom or conflict?

These are all ways in which children are becoming injured and in which they can sustain traumatic brain and spinal cord injuries. This is a student risk survey for students in Florida. (overhead #7)

Florida Department of Education
Youth Risk Behavior Survey

*60% of the students reported swimming without adult or lifeguard supervision.

*29% of ninth graders, 36% of tenth graders, 49% of eleventh graders, 41% of twelfth graders in the survey always wore a seat belt when riding in a car driven by someone else.

*48% of the students in the survey had worn a helmet while riding a motorcycle in the past year.

*1% of the surveyed students wore a bicycle helmet while riding a bicycle in the past year.

Many students are swimming without supervision and if they do not understand the rationale of swimming safety rules or refuse to follow them, serious implications can arise.

As you can see, the numbers for wearing of safety belts is low. It seems to peak for 11th graders who may be getting their driver's licenses, but then fall back some.

Only 1% of the students surveyed wore bicycle helmets. On the average, approximately 15% of adults and children in the United States wear bicycle helmets regularly.

ThinkFirst for Kids addressed each of these issues in a specific module designed to influence student's behavior toward taking the necessary precautions to prevent injuries associated with these activities.

As it has already been established, the cost of one brain or spinal cord injury is astronomical. The cost of prevention can be nominal, as in the case of wearing a bicycle helmet. This comparison was made by SAFE KIDS to show the direct and indirect health care costs to society versus the cost of a bicycle helmet to prevent this injury (overhead #8).

INVESTMENT

Every $15 bike helmet saves this country $30 in direct health care costs and an additional $420 in in-direct health costs and costs to society

V. ThinkFirst for Kids Educational Program

A. Goals

The goal of this program is to increase the knowledge and awareness among children in grades 1-3 of:

1. The causes and risk factors involved in sustaining brain and spinal cord injuries
2. Injury prevention and the use of safety habits for life

B. Strategies

The teaching strategies employed in this curriculum inspire creativity in children as they learn the safety messages by doing and through interaction. The curriculum provides solid strategies that when employed can effectively prevent brain and spinal cord injuries. The teaching method is to present the problem. The students practice problem solving skills and taking responsibility for their actions.

C. Learning Theory and the Program Components

The curriculum is based upon the learning theories of using interrelated themes and specific concepts given over time will increase the students' understanding, knowledge retention and sustained behavior. The purpose of curriculum design three-fold:

1. To help students learn safety messages in relation to subjects-work in classroom lessons.
2. To help teachers to implement an injury prevention program without having to teach an extra course.
3. To help students learn safety habits which will ultimately reduce the number and severity of traumatic brain and spinal cord injuries?

D. Curriculum Design (overhead #9)

ThinkFirst for Kids Program

KEY FEATURES

- Designed to be implemented by teachers in their daily/weekly lesson plans.
- Program for children focusing on brain and spinal cord injury prevention, and safety habits to prevent injury.
- Written to be teacher-friendly-interesting and fun to teach.
- Complete program with Street Smart video, grade specific (1-3) bound curriculum, comic book, and posters.
- Developed by neurosurgeons, traffic safety and public health workers, and education program specialists.
- Six-lessons of 30-45 minute duration.
- Set of duplicates of exercises ready for photocopying.
- Safety messages integrated in subject material (language, mathematics, science, social studies, etc.)
- Teachers can value the contribution to their students.

ThinkFirst for Kids was designed to be presented through the introduction of six specific modules:

1. Introduction of the brain and spinal cord
2. Motor vehicle safety
3. Bicycle safety
4. Water safety
5. Recreational safety
6. Weapons safety

An animated video, *"Street Smart: A* **Think**First *Adventure"*, is used to introduce the program. The Street Smart character was created to serve as sort of a "super-hero" figure who is a normal kid who engages in all kinds of recreational activities but never gets hurt because he practices safety strategies. His mission is to share these strategies with other children to prevent them from sustaining brain and spinal cord injuries and to teach them to **Think**First.

APPENDIX E

THINK FIRST FOR KIDS: PRE- AND POSTTEST,

GRADES 1 THROUGH 3

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)
  1= Male 2= Female

- **Race/Ethnicity:** (circle one)
  1= Caucasian 2= African American
  3= Hispanic 4= Filipino
  5= American Indian 6= Asian
  7= Pacific Islander 8= Other

Grade 1: Pre-Test

Teacher Directions: Please read the directions, ask the questions, and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. You only need to wear a safety belt when you go on long care trips.
   a. No
   b. Yes

5. The skull is hard enough to protect the brain from all injuries.
   a. No
   b. Yes

6. The brain makes your whole body work.
   a. No
   b. Yes

7. Where in your body is your spinal cord?
   a. In your stomach
   b. Along your back
   c. Along your legs

8. Messages travel along the spinal cord between the brain and the body.
   a. No
   b. Yes

9. I only need to wear a bicycle helmet for long bike rides.
   a. No
   b. Yes

10. Car drivers and bicycle riders must obey the same traffic signs.
    a. No
    b. Yes

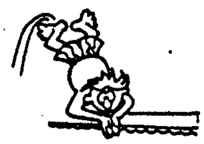
11. Only children must stop and look both ways before crossing the street.
    a. No
    b. Yes

12. Where is the danger zone near a school bus?
    a. In front of the bus
    b. All around the bus
    c. Behind the bus

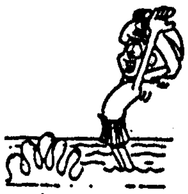
13. On a bicycle, you should ride:
    a. Facing the cars coming toward you
    b. Going in the same direction as the cars
    c. Going in either direction

14. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

15. **Matching:** Draw a line from each picture of Street Smart or his friends to the good water safety habit they are using.



a. The first time you go into the water, go feet first.



b. Always swim with a buddy.

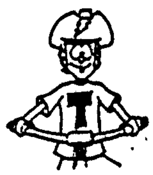
c. Hands over your head when diving.

16. Diving into an above ground swimming pool is safe.
    a. No
    b. Yes

17. If I see a gun in my home or anywhere else I should:
    a. Pick up the gun and put it away.
    b. Not touch and call an adult.
    c. Pick up the gun and unload it.

18. Before I slide down on a slide on a playground, I should:
    a. Wave to my friends so they can see me
    b. Wait until the person ahead of me is down and off
    c. Jump up and down on the top of the slide.

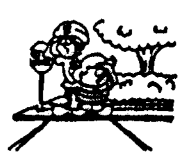
19. <u>Matching</u>: Draw a line from each picture of Street Smart or his friends to the good safety habit they are using.



a. Wear a seat belt.

b. Look before crossing the street.

c. Both hands on the handlebars.



d. Wear a helmet and pads.

20. If my friend brings a gun to school I should:
    a. Get angry
    b. Tell an adult
    c. Play with the gun

21. It is better to talk things over together than to get angry with people.
    a. No
    b. Yes

22. Before swinging a baseball bat or a tennis racket, how often do you check to see that no one is in the way?
    a. Always
    b. Sometimes
    c. Never

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)

  1= Male 2= Female

- **Race/Ethnicity:** (circle one)

1= Caucasian	2= African American
3= Hispanic	4= Filipino
5= American Indian	6= Asian
7= Pacific Islander	8= Other

Grade 1: Post-Test

Teacher Directions: Please read the directions, ask the questions, and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. The brain makes your whole body work.
    a. No
    b. Yes

5. I only need to wear a bicycle helmet for long bike rides.
    a. No
    b. Yes

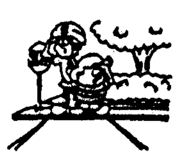
6. On a bicycle, you should ride:
    a. Facing the cars coming toward you
    b. Going in the same direction as the cars
    c. Going in either direction

7. **Matching:** Draw a line from each picture of Street Smart or his friends to the good safety habit they are using.

a. Wear a seat belt.

b. Look before crossing the street.

c. Both hands on the handlebars.



d. Wear a helmet and pads.

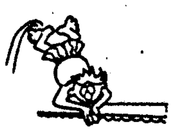
8. The skull is hard enough to protect the brain from all injuries.
    a. No
    b. Yes

9. Only children must stop and look both ways before crossing the street.
   a. No
   b. Yes

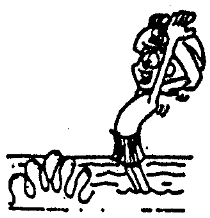
10. If I see a gun in my home or anywhere else I should:
    a. Pick up the gun and put it away.
    b. Not touch and call an adult.
    c. Pick up the gun and unload it.

11. You only need to wear a safety belt when you go on <u>long</u> car trips.
    a. No
    a. Yes

12. **<u>Matching</u>:** Draw a line from each picture of Street Smart or his friends to the good water safety habit they are using.



a. The first time you go into the water, go feet first.



b. Always swim with a buddy.

c. Hands over your head when diving.

13. Messages travel along the spinal cord between the brain and the body.
    a. No
    b. Yes

14. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

15. Where in your body is your spinal cord?
    a. In your stomach
    b. Along your back
    c. Along your legs

16. Where is the danger zone near a school bus?
    a. In front of the bus
    b. All around the bus
    c. Behind the bus

17. Diving into an above ground swimming pool is safe.
    a. No
    b. Yes

18. Before I slide down on a slide on a playground, I should:
    a. Wave to my friends so they can see me
    b. Wait until the person ahead of me is down and off
    c. Jump up and down on the top of the slide.

19. Car drivers and bicycle riders must obey the same traffic signs.
    a. No
    b. Yes

20. If my friend brings a gun to school I should:
    a. Get angry
    b. Tell an adult
    c. Play with the gun

21. It is better to talk things over together than to get angry with people.
    a. No
    b. Yes

22. Before swinging a baseball bat or a tennis racket, how often do you check to see that no one is in the way?
    a. Always
    b. Sometimes
    c. Never

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4
- **Gender:** (circle one)
  1= Male 2= Female
- **Race/Ethnicity:** (circle one)
  1= Caucasian 2= African American
  3= Hispanic 4= Filipino
  5= American Indian 6= Asian
  7= Pacific Islander 8= Other

Grade 2: Pre-Test

Teacher Directions: Please read the directions, and if necessary, ask the questions and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. The skull can protect the brain from all injuries.
    a. No
    b. Yes

5. The brain makes your whole body work.
    a. No
    b. Yes

6. Where is the spinal cord found?
    a. Between your head and shoulders
    b. Along your arms and legs
    c. Along your back

7. Messages travel along the spinal cord between the brain and the body.
    a. No
    b. Yes

8. You only need to wear a safety belt when you go on long car trips.
    a. No
    b. Yes

9. School crossing signs are red and white.
    a. No
    b. Yes

10. Adults do not have to look both ways before crossing the street.
    a. No
    b. Yes

11. The danger zone is how many feet around the bus?
    a. 2 feet
    b. 10 feet
    c. 50 feet

12. Car drivers and bicycle riders obey different traffic signs.
    a. No
    b. Yes

13. On a bicycle, you should ride:
    a. Going in either direction
    b. Going in the same direction as traffic
    c. Facing the traffic coming toward you

14. When is it best to wear a bicycle helmet?
    a. When riding on mountain trails
    b. When riding on the highway
    c. Whenever you ride your bike
    d. When riding in your neighborhood

15. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

16. Diving into an above ground swimming pool is not safe.
    a. No
    b. Yes

17. How deep does the water need to be to dive from the side of a pool?
    a. Just over your head
    b. 5 feet
    c. 9 feet

18. If I see a gun in my home or anywhere else I should:
    a. Pick up the gun and put it away.
    b. Not touch the gun and call an adult.
    c. Pick up the gun and unload it.

19. Ammunition for a gun should be:
    a. Stored and locked in a separate place from the gun
    b. Stored close to the gun
    c. Stored in the gun

20. Circle **all** of the pictures of Street Smart or his friends using good safety habits.

21. Talking over differences with other people and solving problems is better than getting angry and acting out.
    a. No
    b. Yes

22. When I play near the road and a ball goes into the street, I run out into the street to get the ball:
    a. Never
    b. Sometimes
    c. Always

23. How often should kids wear pads and helmets when they play baseball?
    a. Always
    b. Sometimes
    c. Never

24. How often do you do tricks, like hanging by your legs or one arm on the monkey bars?
    a. Never
    b. Sometimes
    c. Always

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)

  1= Male 2= Female

- **Race/Ethnicity:** (circle one)

1= Caucasian	2= African American
3= Hispanic	4= Filipino
5= American Indian	6= Asian
7= Pacific Islander	8= Other

Grade 2: Post-Test

Teacher Directions: Please read the directions, and if necessary, ask the questions and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. On a bicycle, you should ride:
    a. Going in either direction
    b. Going in the same direction as traffic
    c. Facing the traffic coming toward you

5. If I see a gun in my home or anywhere else I should:
    a. Pick up the gun and put it away.
    b. Not touch the gun and call an adult.
    c. Pick up the gun and unload

6. Where is the spinal cord found?
    a. Between your head and shoulders
    b. Along your arms and legs
    c. Along your back

7. The skull can protect the brain from all injuries.
    a. No
    b. Yes

8. Ammunition for a gun should be:
    a. Stored and locked in a separate place from the gun
    b. Stored close to the gun
    c. Stored in the gun

9. Diving into an above ground swimming pool is not safe.
    a. No
    b. Yes

10. Circle **all** of the pictures of Street Smart or his friends using good safety habits

11. When is it <u>best</u> to wear a bicycle helmet?
    a. When riding on mountain trails
    b. When riding on the highway
    c. Whenever you ride your bike
    d. When riding in your neighborhood

12. You only need to wear a safety belt when you go on <u>long</u> car trips.
    a. No
    b. Yes

13. How deep does the water need to be to dive from the side of a pool?
    a. Just over your head
    b. 5 feet
    c. 9 feet

14. School crossing signs are red and white.
    a. No
    b. Yes

15. Messages travel along the spinal cord between the brain and the body.
    a. No
    b. Yes

16. Car drivers and bicycle riders obey different traffic signs.
    a. No
    b. Yes

17. The brain makes your whole body work.
    a. No
    b. Yes

18. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

19. The danger zone is how many feet around the bus?
    a. 2 feet
    b. 10 feet
    c. 50 feet

20. Adults do <u>not</u> have to look both ways before crossing the street.
    a. No
    b. Yes

21. Talking over differences with other people and solving problems is better than getting angry and acting out.
    a. No
    b. Yes

22. When I play near the road and a ball goes into the street, I run out into the street to get the ball:
    a. Never
    b. Sometimes
    c. Always

23. How often should kids wear pads and helmets when they play baseball?
    a. Always
    b. Sometimes
    c. Never

24. How often do you do tricks, like hanging by your legs or one arm on the monkey bars?
    a. Never
    b. Sometimes
    c. Always

Date of Post-Test: ______________________
Grade: ______________________
School District: ______________________
School: ______________________
Teacher: ______________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)

  1= Male 2= Female

- **Race/Ethnicity:** (circle one)
  1= Caucasian 2= African American
  3= Hispanic 4= Filipino
  5= American Indian 6= Asian
  7= Pacific Islander 8= Other

Grade 3: Pre-Test

Teacher Directions: Please read the directions for each section, and if necessary, ask the questions and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. The brain cannot be injured unless the skull is broken.
   a. No
   b. Yes

5. The cerebrum helps people walk straight and keep their balance.
   a. No
   a. Yes

6. Which part of the brain helps you think and remember?
   a. Cerebrum
   b. Cerebellum
   c. Brain stem

7. Which part of the brain keeps your lungs breathing while you sleep?
   a. Cerebrum
   b. Cerebellum
   c. Brain stem

8. You only need to wear a safety belt when you go on <u>long</u> car trips.
   a. No
   b. Yes

9. The danger zone is how many feet around the bus?
   a. 2 feet
   b. 10 feet
   c. 50 feet

10. School crossing signs are red and white.
   a. No
   b. Yes

11. When is it <u>best</u> to wear a bicycle helmet?
   a. When riding on mountain trails
   b. When riding on the highway
   c. Whenever you ride your bike
   d. When riding in your neighborhood

12. Car drivers and bicycle riders obey different traffic signs.
    a. No
    b. Yes

13. On a bicycle, you should ride:
    a. Going in either direction
    b. Going in the same direction as traffic
    c. Facing the traffic coming toward you

14. Ammunition for a gun should be:
    a. Stored and locked in a separate place from the gun
    b. Stored close to the gun
    c. Stored in the gun

15. If I see a gun at home or anywhere I should: (***number the choices*** in the order that they should happen)
    ____ Leave the area
    ____ Stop
    ____ Tell an adult
    ____ Don't touch the gun

16. Many children are killed or wounded by guns in their own homes.
    a. No
    b. Yes

17. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

18. Diving into an above ground swimming pool is unsafe.
    a. No
    b. Yes

19. How deep does the water in a pool need to be in order to dive off a diving board?
    a. Just over your head
    b. 7 feet
    c. 12 feet

20. Children riding in a boat with an adult do not need to wear a life jacket .
    a. No
    b. Yes

21. If a person is having trouble in the water, I should:
    a. Call to an adult and throw a line or a preserver
    b. Jump in and swim to the person

22. The brain and spinal cord are connected.
    a. No
    b. Yes

23. If I see a knife in the kitchen or anywhere, I should pick it up and put it away.
    a. No
    b. Yes

24. When playing at the playground, kids should always be courteous and wait their turn.
    a. No
    b. Yes

25. When someone you are playing with wants to do something different than you do, you should try to listen to each others ideas.
    a. No
    b. Yes

26. How often do you do tricks, like hanging by your legs or one arm on the monkey bars?
    a. Never
    b. Sometimes
    c. Always

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)
  1= Male 2= Female

- **Race/Ethnicity:** (circle one)

1= Caucasian	2= African American
3= Hispanic	4= Filipino
5= American Indian	6= Asian
7= Pacific Islander	8= Other

Grade 3: Post-Test

Teacher Directions: Please read the directions for each section, and if necessary, ask the questions and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. The brain cannot be injured unless the skull is broken.
    a. No
    b. Yes

5. The cerebrum helps people walk straight and keep their balance.
    a. No
    a. Yes

6. Which part of the brain helps you think and remember?
    a. Cerebrum
    b. Cerebellum
    c. Brain stem

7. Which part of the brain keeps your lungs breathing while you sleep?
    a. Cerebrum
    b. Cerebellum
    c. Brain stem

8. You only need to wear a safety belt when you go on <u>long</u> car trips.
    a. No
    b. Yes

9. The danger zone is how many feet around the bus?
    a. 2 feet
    b. 10 feet
    c. 50 feet

10. School crossing signs are red and white.
    a. No
    b. Yes

11. When is it <u>best</u> to wear a bicycle helmet?
    a. When riding on mountain trails
    b. When riding on the highway
    c. Whenever you ride your bike
    d. When riding in your neighborhood

12. Car drivers and bicycle riders obey different traffic signs.
    a. No
    b. Yes

13. On a bicycle, you should ride:
    a. Going in either direction
    b. Going in the same direction as traffic
    c. Facing the traffic coming toward you

14. Ammunition for a gun should be:
    a. Stored and locked in a separate place from the gun
    b. Stored close to the gun
    c. Stored in the gun

15. If I see a gun at home or anywhere I should: (***number the choices*** in the order that they should happen)
    ____ Leave the area
    ____ Stop
    ____ Tell an adult
    ____ Don't touch the gun

16. Many children are killed or wounded by guns in their own homes.
    a. No
    b. Yes

17. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

18. Diving into an above ground swimming pool is unsafe.
    a. No
    b. Yes

19. How deep does the water in a pool need to be in order to dive off a diving board?
    a. Just over your head
    b. 7 feet
    c. 12 feet

20. Children riding in a boat with an adult do not need to wear a life jacket .
    a. No
    b. Yes

21. If a person is having trouble in the water, I should:
    a. Call to an adult and throw a line or a preserver
    b. Jump in and swim to the person

22. The brain and spinal cord are connected.
    a. No
    b. Yes

23. If I see a knife in the kitchen or anywhere, I should pick it up and put it away.
    a. No
    b. Yes

24. When playing at the playground, kids should always be courteous and wait their turn.
    a. No
    b. Yes

25. When someone you are playing with wants to do something different than you do, you should try to listen to each others ideas.
    a. No
    b. Yes

26. How often do you do tricks, like hanging by your legs or one arm on the monkey bars?
    a. Never
    b. Sometimes
    c. Always

APPENDIX F

THINK FIRST FOR KIDS:

FOURTH GRADE SURVEY

Date of Post-Test: ____________________
Grade: ____________________
School District: ____________________
School: ____________________
Teacher: ____________________
C: A:

- I have gone to this school for grades (check)
  1 2 3 4

- **Gender:** (circle one)
  1= Male 2= Female

- **Race/Ethnicity:** (circle one)

1= Caucasian	2= African American
3= Hispanic	4= Filipino
5= American Indian	6= Asian
7= Pacific Islander	8= Other

Grade 4: Survey

Teacher Directions: Please read the directions for each section, and if necessary, ask the questions and assist the students in identifying their choices and marking their answers.

Student Directions: Circle the one best answer to the following questions.

1. I have a bicycle that I ride.
   a. No
   b. Yes

2. I have a bicycle helmet to use.
   a. No
   b. Yes

3. When you ride a bicycle, how often do you wear a helmet?
   a. Always
   b. Sometimes
   c. Never

4. The brain cannot be injured unless the skull is broken.
    a. No
    b. Yes

5. The cerebrum helps people walk straight and keep their balance.
    a. No
    a. Yes

6. Which part of the brain helps you think and remember?
    a. Cerebrum
    b. Cerebellum
    c. Brain stem

7. Which part of the brain keeps your lungs breathing while you sleep?
    a. Cerebrum
    b. Cerebellum
    c. Brain stem

8. You only need to wear a safety belt when you go on <u>long</u> car trips.
    a. No
    b. Yes

9. The danger zone is how many feet around the bus?
    a. 2 feet
    b. 10 feet
    c. 50 feet

10. School crossing signs are red and white.
    a. No
    b. Yes

11. When is it <u>best</u> to wear a bicycle helmet?
    a. When riding on mountain trails
    b. When riding on the highway
    c. Whenever you ride your bike
    d. When riding in your neighborhood

12. Car drivers and bicycle riders obey different traffic signs.
    a. No
    b. Yes

13. On a bicycle, you should ride:
    a. Going in either direction
    b. Going in the same direction as traffic
    c. Facing the traffic coming toward you

14. Ammunition for a gun should be:
    a. Stored and locked in a separate place from the gun
    b. Stored close to the gun
    c. Stored in the gun

15. If I see a gun at home or anywhere I should: (***number the choices*** in the order that they should happen)
    ____ Leave the area
    ____ Stop
    ____ Tell an adult
    ____ Don't touch the gun

16. Many children are killed or wounded by guns in their own homes.
    a. No
    b. Yes

17. If you know how to swim, you may swim alone as long as you are careful.
    a. No
    b. Yes

18. Diving into an above ground swimming pool is unsafe.
    a. No
    b. Yes

19. How deep does the water in a pool need to be in order to dive off a diving board?
    a. Just over your head
    b. 7 feet
    c. 12 feet

20. Children riding in a boat with an adult do not need to wear a life jacket.
    a. No
    b. Yes

21. If a person is having trouble in the water, I should:
    a. Call to an adult and throw a line or a preserver
    b. Jump in and swim to the person

22. The brain and spinal cord are connected.
    a. No
    b. Yes

23. If I see a knife in the kitchen or anywhere, I should pick it up and put it away.
    a. No
    b. Yes

24. When playing at the playground, kids should always be courteous and wait their turn.
    a. No
    b. Yes

25. When someone you are playing with wants to do something different than you do, you should try to listen to each others ideas.
    a. No
    b. Yes

26. How often do you do tricks, like hanging by your legs or one arm on the monkey bars?
    a. Never
    b. Sometimes
    c. Always

APPENDIX G

PERMISSION LETTER FROM

SHARP REHABILITATION SERVICES

SHARP. REHABILITATION SERVICES

February 21, 2005

Dear IRB Representative:

On behalf of Sharp Rehabilitation Services, I give my permission for Dorothy Zirkle to use the existing Think First for Kids Longitudinal database for analysis purposes toward her doctoral dissertation.

The data was collected in 2000-2002, and the information is recorded in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.

Sincerely,

Clair Jones
System Director

Leading the Way – From Possibility To Ability

Sharp Cabrillo Campus • Sharp Chula Vista Medical Center • Sharp Coronado Hospital and Motion Center
Grossmont Hospital and Brier Patch Campus • Sharp Memorial Hospital

APPENDIX I

CHARACTERISTICS OF COHORT A

COHORT A

Cohort A students progressed from Grade 1, to 2 to 3 over the course of the 3-year study. As seen in Table 25, a total of 1,838 students participated in Cohort A; 1,253 intervention students and 585 control students. The intervention and control groups were similar in terms of gender (Figure 16). Overall, the majority of the students were White followed by Hispanic and Black (Figure 17). Although the schools were matched on the overall school racial/ethnic composition, missing data on race/ethnicity made it difficult to determine the comparative aspects for individual students limits generalizability of the findings.

Table 25

Cohort A by Grade Level, Group, and Year

		Year			
Group	Grade level	2000	2001	2002	Total
Intervention	1	496	0	0	496
	2	0	407	0	407
	3	0	0	350	350
Total		496	407	350	1,253
Control	1	226	0	0	226
	2	0	194	0	194
	3	0	0	165	165
Total		226	194	165	585

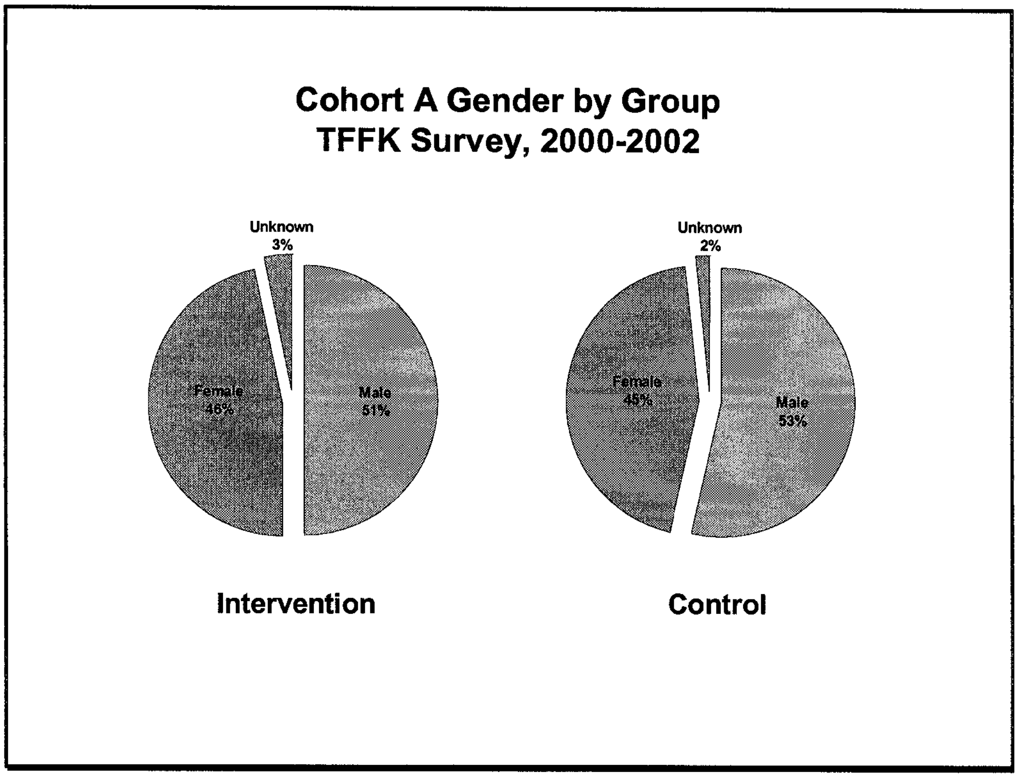


Figure 16. Cohort A gender by group: TFFK Survey, 2000-2002.

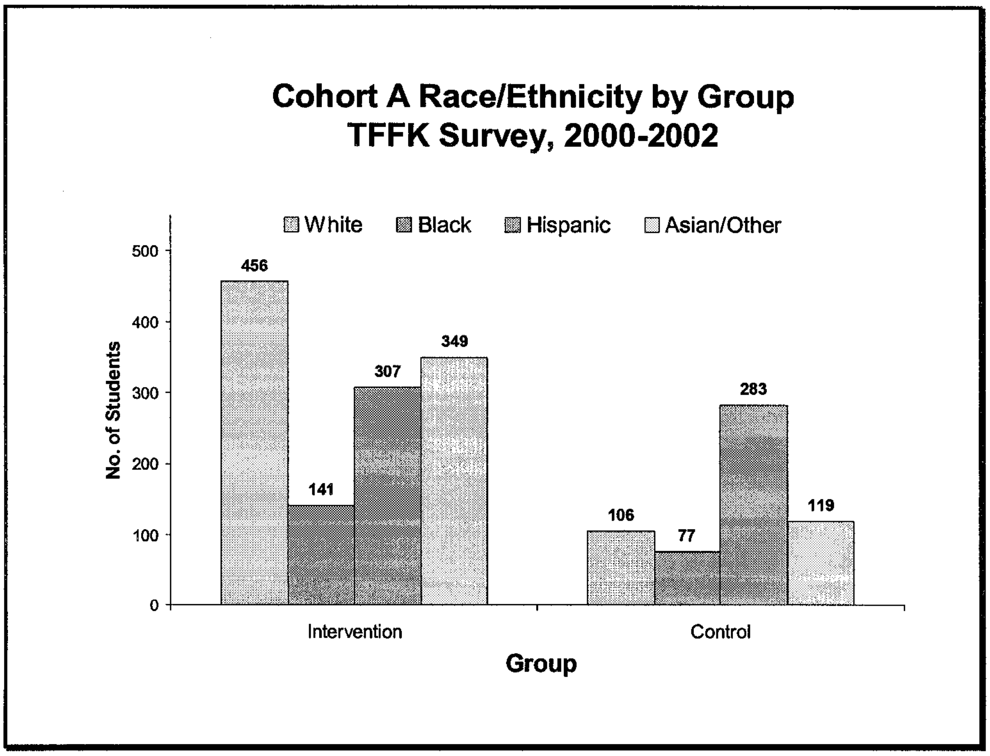


Figure 17. Cohort A race/ethnicity by group: TFFK Survey, 2000-2002.

APPENDIX J

CHARACTERISTICS OF COHORT B

COHORT B

Cohort B students progressed from Grade 2 to 3 to 4 over the course of the 3-year study. As seen in Table 26 and Figure 18, a total of 1,706 students participated in Cohort B; 1,149 intervention students and 557 control students. The intervention and control school students were similar in terms of gender; about 44% female and 51% male, and 4% unknown (Figure 18). The majority of students were White, followed by Hispanic and Black (Figure 19). Although the schools were matched on the overall school racial/ethnic composition, missing data on race/ethnicity made it difficult to determine the comparative aspects for individual students.

Table 26

Cohort B by Grade Level, Group, and Year

		Year			
Group	Grade level	2000	2001	2002	Total
Intervention	2	479	0	0	479
	3	0	350	0	350
	4	0	0	320	320
Total		479	350	320	1,149
Control	2	208	0	0	208
	3	0	161	0	161
	4	0	0	188	188
Total		208	161	188	557

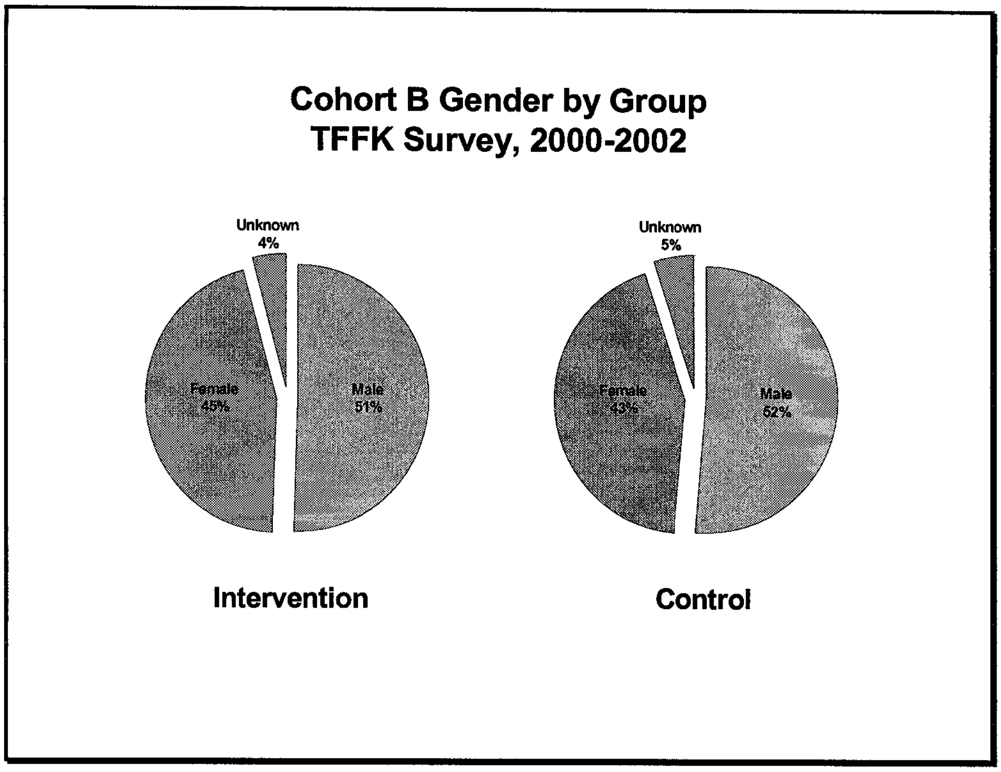


Figure 18. Cohort B gender by group: TFFK Survey, 2000-2002.

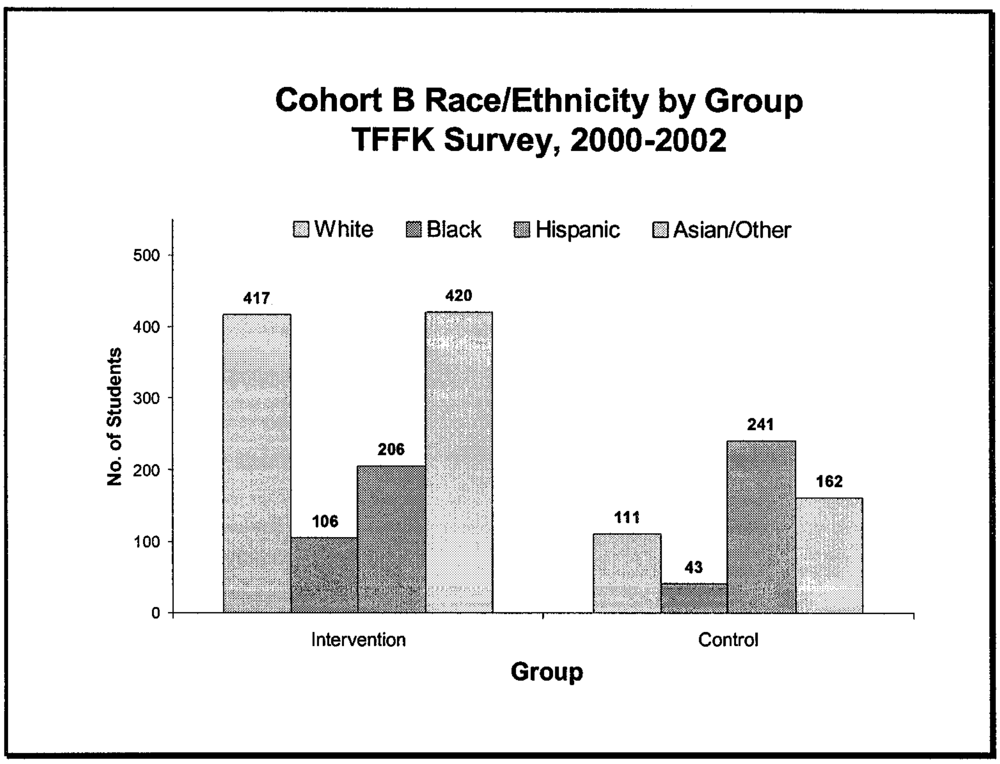


Figure 19. Cohort B race/ethnicity by group: TFFK Survey, 2000-2002.

APPENDIX K

CHARACTERISTICS OF COHORT C

COHORT C

Cohort C students progressed from Grade 3 to 4 over the course of the 3-year study. As seen in Table 27, a total of 648 students participated in Cohort C; 234 action students and 414 control students. The intervention and control school students were similar in terms of gender; about half male and female (Figure 20). The students were mainly White and Hispanic, followed by Black (Figure 21). Although the schools were matched on the overall school racial/ethnic composition, missing data on race/ethnicity made it difficult to determine the comparative aspects for individual students.

Table 27

Cohort C by Grade Level, Group, and Year

		Year		
Group	Grade level	2000	2001	Total
Intervention	3	124	0	124
	4	0	110	110
Total		124	110	234
Control	3	229	0	229
	4	0	185	185
Total		229	185	414

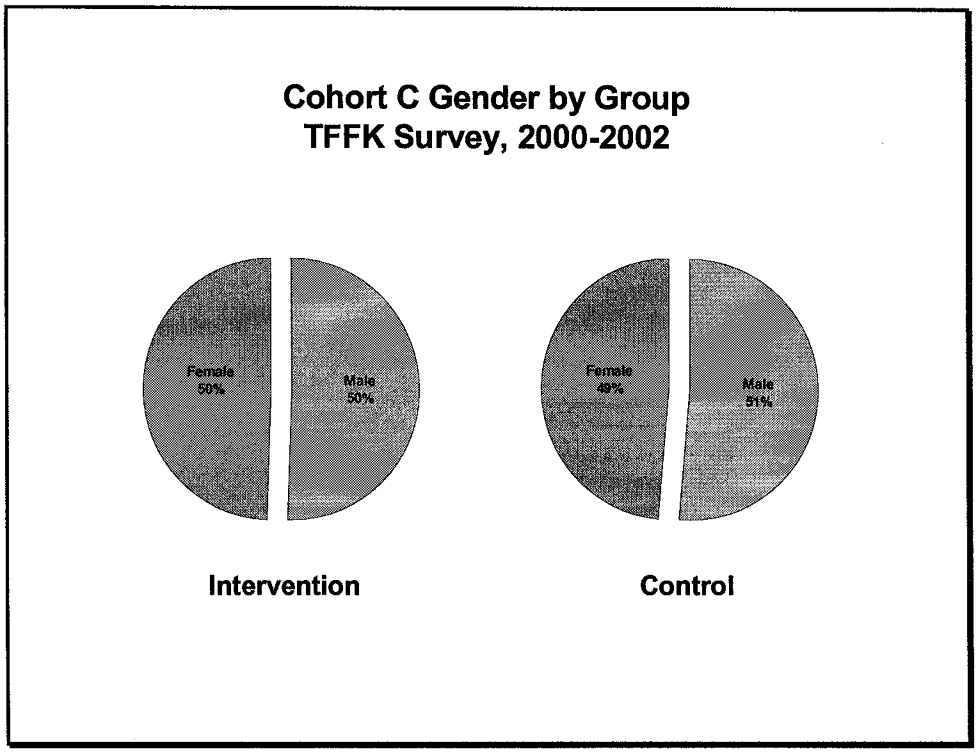


Figure 20. Cohort C gender by group: TFFK Survey, 2000-2002.

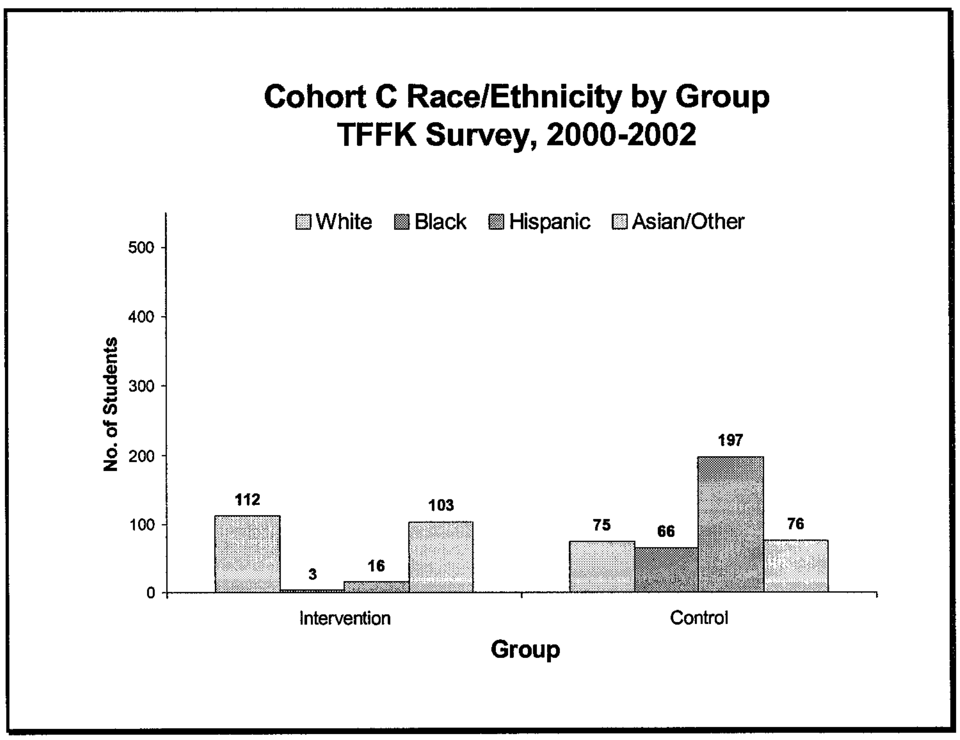


Figure 21. Cohort C race/ethnicity by group: TFFK Survey, 2000-2002.