This is to certify that the
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EVALUATION OF AN INJURY PREVENTION PROGRAM

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MARY J. BARRON

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Crystal Fountain Branta
Major Professor's Signature

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EVALUATION OF AN INJURY PREVENTION PROGRAM

VOLUME I

By

Mary J. Barron

A DISSERTATION

Submitted to
Michigan State University
In partial fulfillment of the requirements
For the degree of

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Department of Kinesiology

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ABSTRACT

EVALUATION OF AN INJURY PREVENTION PROGRAM

By

Mary J. Barron

The purpose of this study was to (a) determine if the time-loss (TLIR) and non-time-loss injury rates (NTLIR) in youth football were decreased by the implementation of an injury prevention program, (b) determine the areas of first aid and injury prevention in which youth football coaches were proficient and lacking (c) evaluate the coaches' opinions of the P.R.E.P.A.R.E. program, and (d) assess the decision making ability of these youth coaches and determine if that ability is altered by taking an injury prevention program.

There was a reduction of some of the injury rates during the 2005 season. The game TLIR and game NTLIR were significantly lower during the 2005 season when compared to previous seasons. This reduction may be due in part to some of the coaches completing the entire P.R.E.P.A.R.E. (PC) program and all of the coaches instituting six elements of the program.

Twenty-five percent of the PCs failed the examination three months after they had completed the program. Apparently some of the information that is gained during the program is not being retained. The areas that those coaches were lacking pertained to: heat and cold illnesses, emergency recognition, and warming up and cooling down techniques. Additionally there were significant differences in the coaches' knowledge as it pertains to adjustment to heat, ideal carbohydrate concentration, seizure, care for adislodged tooth, and length of a cool down based upon coaching group

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The PCs were satisfied with the program. They preferred the web-based delivery method, learned some new information, and felt more prepared to handle emergency situations and prevent injuries. The majority of the PCs were interested in a football specific injury prevention program. The National Center of Sports Safety should continue to pursue the development of sport specific injury prevention programs.

The information gained from this study should be used in the refinement of the P.R.E.P.A.R.E. program, development of a refresher course for coaches to take a year after taking the P.R.E.P.A.R.E. program, and the development of sport specific injury prevention programs. Continued research is needed to determine if the injury rates in youth football are consistently reduced by implementation of the P.R.E.P.A.R.E. program. Further research is needed to examine the impact of coaches taking and implementing the P.R.E.P.A.R.E. program on the reduction of injuries in other youth sports. Additionally, further research needs to be conducted on youth coaches from various other sporting activities.

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ACKNOWLEDGEMENTS

With 24 years of education there are so many individuals to thank, that it is impossible to be able to mention everyone who has helped me along my path. So I will mention the few that have made the biggest impact on my life. To my parents who have at times not understood what I was doing, but none the same still supported me through it all. For my sister who bet me that I would not graduate high school and has been proud of me for everything I have accomplished. By the way, Theresa, I am still waiting for the $100. For my brother, who no matter what, was willing to listen and help out any way he could.

Many thanks go out to my dissertation committee members; Crystal Branta, John Powell, Marty Ewing, Dan Gould, and Kim Maier. Their many hours of help and encouragement were much appreciated. Special thanks to Crystal, who I have probably pushed just about as hard as anyone should ever be pushed. Crystal, you can turn chapters 1-3 around in a day, right? Also for her overall support, encouragement, and caring that she has provided me through the past few years.

It would be unjust not to thank my "Michigan family" and my "Football families" for their love and support. I have learned just as much if not more from them as they learned from me.

For my friends who have provided not only moral support but so much more. Lastly, I want to say thank you to Heidi. I would not have been able to make it through this journey without you. Your friendship, love, and support have lifted me to new highs.

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Lastly I would like to thank the agencies that provided funding for this study; National Athletic Trainer's Association, National Football League Charities, and the Institute for the Study of Youth Sports, Michigan State University. Special thanks to Douglas and Carol Rearick for sponsoring the William Wohlgamuth Endowed Fellowship through the Institute for the Study of Youth Sports.

TABLE OF CONTENTS

CHAPTE
METHOD
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CHAPTER V

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REFEREN

LIST OF TABLES

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Tab

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Table

Table

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Table

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CHAPTER I

Introduction

Overview of the Problem

Participation in organized sports is important in the lives of many children and adolescents. The level of participation in youth sports is astonishing. According to the National Council of Youth Sports (NCYS) (2001), in 2000 there were over 38 million youth involved in some form of sports.

With such a high participation level comes a high frequency of sports-related injuries among children. According to O'Connor (1998), 40% of the injuries that children experienced in 1988 were sports related. The true incidence of sports-related injuries is unknown due to a number of factors such as differences in definition of injury, populations studied, and types of injuries studied. Also, due to the differences in study design and methodology, comparisons of studies need to be interpreted with caution. Generally between 3% and 11% of children are injured each year due to a sporting activity. Most studies have found that boys are at a higher risk of injury than girls (Crompton & Tubbs, 1977; Maffulli & Baxter-Jones, 1995; Zaricznyj, Shattuck, Mast, Robertson, & D'Eilia, 1980), but there are two investigations that have reported similar incidence rates for boys and girls (Castiglia, 1995; Sahlin, 1990). More recently, Maffulli, King, and Helms (1994) found that elite British athletes had an incidence rate of less than 1 per 1000 hours of training.

Youth sport injuries, particularly youth football injuries are serious problems that have not been fully addressed. Nor have strategies to reduce the injury rates been developed and implemented. A few epidemiological studies have evaluated the injury rates in

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rates in youth sports, and a few studies have evaluated the effectiveness of injury prevention programs on injuries in youth sports, but to date a comprehensive study examining the effects of an injury prevention program on the injury rates in youth football has not been undertaken.

The injury rate in youth football is higher than other youth sports. The time-loss injury rate (TLIR) in youth football has been found to be between 8.5-8.8 injuries per 1,000 player game exposures and 0.2-1.0 injuries per 1,000 practice exposures (Stuart Morrey, Smith, Meis, & Ortiguera, 2002; Turbeville, Cowan, Asal, Owen, & Anderson, 2003). The TLIR of youth soccer has been found to be 0.51 per 1,000 hours of exposure. Direct comparison between injury rates per game exposures and per hours of exposure is not ideal but does illustrate the difference in the injury rates between youth soccer and youth football. A youth football game is typically one hour in length, thus the game TLIR rate could also be expected to be approximately 8.5-8.8 per 1,000 hours of exposure. Youth football practice is usually two hours in length so the practice TLIR is approximately .1-0.5 per 1,000 hours of exposure. Time loss (TL) injuries are those injuries in which the child was unable to return to play on the day of injury or on a subsequent day.

What has not been reported is the non-time-loss injury rate (NTLIR) in youth football. Non-time-loss (NTL) injuries are injuries in which the injury did not result in the child missing either a practice or game. The majority of the injuries that occur in sports are NTL injuries. A few examples of NTL injuries are a laceration (not needing stitches), jammed finger, or contusion. NTL injuries require only minor first aid for the child to return to activity.

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The study of NTL injuries is important due to the sheer number of those injuries that youth football coaches are presented. Youth football coaches are likely to realize what to do in the case of a major injury; they realize that they need emergency medical systems (EMS) help. But they are not as well educated on how to handle less severe injuries.

With the high participation rate in youth sports, youth coaches should be educated in injury prevention and first aid techniques. A number of studies have evaluated the first aid and injury prevention knowledge of youth coaches. All of the studies have found a severe lack of first aid and injury prevention knowledge in coaches. Rowe and Robertson (1986) administered a first aid test to Alabama high school coaches; only 27% passed. Rowe and Miller (1991) administered the same test to high school coaches in Georgia, and only 38% of those coaches passed the test. In 1999, Ransone and Dunn-Bennett used the Revised First Aid Assessment (FAA) to assess the first aid knowledge of high school coaches in California. Only 36% of those coaches passed the test, in light of 92% of them being currently certified in first aid. Most recently Barron (2004) found that only 5.17% of youth basketball, soccer, and football coaches passed the FAA.

The results of the studies examining the first aid and injury prevention knowledge of youth coaches demonstrates that they are inadequately prepared to prevent and handle injuries that occur through physical activity. The first person to respond to a youth sporting injury is most likely the coach. Youth sport coaches should know how to handle and treat the injuries that are likely to occur in sports in order to promote the safest venue possible for developing athletes.

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In addition, to evaluating first aid knowledge researchers have evaluated in what situations coaches decide to return an injured athlete to participation. Using the Game Situation Data Sheet (GSDS), Flint and Weiss (1992) assessed the decisions made by high school coaches of when they would return an injured athlete to competition. Coaches were presented with varying game situations (clearly winning, clearly losing, or close game) and differing player status (starter, first off the bench, bench player). Coaches were asked whether they would return the injured athlete to competition. The decision to return an athlete to competition depended upon player status and game situation. In a game situation where the outcome was already determined, coaches were more likely to return a first substitute or bench player than a starter. In a close game situation coaches were more likely to return a starter than a bench player or first substitute. Barron (2004) studied when youth coaches would return an injured youth athlete to competition. Youth coaches were likely to return an injured starter to competition 14.8%, 31.7%, and 45.4% for the game situations of clearly losing, clearly winning, or in a close competition, respectively. In a clearly winning situation or clearly losing situation, 13.4% and 10.9% of coaches, respectively, returned a first substitute. While in a close game situation, 45.3% of coaches would return the first substitute to the game. When the injured athlete was a bench player, coaches were likely to return them 32.7%, 13.4%, and 23.2% of the time in a clearly losing, clearly winning, or close game situation, respectively.

Sporting injuries are not accidents. According to the National Committee for Injury Prevention and Control (1989), a summary definition of an injury would be that an injury is damage or harm to the body resulting in impairment or destruction of health.

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The damage or harm could be the result of thermal, mechanical, electrical, or chemical energy or the absence of essential elements such as heat or oxygen. The main features of injuries are that they are expected, predictable, and avoidable. On the other hand accidents are unexpected, unpredictable, and unavoidable events.

Youth football injuries, just like all injuries are expected, predictable, and avoidable. Because injuries are expected, predictable and avoidable, injury prevention measures can be developed and instituted to reduce their occurrence. Some injury preventive measures have been taken in youth football. Such rules as forbidding spearing and requiring mouth guards have been developed to enhance safety, but these rule changes are not enough. In the ideal world one would prevent injuries from ever happening. There are many ways and techniques that are considered to be factors that would reduce the injury rate in youth football, ranging from better training techniques to better field conditions. One of those potential ways to reduce the injury rate in youth football would be to educate the coaches on injury prevention and first aid techniques.

In 2002 the National Center for Sports Safety (NCSS) along with the National Athletic Trainers Association (NATA) developed a program that solely focuses on first aid and injury prevention. The program is called P.R.E.P.A.R.E. (Pre-plan, Recognize, Emergency Plan, Principles of First Aid, ABCs, Return to Play, and Enjoy). P.R.E.P.A.R.E. is an online sports safety course aimed at educating coaches on how to prevent common injuries, how to recognize symptoms of potentially dangerous conditions, and how to respond in emergency situations.

There are seven modules in the P.R.E.P.A.R.E. program. The first module informs the coach on how to plan and handle emergency situations. The second module

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provides information on environmental conditions such as heat-and-cold-related injuries and proper hydration. The third module helps prepare the coach to evaluate an injured athlete's airway, breathing, and circulation and how to recognize and manage emergency situations in sports. The fourth module covers the handling of special situations, such as seizures, asthma attacks, allergic reactions, diabetic coma, and insulin shock. Basic first aid is the topic of the fifth module. In this section of the program coaches learn the universal precautions for caring for an athlete, how to distinguish between different types of wounds and how to treat those wounds, and the signs and symptoms of wound infections. The sixth module is very important because it deals with the life threatening conditions of injuries to the head and neck. Information is given to the coach on how to recognize and manage head and neck injuries. The last module provides material on warming up and cooling down and how they are important in injury prevention. Contained within this module are examples of warm up and stretching techniques.

The P.R.E.P.A.R.E. program is one of the few first aid and/or injury prevention programs to be offered. Sports First Aid and Safety, offered by the American Red Cross, is an example of another program, but that program and similar programs concentrate on first aid and not on ways in which to prevent injuries from happening in the first place. The P.R.E.P.A.R.E. program covers not only ways in which to treat injuries but how to prevent or minimize the risk of those injuries from happening. Additionally the P.R.E.P.A.R.E. program provides guidelines for return to play. Coaches of all skill levels need to know and can benefit from the information contained within the P.R.E.P.A.R.E. program.

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Need for the Study

To date, no study had been conducted to evaluate the effectiveness of the P.R.E.P.A.R.E. program. The P.R.E.P.A.R.E. program needed to be evaluated for its effectiveness of teaching coaches proper injury prevention and first aid techniques and how that translated into the reduction of injuries seen in youth sports. Additionally no study had examined the coach's opinion of the P.R.E.P.A.R.E. program. The information gained from this study can be used as support for coaching education and for the effectiveness of the P.R.E.P.A.R.E. program. Additionally requirements for coaches to take the P.R.E.P.A.R.E. program can be instituted on the local, state, or national level.

Purpose of Study

The purpose of this study was to assess the effectiveness of the P.R.E.P.A.R.E. program. In order to accomplish this assessment, there were four objectives. The first objective was to measure the effectiveness of the P.R.E.P.A.R.E. program in reducing both TLIRs and NTLIRs. The second was to evaluate youth coaches' P.R.E.P.A.R.E. capabilities, as measured by their scores on the P.R.E.P.A.R.E. examination. The third objective was to measure the coaches' perspectives on the P.R.E.P.A.R.E. program. Coaches provided their perspectives on how satisfied they were with the program overall, how much they learned from the program, if they were interested in a program designed specifically for football, opinion of delivery method, how often they utilized the information from the program, a ranking of each module, how prepared they felt to prevent injuries and handle emergency situations, and their recommendations for the P.R.E.P.A.R.E. program. The fourth objective was to evaluate the effect of participating in the P.I

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in the P.R.E.P.A.R.E. program on a coaches' decision to return an injured athlete to participation as measured by the GSDS.

Continuing Injury Surveillance

In the fall of 2000 a youth football injury surveillance study was started in the Mid-Michigan area. Originally the study was to be conducted for two years, but due to continued interest and resources the study was continued for an additional four years. Therefore, the data from 2000-2004 were available as baseline data for this study.

The study was conducted in the same two Mid-Michigan football programs throughout the six years. One of the programs offers fourth through seventh graders opportunities to play. The other program additionally offers a chance for eighth graders to play. These two programs participate in the Mid-Michigan Pony Football League, Inc.

A wide range of information has been collected throughout this study. Data collected include:

- Height and weight of approximately 1000 boys and girls
- Parental heights
- Player's perceived risk of injury
- Exposure data (number of athletes participating in practices and games)
- Injury statistics (player; date; player position; weather conditions; field conditions; location, type, and severity of injury; and action taken).

Injury statistics were collected and recorded on all injuries that were presented to the Certified Athletic Trainer (ATC), including NTL injuries.

The youth football injury surveillance study was conducted with the aid of four institutions. The first two years of the study were funded by the National Athletic Trainers Association, the third year was completed on a volunteer basis with support from Mich

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from Michigan State University and the two Towns, and the fourth and fifth years of the study were funded by the National Football League (NFL) Charities. The sixth year was funded with remaining monies from the NFL Charities and by the William Wohlgamuth Memorial Fellowship for the Study of Youth Sports (Institute for the Study of Youth Sports, Michigan State University, East Lansing, Michigan).

Research Hypotheses:

1. The game and practice TLIRs in the 2005 football season will be statistically less than the TLIRs during the 2000-2004 football seasons.
2. The game and practice NTLIRs in the 2005 football season will be statistically less than the NTLIRs during the 2000-2004 football seasons.

Research Questions

1. What areas of first aid and injury prevention were coaches' proficient and lacking in as measured by the P.R.E.P.A.R.E. examination?
2. What were the coaches' opinions of the P.R.E.P.A.R.E. program?
3. Did coaches' decisions, as determined by the GSDS data, to return an injured athlete change after taking the P.R.E.P.A.R.E. program?

Overview of the Research Methods

A comparison between the injury rates prior to youth football coaches taking the P.R.E.P.A.R.E. program was made to the injury rates after youth football coaches took the program. During the 2000-2004 football seasons, data on the injury rate and severity of injuries in two Mid-Michigan youth football programs were collected. During the summer of 2005 the youth football coaches from those programs were offered the P.R.E.P.A.R.E. program (free of cost to them). The coaches of those two programs signed a consent form to participate in the study, filled out a demographic information sheet, completed the GSDS, and were given an access code to take the P.R.E.P.A.R.E.

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program. At the end of the season, the coaches completed the GSDS. If a coach did not wish to take the P.R.E.P.A.R.E. program, he/she could have also participated in this study as potential control participants by completing the GSDS two times during the season and taking the P.R.E.P.A.R.E. examination once.

Six elements (emergency action plan; gradual activity plan; water breaks; warm up/stretching; stocked first aid kit; and possession of signs/symptoms/management cards for common sporting injuries) of the P.R.E.P.A.R.E. program were stressed and monitored during the season. These six elements were approved by the presidents of the two programs and support was given for compliance. Even if coaches did not wish to take the P.R.E.P.A.R.E. program, they were required by the program administrators to conduct practice in accordance to the six elements (complete first aid kit, gradual activity, water breaks, and warm up/stretching).

Data on the injury rate and severity were also collected during the 2005 football season. At the end of the season coaches who took the program were asked to complete a survey about their opinions on the P.R.E.P.A.R.E. program. Also at the end of the season coaches who did not take the program took the P.R.E.P.A.R.E. examination. Three months after taking the program those coaches were contacted and took the P.R.E.P.A.R.E. examination a second time. After completion of the season, the injury rates during the 2005 season were compared to the injury rates from the previous five years. The results of the P.R.E.P.A.R.E. examination were compared between the first and second exams for the coaches who took the program and the exam results of the coaches who did not take the program were compared to the second exam results of those that took the program. How the coaches' decisions to return an injured athlete to participation changed after taking the P.R.E.P.A.R.E. program were evaluated. Additionally, the coaches' opinions of the P.R.E.P.A.R.E. program were evaluated.

Limitations

1. The sample is limited to only youth football players and coaches in two Mid-Michigan football programs.

2. The results may only be applicable to youth football players and coaches.

3. Coaches may not use the knowledge that they received from the P.R.E.P.A.R.E. program in the conduct of their practices and games.

4. Coaches may only institute the recommendations and guidelines of the P.R.E.P.A.R.E. program because they are being monitored.

5. The changes in the injury rates may be due to factors other than the P.R.E.P.A.R.E. program.

The changes in the number injuries seen during the 2005 season could be due to other reasons besides the P.R.E.P.A.R.E. program. The natural fluctuation of injury rates may be the reason for the reduction of injuries during the 2005 season. The subject pool varied throughout the six years of this study. It was possible that a group of children that were more injury prone, more reckless, or more/less aggressive participated during one or more of the years of this study. Even though this study is conducted at the group level, if there were dramatic individual differences it could have affected the group level results.

6. A Certified Athletic Trainer (ATC) will be present at all practices and home games. The presence of this individual may lead the coach to just refer all injuries to the ATC to be evaluated instead of dealing with the minor injuries themselves.

The availability of the ATC is limited, due to the number of children participating in the two programs. Through the six years of this study the number of athletes participating in the youth football programs has increased from 346 athletes to 482 athletes. Each year only one ATC was assigned to each program. The coaches who coached t

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coached the previous five years understood that the availability of the ATC had been decreasing through the years. Those coaches also knew, and those new to coaching found out, that at times it may have taken awhile for the ATC to address an injury. It was hoped that the coaches would realize that with their new knowledge they could handle a number of the injuries on their own, without the help of the ATC.

Assumptions

1. Coaches will be truthful with regards to the information that they provide on the demographic information sheet.
2. Coaches will use the information that they received through the P.R.E.P.A.R.E. program while they are coaching.
3. Coaches will be truthful in reporting their decisions on when to return an injured athlete to competition.
4. Coaches will be truthful in reporting their opinions of the P.R.E.P.A.R.E. program.
5. The athletes participated at the same intensity and with the same enthusiasm as the previous five years.

CHAPTER II

Review of Literature

Participation in Youth Sports

In today's society, young male and female athletes can choose from a variety of sport activities. High schools offer as many as 32 male and 27 female competitive scholastic sports. However, high school is not the only level of competitive sports for young males and females.

The level of participation in youth sports has increased dramatically over the years. The National Council of Youth Sports (NCYS) (2001) conducted a study in 1997 of its member organizations. In 1997 approximately 33 million youths were involved in the 52 youth sports organizations that participated. A follow-up study in 2000 found that there were 38.3 million youths involved in the 61 youth sports organizations participating. The level of participation in football is also high. According to Saal (1991) there are approximately 1.5 million athletes playing football each year at all levels.

Benefits and Risk of Participation in Youth Football

Participation in organized sports is an important activity in the lives of many children and adolescents. Participation in youth sports comes with its own benefits and risks. Coaches and parents must be made aware of the potential benefits and risks of youth sport participation so that they can maximize the positives and help reduce the negative aspects of sports. The benefits that have been reported are: regular physical activity; motor skill and physical fitness enhancement; physical/physiological benefits; positive influence on growth, maturation, body mass, and body composition; and the social and psychological benefits (such as self-concept, social competence, moral and ethical competence, learn what is right and wrong, and learn how to play within the rules of the game) (Brown, Clark, Ewing, & Malina, 1998; Malina, 2001). The risks associated with sport participation that were reported are the effects on growth and maturation, psychological stress (such as low self-esteem, elevated anxiety, or possible aggressive behavior), risk of injury, lack of developmentally appropriate programs, potential for child abuse, and the female athlete triad (Brown, Clark, Ewing, & Malina, 1998; Malina, 2001).

Youth football has additional benefits. Due to the various positions and the varying physiques needed to complete a football squad, children of all shapes and sizes have a potential opportunity to play. Children who otherwise would not partake in other sports, due to physique and/or physical abilities, can find a position on a football team suited to their needs. For example, larger youth athletes might find that their physiques are an advantage as linemen or smaller youth athletes might find that their size and speed are advantageous as running backs and defensive corners.

Epidemiology

Epidemiology is the study of the frequency of diseases in specific populations and how those diseases relate to an exposure (opportunity to develop disease). The study of the relationship of an exposure to a disease aids in developing an understanding of how to control that disease. The foundations of epidemiology that have been used in the study of diseases can also be used in the study of injuries.

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Types of Epidemiological Studies

Five general types of epidemiological studies are case-series and population case-series, cross-sectional, case-control, cohort, and trial. Case-series or population case-series studies can be described as a register of cases. Case-series studies are used to study the signs and symptoms and create definitions of diseases/injuries. The aim of a cross-sectional study is to take a snapshot of the health and disease states of a population, or populations, at a defined place and time. Cross-sectional studies are used to measure the prevalence of a disease/injury, determine associations between the disease/injury and other factors, generate/test hypotheses, and evaluate changes in disease/injury rates or measure the effectiveness of an intervention. A case-control study is a comparison of people with the disease or injury to people without the disease or injury. The primary objective of case-control studies is to seek associations between exposure and disease. A cohort is typically a group of people with something in common, most likely an exposure. Cohort studies can be used to study the natural history of a disease, measure the incidence of a disease, link disease to possible causes, and to generate and test hypotheses (Bhopal, 2002, p.233). Lastly, a trial is a type of intervention to improve the health of the population being studied.

Cohort studies can be either prospective or retrospective. In a retrospective cohort all of the exposures and the outcomes (disease/injury) have already occurred. A population is studied to seek who was exposed and who has developed the disease/injury, and whether there is a link between the exposure and the disease. A prospective cohort design is one in which the cohort, the study population, does not have the disease/injury at the beginning of the study. A prospective cohort is a study in which one looks

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forward, not backward as in the retrospective cohort. The advantage of a prospective cohort over a retrospective cohort is the ability to control confounding. In a prospective cohort a group of people are followed for the development of the disease, or in the case of this study an injury. The amount of exposure is recorded and relationships between the exposure and the outcome are able to be calculated as incidence rates. Incidence rates consider not only the outcome, injury, but also the opportunity to be injured (the exposure). Within injury epidemiology incidence rates are also known as injury rates.

The Host, the Agent, and the Environment

Diseases, and for that matter injuries, are the result of three forces coming together at a particular point in time. Those three forces are the host, the agent, and the environment. For example the host could be a running back rushing to the goal line, the agent could be an external force from a linebacker, and the environment could be such that the football game is being played on a muddy field. If these three forces come together at the right time and place an injury may result. An injury, such as a spiral fracture of the running back's tibia because his foot was stuck in the mud and he was rotated when he was hit by the linebacker, can result when those three forces came together. The host and the environment are easily understood forces, but the agent is less understood as a force. In the disease model, the agent is the virus or toxin. In the injury model, the agent is an energy interchange. During the scenario about the running back, the agent was the mechanical energy from the linebacker that was transferred to the running back. The transfer of the energy from the linebacker was greater than the forces that the running back's tibia could withstand, and thus a spiral fracture resulted.

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Studying each aspect, the host, agent, and environment provide information that is utilized to develop measures to reduce the rate of injury. Studying the host provides information as to which sub-groups are at risk. Studying the agent and how the agent is transferred aids in developing strategies on how to control that agent. Lastly by studying the environment, an understanding of which environments aid in the transfer of the agent is developed, so that countermeasures can be taken to reduce the chance of injury from that environment. By studying the relationship of the host, agent, and environment an understanding of the relationship of those three to injury is developed.

Injuries

In epidemiology, the words injury and accident were once used interchangeably. Within the last two decades the term "injury" has been separated from the term "accident." The definition of injury and accident are complete polar opposites. Many people, groups, and committees have provided a definition of the word injury (Gordon, 1949; Haddon & Baker, 1981; National Committee for Injury Prevention and Control, 1989). A summary definition would be that an injury is damage or harm to the body resulting in impairment or destruction of health. The damage or harm could be the result of thermal (high heat index), mechanical (stretching of tissue), electrical (lightning strike), or chemical (poisonous gases) energy or the absence of essential elements such as heat or oxygen. The main features of injuries are that they are expected, predictable, and avoidable. On the other hand accidents are unexpected, unpredictable, and unavoidable events.

The main reason for keeping the terms "injury" and "accident" separate lies in the contrasting definitions. Accidents are unexpected events (no one knows why accidents happen).

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happen), nor can accidents be predicted (no one knows when an accident will occur), and lastly accidents are unavoidable (there is nothing that can be done to prevent their occurrence). Because accidents are unexpected, unpredictable, and unavoidable, a control program cannot be developed to counteract these events. Injuries on the other hand, are expected to happen; they may be predicted as to when/where/who are going to be injured, and lastly, they may be avoided or prevented. Because injuries are expected, predictable, and avoidable, injury control programs can be developed to limit or reduce the risk of injury.

Traumas related to youth sports are injuries, not accidents. By being defined as an injury they are expected, predictable, and avoidable/preventable. By such, an intervention program can be used to reduce the injury rate in youth sports.

Youth Football Injuries

Incidence of Injury in Youth Football. To date there have only been a few published studies that have examined injuries in youth football. The results of the data from those studies are presented in Table 1. All of those studies were observational cohorts that were conducted for one or two years. In the studies that were evaluated, youth participants were defined as children between the ages of 9-15. Radelet, Lephart, Rubinstein, and Myers (2002) classified youth participants to be as young as seven.

Table 1

Studies Examining Injury Rates in Youth Football

Table 1

Studies Examining Injury Rates in Youth Football

	Study Design	Number of injuries /players	Definition of Injury	Measurement of Exposure	Data Collection Method	Injury Rate
Roser & Clawson (1970)	Prospective cohort (9-15 years old)	48/2079 7 (15%) less than 1 week 16 (35%) up to 3 weeks 7% >3 weeks 20 (43%) remainder of season	Time loss (any injury severe enough to require missing practice or game)	Estimated by the number of players multiplied by number of hours of practice and games	Questionnaire completed by coach	2.3% injured
Goldberg, Rosenthal, & Nicholas (1984)	Prospective cohort (9-14 years old)	67/436 42 (63%) minor 18 (27%) significant	Time loss (greater than or equal to one day)	None	Questionnaire completed by league personnel	15.4% injured
Linder, Townsend, Jones, Balkcom, & Anthony (1995)	Prospective cohort (11-15 years old)	55/340	Time loss (removal from or missing subsequent practice or game)	None	Coach	16% injured

Table 1 continued

Studies Examining Injury in Youth Football

Table 1 continued

Studies Examining Injury in Youth Football

	Study Design	Number of injuries /players	Definition of Injury	Measurement of Exposure	Data Collection Method	Injury Rate
Stuart et al. (2002)	Prospective cohort (9-13 years old)	55/915 55 (93%) mild 4 (7%) serious	Time loss (remainder of game), attention of a physician, all concussion, dental, eye, and nerve injuries	Individual player game participation, number of plays/game for each team	Physician examination	8.5 injuries per 1,000 player-games 0.2 injuries per 1,000 player plays
Radelet et al. (2002)	Prospective cohort (7-13 years old)	129/252 13% serious injuries	Injury that brought a coach onto the field to check the condition of a player, or one in which a player was removed from participation, or one in which a player needed any type of first aid during an event	Number of players multiplied by the number of games and practices	Coaches	1.5 per 100 AE overall 4.3 per 100 game AE 0.7 per 100 practice AE

Table 1 continued

Studies Examining Injury in Youth Football

Table 1 continued

Studies Examining Injury in Youth Football

	Study Design	Number of injuries /players	Definition of Injury	Measurement of Exposure	Data Collection Method	Injury Rate
Turbeville et al. (2003)	Prospective cohort (10-15 years old)	64/646 57 (89%) <1 game 7 (11%) >3 games	Time loss (missing practice or game or a head injury with impairment consciousness)	Estimated collective exposure (total number of players X total number of practices and games	Coach or athletic trainer report	8.8 injuries per 1,000 game exposures 1.0 injuries per 1,000 practice exposures

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Only three of the studies collected data on exposure (opportunity to be injured), thus only those three were able to calculate injury rates. The studies by Stuart, Morrey, Ssmith, Meis, and Ortiguera (2002) and Turbeville, Cowan, Asal, Owen, and Anderson (2003) report similar injury rates for games, 8.5 and 8.8 injuries per 1,000 player games, respectively. Radelet, et al. (2002) found a higher game injury rate, 43 per 1000 game athlete exposures (AE). Turbeville et al. (2003) found the practice injury rate to be 1.0 per 1000 practice AE. While Radelet et al. (2002) found a much higher practice injury rate, 7 per 1000 practice AE during practices.

The reason for these differences lies in the definition of an injury used in the study. The study conducted by Stuart et al. (2002) and Turbeville et al. (2003) used similar injury definitions. Their definition involved a time-loss component, meaning that the child was unable to return to play (on the day of injury or subsequent day) after suffering from an injury. Both studies also included head injuries (concussions) as part of a reportable injury. The study by Radelet et al. (2002) had a much broader injury definition: "A reportable injury was defined as an injury that brought a coach onto the field to check the condition of a player, or one in which a player was removed from participation, or one in which a player needed any type of first aid during an event" (p. 2). With a broader injury definition, there will be a higher reported injury rate.

Even though the studies conducted by Stuart et al. (2002), Radelet et al. (2002), and Turbeville et al. (2003) did collect exposure data, they were not without faults. In the study conducted by Stuart et al. (2002) six of the youth football players did not participate in the study. Those six athletes were included in the exposure counts but not in the frequencies of injuries. In order to have a full understanding of the injury rate one mus

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must include all of the injuries suffered by all of the participants or exclude those whose parents did not wish to participate in the study. Additionally, the classification of severity in the Stuart et al. (2002) study combined non-time-loss (NTL) injuries with injuries in which athletes were expected to return to football within three days and labeled those injuries as mild injuries.

Similar to the Stuart et al. (2002) study, the Turbeville et al. (2003) study did not examine all of the athletes who were on the teams. Youth football players were eligible to participate in the Turbeville et al. (2003) study if they were on the football team roster and were present on the day that baseline measurements were collected. Thus, there were some youth football players on those teams who were not participating in the study. To compute the total number of game athlete exposures (AE), they multiplied the total number of players on a team by the number of games in the entire season. Similarly, for the total number of practice AEs, they multiplied the total number of players by the number of practices per week for the entire season. Additionally, the researchers did not take into consideration that there may be some days in which some of the youth football players may not be present at a game or practice. Turbeville et al. (2003) included all of the athletes in the exposure count and did not take into consideration absenteeism.

Youth coaches are not the optimal data recorders, but were used by Radelet et al. (2002). Youth coaches have a lot of things to attend to during practices and games. They have to plan and conduct practices, teach the athletes the rules of the game and how to play the game, and make sure that all of the athletes are getting the required amount of playing time to name a few of the things that a youth coach has to do on a daily basis. On top of that they were to record all of the injuries for which they had to come onto the field to assist an a

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to assist an athlete or any time they provided any type of first aid to an athlete. Due to the demands on a youth coach, there was a high likelihood that there would be inaccurate data recording in a situation such as the one described. Additionally, for teams whose coaches did not participate on a regular, basis the researchers attended practices and games and recorded the data. There may have been a difference in the reporting styles of the coaches and the researchers. The researchers had no other team responsibility, unlike the coaches, and thus were able to pay more attention to the recording of the injuries. The researchers were also there to "check the accuracy of data from reporting coaches at those games." Radelet et al. (2002) made mention that a comparison of coach-reported/researcher-reported data for the same events would have helped to assess the accuracy in which the coaches were reporting the injuries. They failed to do such a comparison, stating that it was beyond the scope of the article. To date there has been no published articles by Radelet et al. (2002) reporting on whether there were are significant differences in the injury reporting rates of youth coaches and the researchers that conducted the study.

The study conducted by Radelet et al. (2002) had a small sample size. There were only 252 youth football players who participated in that study. The study conducted by Turbeville et al. (2003) had 646 participants and Stuart et al. (2002) reported 915 youth football players in their study. With such a small sample size, the ability to generalize of the results from the Radelet et al. (2002) study is limited.

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Youth Football Injury Severity. Except for the study conducted by Roser and Clawson (1970), the majority of the injuries reported for youth football players were minor or mild. Most of the studies considered minor or mild injuries to be injuries in which the child was able to return to play within seven days following the injury. Roser and Clawson (1970) do not give any speculation on why in their study there was such a high percentage of severe injuries. As of yet the non-time-loss (NTL) injury rate has not been reported in any published study. This information may prove to be important because coaches are more likely to see NTL injuries while coaching youth football than they are time-loss (TL) injuries.

Common Types of Injuries and Injury Location in Youth Football. The majority of the studies concur on the common types of injuries and injury location. The most common types of injuries are contusions, strains/sprains, and fractures. The most common injury locations are the knee, ankle, and arm/hand. Attention needs to be drawn to the fact that these are the most common types and locations of reportable injuries or TL injuries. There are many injuries that do not fit the definition of a reportable injury (injuries in which a child is able to return to activity without any restrictions). If information on non-reportable injuries were to be collected, the most common injury type probably would be contusions; while the knee and hand/arm would be the most often injured site.

Injury Rates and Age/Weight/Maturity/Experience. The relationship of injury to age, weight, maturity, or experience has been examined by a number of studies. Goldberg, Rosenthal, and Nicholas (1984) and Roser and Clawson (1970) found that age did not seem to be a predisposing factor for injury. Goldberg, Rosenthal, and Nicholas

(1984) found that in the midget division (the oldest and heaviest division) the heaviest players had an increased incidence of injury ($p < 0.001$). In the univariate analysis Turbeville et al. (2003) found that injured players were significantly bigger, but when controlling for strength and experience, size was not significantly different for injured versus non-injured players. Roser and Clawson (1970) did not find any indication of an increased risk of injury with increasing weight. Linder et al. (1994) examined the injury rates in youth football and their relationship to sexual maturity. Utilizing Tanner stages of maturity, Linder et al. (1994) found that more mature players had a higher injury rate than less mature players ($p = 0.03$). Turbeville et al. (2003) found that experience was a significant predictor of injury when controlling for strength and size. The odds of injury increased by 53% for more experienced players (OR = 1.53; 95% CI = 1.03-2.26). Turbeville et al. (2003) speculated that experience was a surrogate for the amount of exposure time or athleticism. They believed that the more athletic and experienced players were likely to play more than one position and be in more plays, thus they would have a higher opportunity for injury.

Risk Factors for Injury in Pediatric Sport

Risk factors for injury in pediatric sports can be broadly classified as extrinsic or intrinsic and non-modifiable or potentially modifiable. Extrinsic factors are outside of the athlete, for example, weather or field conditions. Intrinsic factors pertain to factors that are within the participant, such as age and weight. Non-modifiable risk factors are those that cannot be altered, such as the weather or the time of season or day. Potentially modifiable risk factors are those that can be altered by an injury prevention program to re

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reduce injury rates, for instance fitness level, flexibility, and strength. Table 2 presents a list of non-modifiable and potentially modifiable extrinsic and intrinsic risk factors.

Table 2

Non-modifiable and Potentially Modifiable Extrinsic and Intrinsic Risk Factors

Extrinsic Risk Factors	Intrinsic Risk Factors
Non-modifiable	*Non-modifiable*
Sport played (contact/non contact)	Previous injury
Level of play (recreational/elite)	Age
Position played	Sex
Weather	
Time of season/Time of day	
Potentially modifiable	*Potentially modifiable*
Rules	Fitness level
Playing time	Preparticipation sport specific training
Playing surface	Flexibility
Equipment (protective/footwear)	Strength
	Joint stability
	Biomechanics
	Balance/Proprioception
	Psychological/Social factors

Maffulli & Caine (2005)

Preseason training is one of the most powerful potentially modifiable risk factors. Upton, Roux, and Noakes (1996) found that less than 40% of high school rugby players did any preseason conditioning. A number of studies (Cahill, & Griffith, 1978; Lysens, Steverlynck, va den Auweele, Lefevre, Renson, Clasessen, et al., 1984; Heidt, Sweeterman, Carlonas, Traub, & Tekulve, 2000; Jung, Rosch, & Peterson, 2002; Wedderkopp, Kaltoft, Lundgaard, Rosendahl, & Froberg, 1999) have found that high injury rates may be related to a decrease in endurance and or strength that is associated with limited preseason training in youth athletes. Jung, Rosch, and Petereson (2002) also foun

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found that low-skilled players may benefit more from training programs than higher-skilled players.

First Aid Knowledge of Youth Coaches

Because children are under the supervision of youth coaches for such an extended amount of time, these coaches should be trained in basic first aid and injury prevention. Moreover 85% of coaches are parents or others who have no formal training in how to coach (Engh, 1981). The National Youth Sports Safety Foundation (NYSSF), (Coaching Education, 2000) states that there are no federal laws requiring coaching education at any level of competition. Except for a few states, there are no laws that require youth coaches to undergo any formal training on how to coach, teach, develop training sessions, or prevent, recognize, and treat injuries.

To date there has been only one study that has evaluated the first aid and injury prevention knowledge of youth coaches. Barron (2004) conducted a study that examined the first aid and injury prevention knowledge of youth basketball, football, and soccer coaches using the Revised First Aid Assessment (FAA). Fifteen coaches (5.17%), out of 290, earned a passing score (range 31 – 33). A score of 31 (80%) or higher is required to pass the FAA. Of these 15 coaches nine coached football (3.81%), one coached basketball (2.86%), and five coached soccer (26.32%). Of the 15 coaches who passed the FAA, 13 coaches were male, one was female, and one gender was not reported. Twelve (80%) coaches reported having some form of formal first aid training, nine (60%) reported having been trained in CPR, and five (33%) reported being currently first aid or CPR certified.

Youth coaches on average knew approximately two-thirds of the material covered by the FAA. The questions on the FAA were broken down into five constructs: Injury prevention, injury identification/general medical knowledge, CPR, injury management, and wound care. Coaches on average answered correctly 77% of the injury prevention questions, 52% of the injury identification/general medical knowledge questions, 58% of the CPR questions, 70% of the injury management questions, and 78% of the wound care information questions.

The first aid knowledge of the youth coaches, by sport coached, differed for the injury identification/general medical knowledge construct only. The difference was only found for football ($M = 4.82$) and soccer ($M = 5.95$) coaches. No difference was found between football and basketball coaches or between basketball and soccer coaches, additionally no other knowledge differences were found.

Of the 150 coaches who completed the demographic sheet, only twenty-one (12.4%) reported being currently first aid certified. Of those 21 coaches only five passed the FAA. Additionally possessing current first aid certification significantly improved one's score only on the wound care construct.

Similar results have been found in previous investigations of high school coaches. Ransone and Dunn-Bennett (1999) reported having a higher percentage of coaches passing the FAA. Thirty-eight (36%) of the 104 coaches that participated passed the FAA. Of those 104 high school coaches 96 (92%) were currently certified in first aid, as required by California law. In 1986 Rowe and Robertson developed and administered a first aid test to Alabama high school coaches. Only 34 (27%) of the 127 coaches tested earned a passing score. In 1991 Rowe and Miller administered the same test to Georgia high school coaches. Fifty (38%) of the 130 Georgia high school coaches passed the first aid test, in light of 116 (89%) of the coaches having current first aid certification.

Decision Making of Coaches

Decision Making of High School Coaches

In many cases coaches will be determining if an injured athlete is to return to competition. Flint and Weiss (1992) assessed the decisions made by high school basketball coaches about returning an injured athlete to competition, using the Game Situation Data Sheet (GSDS). Coaches were presented with varying game situations (clearly winning, clearly losing, or close game) and differing player status (starter, backup, bench player). Coaches were asked whether they would return the injured athlete to competition. The decision to return an athlete to competition depended upon player status and game situation. In a game situation where the outcome was already determined coaches were more likely to return a backup or bench player than a starter. In a close game situation coaches were more likely to return a starter than a bench player or back up player. Also utilizing the GSDS, Ransone and Dunn-Bennett (1999) studied the decision making of high school coaches from 15 different sports. For seven of the nine game situations, 75% of the coaches chose to return the athlete to play. However, when presented with a situation in which a starting player is injured and the team was down by five points only 63% of the coaches returned the player. When presented with an injured backup player in a game that is close but their team is winning, only 58% of the coaches returned the player.

Decision Making of Youth Coaches

In previous research, football, basketball, and soccer coaches returned injured youth athletes 25% of the time when they needed to make the decisions to return or not return the athlete (Barron, 2004). Coaches varied considerably based upon game situations when deciding to return a starter to play. In a game that the team was clearly winning, 31.7% of the coaches returned the starter; while when the team was clearly losing the game, only 14.8% of coaches returned the starter. However, when the game situation had their team down by five points, 45.4% of the coaches returned the starter. In a clearly winning situation or clearly losing situation, 13.4% and 10.9% of coaches, respectively, returned a backup player. Similar to the close game situation with a starter, 45.3% of coaches returned a backup player when it was a close game situation. Coaches' decisions to return a bench player varied based upon game situation and varied from the decisions made for starters and backup players. In a game that the team is clearly winning, 13.4% of the coaches returned an injured bench player, while in a game that the team is clearly losing, 32.7% of the coaches returned an injured backup player. When the game situation had the team down by four points, 23.2% of coaches returned an injured back up player. The percentage of coaches that returned an injured athlete to play varied not only by the game situation but the type (starter, backup, or bench player) of athlete involved.

Coaches' Liability

Youth coaches and youth organizations are placing themselves at risk for liability lawsuits. Youth coaches are liable for taking care of the young athletes under their supervision, including any injuries. One of the primary duties of a youth coach is to minimize the risk of injury of the participants. According to McCaskey and Biedzynski (1996) case law and legal writings have established that the following are the duties of a coach: (a) supervision; (b) training and instruction; (c) ensuring the proper equipment; (d) providing competent and responsible personnel; (e) warning of latent dangers; (f) providing prompt and proper medical care; (g) preventing injured athletes from competing; and (h) matching athletes of similar competitive levels.

There are a number of examples of coaches violating one of the eight duties. In Duda v. Gaines (1951), a high school coach was found negligent for improper care when a football player dislocated his shoulder (Shroyer, 1982). Rather than summoning emergency medical services, the coach relocated the shoulder. Three days later the child's shoulder dislocated again, causing more damage than the first dislocation. Mogabgab v. Orleans Parish School Board (1970) found that two football coaches were responsible for the death of an athlete for failure to provide prompt and proper medical care (McCaskey & Biedzynski, 1996). In the 1975 Thompson v. Seattle Public School District case, Thompson was awarded $6.4 million because the high school coaches did not warn him of the dangers of participating in football and for teaching improper tackling techniques (Lubell, 1987). As a result Thompson was left as a quadriplegic. Such cases could also occur at the youth level.

Several states have enacted "volunteer statues" to protect volunteer coaches from liability for injuries due to negligence in connection with their coaching activities (Hurst & Knight, 2003). Many of these statues only apply to volunteer coaches. Additionally some statues, like that found in the state of New Jersey, require that coaches undergo some form of training. The New Jersey Minimum Standards for Youth Coaches Safety

Orientation and Training Skills Programs identifies the topics that must be covered in order for a coaching/managing/officiating programs for safety orientation and training skills programs (Youth Sports Research Council, n.d.). First the program must be at least three hours in length and the coach must receive a certificate of proof of attendance. There are five areas that need to be addressed within the orientation and training skills program: medical, legal, and first aid aspects of coaching; training and conditioning of athletes; psychological aspects of coaching; general coaching concepts; and general officiating concepts. There are a number of topics within each area that need to be covered, for instance in the medical, legal, and first aid aspects of coaching all of the following need to be covered: legal and ethical responsibilities of the coach; recognizing common sports injuries specific to the athletes' coaches; safety plans and procedures for injury prevention; safety issues specific to athletes served; plans and procedures for emergencies, and care and treatment of injuries associated with athletic activity. If a coach, in New Jersey, attends a program that covers all of these topics they have civil immunity.

Injury Prevention

Haddon and Baker (1981) explained that the host, agent, and the environment could be analyzed in terms of a preinjury phase, an injury phase, and a postinjury phase. During the preinjury phase, primary injury preventative measures can be instituted to reduce the likelihood of an injury. Secondary injury preventative measures are instituted during the injury and are used to reduce the severity of the injury. The postinjury phase is when tertiary prevention measures are used to reduce the effects of an injury. Tertiary injury prevention methods are applied after the injury but are used to enhance the outcome of the injury. Haddon's Matrix visually depicts the relationship of the host, agent, and environment and the preinjury, injury, and postinjury phases. Table 3 from the Prehospital Trauma Lift Support: Injury Prevention Lecture by the National Association of Emergency Medical Technicians, illustrates the relationship of the host, agent, and environment in the varying phases of injury for a child who drowns in a pool at their house.

Table 3

Example of Haddon's Matrix

	Preinjury	Injury	Postinjury
Host	Poorly developed motor control	Cannot swim	Not breathing
Agent	Water left in the pool	Water above the victims head	No one knew CPR
Environment	No barrier device around the pool	No one near the pool to hear the victim fall in or struggle	First Responders and EMS cannot find the house

Prehospital Trauma Life Support: Injury Prevention

General Principles of Injury Prevention

Injury prevention techniques can be instituted for any of the three phases of injury (preinjury, injury, or postinjury) and for any of the contributing factors (host, agent, or environment). According to Haddon and Baker (1981) there are 10 basic approaches or countermeasures that would prevent or interrupt the transfer of energy:

1. Preventing the creation of the hazard
2. Reducing the amount of energy within the hazard

3. Preventing the release of the hazard
4. Modifying the rate of distribution of the hazard
5. Separating the hazard in time or space from those to be protected
6. Separating the hazard from those to be protected by a barrier
7. Modifying the relevant basic qualities of the hazard
8. Increase resistance to the hazard
9. Countering the damage already done by the hazard
10. Stabilizing, repairing, and rehabilitating the individual damaged

These basic countermeasures are not specifically connected to the different phases, but rather the preventative measures can be instituted throughout the injury process. For instance, using the drowning example presented in Table 4 the hazard could have been prevented with the addition of a fence around the pool. Such an environmental preventative measure would take place in the preinjury phase. The following would be examples of how three of the ten countermeasures could be related to the athletic world: provide age appropriate conditioning drills for youth athletes (prevent the creation of the hazard), ensure proper use of all safety equipment (separating the hazard from those to be protected by a barrier), or have the injured athlete fully rehabilitated prior to his/her return to activity (stabilizing, repairing, and rehabilitating the individual damaged).

The Three Es

The three Es of injury prevention are: Education, Engineering, and Enforcement (National Committee for Injury Prevention and Control, 1989). Education has been the mainstay of injury prevention efforts since the beginning of injury preventative measures. Educational efforts have changed through the years, but the three basic sequential goals of education injury prevention have remained the same. The first goal, to provide information, is to help people understand the risks and how to avoid those risks. Changing attitudes towards risky behaviors is the second goal of educational injury prevention strategies. No matter how much information is given to people, if they do not understand how that information fits into their daily lives it is useless. Many injuries result not from a lack of knowledge but rather from failure to apply that knowledge (Committee on Trauma Research, 1985). The third goal of educational injury prevention is to alter behaviors. Now that a person has the knowledge and understands how it relates and affects them they need to believe in the preventative measures. A classic situation of education was the seat belt campaign of the 80s and 90s. There were countless television ads explaining that using seat belts could save lives.

In the early 2000s to the present time there has been another injury prevention strategy to increase the use of seat belts, the "Click it or Ticket" campaign. The "Click it or Ticket" campaign is an example of an enforcement/enactment strategy. Local, state, or federal laws are enacted to help reduce the risk of injury. Persons violating those laws will be punished through the legal system. The athletic world has similar rules and regulations that have developed through the years. For instance, the requirement of football players to wear mouth guards is an enforcement/enactment injury prevention technique. If an official sees a football player not wearing a mouth guard, his/her team will be assessed a 5 yard penalty. The development and enactment of new rules in a sporting event takes time, but their impact is greater than those from education.

New protective measurements are always being engineered. These protective measurements are an effective way to reduce the transfer of energy to the host. Examples of engineering protective measurements are the new generation of football helmets, softer baseballs/softballs, and age and size appropriate sporting equipment.

According to some, like the American College of Surgeons Committee on Trauma (n.d.), there is a fourth E, economic incentives and penalties. When costs act as a barrier, economic incentives and penalties can be used to aid in the access to such items. The classic example deals with child restraint seats. In low socioeconomic areas child restraint seats can be either offered at a reduced rate (via a coupon) or offered free to those that are in need.

Coaching Education

Coaches in youth leagues are most often volunteers who have little education on strength and conditioning, injuries, and how to treat injuries. According to the National Youth Sport Safety Foundation (NYSSF), "less than 10% of the two and a half million volunteer coaches, and less than one-third of the interscholastic coaches in the United States have had any type of coaching education" ("Did You Know," 2000). These coaches very rarely are given any educational background on how to conduct conditioning and practice. This lack of training could result in injuries. These coaches are not educated on how to condition and train an athlete, nor do they know about injury prevention, detection, and treatment of injuries. According to Stanitski (1989), the ignorance of the types of injuries or inability to recognize injuries other than grossly incapacitating ones are commonly seen in volunteers or even supposedly trained coaches.

Injury prevention is just as important as first aid care. Courses such as the American Red Cross Basic First Aid, Community First Aid, and First Aid with CPR do not address the issue of injury prevention. Youth coaches may be putting their athletes in

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undue risk by the way they conduct practice. From the type of drills they conduct, the amount of time they have the athletes do the drills, or to how many water breaks they provide for the athletes, coaches may put the athlete at risk of injury. Over the years it has been determined that some drills that were done in the past are not safe. Youth coaches who have no formal training on how to coach, will rely on how they were coached, as a result they might have the athletes perform unsafe drills. Having the athletes do repetitive movements (drills) may put the athlete at risk for an overuse injury. Overuse injuries are injures that require a lot of time, patience, and proper technique to heal. Some coaches use water breaks as rewards for their team performing well. Thus, if their team is not performing well, they will not get a water break. Such punishment puts the athletes at risk of heat and hydration illnesses.

Prevention Programs

The need for the development of a first aid and injury prevention program for youth sports, or the increase in education for coaches, parents, and participants has been documented (Antich, Clive, & Brewster, 1985; Congeni, 1994; Stanitski, 1993; Wall, 1998; Wells & Bell, 1995; Whiteside, Andrews, & Fleisig, 1999). A number of groups have developed coaching education plans/programs that contain sections on first aid and injury prevention, but it was not until recently that a comprehensive program devoted solely to first aid and injury prevention was developed.

Those groups that have developed programs are the National Youth Sports Coaches Association (NYSCA), Human Kinetics, Institute for the Study of Youth Sports, Little League Baseball, and the National Center for Sports Safety (NCSS). The topics covered by these organizations range from just coaching techniques to an all inclusive experience covering a number of different topics such as; injury prevention, first aid, conditioning, and organization and administration.

The National Youth Sports Coaches Association's (NYSCA) offers an "e-learning experience" called the Gold Level Certified Coach Online Course. The goal of NYSCA's program is to help coaches obtain a higher level of education. The course covers eight key topic areas: Philosophy & Ethics, Sports Safety and Injury Prevention, Physical Preparation and Conditioning, Growth & Development, Teaching & Communication, Organization & Administration, Skills & Tactics, and Evaluation. Additionally NYSCA boasts that there is a skills and drills section with over 430 links to websites covering 21 sports. The cost of this e-learning experience is $60 in addition to the $20 membership fee.

The Institute for the Study of Youth Sports of Michigan State University, East Lansing, MI offers a coaches education program called PACE (Program for Athletic Coaches' Education). PACE is a 12-hour program that covers a wide array of topics, after the program coaches are given a test and upon passing the test coaches receive certification. Some topics that are covered during the PACE program are Legal Responsibilities of a coach, Emergency Procedures for Victims of Accidents and Injuries; Essential Medical Records for Interscholastic Athletes; Prevention, Care and Rehabilitation of Sports Injuries; Planning, Conducting and Evaluating Effective Instruction; Physical Conditioning and Contraindicated Activities; Motivating Athletes; and Positive Coaching.

There are other injury prevention programs that are designed for the reduction of specific injuries or injuries in specific sports. Little League Baseball provides training for coaches in the areas of teaching skills and understanding child psychology (Quain, 1989). The American Coaching Effectiveness Program (ACEP) program deals with the physiological and psychological aspects of youth and sports medicine (Quain, 1989). The Sport Injury Prevention Program (SIPP) is designed to reduce anterior cruiciate ligament injuries in females. The American Academy of Orthopedic Surgeons offer tips to prevent volleyball, tennis, swimming, gymnastics, soccer, basketball, and baseball injuries on their website. USA Football provides numerous links to injury prevention and injury care topics on their web-site.

The American Sport Education Program offers a number of courses. One such course is about sport first aid. The focus of this program is on how to prevent sport injuries and to make the correct decisions during on-field emergency situations. This particular program is designed for coaches with athletes aged 14 and up.

In the summer of 2002 the National Center for Sports Safety (NCSS), along with the National Athletic Trainers Association (NATA) and other top medical and safety experts, developed an injury prevention and first aid program entitled P.R.E.P.A.R.E. (Pre-plan, Recognize, Emergency Plan, Principles of First Aid, ABC's, Return to Play, and Enjoy). P.R.E.P.A.R.E. is an online sports safety course aimed at educating coaches on how to prevent common injuries, how to recognize symptoms of potentially dangerous conditions, and how to respond in emergency situations. The cost of the P.R.E.P.A.R.E. program is $28 per coach.

There are seven modules in the P.R.E.P.A.R.E. program. The first module informs the coach on how to plan and handle emergency situations. The second module provides information on environmental conditions such as heat-and-cold-related injuries and proper hydration. The third module helps prepare the coach to evaluate an injured athlete's airway, breathing, and circulation and how to recognize and manage emergency situations in sports. The fourth module covers the handling of special situations, such as seizures, asthma attacks, allergic reactions, diabetic coma, and insulin shock. Basic first aid is the topic of the fifth module. In this section of the program coaches learn the universal precautions for caring for an athlete, how to distinguish between different types of wounds and how to treat those wounds, and the signs and symptoms of wound infections. The sixth module is very important because it deals with the life threatening conditions of injuries to the head and neck. Information is given to the coach on how to recognize and manage head and neck injuries. The last module provides material on warming up and cooling down and how they are important in injury prevention. Contained within this module are examples of warm-up and stretching techniques.

The P.R.E.P.A.R.E. program is one of the few first aid and/or injury prevention programs to be offered. Sports First Aid and Safety, offered by the American Red Cross, is an example of another program, but that program and similar programs concentrate on first aid and not on ways in which to prevent injuries from happening in the first place. The P.R.E.P.A.R.E. program covers not only ways in which to treat injuries but how to prevent those injuries from happening. Additionally, the P.R.E.P.A.R.E. program is the only one that the NATA was involved in developing. Coaches of all skill levels need to know and can benefit from the information contained within the P.R.E.P.A.R.E. program.

Currently the NCSS is developing sport specific injury prevention and first aid courses. These courses will cover in more detail some of the common injuries found in a parti

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particular sport. Information will be given to coaches on how to prevent, treat, and when to return to play an athlete that has suffered from such injuries.

P.R.E.P.A.R.E. is an online injury prevention and first aid program. Due to the fact that the P.R.E.P.A.R.E. program is online, coaches are able to complete the course when it fits their schedule and at their own pace. Thus, coaches do not need to devote a whole Saturday to training. If they wish they can do one module at a time, and return to the following modules at a later date and time.

Injury Prevention Studies

There are very few prospective studies that have examined injury prevention methods on the reduction of injury in youth sports (Table 5). The only study conducted on football players was by Bixler and Jones (1992). In that study high school football teams either received an intervention, half-time warm-up and stretching exercises, or they did not receive any intervention. Bixler and Jones (1992) did not find any statistical difference between the intervention and the control groups.

A number of studies have investigated the effects of a training program on the reduction of injuries while in sport (Emery, Cassidy, Kassen, Rosychuck, & Rowe, 2004; Heidt, Sweeterman, Carlonas, Traub, & Tekulve, 2000; Hewett, Kindenfeld, Riccobene, & Noyes, 1999; Junge et al., 2002; Myklebust, Engebretsen, Braekken, Skjolberg, Olsen, & Bahr, 2003; Wedderkopp et al., 1999; and Wedderkopp, Kaltoft, Holm, & Froberg, 2003). Table 4 presents the findings from those intervention studies. The comparison of two incidence rates, the population of interest divided by the rate of a comparison population, yields the relative risk (RR). A RR of 2 would indicate double the risk of injury. Another measure of reduction of injury rate is the odd ratio (OR). An OR is one sc

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set of odds divided by another set. If the OR is equal to one there is no association between the exposure and the injury and if the OR is less than one the exposure is protective against the injury. Wedderkopp et al. (1999 and 2003), Hewett et al. (1999), Heidt et al. (2000), Junge et al. (2002), and Emery et al. (2004) found that there was a reduction in the injury rates when various training programs were instituted. While Myklebust et al. (2003) did not find any reduction in the injury rate with floor, balance mat, and wobble board exercises.

Most of the studies examining the effectiveness of injury prevention programs have focused on high school aged athletes. In fact there was only one study that was conducted on youth athletes (Marshall, Mueller, Kiby, & Yang, 2003). In that study the injury prevention method was not related to training but rather to equipment issues.

Table 4

Table 4

Studies Examining Injury Prevention Methods in Youth Sports

Author	Study Design	Participants	Prevention Strategy	Injury Definition	Results
Bixler & Jones (1992)	Non-Randomized Control Trial (RCT)	High school football players (3 intervention teams and 2 control teams)	1. Intervention: ½ warm-up and stretching exercises 2. Control: No exercise	Injury requiring medical attention	Injury rates not statistically different between groups
Wedderkopp et al. (1999)	RCT	237 female European team handball (16-18)	1. Intervention: Practice session training program (warm-up with 2 or more functional large muscle group exercises and properioceptive ankle disk activity) 2. Control: Nonspecific practice training session	Time loss (injury requiring a player to miss next session or unable to participate without considerable discomfort	RR = 0.17 (95% CI; 0.09-0.32
Hewett, Kindenfeld, Riccobene, & Noyes (1999)	Non-RCT	1,263 high school students (soccer, volleyball, and basketball)	1. Intervention: 366 girls (6 week jump training – 60-90 minutes 3 X week) 2. Control 1: 463 girls 3. Control 2: 434 boys	Serious knee injury (ligament sprain) seen by athletic therapist (time loss >5 days)	14 serious knee injuries (2 intervention, 2 male control, 10 female control) RR = 0.42 (male) RR = 0.17 (female)

RR = relative risk

Table 4 continued

Studies Examining Injury Prevention Methods in Youth Sports

Author	Study Design	Participants	Prevention Strategy	Injury Definition	Results
Heidt, Sweeterman, Carlonas, Traub, & Tekulve (2000)	RCT	300 female high school soccer players (14-18)	1. Intervention: 7 week preseason Frappier acceleration program 2. Control: No program	Time-loss (injury requiring missing at least 1 practice or game)	RR = 0.42 (95% CI; 0.2-0.9)
Junge et al. (2002)	Non-RCT	194 soccer players	1. Intervention: Coach and player education, rehabilitation + conditioning program including cardio-vascular, strength, flexibility, and plyometrics training 2. Control: Not defined well	Injury resulting in physical complaint >2 weeks or missed season	1. 20% reduction in the number of injured players 2. 36% reduction in the rate of injury per player 3. Higher reduction of injury rates in lower skilled players
Marshall, Mueller, Kiby, & Yang (2003)	Non-RCT	Little League baseball players	1. Reduced-impact safety ball vs. traditional ball 2. Faceguard vs. no faceguard		1. RR (safety ball) = 0.72 (95% CI; 0.57-0.91) 2. RR (faceguard) = 0.65 (95% CI; 0.43-0.98)

Table 4 continued

Studies Examining Injury Prevention Methods in Youth Sports

Table 4 continued

Studies Examining Injury Prevention Methods in Youth Sports

Author	Study Design	Participants	Prevention Strategy	Injury Definition	Results
Myklebust, Engebretsen, Braekken, Skjolberg, Olsen, & Bahr (2003)	Non-RCT (three seasons)	Female European team handball players (16-18)	1. Control year 2. 1st intervention season: floor, balance mat, and wobble board exercises (15 min) (handout) – video + coach delivered (3X/week for 5-7 weeks) 3. 2nd intervention season: same as 1st intervention season but delivered by physiotherapist every practice (15 min) (3X/week for 5-7 weeks and 1X/week for season)	Anterior cruciate ligament injury (>1 week time loss) as assessed by PT	OR (1st) = 0.87 (95% CI; 0.5-1.52) OR (2nd) = 0.64 (95% CI; 0.35-1.18)
Wedderkopp, Kaltoft, Holm, & Froberg (2003)	Cluster RCT	16 teams of female European team handball players (16-18)	1. Intervention: Practice session included 10-15 min use of ankle disk and warm-up w/ 2 or more functional large muscle group exercise as in Wedderkopp (1999) 2. Control: No ankle disk	Time loss (injury requiring a player to miss next session or unable to participate without considerable discomfort)	OR = 0.21 (95% CI; 0.09-0.53)

OR = Odds Ratio

Table 4 continued

Studies Examining Injury Prevention Methods in Youth Sports

Author	**Study Design**	**Participants**	**Prevention Strategy**	**Injury Definition**	**Results**
Emery, Cassidy, Kassen, Rosychuck, & Rowe (2004)	Cluster RCT	120 high school physical education students (14-18) (10 schools)	1. Intervention: Daily progressive home program using a wobble board 2. Control: No program	Injury occurring during a sporting activity which required medical attention and/or loss of at least one day of activity	RR = 0.20 (95% CI; 0.05-0.88)

Summary

With the increased participation in youth sports there has been a rise in the number of sports-related injuries. Sports injuries, like all injuries, are expected, predictable, and avoidable. Individuals need to be provided with the information to prevent or reduce sports injuries.

Previous research has indicated that there is a serious lack in the first aid and injury prevention knowledge of youth coaches. Youth sport coaches are the individuals that are present at the time of injury and need to be armed with the knowledge of how to handle these situations. Not only do coaches need to be able to handle injury and emergency situations but they also need to be able to prevent such injuries from happening.

The P.R.E.P.A.R.E. program is the most recent and most complete injury prevention and first aid program to be developed. Neither the effectiveness of the P.R.E.P.A.R.E. program in the reduction of injuries and injury severity, nor how taking the P.R.E.P.A.R.E. program alters a coaches' decision to return an injured athlete have been evaluated. The purpose of this study was to test the effectiveness of the P.R.E.P.A.R.E. program in the reduction of injuries in youth football, and how taking the program changed the decision-making process when youth football coaches must determine whether or not to return an injured athlete to competition.

Chapter III

Methods

Research Design

This study consisted of two research groups: the youth football coaches and the youth football players. With regard to the youth football coaches, the research study design was a static group comparison, with data collection consisting of demographic information (such as age, years of coaching, grade level currently coaching) provided by the coaches, the results of the P.R.E.A.P.R.E. examination, the coaches' opinions of the P.R.E.P.A.R.E. program, and the coaches' responses to the Game Situation Data Sheet (GSDS).

In regards to the youth football players, the research design for this study was a prospective observational cohort. The variables examined were the player characteristics (such as height, weight, predicted adult height, percent predicted adult height, and BMI), and the injury rate during the 2005 football season relative to the injury rates in previous seasons and other published studies. A prospective observational cohort design was chosen for a number of reasons. First, because data collection moves forward, the researcher was able to establish a sequence of events between the risk factors. Secondly, injury rates could be calculated because the design involved not only information about the injuries but also information about the amount of exposures. Lastly, the prospective cohort allowed for a range of potential risk factors to be studied simultaneously.

Data Collectors

This study utilized certified athletic trainers (ATCs) as the data recorders. These individuals had no coaching responsibilities. They were there solely to record the number of athletes participating and the injuries suffered by those athletes. Thus, these individuals did not have the time constraints or burden of other responsibilities to distract them from the accurate recording of injuries. In fact, the process was part of their paid responsibility.

ATCs are highly trained healthcare professionals. Not only must they successfully complete a bachelor's degree during which they studied the prevention, care, and rehabilitation of athletic injuries they also have to pass a national certification exam. National Athletic Trainers (NATA) Board of Certification examination is a rigorous exam that tests not only the content knowledge of the individual, but also the practical and decision making abilities as it relates to the prevention, care and rehabilitation of athletic injuries. The ATCs that collected the data in this study were not only certified, but either had completed at least a Master's degree or were in the process of completing a Master's or Doctoral degree in athletic training. Due to the training and education that ATCs receive they are the ideal sports injury data recorders (Powell, 1991; Garrick, 1991).

A number of procedures were put in place to insure adequate and consistent data recording. First, all of the ATCs were informed of the operating definitions of the study; for example what was an athlete exposure, time-loss-injury, non-time-loss injury, and what type of injury constituted a mild, moderate, or severe injury. Standardized forms were used to collect the data throughout the six years. Additionally there was one ATC that collected data throughout the six years of the study and aided the other ATCs on the methods and standards used in data collection.

Participants

Youth Football Coaches

The criterion for inclusion was registration as a coach, active participant in the youth football league, a willingness to take GSDS, the willingness to implement six elements of the P.R.E.P.A.R.E. program, and if they wished to take the P.R.E.P.A.R.E. program. In addition to obtaining permission to conduct this study from the respected program officials, informed consent was obtained from the participants (Appendix A).

A total of 55 youth football coaches participated in this study. One of the coaches was actually a program administrator who oversaw the daily operation of one of the two programs examined in this study. The mean age of the participants was 40.25 years (*SD* = 7.59) with a range of ages from 15-61. Two of the coaches did not report their age. For one participant who was a minor, consent was given by his father who was also one of the coaches who participated. Fifty-four participants were male and one participant was female.

Youth Football Players

The mean age of the youth football participants was 11.49 (SD = 1.34) ranging from 8.10-14.64 years of age. The criterion for inclusion was registration with the youth football program in the community and membership on a team. In addition to obtaining permission to conduct this study from the respective program officials, informed consent (Appendix B) was obtained from the parent(s) or legal guardian of the child, and informed assent (Appendix C) was obtained from the child.

Instrumentation

Height/Weight Recorder

Height was measured with a field anthropometer, to the nearest millimeter. Weight was measured with a digital scale, to the nearest 1/10 of a kilogram. Both measurements were taken with the participant dressed in athletic shorts and a tee-shirt, without shoes. Both measurements were recorded on the Height/Weight record sheet (Appendix D).

Coaches Demographic Information Sheet

The Coaches Demographic Information Sheet (Appendix E) was used to gather data on the youth football coaches' age, years of coaching experience, terminal degree, grade of athletes he/she coaches, and prior first aid training.

Player Demographic Information Sheet

The Player Demographic Information Sheet (Appendix F) was used to gather information about date of birth, sport participation history, years of football experience, sport injury history, and biological parental heights.

Game Situation Data Sheet

Flint and Weiss (1992) developed the GSDS (Appendix G) to assess a basketball coaches' decision making in hypothetical athletic situations. Composed of nine different athletic situations, the GSDS asks the individual whether or not they would allow an athlete to return to activity. Participants check yes or no as to whether they would return an athlete to competition. The athletic situations included players of different ranking (i.e., starter, back up, or bench warmer). In addition the athletic situations involved a number of different game situations, such as close or blow out games, winning, and losing. Ransone and Dunn-Bennett (1999) used the GSDS to assess the decision making of high school coaches from 15 different sports. For this study slight adjustments were made to the GSDS to make all of the situations relevant to football.

Injury Report Form

After evaluation of all injuries, a Certified Athletic Trainer (ATC) filled out the injury report form (Appendix H). This form documented the date, weather conditions, and player position at the time of the injury; the location, evaluation, and severity of the injury; and what action was taken at the time of injury (player returned immediately, player returned after resting, player sat out, player was taken to hospital by parents, or player was transported to the hospital via ambulance).

P.R.E.P.A.R.E. Program

The P.R.E.P.A.R.E. (Pre-plan, Recognize, Emergency Plan, Principles of First Aid, ABC's, Return to Play, and Enjoy) program was offered, free of charge, to all youth football coaches in the selected programs. P.R.E.P.A.R.E. is an online sports safety course aimed at educating coaches on how to prevent common injuries, how to recognize symptoms of potentially dangerous conditions, and how to respond in emergency situations.

There were six elements of the P.R.E.P.A.R.E. program that were stressed and monitored by the ATC on site. The first element was that each team of coaches were to develop an emergency action plan for both practices and home games. The emergency action plan should have addressed areas such as:

Where is there a phone to call 911?

If there is a pay phone, where is change to make that call?

Who will make the call to 911?

Who will stay with the athlete?

Who will contact the parents?

Who will call absent parents if a child needs to go to the hospital?

What is the best way to access the field?

Who will meet the ambulance?

Who will unlock the gate/door?

Who will get the medical records of the athlete?

Who will control the scene?

Adjustment to heat and activity was the area of concern for the second element. Coaches followed the recommended plan of gradual activity levels for the first five days of practice. The recommended activity levels were as follows:

Day 1: Light activity for 30 minutes

Day 2: Light activity for 45 minutes

Day 3: Light activity for 30 minutes and moderate for 15 minutes

Day 4: Light activity for 15 minutes and moderate for 30 minutes

Day 5: Moderate activity for 45 minutes

Recommended water breaks were the third element of the program that was stressed and monitored. The P.R.E.P.A.R.E. program recommends that children be given water breaks every 10-20 minutes.

The fourth element was that coaches conduct a proper warm-up and stretching routine. The P.R.E.P.A.R.E. program recommends a five minute gradual warm up followed by 10 minutes of stretching. Each stretch should have been held for 30 seconds.

The areas to be stretched were: the neck, shoulders, back, hip/groin, hamstrings, quadriceps, and calves. Appendix I illustrates each of the stretches that were performed.

The fifth element of the program was that all teams had a stocked first-aid kit. Appendix J lists the items that are recommended by NCSS for a first aid kit. The first aid kit was to be kept with all of the other team football gear.

The last element deals with coaches having handy access to the signs and symptoms of the major injuries/illness. Each coach was given a set of cards that covered the signs and symptoms of specific injuries and what to do to manage those injuries (Appendix K). These cards were to be kept in the first aid kit.

The elements were stressed and monitored by the ATC on site. Each team of coaches was responsible for developing and giving a copy of their emergency action plan to the ATC. The ATC reviewed the plan and made any recommendations if needed. The ATC kept a copy of the emergency action plan, and so did the coaches (to be kept in the first aid kit). The program officials agreed to gradual activity recommendations. Each coach was given a copy of the recommendations and their compliance was monitored by the ATC on site and the program directors. One coach for each team was to be in charge of keeping the schedule of water breaks. The ATC checked to make sure that all teams were given a water break every 10-20 minutes. The coaches were expected to provide their players with a gradual warm-up. The ATC on site monitored this activity and if necessary made recommendations to the coaches that are conducting the warm-up. Each coach was be given a copy of the stretches that were to be completed as part of the stretching routine. Appendix I illustrates the stretches. The ATC went over the stretches with the coaches to make sure that they instructed the children properly. The ATC on site monitored that the stretches were done correctly and for the proper amount of time. The ATC checked to make sure that the first aid kit was stocked and that the signs/symptoms cards were being kept in the first aid kit.

If the ATC found that a coach was not conducting practice in accordance to the recommendations, and the ATC tried to intervene, a program official was contacted. The program official and the ATC worked with the coach in such a way as that they may have met the recommendations.

Certified Athletic Trainer Monitoring System

The coaches were given a template for an emergency action plan (Appendix L). The coaches were to complete the emergency action plan, according to the recommendations of the P.R.E.P.A.R.E. program, and present their plan to the ATC on site. The ATC evaluated the plan and to make sure that all of the major areas (mentioned above) were covered. If the plan was deemed adequate, the ATC informed the coach to keep a copy of the plan in the first aid kit at all times. The ATC also kept two copies of the plan; one to keep with her at all times, and the other copy for research documentation.

The daily activity check off-sheet (Appendix M) was used to monitor that each team was completing a gradual warm-up, the recommended stretching routine, and recommended water break schedule. Through visible observation the ATC monitored that each team was completing a gradual warm-up and proper stretching routine. The ATC inquired from the coach how often water breaks were being given.

The gradual activity sheet (Appendix N) was used to make sure that each team was following the recommended gradual activity plan. The ATC consulted with each team for the first five days of practice, and inquired about the amount and the level of ex

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exertion of the activities completed during practice. Additionally, the ATC visibly monitored to make sure the coaches were following the gradual activity plan.

The ATC consulted and checked the first aid kits that were provided by the two programs. The coaches were to check the first aid kits on regular bases to make sure that all of the necessary items were present. Appendix O contains the check off sheet for the first aid kits.

P.R.E.P.A.R.E. Examination

The NCSS developed the P.R.E.P.A.R.E. Examination (Appendix P) in 2002 to measure an individual's proficiency after completing each module of the P.R.E.P.A.R.E. program. The test consists of 70 questions. In order to earn the coaching certificate the coach must receive a score of 70% or higher on each module. This test is part of the P.R.E.P.A.R.E. program which is an online injury prevention and first aid training.

P.R.E.P.A.R.E. Program Evaluation

At the end of the season the youth football coaches who took the P.R.E.P.A.R.E. program completed an evaluation of the program (Appendix Q). Coaches were to present their opinions concerning their satisfaction of the program, method of delivery, applicability of material, how often they utilized the knowledge that they gained, and their recommendations on improving the program.

Injury Definition

This study utilized the operational definition used in the NATA Injury Surveillance Study (Powell & Barber-Foss, 1999):

- Any injury that causes cessation of participation in the current game or practice and prevents the player's return to that session.

- Any injury that causes cessation of a player's customary participation on the day following the day of onset.

- Any fracture that occurs, even though the athlete does not miss any regularly scheduled session.

- Any dental injury, including filling, luxations, and fractures.

- Any mild brain injury that requires cessation of a player's participation for observation before returning, either in the current session or the next session.

Injury Severity

Time loss (TL) injuries were classified as minor, moderate, or major/severe. Severity was based upon the number of calendar days lost due to the injury: minor <7 days, moderate 8-21 days, and major/severe >21 days (Powell & Barber-Foss, 1999). Non-time-loss (NTL) injuries are injuries that the ATC evaluated but the participant was able to return without any restrictions.

Data Collection Procedures

This study was conducted during the 2005 football season. The participants were youth football players and coaches from two Mid-Michigan programs that participated in the Mid-Michigan Pony Football League, Inc. The programs were selected based upon community support, participant willingness, previous participation in research, and proximity to the research institution.

This study was part of an on going research study that was examining the injury rates in youth football. That study had been approved by the University Committee on Research Involving Human Subjects (UCRIHS) and approval was gained for the addition of this aspect to the study (Appendix A).

Recruitment of Youth Football Coach Participants

At a meeting with the researcher and the research assistants, the presidents of the two programs were presented with the opportunity for their communities to participate in this study. At that meeting the presidents were provided with the overall study design, what participation involved, and the benefits and risks of participation.

After obtaining the permission of the two program presidents, there were meetings with the coaches from each town. At that time the researcher and research assistants presented the opportunity to participate in this study to the coaches. A description of the study, what involvement entailed, and the benefits and risks of participation were presented to the coaches. The P.R.E.P.A.R.E. program was offered, free of charge, to all the coaches. If a coach did not have internet access, access would have been provided for completion of the P.R.E.P.A.R.E. program. If a coach did not wish to take the P.R.E.P.A.R.E. program, he/she was still able to participate, as controls, by completing the P.R.E.P.A.R.E. examination once and the GSDS twice (once at the beginning and once at the end) during the season. The participants had an opportunity to ask any questions about the study. Once all questions had been answered the participants were then asked to sign the consent form (Appendix A) indicating whether they agreed or declined to participate in the study. Coaches may have chosen to withdraw their consent at any time prior, during, or after the collection of data.

Recruitment of Player Participants

At the beginning of the 2005 season when the players were receiving their equipment they were introduced to the researcher and research assistants. In addition to receiving their equipment each player's name, height, and weight were recorded

(Appendix D). If the parent(s) of the football player were present, they too were introduced to the Researcher/Certified Athletic Trainer (ATC) that would be working in their town. The ATC provided a brief overview of the study, what participation entailed, and the benefits and risks of participation. It was stressed that if they did not wish to participate, and their child was to get injured, the ATC would still care for them. The parent(s) were given a chance to ask any questions that they might have at that time. After the questions were answered, the parent(s) were given the consent form (Appendix B) to either complete at that time or to return it to the ATC at their earliest convenience. If the parent(s) of the player were not present at equipment hand out, the player was given a consent form to give to his/her parent(s).

Program officials recommended that within the first two weeks of practice that each team have a parents' meeting. The ATC was present at all of those meetings. The coach introduced and provided the ATC a few moments to provide a brief overview of the study, what participation entailed, and the benefits and risks of participation. After which the ATC provided the parents time to ask questions. Once all questions were answered the consent forms were distributed to those parents who had not already completed and returned the consent forms. Parents were asked to complete the consent form and return it to the ATC at their earliest convenience.

Background Information

The research procedures that had been used for the previous five years, and previously approved by UCRIHS, for the youth football injury surveillance study were followed. The original agreement, made between the institution and the two programs was that all injuries would be evaluated and recorded by an ATC and all players' heights and weights' would be recorded. Parental/legal guardian consent was attained for the youth football players to participate in this study. The youth football player consent form (Appendix B) that the parent(s) or legal guardian(s) of the football player signed gave consent for their child to fill out a survey of perceived risk, provided sporting history, sports injury history, and biological parental heights. The assent form (Appendix C) that the youth football player signed, acknowledged that he/she was willing to participate in the study.

Utilizing the height and weight measurements the players' body mass index (BMI) was calculated. Height, weight, and BMI provide information about player size and physique and may be used as risk factors for injury. Biological parental height was obtained from the parent(s) of the player. Midparent height along with player's decimal age, current height, and current weight were entered into an Excel (Microsoft) spreadsheet. To determine the player's predicted adult height, using the method developed by Roche, Tyleshevski, & Rogers (1983), the player's current height was divided by their predicted adult height to attain a percentage of adult stature attained. This measurement has been used as an indicator of biological maturity (Malina, Cumming, Morano, Barron, & Miller, 2005; Malina & Beunen, 1996; Malina & Bouchard, 2004)

Game Situation Data Sheet Data Collection

The coaches who agreed to participate in the evaluation of when coaches return an injured athlete to competition completed the GSDS twice during the season. After signing the consent form and at the end of the season, all participating coaches completed the GSDS.

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P.R.E.P.A.R.E. Data Collection

The coaches who agreed to participate in the injury prevention program were given instructions on how to access the P.R.E.P.A.R.E. program. The P.R.E.P.A.R.E. program is a password restricted web-site program. Coaches were encouraged to complete the P.R.E.P.A.R.E. program by the end of the second week of football practice. The P.R.E.P.A.R.E. program is designed such that a coach could log on at any time he/she wished and complete the modules. If a coach wished to continue the program at a later time, he/she was able to bookmark the place and return to that spot next time. At the end of each module there were five practice questions, a review, and then the examination on that module.

Upon successful completion of the P.R.E.P.A.R.E. program the coach earned a certificate. Once a coach had successfully completed the P.R.E.P.A.R.E. program his/her name was placed on a list by the NCSS. NCSS provided the researcher a list of coaches who took the program. Once all of the coaches had successfully completed the program, the researcher contacted NCSS to gain the results of the P.R.E.P.A.R.E. examination. The results of the examination were entered into SPSS.

At the end of the season the coaches who did not take the program (NPCs) were given a packet that contained the demographic sheet, the second GSDS, and the P.R.E.P.A.R.E. examination. Coaches were instructed to complete this packet and return it to the ATC. If coaches did not return their packet in a timely manner, a packet was mailed to them with a self-addressed stamped envelope.

The P.R.E.P.A.R.E. coaches (PCs) were also given a packet at the end of the season. Their packet contained the coaches' demographic sheet, the second GSDS, and the P.R.E.P.A.R.E. Evaluation Form, and a Coaches' Information Sheet. The Coaches' Information Sheet asked the coaches to provide their home address. Approximately three months after they completed the P.R.E.P.A.R.E. program they were mailed the P.R.E.P.A.R.E. examination.

Approximately three months after the coaches took the P.R.E.P.A.R.E. program they were mailed a packet to complete. Contained within this packet was the P.R.E.P.A.R.E. examination and the NCSS Information Sheet. The NCSS Information Sheet inquired about the coaches username (email) and password that they utilized for the program. This information was needed to gain access to the PCs first examination results.

Due to low responses from both the NPCs and the PCs in returning all of the materials, an incentive was offered. Prior to the incentive being offered 36 (65.45%) NPCs and 10 (52.63%) PCs had completed all of the necessary paperwork. MSU Women's Basketball or Men's Hockey tickets were offered. Coaches who completed all of the paperwork were randomly mailed either two basketball or hockey tickets. The coaches had a one in four chance of receiving the hockey tickets. This incentive dramatically increased the return rate as all of the information requested was returned.

Injury Surveillance

Throughout the 2005 football season an ATC was present at all practices and home games. For each practice and game, the ATC counted the number of football players present and participating, to determine the athlete exposures (AE). If the game was an away game, on the next day of practice the ATC asked the coach for the number of players present and participating in the game. The ATC was to evaluate and record any injuries that they were presented. At the time of injury the ATC determined what action needed to be taken in the best interest of the child. If an injury occurred at an away game, the coach notified the ATC of the injury at the next practice session. At that time the ATC gathered the injury information from the participant and evaluated the injury. If the child was withheld from returning, or withheld on a subsequent day, the ATC kept a running tab of the number of days that the athlete was unable to participate in football. After an evaluation of all injuries the ATC completed an Injury Form (Appendix E). After the season all injuries were entered into the existing youth football injury database. The youth football injury database is comprised of all players and player demographics, injuries, injury severity, and action taken.

Statistical Methods

Player descriptive statistics were calculated

At the end of the season, the means and standard deviations of the player demographics were calculated. Descriptive statistics were calculated for player height, weight, BMI, and percentage of predicted adult height attained. These data were used to summarize participant characteristics.

Test for Heterogeneity of Players

In order to compare the injury rates in the youth football players, the researcher had to make sure that the previous five years and the current year showed no variation in player descriptive statistics. Analysis of variance (ANOVA) was used to compare the player characteristics (weight, height, BMI, percent of predicted adult height attained) for the first five years to the player characteristics for the current year.

Injury Patterns

The TL and NTL injuries were tabulated. Percentages were calculated by setting (practice or game). Injury rates were determined. Injury rate was the number of injuries divided by the total number of athlete exposures (AE). Injury rates were expressed per 1000 AE.

TL and NTL injury rates (IR) were estimated by incidence rates (Powell and Barber-Foss, 1999). Incidence rates were best suited for this analysis because it considers not only the injury but also the opportunity to be injured (athlete exposures or number of athletes). For this study the number of injuries per 1000 athlete exposures were calculated as follows:

- TLIR = Number of TL Injuries/1000 athlete exposures
- NTLIR = Number of NTL Injuries/1000 athlete exposures

(Each practice or game is considered an exposure. Exposure data were collected by counting the number of players present at every practice and game.)

The particular injury rate for TL and NTL injuries in practices and games were computed as follows:

- Practice TLIR = Number of TL injuries during practice/1000 practice athlete exposures
- Game TLIR = Number of TL injuries during games/1000 athlete game exposures
- Practice NTLIR = Number of NTL injuries during practice/1000 practice athlete exposures
- Game NTLIR = Number of NTL injuries during games/1000 athlete game exposures

To test the first hypothesis, *the TLs injury rate in the 2005 football season will be significantly less than the time loss injury rates of the 2000-2004 football seasons*, the TLIR during the 2005 season was compared to the TLIR during the 2000-2004 seasons.

An incidence density ratio (IDR) presents information regarding how much more likely injuries are to happen in one situation as compared to another situation. An IDR of 1 indicates that there was no difference in the TLIR between the 2005 season and the 2000-2004 seasons. An IDR greater than one indicates that 2005 season had a higher injury rate, while an IDR of less than one indicates that the 2000-2004 seasons had higher injury rate. A 95% confidence interval was computed using the method described by Motulsky (1995). The method described by Motulsky (1995) is as follows:

- Approximate 95% CI = $(p-1.96\sqrt{p(1-p)/N})$ to $(p+1.96\sqrt{p(1-p)/N})$
  Where p = proportion and 95% confidence interval will be computed as follows:

There are three assumptions to using this equation. The first assumption is that the subjects are randomly selected from a population or that they are at least representative of the population. The second assumption deals with subjects being chosen independently of the rest. The last assumption is that the difference between the two groups is the exposure to the risk factor. In the current study the youth football players are a representative sample of all youth football players in the mid-Michigan area. The second assumption does not really apply to the current study. And lastly, the only known difference between the two groups was being coached by coaches that took the P.R.E.P.A.R.E. program and the six elements being instituted. A number of tests to check for heterogeneity of players was conducted to ensure that there were no differences in physical attributes of the youth football players.

The TL IDR was computed as follows

- TLIR for the First Five Years/TLIR of Current Year

The IDR and 95% confidence interval was computed for practices and games individually:

- Practice TLIR First Five Years/Practice TLIR of Current Year
- Game TLIR First Five Years/Game TLIR of Current Year

To test the second hypothesis, *the NTLIR in the 2005 football season will be significantly less than the non-time-loss injury rates during the 2000-2004 football seasons*, the same calculations that were performed on the TL injuries were computed for the NTL injuries. Those calculations are as follows:

- Practice NTLIR First Five Years/Practice NTLIR of Current Year
- Game NTLIR First Five Years/Game NTLIR of Current Year

P.R.E.P.A.R.E. Examination

To examine the research question concerning *what areas of first aid and injury prevention coaches' are proficient at and lacking in*, a number of comparisons were made. NCSS was contacted for the results of the first P.R.E.P.A.R.E. examination. The overall and module specific means and standard deviations were computed. Due to computer technicalities NCSS was unable to provide the results of each of the individual questions for the first examination that the PCs took. Only the overall and module specific results were provided. An ANOVA was used to make a comparison of the overall and module specific means between the two tests that the PCs took. Overall and module specific means and standard deviations were computed for the second test the PCs took and the first test the NPCs took. Additionally each question was analyzed to determine the percentage of coaches answering correctly. Fisher's Exact Test was utilized to compare the frequency of PCs to NPCs correctly answering a number of the questions contained within the P.R.E.P.A.R.E. examination. Fisher's Exact Test was used in place of Chi-Square due to the low cell values (<5). Questions in which it was apparent that there was no significant difference in the frequency of PCs and NPCs providing the correct answer (very high percentage of both correctly answering), Fisher's Exact Test was not conducted.

P.R.E.P.A.R.E. Evaluation

To examine the research question, *what are the coaches' opinions of the P.R.E.P.A.R.E. program,* the PCs opinions were tabulated. Percentages were calculated for satisfaction level, amount of material learned, opinions on delivery method, how often the information was used, ranking of each module, preparedness to prevent injuries and respond to an emergency situation, and interest in taking a sports specific injury prevention and first aid program.

Game Situation Data Sheet

Percentages were calculated for when coaches returned injured players to competition based upon playing status and game situation. *To examine the research question of do coaches' decisions to return an injured athlete change after taking the P.R.E.P.A.R.E. program,* McNemar's Test was conducted. McNemar's Test was used due to the fact that the data were not independent. The significance level was set at p=0.05. If there was an overall significant finding, the researcher examined the cells to determine where the difference laid.

CHAPTER IV

Results

Two hypotheses and three research questions guided this study. The hypotheses proposed that the time-loss (TL) and the non-time-loss (NTL) injury rates would be significantly lower in the 2005 football season when compared to the 2000-2004 football seasons. The research questions inquired about (a) the areas of first aid and injury prevention in which the coaches were proficient and lacking as measured by the P.R.E.P.A.R.E. examination, (b) the coaches' opinions of the P.R.E.P.A.R.E. program, (c) the change, if any in coaches' decisions, as determined by the Game Situation Data Sheet (GSDS), to return an injured athlete to competition after taking the P.R.E.P.A.R.E. program. The results are organized into six sections: participant demographics, injury rates, first aid and injury prevention knowledge, certified athletic trainer's (ATC) monitoring system, P.R.E.P.A.R.E. evaluation, and GSDS. Participant demographics and statistical testing of homogeneity of players are presented in the first section. The injury rates section addresses the two research hypotheses. The first aid and injury prevention knowledge section provides the results to answer the research question concerned with the areas in which coaches are proficient and lacking. The fourth section, the ATC monitoring system, provides the information about the implementation of the six elements that were being stressed from the P.R.E.P.A.R.E. program. The fifth section, P.R.E.P.A.R.E. evaluation, is devoted to the coaches' opinions of the P.R.E.P.A.R.E. program. Lastly, the section entitled GSDS reveals the results of the coaches' decisions on returning an injured athlete to competition.

Participant Demographics

Football Coaches

A total of 55 youth football coaches participated in this study. One of the coaches was actually a program administrator who oversaw the daily operation of one of the two programs examined in this study. The mean age of the participants was 40.25 years (SD = 7.59) with a range of ages of 15-61. Two of the coaches did not report their age. For the one participant that was a minor, consent was given by his father who was also one of the coaches who participated. Fifty-four participants were male and one participant was female. Table 5 presents the means and standard deviations of the coaches' age by whether or not they took the P.R.E.P.A.R.E. program (PROGRAM). A one-way ANOVA was run with PROGRAM as the independent variable and age as the dependent variable and revealed no significant difference, $F(1, 51) = 1.287, p = 0.262$ in age based upon PROGRAM.

Table 5

Coaches' Age by PROGRAM

P.R.E.P.A.R.E.	N	Range	Mean	SD
Yes	18	33-61	41.89	7.03
No	35	15-59	39.40	7.82

The mean years of coaching experience was 7.09 ($SD = 6.274$), with a range of 0-36 years (Table 6). No significant difference was found when a one-way ANOVA with PROGRAM as the independent variable and years of coaching experience as the dependent variable, $F(1, 52) = 1.640, p = 0.206$, was conducted.

Table 6

Years of Being a Youth Coach by PROGRAM

P.R.E.P.A.R.E.	N	Range	Mean	SD
Yes	18	0-15	5.56	4.12
No	35	0-36	7.86	7.04

The youth football coaches reported an average of 4.13 years (SD = 4.52) of youth football coaching experience which ranged from 0-29 (Table 7). A one-way ANOVA with whether or not the coach took the program as the independent variable and years of being a youth football coach as the dependent variable revealed no significant difference, $F\,(1, 52) = 1.091$, $p = 0.301$.

Table 7

Years of Being a Youth Football Coach by PROGRAM

P.R.E.P.A.R.E.	N	Range	Mean	SD
Yes	18*	0-12	3.22	3.10
No	36	0-29	4.58	5.06

*excluding one participant because he/she was an administrator

Almost 45% of the coaches reported having either a high school diploma/equivalent or were in the process of attaining one. The breakdown of the educational background information of the participants by program is reported in Table 8. The proportions of coaches in the varying educational categories was not significantly different, Chi-Square (3, N = 54) = 3.407, $p = 0.333$ by PROGRAM.

Table 8

Educational Background of Coaches by PROGRAM

Type of Training	P.R.E.P.A.R.E. Yes	No	Total	%
High School Diploma/Equivalent or in process for Diploma	9	16	25	44.64
Associates Degree	4	4	8	14.29
Bachelors Degree	4	14	18	32.14
Advanced Degree	2	1	3	5.36
Missing	1	1	2	3.57
Total	20	36	56	100.00

Sixteen (28.6%) coaches reported having been trained in American Red Cross First Aid, 18 (32.1%) by the American Red Cross in CPR, five (8.9%) by American Heart CPR, four (7.1%) as an Emergency Medical Technician, and three (5.4%) in paramedical training. Ten (17.9%) coaches reported having another type of first aid training. Surprisingly, though, 25 (44.6%) of the coaches reported no formal first aid training. Table 9 presents the types of first aid training the coaches had by PROGRAM. Chi-Square analysis was conducted on the different types of first aid and CPR training by PROGRAM. There was no significant difference in the types of first aid and CPR training between the two groups of coaches. Table 10 illustrates the Pearson Chi-Square value and the probability for each of the types of training. Thirteen (23.2%) coaches reported being currently certified in First Aid, 4 PCs and 9 NPCs. Additionally, 19 (33.9%) coaches reported being currently certified in CPR. There were significant differences in the number of coaches that were currently certified in First Aid or CPR by PROGRAM (Table 11).

Table 9

Types of First Aid and CPR Training by PROGRAM

Type of Training	PREPARE Yes	PREPARE No	Total	%
American Red Cross First Aid	7	9	16	28.47
American Red Cross CPR	7	11	18	32.14
American Heart CPR	1	4	5	8.93
Emergency Medical Technician	1	3	4	7.14
Paramedical Training	2	1	3	5.36
Other Training	4	1	5	8.93
None	6	19	25	44.64
Total	27*	48**	76+	137.39++

* total exceeds 20 because a coach could have had training in more than one category
** total exceeds 36 because a coach could have had training in more than one category
+ total exceeds 56 because a coach could have had training in more than one category
++ total exceeds 100% because a coach could have had training in more than one category

Table 10

Pearson Chi-Square for Various Types of First Aid Training by PROGRAM.

Situation	Pearson Chi-Square Value	df	p
American Red Cross First Aid	0.845	1	0.358
American Red Cross CPR	0.223	1	0.637
American Heart CPR	0.515	1	0.473
Emergency Medical Technician	0.174	1	0.677
Paramedical Training	1.448	1	0.229
Other Training	0.161	1	0.688

Table 11

Pearson Chi-Square for Current First Aid or CPR Certification by PROGRAM.

Question	Pearson Chi-Square Value	df	p
Currently certified in first aid	0.058	1	0.003*
Currently certified in CPR	4.199	1	0.040*

* significant at the p = 0.05 level.

Youth Football Players

A total of 1,295 youth football players participated during the six years of this study. Table 12 presents the number of athletes participating in the various years of the study. The sum of the number of athletes that participated in the various seasons exceeds 1,295 due to some of the athletes participating in more than one season.

Table 12

Number of Youth Football Players during Each Season

Year of Study	Number of Athletes
2000	358
2001	363
2002	359
2003	421
2004	447
2005	484
Total	2432*

* total exceeds 1,295 because some athletes participated more than one year

The mean age of the participants over the six years was 11.49 (SD = 1.34), ranging from 8.10-14.64 years old. The exact age was not known for all athletes. Table 13 presents the age mean, range, and standard deviations for the various years of the study for the athletes whose ages were known. A one-way ANOVA with age as the dependent variable and season as the independent variable revealed no significant differences in the ages of the athletes over the six years of the study, $F\ (1,5) = 2.059$, $p = 0.068$.

Table 13

Youth Football Players' Age by Season

Season	N	Range	Mean	SD
2000	350	8.93-14.20	11.543	1.306
2001	328	8.72-14.62	11.448	1.343
2002	328	8.64-14.58	11.294	1.276
2003	363	8.73-14.41	11.566	1.327
2004	409	8.10-14.47	11.551	1.377
2005	413	8.39-14.64	11.524	1.365

The mean weight of the participants over the six years was 49.09 kg (SD = 16.90), ranging from 23.40-131.80 kg. Some of the athletes were not measured due to unavailability on measurement days. Table 14 presents the mean, range, and standard deviations for weight, by grade, of the various years of the study. A one-way ANOVA with weight as the dependent variable and season as the independent variable revealed that there were no significant differences in the athletes' weights over the six years of the study, F (1,5) = 0.720, p = 0.609.

Table 14

Youth Football Players' Weight (kg) by Grade and Season

Grade	Year	N	Range	Mean	SD
	2000	129	25.0-79.2	41.902	12.118
	2001	121	23.4-77.0	38.790	9.799
4th-5th	2002	130	24.2-78.0	39.992	10.392
	2003	141	23.6-81.4	41.424	11.221
	2004	162	25.6-108.0	40.449	11.224
	2005	163	24.0-96.2	40.207	11.034
	2000	83	31.2-93.6	48.528	13.109
	2001	91	31.0-93.6	50.637	14.566
6th	2002	76	30.0-82.8	44.871	10.639
	2003	108	25.8-102.4	46.391	13.394
	2004	94	26.8-98.8	52.681	15.593
	2005	107	30.0-96.2	46.036	10.885
	2000	97	35.0-99.0	55.858	13.569
	2001	81	31.6-104.0	56.478	14.321
7th	2002	82	33.6-101.4	57.759	16.248
	2003	97	31.8-117.8	53.396	15.749
	2004	114	27.8-111.8	53.440	16.287
	2005	98	29.0-103.7	58.036	15.639
	2000	121	23.4-77.0	67.089	15.813
	2001	38	44.2-105.0	62.558	15.053
8th	2002	29	42.4-112.4	59.048	17.156
	2003	59	38.2-108.4	65.786	17.557
	2004	58	31.8-131.8	63.250	19.930
	2005	73	35.6-130.6	60.586	18.103

Participants' mean height over the six years was 150.039 cm (SD = 11.425), ranging from 121.7-186.5 cm. Some of the athletes were not measured due to unavailability on measurement days. Table 15 presents the mean, range, and standard deviations for height, by grade, of the various years of the study. A one-way ANOVA with height as the dependent variable and season as the independent variable revealed that there was no significant differences in the heights of the athletes over the six years of the study, $F(1,5) = 2.036, p = 0.071$.

Table 15

Youth Football Players' Height (cm) by Grade and Season

Grade	Year	N	Range	Mean	SD
	2000	125	123.1-163.2	142.122	7.748
	2001	122	121.8-157.8	139.018	7.169
4th-5th	2002	129	121.7-157.6	140.783	6.961
	2003	141	127.9-159.3	141.676	6.296
	2004	162	124.9-161.7	141.019	6.763
	2005	163	124.0-160.3	140.900	7.229
	2000	84	137.0-169.2	150.556	6.936
	2001	91	131.2-172.2	150.468	8.249
6th	2002	76	132.5-172.1	147.676	6.784
	2003	108	132.3-175.4	149.040	7.537
	2004	94	127.6-171.1	151.129	7.680
	2005	107	130.5-170.2	149.2	6.711
	2000	93	145.0-178.2	158.465	7.445
	2001	81	138.1-180.5	157.675	7.966
7th	2002	82	135.1-172.0	156.445	8.615
	2003	97	138.4-177.0	155.040	7.887
	2004	114	134.4-180.9	155.824	8.607
	2005	98	134.6-177.4	158.541	8.731
	2000	35	148.7-181.0	167.089	7.464
	2001	38	150.5-181.7	165.087	6.537
8th	2002	29	152.2-186.2	163.917	8.388
	2003	59	142.8-184.0	164.063	9.801
	2004	58	142.4-180.9	163.372	7.974
	2005	73	141.6-186.5	162.132	8.012

Percent of predicted adult height (PPAH) was used as an indicator of maturity. An athlete with a higher the percentage is considered more physically mature than an athlete with a lower percentage. The mean percent of attained height was 83.966 (SD = 4.975), ranging from 73.05-98.52. Table 16 presents the mean, range, and standard deviations for PPAH, by grade, of the various years of the study. A one-way ANOVA with PPAH as the dependent variable and season as the independent variable revealed that there was not a significant difference in the PPAH of the athletes over the six years of the study, $F(1,5) = 1.228$, $p = 0.293$.

Table 16

Youth Football Player's PPAH by Grade and Season

Grade	Year	N	Range (% Difference)	Mean	SD
4th-5th	2000	108	74.20-86.57 (12.37)	79.632	2.727
	2001	104	74.04-85.37 (11.33)	78.762	2.504
	2002	114	74.47-84.83 (10.36)	78.994	2.226
	2003	119	73.92-86.05 (12.13)	79.362	2.668
	2004	139	73.90-85.22 (11.32)	79.063	2.231
	2005	139	73.05-86.53 (13.48)	79.140	2.709
6th	2000	68	78.59-89.16 (10.57)	83.734	2.381
	2001	85	78.14-95.60 (17.46)	84.266	2.840
	2002	71	78.40-91.57 (13.17)	83.114	2.521
	2003	89	78.43-90.58 (12.15)	83.125	2.222
	2004	84	78.00-90.18 (12.18)	84.143	2.723
	2005	102	78.45-88.88 (10.43)	83.158	2.070
7th	2000	85	82.47-95.67 (13.20)	87.819	2.623
	2001	78	80.57-95.71 (15.14)	87.267	2.796
	2002	80	81.81-98.52 (16.71)	87.322	3.052
	2003	88	79.90-91.39 (11.49)	86.532	2.808
	2004	105	80.61-93.74 (13.13)	86.985	2.834
	2005	93	81.03-96.22 (15.19)	87.942	2.794
8th	2000	29	83.48-95.87 (12.39)	91.765	2.968
	2001	38	85.85-96.35 (10.50)	90.962	2.652
	2002	27	84.99-97.41 (12.42)	90.474	2.843
	2003	55	84.93-97.29 (12.36)	90.930	2.707
	2004	55	84.08-98.15 (14.07)	91.054	3.124
	2005	71	82.68-97.73 (15.05)	90.476	2.954

Examining the range of PPAH by grade indicates that there is a larger spread between the most immature and most mature player as grade increases. This finding is expected due to the differences in the timing of biological maturity between children. If 6th and 7th graders were to play on the same team, the largest difference in maturity would be 20.12%. This finding highlights the significance of placing children of the same grade on the same team. What is surprising is that, for five of the six years, the most mature 4th-5th grader was more mature than the least mature eight grader.

A sub sample of the youth football players were examined for skeletal maturity and comparison to the CDC Growth Charts for boys 2 to 20 for stature-for-age and weight-for-age (Ogden, Kuczumarski, Flegal, Mei, Guo, et al., 2002). Dompier (2005) found that the sub sample was slightly advanced in skeletal maturity. The difference between the chronological age and skeletal age was 0.7 years. The subset was found to be between the 50th and 75th percentiles for stature and between the 75th and 90th percentiles for weight (Dompier, 2005).

Injury Rates

Exposures

To compute injury rates it is necessary to know the number of athlete exposures (AE) for the various years. An AE is one athlete participating in one practice or game (an opportunity to be injured). During the 2000-2004 seasons the total AE was 67,456 (55,936 practice and 11,520 game, see Table 17 and Appendix R).

Table 17

Practice and Game Athlete Exposure Data for the 2000-2004 Seasons

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4th-5th	10,831	2,259	9,511	1,849	20,342	4,108
6th	7,194	1,434	6,468	1,252	13,662	2,686
7th	7,636	1,647	7,064	1,476	14,700	3,123
8th	7,232	1,603	0	0	7,232	1,603
Total	32,893	6,943	23,043	4,577	55,936	11,520

During the 2005 season there was a total of 16,100 AE (13,416 practice and 2,684 game) for the two towns combined. Table 18 illustrates the number of practice and game AE by town and grade for the 2005 season.

Table 18

Practice and Game Athlete Exposure Data for the 2005 Season

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4th-5th	2,731	453	2,112	480	4,843	933
6th	1,955	372	1,441	257	3,396	629
7th	1,906	396	1,014	228	2,920	624
8th	2,257	498	0	0	2,257	498
Total	8,849	1,719	4,567	965	13,416	2,684

Time-Loss Injury Rates

A TL injury was one in which the athlete did not return to play on the day of injury or on the next day. A total of 580 TL injuries occurred during the 2000-2004 seasons (Table 19 and Appendix S). The number of TL injuries divided by the number of AE produced the TL injury rate (TLIR). There were 67,456 AE (Table 17) during the

2000-2004 seasons. The overall TLIR for the 2000-2004 seasons was 8.6 per 1000 AE (95% CI 7.93-9.32).

Table 19

Time-Loss Injury Data for the 2000-2004 Seasons by Town and Grade

Grade	Town A	Town B	Total
4^{th}-5^{th}	82	43	125
6^{th}	84	57	141
7^{th}	93	88	181
8^{th}	133	0	133
Total	392	188	580

A total of 114 TL injuries occurred during the 2005 season (Table 20). There were 16,100 AE for the 2005 season (Table 18). The overall TLIR for the 2005 season was 7.08 per 1000 AE (95% CI 5.9-8.5).

Table 20

Time-Loss Injury Data during the 2005 Season by Town and Grade

Grade	Town A	Town B	Total
4^{th}-5^{th}	20	7	27
6^{th}	16	9	25
7^{th}	19	6	25
8^{th}	37	0	37
Total	92	22	114

TLIRs between the 2000-2004 seasons and the 2005 season were compared as an incidence density ratio (IDR). An IDR presents information regarding how much more likely injuries are to happen in one situation as compared to another situation. An IDR of

1 indicates that there is no difference in the 2000-2004 and 2005 injury rates. An IDR greater than one indicates that the 2005 season had a higher injury rate, while an IDR of less than one indicates that the 2000-2004 seasons had a higher injury rate. If the 95% confidence interval (CI) includes 1, then there was not a significant difference between injury rates. The TL IDR of the 2005 season compared to the 2000-2004 seasons was 0.82 (95% CI 0.67-1.01). Therefore, no significant difference was apparent in the TLIRs between the 2005 season and the 2000-2004 seasons.

In summary there were no significant differences between the 2000-2004 season overall TLIR and the 2005 season overall TLIR. Table 21 depicts the number of TLIs, AE, TLIRs, and TLI IDR for the seasons studied.

Table 21

Time-Loss Injury Rate Data for 2000-2004 & 2005 Seasons

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	580	67,456	8.60 (7.93-9.32)	0.82 (0.67-1.01)
2005	114	16,100	7.08 (5.90-8.50)	Not applicable

Practice time-loss injury rates. There was a total of 399 practice TL injuries (Table 22 and Appendix S) and 55,936 practice AE (Table 17) during the 2000-2004 seasons. The number of practice TL injuries during 2000-2004 divided by the number of practice AE during that time produced the practice TLIR for the 2000-2004 seasons. The practice TLIR for the 2000-2004 seasons was 7.13 per 1000 AE (95% CI 6.47-7.87).

Table 22

Practice and Game Time-Loss Injury Data during the 2000-2004 Seasons

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	52	30	34	9	86	39
6^{th}	65	19	40	17	105	36
7^{th}	56	37	62	26	118	63
8^{th}	90	43	0	0	90	43
Total	263	129	136	52	399	181

A total of 85 practice TL injuries occurred during the 2005 season (Table 23). There were 13,416 practice AE (Table 18) during the 2005 season. The overall TLIR for the 2005 season was 6.34 per 1000 AE (95% CI 5.13-7.83). There was not a significant difference in the practice TLIR between the 2000-2004 and the 2005 seasons, the practice TL IDR of the 2005 season compared to the 2000-2004 seasons was 0.89 (95% CI 0.70-1.12).

Table 23

Practice and Game Time-Loss Injury Data for the 2005 Season

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	17	3	5	2	22	5
6^{th}	14	2	9	0	23	2
7^{th}	11	8	5	1	16	9
8^{th}	24	13	0	0	24	13
Total	66	26	19	3	85	29

In summary there were no significant differences between the 2000-2004 seasons practice TLIR and the 2005 season practice TLIR. Table 24 depicts the number of TLIs, AE, TLIRs, and TLI IDRs for the seasons studied.

Table 24

Practice Time-Loss Injury Rate Data

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	399	55,936	7.13 (6.47-7.87)	0.89 (0.70-1.12)
2005	85	13,416	6.34 (5.13-7.83)	Not applicable

The practice TLIRs can be compared by town. Tables 25 and 26 present the practice TL injury data for Towns A and B. There were no significant differences in the practice TLIR by town between the 2000-2004 and 2005 seasons.

Table 25

Practice Time-Loss Injury Rate Data for Town A

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	263	32,893	8.00 (7.09-9.12)	0.93 (0.71-1.22)
2005	66	8,849	7.46 (5.87-9.48)	Not Applicable

Table 26

Practice Time-Loss Injury, Rate Data for Town B

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	136	23,043	5.90 (4.99-6.98)	0.69 (0.43-1.11)
2005	19	4,567	4.16 (2.67-6.49)	Not Applicable

In summary, there were no significant findings when comparing the practice TL injuries between the seasons in the current study when combining the data from both towns. Dividing the practice TL injuries by Town also revealed no significant differences in the practice TL injuries in the 2000-2004 seasons compared to the 2005 season.

Game time-loss injury rates. During the 2000-2004 seasons the athletes experienced 181 game TL injuries (Table 22 and Appendix S) and during the 2005 season 29 game TL injuries (Table 23) were suffered by the athletes. There were 11,520 AE (Table 17) during the 2000-2004 seasons and 2,684 (Table 18) in 2005. The game TLIR for the 2000-2004 seasons was 15.71 per 1000 AE (95% CI 13.6-18.15) and 10.81 per 1000 AE (95% CI 7.53-15.47) for the 2005 season. The game TL IDR of the 2005 season compared to the 2000-2004 seasons was 0.69 (95% CI 0.47-1.02). No significant differences were found comparing the overall game TLIRs between the 2000-2004 seasons to the 2005 season (Table 27).

Table 27

Game Time-Loss Injury Rate Data

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	181	11,520	15.71 (13.60-18.15)	0.69 (0.47-1.02)
2005	29	2,684	10.81 (7.53-15.47)	Not applicable

Comparisons were made for the game TLIRs for the previous seasons to the current season by town. Tables 28 and 29 present the game TL injury data for Towns A and B respectively. There was not a significant difference in game TLIRs between the 2000-2004 seasons and the 2005 season in Town A, but there was a significant difference for Town B. To determine by how much more likely the athletes in the 2000-2004 seasons were to suffer a game TL injury, the 2000-2004 TLIR (11.41 per 1000 AE) was divided by the 2005 TLIR (3.11 per 1000 AE). The TL IDR of the 2000-2004 season compared to the 2005 season was 3.67 (95% CI 1.24-10.87). Thus the athletes during the 2000-2004 seasons were slightly more than 3 ½ times more likely to suffer a game TL injury than the 2005 athletes.

Table 28

Game Time-Loss Injury Rate Data for Town A

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	129	6,943	18.58 (15.66-22.03)	0.81 (0.53-1.24)
2005	26	1,719	15.13 (10.34-22.07)	Not Applicable

* significant at the $p = 0.05$ level

Table 29

Game Time-Loss Injury Rate Data for Town B

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	52	4,557	11.41 (8.71-14.93)	0.27 (0.09-0.81)*
2005	3	965	3.11 (1.06-9.10)	Not Applicable

* significant at the $p = 0.05$ level

In summary, there was not a significant difference in the game TLIR between the 2000-2004 seasons and the 2005 season overall. Further examination revealed that there were significantly more game TL injuries during the 2000-2004 season compared to the 2005 season in Town B. The 2000-2004 athletes in Town B were over 3 ½ times as likely to have a game TL injury than the 2005 athletes.

Non-Time-Loss Injury Rates

A NTL injury was one in which the athlete was seen by the ATC but was able to return to play. A total of 847 NTL injuries occurred during the 2000-2004 seasons (Table 30 and Appendix T). The number of NTL injuries divided by the AE produced the NTL injury rate (NTLIR). There were 67,456 AE (Table 17) during the 2000-2004 seasons. The overall NTLIR for the 2000-2004 seasons was 12.56 per 1000 AE (95% CI 11.74-13.42).

Table 30

Non-Time-Loss Injuries for the 2000-2004 Seasons by Town and Grade

Grade	Town A	Town B	Total
4^{th}-5^{th}	92	168	260
6^{th}	85	140	225
7^{th}	83	188	271
8^{th}	91	0	91
Total	351	496	847

There was a total of 144 NTL injuries during the 2005 season (Table 31). In 2005, 16,100 AE (Table 18) occured. The overall NTLIR for the 2005 season was 8.94 per 1000 AE (95% CI 7.6-10.52).

Table 31

Non-Time-Loss Injuries for the 2005 Season by Town and Grade

Grade	Town A	Town B	Total
4^{th}-5^{th}	17	23	40
6^{th}	30	20	50
7^{th}	16	20	36
8^{th}	18	0	18
Total	81	63	144

The NTLIRs of the 2005 season and the 2000-2004 seasons were compared as an IDR. The overall NTL IDR was 0.71 (95% CI 0.60-0.85). To determine how much more likely the athletes were to get a NTL injury during the 2000-2004 seasons, the NTLIR (12.56 per 1000 AE) was divided by the 2005 NTLIR (8.94 per 1000 AE). The NTL IDR of the 2000-2004 seasons compared to the 2005 season was 1.40 (95% CI 1.18-1.67). Athletes during the 2000-2004 season were 40% more likely to suffer an injury than the

2005 athletes. Table 32 summarizes the overall NTL injury information. Further examination was conducted to determine in which session differences occurred.

Table 32

Non-Time-Loss Injury Rate Data

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	847	67,456	12.56 (11.74-13.42)	0.71 (0.60-0.85)*
2005	144	16,100	8.94 (7.60-10.52)	Not applicable

Practice non-time-loss injury rates. Results show a total of 542 practice NTL injuries (Table 33 and Appendix T) and 55,936 practice AE (Table 17) during the 2000-2004 seasons. The practice NTLIR for the 2000-2004 seasons was 9.69 per 1000 AE (95% CI 8.91-10.54).

Table 33

Practice and Game Non-Time-Loss Injury Data during the 2000-2004 Seasons

Grade	Town A		Town B		Total	
	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	65	27	104	64	169	91
6^{th}	60	25	92	48	152	73
7^{th}	56	27	103	85	159	112
8^{th}	62	29	0	0	62	29
Total	243	108	299	197	542	305

During the 2005 season the athletes experienced a total of 101 practice NTL (Table 40) and 13,416 practice AE (Table 21). The practice NTLIR for the 2005 season was 7.53 per 1000 AE (95% CI 6.2-9.14). The practice NTL IDR of the 2005 season compared to the 2000-2004 seasons was 0.78 (95% CI 0.63-0.96) (Table 35). To determine how much more likely the athletes were to get injured during the 2000-2004 seasons, the 2000-2004 practice NTLIR (9.69 per 1000 AE) was divided by the 2005 NTLIR (7.53 per 1000 AE). The NTL IDR comparing the 2000-2004 seasons to the 2005 season was 1.29 (95% CI 1.04-1.59). Therefore, the athletes during the 2000-2004 seasons were at a 29% higher rate of injury when compared to the 2005 athletes.

Table 34

Practice and Game Non-Time-Loss Injury Data during the 2005 Season

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	13	4	16	7	29	11
6^{th}	22	8	17	3	39	11
7^{th}	11	5	11	9	22	14
8^{th}	11	7	0	0	11	7
Total	57	24	44	19	101	43

Table 35

Practice Non-Time-Loss Injury Rate Data

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	542	55,936	9.69 (8.91-10.54)	0.78 (0.63-0.96)*
2005	101	13,416	7.53 (6.20-9.14)	Not applicable

* significant at the p = 0.05 level

The practice NTLIRs were compared by town. Tables 36 and 37 present the practice NTL injury rate data for Towns A and B. There were not any significant differences in practice NTLIRs when the data was separated by town.

Table 36

Practice Non-Time-Loss Injury Rate Data for Town A

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	243	32,893	7.39 (6.52-8.37)	0.87 (0.65-1.16)
2005	57	8,849	6.44 (4.98-8.34)	Not Applicable

Table 37

Practice Non-Time-Loss Injury Rate Data for Town B

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	299	23,043	12.98 (11.59-14.52)	0.74 (0.54-1.02)
2005	44	4,567	9.63 (7.18-12.91)	Not Applicable

Game non- time-loss injury rates. Athletes suffered 305 game NTL injuries during the 2000-2004 seasons and 43 during the 2005 season (Tables 33 and 34). There were 11,520 AE (Table 17) during the 2000-2004 seasons and 2,684 AE (Table 18) during the 2005 season. The game NTLIR for the 2000-2004 seasons was 26.48 per 1000 AE (95% CI 23.7-29.57) and 16.02 per 1000 AE (95% CI 11.92-21.51) for the 2005 season. The game NTL IDR of the 2005 season compared to the 2000-2004 seasons was 0.61 (95% CI 0.44-0.83). To determine how much more likely the athletes were to get a game NTL injury during the 2000-2004 seasons, the 2000-2004 NTLIR (26.48/1000 AE) was divided by the 2005 NTLIR (16.02/1000AE). The game NTL IDR of the 2000-2004 seasons compared to the 2005 season was 1.65 (95% CI 1.20-2.27). The athletes participating in the 2000-2004 seasons had a 65% greater likelihood of suffering a game NTL injury than their 2005 counterparts. Table 38 presents the game NTL injury rate data.

Table 38

Game Non-Time-Loss Injury Rate Data

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	305	11,520	26.48 (23.70-29.57)	0.61 (0.44-0.83)*
2005	43	2,684	16.02 (11.92-21.51)	Not applicable

* significant at the $p = 0.05$ level

There were statistically more game NTL injuries in Town B in the 2000-2004 seasons than in season 2005 (Table 39). To determine how much more likely those athletes were to be injured, an IDR comparing those seasons to the 2005 season was computed. Town B's 2000-2004 athletes were over two times as likely to suffer a game NTL injury as the 2005 athletes (IDR = 2.20; 95% CI 1.39-3.47). There was not a significant difference in the 2000-2004 and the 2005 game NTLIR for town A (Table 40).

Table 39

Game Non-Time-Loss Injury Rate Data for Town B

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	197	4,557	43.23 (37.70-49.53)	0.46 (0.29-0.72)*
2005	19	965	19.69 (12.64-30.55)	Not Applicable

* significant at the $p = 0.05$ level

Table 40

Game Non-Time-Loss Injury Rate Data for Town A

Season	Number of Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to 2005)
2000-2004	108	6,943	15.56 (12.90-18.75)	0.90 (0.58-1.40)
2005	24	1,719	13.96 (9.40-20.69)	Not Applicable

In summary there was a statistical difference between the NTLIR during the 2000-2004 seasons combined and the 2005 season. During the 2000-2004 seasons the athletes were 40% more likely to get a NTL injury than the athletes in the 2005 season. Further examination revealed that the athletes during the 2000-2004 seasons were almost 30% more likely to get a NTL injury during practice than the 2005 athletes and 65% more likely to suffer a NTL injury during a game.

First Aid and Injury Prevention Knowledge

Research question one inquired about the first aid and injury prevention areas in which youth coaches were proficient and deficient as measured by the P.R.E.P.A.R.E. examination. One interest was what percentage of coaches responded correctly to each question in the P.R.E.P.A.R.E. examination, and if there was a difference in the number of coaches responding correctly based upon whether they took the P.R.E.P.A.R.E. program (PROGRAM) or not. The P.R.E.P.A.R.E. examination is comprised of seven modules: emergency planning, heat and cold illnesses, emergency recognition, medical conditions, principles of first aid, head/neck/facial injuries, and warm up and cool down. Each module contains 10 questions. A score of 70% or higher is necessary to pass each module.

The P.R.E.P.A.R.E. examination was taken twice by the coaches who took the P.R.E.P.A.R.E. program (PCs) and once by the coaches who did not take the program (NPCs). The coaches who took the program completed the examination at the end of the program and three months afterwards. A comparison of the scores from the first and second exams completed by the PCs sheds light on how well the coaches retained the knowledge from the P.R.E.P.A.R.E. program. Evaluation of the results from the NPCs revealed areas in which youth football coaches were lacking in knowledge. Lastly, a comparison of the scores between the PCs and the NPCs revealed how different they are in their first aid and injury prevention knowledge.

First P.R.E.P.A.R.E. Examination for P.R.E.P.A.R.E. Coaches

The PCs did very well the first time they took the P.R.E.P.A.R.E. examination. The overall average was 64.368 (SD = 2.191). The lowest score was 8 out of 10 on each module (Table 41). Due to computer technicalities analysis was not able to be conducted on the individual questions within each module.

Table 41

Module Specific Ranges, Means, and Standard Deviations for PCs First P.R.E.P.A.R.E. Examination

Module	Range	Mean	SD
Module 1: Emergency Planning	8-10	8.89	0.74
Module 2: Heat and Cold Illnesses	8-10	9.11	0.81
Module 3: Emergency Recognition	8-10	9.00	0.82
Module 4: Medical Conditions	8-10	9.26	0.87
Module 5: Principles of First Aid.	8-10	9.37	0.76
Module 6: Head/Neck/Facial Injuries.	8-10	9.00	0.82
Module 7: Warming Up and Cooling Down	8-10	9.74	0.56
Overall Score	61-68	64.37	2.19

Second P.R.E.P.A.R.E. Examination for P.R.E.P.A.R.E. Coaches

The PCs scored an overall average of 61.37 (SD = 3.82) on the P.R.E.P.A.R.E. examination the second time they took the exam (3 months after taking the program). Fourteen (73.7%) PCs passed all seven modules of the examination. One coach failed the first module, four failed the second module, and one failed the third module. The coach who failed module three was also one of the coaches who failed the second module. For modules 4-7 all of the PCs passed the examination. Module specific scores ranged from 6-10 (see Table 42).

Table 42

Overall & Module Specific Results for Second Examination of PCs

Module	Range	Mean	SD
Module 1: Emergency Planning	6-10	8.84	0.96
Module 2: Heat and Cold Illnesses	6-10	8.10	1.33
Module 3: Emergency Recognition	6-10	8.00	1.05
Module 4: Medical Conditions	7-10	8.89	1.15
Module 5: Principles of First Aid.	7-10	9.21	0.92
Module 6: Head/Neck/Facial Injuries.	8-10	9.11	0.81
Module 7: Warming Up and Cooling Down	7-10	9.21	0.98
Overall Score	52-67	61.37	3.82

Module one: emergency planning. All PCs correctly answered five of the questions in module one (Appendix U and V). Those questions dealt with who should write and review an emergency plan, what should be kept immediately available for use in providing information to Emergency Medical Services (EMS), how to dispose of contaminated gauze and gloves after caring for a injured/bleeding athlete, how often the emergency plan should be reviewed, and what is the pertinent information to provide when calling EMS.

Seven (36.84%) of the PCs did not know that they should have enough change to make three phone calls from a pay phone in case of an emergency. Two (10.53%) PCs stated they needed enough change to make one call and five (26.32%) stated they needed enough to make two calls.

Five (26.32%) PCs incorrectly answered questions five and nine in module one. Question five inquired about what to do in regards to their emergency plan when traveling to another facility. The correct response was to contact the other facility prior to the day of competition and make alterations as needed to their existing emergency plan. Three (15.79%) PCs responded that they would obtain a copy of that facility's plan when they arrived, and two (10.53%) responded that they would use the same plan they would normally use at their own facility. Question nine pertained to the first step in the first aid procedure when caring for a victim of a lightning strike. Two (10.53%) PCs reported that moving the victim with care to a safer location and three (15.79%) reported to evaluate airway, breathing, and circulation as the first step in caring for a lightning strike victim, not surveying the scene for safety.

Module two: heat and cold illnesses. All the PCs correctly answered question seven in module two (Appendix W and X). That question pertained to the signs and symptoms of heat exhaustion.

Seven (36.84%) or more PCs incorrectly answered the questions dealing with dehydration, ideal carbohydrate concentration of fluid replacement solutions, and a way to treat a mild case of a cold illness. Seven (36.84%) PCs did not know that skin that is hard to touch is not a sign of dehydration. Five (26.32%) of the PCs thought that the ideal carbohydrate concentration of a fluid replacement solution should be 20-25% and one (5.26%) PC thought that 2-4% was ideal. The ideal carbohydrate concentration of a fluid replacement solution is 6-8%. Surprisingly, less than half of the PCs knew the correct way to treat a mild case of cold illness, i.e., to blow hot breath on the area. One (5.26%) PC thought rubbing the area and one (5.26%) thought placing the area in water were what should be done for a mild cold illness. Additionally, nine (47.37%) PCs thought that blowing hot breath on the area, rubbing the area, and placing the area in water were all acceptable treatment options for a mild case of cold illness; another coach failed to answer that question.

Module three: emergency recognition. Overall the PCs did well on module three (Appendix Y and Z). All of the PCs correctly answered four questions. Those questions pertained to vital signs, paralysis, symptoms that need to be cleared by a medical professional, and common areas to take a pulse.

Three questions in module three were answered incorrectly by six (31.58%) or more PCs. Question two asked about the number of vital signs that can be quickly checked. The correct answer was nine; only two (10.53%) PCs provided that answer. Six (31.57%) thought there were seven signs and 11 (57.89%) thought there were five signs. Question three inquired about the normal pulse range for a person 10 years or older, which is 60-100. Six (31.58%) PCs responded that the normal pulse range of a 10-year-old or greater was 80-140. Question five pertained to the symptoms of hyperventilation. Numbness, tingling in the hands, and light headedness are all signs of hyperventilation. One (5.26%) PC thought only tingling in the hands was a symptom, and seven (36.84%) thought that only light headedness was a symptom of hyperventilation.

Module four: medical conditions. The PCs did reasonably well on module four. All of the PCs correctly answered three questions (Appendix AA and AB). For two other questions, only one (5.26%) PC answered incorrectly. Those questions dealt with what triggers asthma attacks, the signs and symptoms of asthma attacks, conditions that need to be evaluated by a medical professional before return to play, what should be done for a person suffering a seizure, and what to do for an athlete after a seizure.

The questions concerning causes of exercise-induced asthma and a diabetic coma posed some difficulty for the PCs. Question seven inquired about in addition to physical exertion what else can cause exercise induced asthma. One (5.26%) coach responded slow stretches and four (21.05%) responded that none of the options could cause an exercise induced asthma attack (slow stretches, high pollen counts, or high blood sugar). Question nine examined the causes of a diabetic coma. Five (26.32%) PCs thought too much insulin could cause a diabetic coma, which is the complete opposite of the true cause, too much sugar. The remaining coach did not respond to this question but did write a note to the researchers stating "A diabetic coma can be caused by too low blood sugar (hypoglycemia) or by too high blood sugar (hyperglycemia).

Module five: principles of first aid. The PCs did well on module five (Appendix AC and AD). Three questions were correctly answered by all PCs. Those questions dealt with the signs and symptoms of an internal injury, description of a dislocation, and the primary reason for ice application. There were only two questions that more than two (10.53%) PCs answered incorrectly. Question two asked about the proper care for an abrasion. Two (10.53%) PCs responded that they would cover the abrasion with gauze applying pressure and one (5.26%) responded that no care was needed that it was just a scratch. Question ten inquired about "what type of care increases circulation, improves stretching ability of tissues, reduces pain, and relieves muscle spasm in an overuse injury." Four (21.05%) PCs indicated that the application of ice not heat would produce those effects.

Module six: head/neck/facial injuries. The PCs did very well on module six (Appendix AE and AF). For all but one question, 17 (89.47%) of the coaches responded correctly. Question ten asked "if you suspect that an unconscious athlete has suffered a concussion, the first thing that you should do is." Ten (52.63%) PCs responded correctly by activating their emergency plan. Six (31.58%) responded that they would maintain her airway, breathing, and circulation. The other three coaches' responses were questionable. For example, one coach (5.26%) responded that he/she would monitor the athlete to make sure her condition did not worsen, and two (10.53%) responded that they would question the athlete about time, place, person, and purpose to determine if there was any memory loss.

Module seven: warming up and cooling down. All of the PCs correctly answered the questions inquiring about event-specific training, reasons for a cool-down period, what should be done during a cool-down period, and how long cool-down and warm-up periods should be (Appendix AG and AH).

Slightly over 42% (8) of PCs were unable to correctly answer one question in module seven. That particular question inquired about the correct order of the stages in a warm-up. The correct answer was "gentle loosening exercises, jogging, stretching, and event-specific exercises." Six (31.58%) PCs indicated that the correct order was "jogging, stretching, gentle loosening exercises, and event specific exercises," and two (10.53%) indicated that "stretching, event-specific exercises, jogging, and gentle loosening exercises" was the correct order of events for a warm-up.

In summary, fourteen (73.7%) PCs passed all seven modules of the examination. One coach failed the first module, four failed the second module, and one coach failed the third module. The coach who failed module three was also one of the coaches that failed module two. For modules 4-7 all of the PCs passed the examination. There were

11 questions from the whole exam that over 25% of PCs answered incorrectly. Those 11 questions dealt with emergency planning when traveling, care for a lightning strike victim, signs of dehydration, ideal carbohydrate concentration of fluid replacement solutions, a way to treat a mild cold illness, the number of vital signs that can be easily checked, symptoms of hyperventilation, causes of exercise induced asthma, the cause of a diabetic coma, the first step that should be taken for an unconscious athlete suspected to have a concussion, and the order of warm-up stages.

Comparison of First P.R.E.P.A.R.E. Examination & Second Examination for PCs

The module specific means of the first P.R.E.P.A.R.E. examination for the PCs were compared to the module specific means of the second examination using the paired *t*-test procedure (Table 43). The PCs score on module two of the first examination (M = 9.11) was significantly higher than their score on module two of the second examination (M = 8.11), $t(18) = 4.14$, $p = 0.001$. There was also a significant difference in the PCs scores of module three of examination one (M = 9.00) when compared to their module three scores on the second examination (M = 8.00), $t(18) = 3.63$, $p = 0.002$. The module seven exam one (M = 9.74) for the PCs was significantly higher than their exam two (M = 9.211) module seven score, $t(18) = 2.535$, $p = 0.021$. There were no other differences between the PCs exam one scores and their exam two scores.

Table 43

Paired t-test Results for PCs Examination One Compared to Examination Two

Module Comparison	Mean of Paired Differences	SD of Mean Difference	t	df	Sig.
Exam 1 module 1 – Exam 2 module 1	0.053	1.129	0.203	18	0.841
Exam 1 module 2 – Exam 2 module 2	1.000	1.054	4.135	18	0.001
Exam 1 module 3 – Exam 2 module 3	1.000	1.202	3.627	18	0.002
Exam 1 module 4 – Exam 2 module 4	0.368	1.116	1.439	18	0.167
Exam 1 module 5 – Exam 2 module 5	0.158	1.015	0.678	18	0.506
Exam 1 module 6 – Exam 2 module 6	-0.105	0.994	-0.462	18	0.650
Exam 1 module 7 – Exam 2 module 7	0.526	0.905	2.535	18	0.021

P.R.E.P.A.R.E. Examination for NPC

The 36 NPCs scored an overall average of 55.81 (SD = 5.14) on the P.R.E.P.A.R.E. examination (Table 44). Scores for the modules ranged from 0-10. All 36 (100%) passed module four. Seventeen (47.22%) NPCs passed all seven modules, while the remaining 19 (52.78%) NPCs passed between two and six modules. Table 45 presents the number and percentage of NPCs failing each module.

Table 44

Overall & Module Specific Scores for NPCs

Module	Range	Mean	SD
Module 1: Emergency Planning	4-10	7.81	1.33
Module 2: Heat and Cold Illnesses	4-10	6.92	1.30
Module 3: Emergency Recognition	0-10	7.42	1.68
Module 4: Medical Conditions	7-10	8.69	0.95
Module 5: Principles of First Aid.	6-10	8.53	1.05
Module 6: Head/Neck/Facial Injuries.	6-10	8.36	1.05
Module 7: Warming Up and Cooling Down	3-10	8.08	1.65
Overall Score	45-67	55.81	5.14

Table 45

Frequency and Percentage of NPCs Failing Each Module

Module	Frequency	%
Module 1: Emergency Planning	6	31.58
Module 2: Heat and Cold Illnesses	14	73.68
Module 3: Emergency Recognition	6	31.58
Module 4: Medical Conditions	0	0.00
Module 5: Principles of First Aid.	1	5.26
Module 6: Head/Neck/Facial Injuries.	2	10.53
Module 7: Warming Up and Cooling Down	5	26.32

Module one: emergency planning. Twenty-seven (75.0%) or more NPCs correctly answered six of the questions in module one (Appendix U and V). Those questions dealt with who should write and review an emergency plan, the information needed when calling EMS, how to dispose of contaminated gauze and gloves, the easiest method to determine the distance to a lightning flash, and how often an emergency plan should be review.

The four questions that nine (25.0%) or more NPCs incorrectly answered pertained to having enough change to make three phone calls in case of an emergency, what to do in regard to the emergency plan when traveling, the first step in caring for a lightning strike victim, and what should be in a properly stocked first aid kit. Five (13.89%) NPCs thought they only needed enough change to make one phone call and nine (25%) thought they only needed enough to make two phone calls. Fourteen (38.89%) NPCs stated that when traveling to another facility that they would use the emergency plan that they would follow normally at their facility. The other five (13.89%) coaches responded that they would obtain a copy of that facility's emergency plan when they arrived. Almost 45% (16) of the NPCs did not know that the first step in the first aid procedure when caring for a lightning strike victim is to survey the scene for safety. Instead four (11.11%) moved the victim to a safer location and 12 (33.33%) evaluated the victims' airway, breathing, and circulation. Eleven (30.56%) NPCs did not know that all of the following should be in a stocked first aid kit: pocket mask, cutters, bags for ice, medical history card for each athlete, and medical release forms.

Module two: heat and cold illnesses. For five of the questions in module two, 30 (83.33%) or more NPCs provided the correct answer (Appendix W and X). Those questions dealt with how often and how much one should drink to stay hydrated, risk factors for heat illness, and the signs and symptoms of heat exhaustion and heat stroke.

Twelve (33.33%) or more NPCs incorrectly answered five questions in module two. Those five questions inquired about adjustment to heat, signs of dehydration, ideal carbohydrate concentration for sports drinks, how to treat a mild case of cold illness, and the signs and symptoms of a moderate cold injury. Slightly over 40% (16) of NPCs reported that adjusting to the heat during practice should occur over approximately 1-2 days and not 10-14 days. Thirteen (36.11%) NPCs thought that the ideal carbohydrate concentration of fluid replacement solutions was 20-25% and six (16.67%) NPCs thought 12-15% was the ideal. Twenty-nine (80.56%) of NPCs did not know to blow hot breath on an area suffering from a mild cold illness. Rather 15 (41.67%) thought that treatment involved rubbing the area, and 14 (38.89%) NPCs thought that blowing hot breath, rubbing the area, and placing the area in water were all viable options.

Module three: emergency recognition. NPCs did well on module three (Appendix Y and Z). Thirty (83.33%) or more NPCs correctly answered seven (70%) of the ten questions. Thirty-two NPCs incorrectly answered question two. Question two inquired about how many vital signs that indicate changes in body function can be assessed quickly. Twenty-one (58.33%) NPCs thought there were only five vital signs that could be checked quickly. Half (18) of the NPCs did not know the answer to question three, which asked what is the normal pulse range for a person 10 years or older. Fifteen (41.67%) responded 80-140 and two (5.56%) responded 30-70 as the pulse range for someone 10 and older. The third question in module three that NPCs had a difficult time with was about the symptoms of hyperventilation. Two (5.56%) and thirteen (36.11%) NPCs reported that tingling in the hands and light headedness were symptoms of hyperventilation respectively.

Module four: medical conditions. NPCs did very well on module four (Appendix AA & AB). All of the NPCs correctly answered the questions on what triggers an asthma attack and the signs and symptoms of an asthma attack. The one question for which 15 (41.67%) of NPCs did not know the correct answer pertained to what should be done to protect an athlete suffering a seizure. Fourteen (38.89%) thought that they should place a tongue depressor in the athlete's mouth, and one (2.78%) thought to hold the athlete tight. For the other seven questions, 26 (72.22%) or more of the NPCs answered correctly.

Module five: principles of first aid. All NPCs correctly answered two of the module five questions (Appendix AC and AD). Those questions inquired about internal bleeding and why a coach would place ice on an injury.

Ten (27.78%) or more NPCs incorrectly answered three questions in module five. Question five solicited the two most common pressure points to use to control bleeding. Six (16.67%) responded the bottom of the foot and the arm; three (8.33%) responded the knee and neck; and four (11.11%) responded the leg and side of the chest area. Question eight posed a situation involving an athlete sliding into base who hurts his/her lower leg. The signs and symptoms of this injury are that the athlete heard a popping sound, complains of severe pain, and there is a slight deformity in his leg. The correct type of injury was a fracture, but 10 (27.78%) indicated that this injury was a dislocation, and one did not answer this question. A high percentage (27.78%) of NPCs did not know that application of heat increases circulation, improves stretching ability of tissues, reduces pain, and relieves muscle spasm in an overuse injury. Eight (22.22%) NPCs indicated that ice application produced those results. The other two (5.56%) coaches indicated that neither heat, nor ice, nor dressing a wound would produce those results.

Module six: head/neck/facial injuries. The NPCs did very well on answering the module six questions (Appendix AE and AF). There were only two questions that more than 20% of the NPCs incorrectly answered. Question one asked where was the best place to keep a dislodged tooth until the athlete is seen by a dentist. Seventeen (47.22%) of the NPCs responded that they would place the tooth in a glass of cold water. The other 19 (52.78%) NPCs correctly placed the tooth in a glass of milk. Question 10 described a situation in which an athlete is unconscious but is thought to have suffered a concussion and asked what should be done first to aid this athlete. Thirteen (36.11%) NPCs answered correctly by activating their emergency plan; while 18 (50.0%) NPCs responded that they would maintain her airway, breathing, and circulation. Five (13.89%) responded that they would question the athlete about time, place, person, and purpose to determine if there was any memory loss.

Module seven: warming up and cooling down. Twenty-seven (75%) or more NPCs answered nine (90%) of the module seven questions correctly (Appendix AG and AH). The one question that posed some difficultly was question two. Question two pertained to the order of stages of a warm-up. Nine (25.0%) NPCs responded that the order was jogging, stretching, loosening exercises, and event-specific exercises. Additionally, eight (22.22%) NPCs responded that the order was stretching, event specific exercises, jogging, and gentle loosening exercises.

In summary, 17 NPCs (47.22%) passed all seven modules. The remaining 19 (52.78%) coaches passed between two and six modules. Six coaches failed module one, 14 failed module two, six failed module three, one failed module five, two failed module six, and five failed module seven. All 36 (100%) passed module four. There were 20 questions in total that 25% or more NPCs incorrectly answered. Those 20 questions dealt with having enough change to make three phone calls during an emergency, emergency planning when traveling, care for a lightning strike victim, proper contents of a first aid kit, length of time needed to adjust to the heat, signs of dehydration, ideal carbohydrate concentration of sports drinks, a way to treat a mild cold illness, signs of a moderate cold illness, the number of vital signs that can be easily checked, symptoms of hyperventilation, care for an athlete having a seizure, pressure point locations, signs and symptoms of a fracture, effects of ice application, where to keep a dislodged tooth, care of an unconscious athlete with a concussion, the order of warm-up stages, and not bouncing when stretching.

Comparison of PCs and NPCs

Comparison of the exam results from the PCs and NPCs provided information about the knowledge difference between the coaches. The PCs second examination was used in this analysis for two reasons: the individual question responses were not available for the PCs first examination and the second examination provided the information that the PCs retained from the program. Fisher's Exact Test was utilized to compare the responses of the PCs and the NPCs on a number of the questions throughout the exam. Fisher's Exact Test was used to determine if the proportions of coaches falling into the correct or incorrect category differed by group. This test was chosen instead of a Chi-Square test because of the small cell numbers. Fisher's Exact Test was not conducted on questions in which there was obviously no statistical difference between the coaches, i.e., those questions on which a very high percentage of both PCs and NPCs correctly answered.

Module one: emergency planning. The results for the questions in module one were similar for PCs and NPCs (Appendix U). For five of the questions less than 4 NPCs

(11.1%) answered incorrectly, and for five of the questions all of the PCs answered correctly. Examination of Appendix U reveals that questions 2, 3, 4, 7, and 8 were the five questions that all of the PCs answered correctly and are also the five questions that four (11.11%) or less NPCs answered incorrectly. Those five questions dealt with who should write and review the emergency plan, information that needs to be kept available for use in providing information to EMS, disposal of contaminated gauze and gloves, how often coaches and staff should review the emergency plan, and what information needs to be given when calling EMS. Fisher's Exact Test was conducted on questions 1, 5, 6, 9, and 10 of the P.R.E.P.A.R.E. exam by PROGRAM (Table 46 and Appendix AI).

PC and NPC statistically differ, at the $p = 0.05$ level, in answering the question that inquired about what to do in regards to the emergency plan when traveling to another facility. Significantly more NPCs incorrectly answered that question. In summary, coaches differed in correctly answering the question about what to do in regards to the emergency action plan when traveling. There were no other significant differences in the number of PCs and NPCs correctly answering the other nine questions in module one.

Table 46

Fisher's Exact Test for Module One Questions 1, 5, 6, 9, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 An effective emergency plan suggests enough change to make how many phone calls from the pay phone?	0.022	1	0.560
#5 When traveling to another facility, what action should be taken concerning your emergency plan	3.541	1	0.054**
#6 What is the easiest and most convenient means of determining the distance to a lightning flash?	0.618	1	0.336
#9 What is the first step in the first aid procedure for managing victims of a lightning strike	1.732	1	0.153
#10 a properly stoked first aid kit should include:	2.764	1	0.089

* utilizing Fisher's Exact Test
** significant at the $p = 0.05$ level

Module two: heat and cold illnesses. Two questions in module two were significantly different between PCs and NPCs, at the $p = 0.05$ level (Appendices W and X). For two of the questions 33 (91.67%) NPCs answered correctly and for one question all of the NPCs answered correctly. For four of the questions 17 (89.47%) PCs answered correctly and for two of the questions all of the PCs answered correctly. Examination of Appendix W reveals that questions 4, 7, and 8 were the three questions that 33 (91.67%) or more NPCs answered correctly and are also three of the questions that 17 (89.47%) or more PCs answered correctly. Interestingly, for question 8, which dealt with the signs of heat stroke, all of the NPC coaches answered correctly while one (5.26%) PC answered incorrectly. A low percentage of both PCs (36.84%) and NPCs (2.78%) incorrectly answered question nine (What is one way to treat a mild case of cold illness?). Fisher's Exact Test was conducted on questions 1, 2, 3, 5, 6, 9, and 10 by PROGRAM (Table 47)

Table 47

Fisher's Exact Test for Module Two Questions 1, 2, 3, 5, 6, 9, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 Adjusting to the heat during practice should happen gradually over how many days?	8.940	1	0.002*
#2 How often should athletes drink to maintain hydration?	0.377	1	0.429
#3 Which is NOT a sign of dehydration?	0.223	1	0.428
#5 The carbohydrate concentration in the ideal fluid replacement solution should be in the range of:	6.486	1	0.012**
#6 How many ounces of water or sports drink should be consumed every 10-20 minutes of exercise?	1.456	1	0.224
#9 What is one way to treat a mild case of cold illness?	1.984	1	0.140
#10 What type of cold injury does an athlete have if his skin is firm to the touch, but the tissue beneath is soft and appears red and swollen at first?	0.909	1	0.264

* utilizing Fisher's Exact Test
** significant at the $p = 0.05$ level

For two of the questions (#1 and #5) in module two there was a significant difference in whether a coach answered correctly based upon PROGRAM. PCs and NPCs differed in correctly answering the questions concerning over how many days should adjustment to heat happen and what is the ideal carbohydrate concentration of replacement fluids. Examining Appendix AJ (Question One: Adjusting to the Heat Should Take How Many Days) more NPCs incorrectly answered this question than expected, while more PCs than expected correctly answered this question. Fifteen (41.67%) NPCs responded that adjustment to heat should happen over approximately 1-2 days. Appendix AJ (Question Five: What is the Ideal Carbohydrate Concentration for Fluid Replacement) shows that more NPCs incorrectly answered this question than expected, and more PCs than expected correctly answered this question. Thirteen (36.11%) NPCs responded that the ideal carbohydrate concentration should be between 20-25% (Appendix X). No statistical difference was found for the other questions examined by PROGRAM.

In summary, PCs were more likely to correctly answer the questions concerning adjustment to heat and the ideal carbohydrate concentration in fluid replacement drinks than NPCs. Both PCs and NPCs were as likely to incorrectly answer the question that dealt with how to treat a mild case of cold illness. Coaches did not differ in correctly answering the other questions in module two.

Module three: emergency recognition. The results for the questions in module three were similar between PCs and NPCs (Appendices Y and Z). All of the PCs answered four of the questions (4, 7, 8, and 9) correctly. Those questions dealt with: which is not a vital sign (swelling), if a conscious athlete is paralyzed on one side of the body what is that indicative of (brain injury, stroke, pinched nerve), if an athlete suffers from what symptoms should he/she not return until permitted by a medical professional (blurred/loss of vision, ringing in the ears, swelling), and what are the two most common areas to take a pulse (artery in the wrist and the artery in the neck). All but one (97.22%) NPCs also correctly answered the questions related to paralysis and where the sites are to take a pulse. A high percentage (91.67% NPC and 94.74% PC) correctly answered question six that dealt with what should be done if an athlete is suspected to have paralysis (not to move the athlete or remove equipment). Twelve (63.16%) PCs and 18 (50.0%) NPCs correctly answered question three (What is the normal pulse range for a person 10 years or older?). Fisher's Exact Test was conducted on questions 1, 2, 3, 4, 5, 8, and 10 by PROGRAM (Table 48 and Appendix AK).

In summary, PCs and NPCs did not statistically differ in how they answered the questions in module three. For the module three questions that dealt with which is not a vital sign; if a conscious athlete is paralyzed on one side of the body what is that indicative of; if an athlete suffers from what symptoms should they not return until permitted by a medical professional; and what are the two most common areas to take a pulse, a high percentage of both PCs (100%) and NPCs (86.11% or higher) answered correctly. While 7 (36.84%) PCs and 18 (50.0%) NPCs incorrectly answered the question that dealt with what the normal pulse range was for a person 10 years and older. Coaches did not differ in correctly answering the questions in module three.

Table 48

Fisher's Exact Test Probability for Module Three Questions 1, 2, 3, 4, 5, 8, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 Which is NOT a technique in managing a victim in shock?	0.377	1	0.429
#2 How many vital signs does the body have that indicate changes in body function and are able to be quickly checked?	0.004	1	0.662
#3 What is the normal pulse range for a person 10 years or older?	0.868	1	0.260
#4 Which of the following is not listed as a vital sign?	2.903	1	0.108
#5 Which of the following is a symptom of hyperventilation?	0.028	1	0.549
#8 An athlete with which symptom should not return to play until permitted by a medical professional?	2.903	1	0.108
#10 Signs and symptoms of shock include all of the following EXCEPT:	0.007	1	0.627

* utilizing Fisher's Exact Test

Module four: medical conditions. The results for the questions in module four were similar between PCs and NPCs (Appendices AA and AB). Two of the questions (#4 and #5) were answered correctly by all of the PCs and NPCs. Those questions dealt with: what can trigger asthma (allergy, exercise, and rapid weather change) and what are the signs and symptoms of an asthma attack (coughing and wheezing). Additionally question ten (what condition prohibits an athlete from returning to play until examined and cleared by a medical professional) all of the PCs and 35 (94.44%) of NPCs answered correctly. Table 49 presents the Fisher's Exact probability for questions 1, 2, 3, 6, 7, 8, 9, and 10 by PROGRAM. Appendix AL presents the actual and expected counts for questions 1, 2, 3, 6, 7, 8, 9, and 10 in module four.

Table 49

Fisher's Exact Test Probability for Module Four Questions 1, 2, 3, 6, 7, 8, and 9 by PROGRAM

Question	Chi-Square Value	df	p*
#1 Medical conditions can be detected in a yearly. . .	0.127	1	0.541
#2 Which of the following should be done to protect an athlete suffering a seizure?	7.990	1	0.004**
#3 After a seizure, you should:	0.002	1	0.728
#6 During an asthma attach, care for the athlete may include:	0.711	1	0.338
#7 In addition to physical exertion, exercise induced asthma can be caused by:	0.013	1	0.586
#8 If an athlete has an allergic reaction requiring the use of an epinephrine pen, it should be administered by . .	0.036	1	0.571
#9 A diabetic coma is caused by:	2.432	1	0.115
#10 Which of the following conditions prohibit an athlete from returning to play until examined and cleared by a medical professional	1.095	1	0.424

* utilizing Fisher's Exact Test
** significant at the $p = 0.05$ level

There was a significant difference in the second question of module four based upon PROGRAM. PCs and NPCs differed in correctly answering the question concerning what should be done to protect an athlete suffering a seizure. PCs were more likely to answer that question correctly. Fourteen (38.89%) NPCs responded that they would place a tongue depressor in the athlete's mouth. Due to the fact that the care of a person having a seizure may have been part of a First Aid Certification program, Fisher's Exact test was completed for that question comparing the non First Aid Certified PCs to the non certified NPCs (Table 50). There was still a significant difference between the non certified PCs and the NPCs, Fisher's Exact Test, $p = 0.038$. There was no statistical difference in the other questions in module four.

Table 50

Frequencies of Non First Aid Certified PCs and NPCs Answers to Question Two Module Four

P.R.E.P.A.R.E.	Exam 2 Module 4 Question 2		Total
	Correct	Incorrect	
No	17	15	32
Yes	9	1	10
Total	26	16	42

In summary, for all but one question in module four there was no statistical difference in answering a question correctly based upon PROGRAM. In fact for questions four "what can trigger asthma" (allergy, exercise, and rapid weather change) and five "what are the signs and symptoms of an asthma attack" (coughing and wheezing), all of the coaches answered correctly. The one question that significantly more PCs as compared to NPCs answered correctly dealt with the care of a person having a seizure. When comparing only the non First Aid Certified PCs to the NPCs there was still a significant difference in those coaches correctly answering the question about the care for a person having a seizure. Coaches did not differ in correctly answering the other questions in module four.

Module five: principles of first aid. The results for the questions in module five were very positive for PCs (Appendices AC and AD). For all but two questions, 17 (89.47%) or more PCs responded correctly. In addition on three (4, 6, and 7) of those questions, all of the PCs responded correctly. Those questions dealt with: the signs and symptoms of internal bleeding, the description of a dislocation, and the primary reason a coach would put ice on an injury. All NPCs also correctly answered the internal bleeding and dislocation questions. Fisher's Exact Test was conducted on questions 1, 2, 3, 5, 6, 8, 9, and 10 by PROGRAM (Table 51 and Appendix AM)

Table 51

Fisher's Exact Test Probability for Module Five Questions 1, 2, 3, 5, 6, 8, 9, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 What type of wound results from a sharp object penetrating the skin?	0.77	1	0.429
# 2 What type of care should be given to an athlete with an abrasion?	0.036	1	0.571
# 3 This type of bleeding is bright red and spurts under pressure in time with the heart. Although not commonly seen in sports, this type of bleeding is very serious and life threatening.	0.515	1	0.430
# 5 If direct pressure and elevation do not control severe bleeding, which two pressure points are most commonly used to control the bleeding?	7.089	1	0.007**
# 6 Which phrase best describes a dislocation?	0.538	1	0.655
# 8 An athlete slides into first base and suffers an injury to his lower leg. The athlete says he heard a popping sound and complains of severe pain and loss of function in his leg. You notice a slight deformity in his leg. Which type of injury might this athlete have?	2.170	1	0.128
# 9 An athlete with tennis elbow has what type of injury?	0.072	1	0.570
# 10 What type of care increases circulation, improves stretching ability of tissues, reduces pain, and relieves muscle spasm in an overuse injury?	0.296	1	0.420

* utilizing Fisher's Exact Test

** significant at the $p = 0.05$ level

PCs and NPCs statistically differed in correctly answering the question that dealt with location of pressure points on the body. Eighteen (94.74%) PCs correctly answered that question while 22 (61.11%) NPCs answered correctly. Due to the fact that the location of pressure points may have been part of a First Aid Certification program, Fisher's Exact test was completed comparing the non First Aid Certified PCs to the non First Aid Certified NPCs. No significant difference was found when comparing the non First Aid Certified PCs to the non certified NPCs, $p = 0.075$. Table 52 presents the frequencies of non First Aid Certified PCs and NPCs responses to question five in module five. PCs and NPCs did not differ in answering the other questions in module five.

Table 52

Frequencies of Non First Aid Certified PCs and NPCs Answers to Question Five Module Five

P.R.E.P.A.R.E.	Exam 2 Module 5 Question 5 Correct	Incorrect	Total
No	19	13	32
Yes	9	1	10
Total	28	14	42

Module six: head, neck, and facial injuries. The results of module six was on the positive end for both PCs and NPCs (Appendices AE and AF). All of the PCs answered four (4, 5, 6, and 7) questions correctly. Those questions asked about symptoms of head injuries, the care of an unconscious athlete, rules for a suspected neck injury, and steps to take to prevent neck injuries. For those same four questions, 34 (94.44%) NPCs also answered correctly. A high percentage of both PCs (89.47%) and NPCs (97.22%) correctly answered question eight, how to remove a foreign body from the eye. Fisher's

Exact Test was conducted on questions 1, 2, 3, 9, and 10 by PROGRAM (Table 53 and Appendix AN).

Table 53

Fisher's Exact Test Probability for Module Six Questions 1, 2, 3, 9, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 The best place to keep a dislodged tooth until the athlete can be seen by a dentist is:	7.406	1	0.006**
#2 Which of the following steps should be taken to prevent head injuries?	0.174	1	0.570
#3 Swelling, possible deformity, bleeding, difficulty breathing and pain are all signs of which injury?	0.456	1	0.430
#9 Management of a nose bleed includes all of the following EXCEPT:	2.012	1	0.155
#10 If you suspect that an unconscious athlete has suffered a concussion, the first thing that you should do is:	1.395	1	0.186

* utilizing Fisher's Exact Test
** significant at the $p = 0.05$ level

PCs and NPCs statistically differed in correctly answering one question in module six. That question inquired about the best place to keep a dislodged tooth until the athlete could be seen by a dentist. Statistically, more PCs knew to put the dislodged tooth in a glass of milk, while seventeen (47.22%) NPCs opted to put the tooth in a glass of cold water and the other 19 (52.78%) put the tooth in a glass of milk. Even though statistically more PCs put the tooth in a glass of milk, one PC put the tooth in a glass of cold water and another PC put the tooth in a carbonated drink.

Question one of module six also needed to be examined for only those coaches that were not currently First Aid Certified because where to place a dislodged tooth may have been covered in such certification courses. Table 54 presents the frequencies of non certified PCs and NPCs for question one, module six. There still was a significant difference between the non certified PCs and the NPCs for question one of module six, $p = 0.009$.

Table 54

Frequencies of Non First Aid Certified PCs and NPCs Answers to Question One, Module Six

P.R.E.P.A.R.E.	Exam 2 Module 6 Question 1		Total
	Correct	Incorrect	
No	18	14	32
Yes	10	0	10
Total	14	28	42

Even though there was no statistical difference between the PCs and NPCs for questions nine and ten, the results of these two questions are noteworthy. Question nine asks "Management of a nose bleed includes all of the following EXCEPT:". Appendix AF presents the frequencies and percentages of the PCs and NPC responses to questions nine and ten. Six (16.67%) NPCs answered that having the athlete sit with the head forward was not part of the treatment protocol for a nose bleed and one (5.26%) PC responded that applying ice to the nose area was not part of the treatment protocol. Question ten asks "if you suspect that an unconscious athlete has suffered a concussion, the first thing that you should do is". There was a high percentage of both PCs (47.37%)

and NPCs (63.89%) that answered this question incorrectly. The majority of those coaches that responded incorrectly chose to "maintain her airway, breathing, and circulation." But also 2 (10.53%) PCs and 5 (13.89%) NPCs responded that they would question an unconscious athlete about the time, place, person, and purpose to determine if there is any memory loss.

In summary NPCs and PCs significantly differed in answering the question of where is the best place to keep a dislodged tooth. A high proportion of NPCs chose to place the tooth in a cold glass of water. There were no significant differences for the other questions in module six.

Module seven: warming up and cooling down. The results of module seven were very positive for PCs (Appendices AG and AH). All of the PCs answered five (3, 4, 5, 6, and 7) questions correctly. Those questions dealt with an event-specific warm-up, reasons why to do a cool-down, what to do during a cool-down, how long a warm up and cool-down should last. For those questions, 34 (94.44%) NPCs also answered correctly. Fisher's Exact Test was conducted on questions 1, 2, 3, 6, 8, 9, and 10 by PROGRAM (Table 55). Appendix AO presents the actual and expected counts for questions 1, 2, 3, 6, 8, 9, and 10.

Table 55

Fisher's Exact Test Probability for Module Seven Questions 1, 2, 3, 6, 8, 9, and 10 by PROGRAM

Question	Chi-Square Value	df	p*
#1 All of the following are benefits of a proper warm-up EXCEPT:	0.036	1	0.571
#2 Which is the correct order for the four stages of warm-up	0.311	1	0.393
#3 A baseball player throwing and catching a ball or hitting a few ground balls is in what stage of warm-up?	3.554	1	0.067
#6 How long should a cool-down period last	4.233	1	0.041*
#8 The warm-up period for distance runners may comprise:	3.257	1	0.070
#9 During a stretch, the athlete should:	1.628	1	0.180
#10 A basketball player doing layups is in what stage of warm-up?	2.613	1	0.105

* utilizing Fisher's Exact Test
** significant at the p = 0.05 level

PCs and NPCs statistically differed in correctly answering the question on how long a cool-down period should last. Statistically, more PCs knew that a cool-down period should last five to 10 minutes. Thirty-four (94.44%) NPCs did correctly answer this question. The remaining coaches responded that a cool-down should last only one to five minutes.

In summary, NPCs and PCs significantly differed in answering the question of how long a cool-down should last. A moderate proportion of NPCs responded that a cool down should last one to five minutes. There were no significant differences for the other questions in module seven.

ATC Monitoring System

The six elements of the P.R.E.P.A.R.E. program that were being stressed (emergency action plan, gradual activity plan, recommended water breaks, proper warm-up and stretching, stocked first aid kit, and possession of the signs and symptom cards) were being monitored by the ATC on site. Through observing visually and inquiring about information from the coaches, the ATC noted compliance to the six elements and recorded the findings. For the most part the six elements were being followed.

Ten teams of coaches (eight from Town A and two from Town B) completed the emergency action plan and returned it to the ATC on site. All of the emergency action plans that were returned were complete and accurate. The teams that did not complete the emergency action plan were reminded at least five times during the course of the season that they needed to complete the emergency action plan and return it to the ATC on site.

The coaches did improve on how they warmed-up and stretched the athletes during the 2005 season compared to previous seasons. They were more conscientious on what drills the athletes did during the event specific aspect of the warm-up and the progression of those drills. The only aspect that the coaches did not institute during the warm-up was the gentle loosening exercises prior to jogging, stretching, and event specific drills. This format was a totally new concept to these coaches. In the past the first thing that the coaches had the athletes do was to jog two laps prior to stretching. This aspect of the program was not adequately stressed by the ATCs during the 2005 season. The reason for the lack of the ATCs enforcing this aspect of the program was that this was viewed as a minor infraction and that they wanted to ensure that the other major aspects (gradual activity plan, water breaks, and stretching routines) of the program were being instituted.

With a few minor exceptions, such as timing a 40-yard dash once, all of the teams followed the gradual activity plan. The coaches were more conscious of the activities that they had the athletes do during the first five days of practice. The ATC recorded the amount of time between water breaks and recorded the number of times each team of coaches had to be reminded about the length of time to hold a stretch. During the first three weeks of the 2005 season the athletes were given water breaks every 15-20 minutes. Due to the coaches' consistency of providing water breaks during the first three weeks, the ATCs did not systematically record the length of time between water breaks, but rather did spot checks one practice a week. All of the teams were in compliance with the length of time between water breaks throughout the season. Six coaches needed to be reminded once that the athletes were to hold the stretch for 30 seconds and two were reminded twice.

The first aid kits that the programs provided to each team were complete with all of the requested items. The kits were checked at the beginning of the season for completeness. The only issue about the first aid kits was that one team, in Town B, practiced half of one day without their kit. On that particular day an athlete on that team needed his inhaler, which was in the first aid kit. The athlete was not having an asthma attack, but knew he could not continue without the risk of an attack. This athlete sat out and was monitored by the coaches and the ATC until the head coach arrived with the football equipment and the first aid kit.

Each coach was given a folder containing the gradual activity plan, stretches, and signs/symptom cards. At least one of these folders was to be kept with the first aid kit. At least one folder was present during all of the spot checks of the first aid kits in both towns.

P.R.E.P.A.R.E. Evaluation

Research question two inquired about the coaches' opinion of the P.R.E.P.A.R.E. program. The coaches who took the P.R.E.P.A.R.E. program (N = 19) were asked a number of questions related to their satisfaction and opinions about the program.

Overall, the coaches were satisfied with the P.R.E.P.A.R.E. program, preferred the internet based approach over a lecture style course, and learned something new about injury prevention. When asked "Overall how satisfied were you with the P.R.E.P.A.R.E. program," 9 (47.37%) of the coaches responded "Very Satisfied" and 10 (52.63%) responded "Satisfied." When questioned about how much they learned from the P.R.E.P.A.R.E. program, two coaches (10.5%) responded a "Few things," four (21.05%) coaches responded "A lot," and 13 (68.42%) coaches responded "Some." It is important to note that one of the coaches who responded he had learned a few things was American Red Cross First Aid and CPR trained, while the other coach was American Heart Association (AHA) CPR trained and was currently an emergency room nurse.

A large percentage of the coaches utilized the knowledge they gained from the P.R.E.P.A.R.E. program at least 1-2 times a week (Table 56). One of the coaches who responded that he/she utilized the knowledge gained from the program less than once a week was the program administrator who participated. The program administrator did not have one team that he/she was directly in charge of, but rather oversaw the whole program. Thus, the opportunity for knowledge use was most likely lower for this individual compared to the other coaches. The other coach who used the knowledge gained less than once a week reported that he/she was very satisfied with the program, interested in a football specific program, learned some new things from the program, and felt very much more prepared to handle an emergency.

Table 56

Frequency of how often the knowledge gained from P.R.E.P.A.R.E. was used

How often did you utilize the knowledge you gained	Frequency	%
< once a week	2	10.53
1-2 times a week	5	26.32
3-4 times a week	8	42.11
Daily	4	21.05
Total	19	100.01*

* exceeds 100 because of rounding

Only one (5.26%) coach, who was a paramedic, reported that he/she did not feel more prepared to prevent injuries and handle emergency situations as compared to previous years. The other paramedic reported feeling somewhat more prepared to prevent injuries and handle emergency situations. Table 57 exhibits the frequencies of coaches' feelings of preparedness to prevent injuries after taking the program by whether this was their first year of coaching or not. Table 58 presents the frequencies of coaches feelings of preparedness to handle emergency situations by whether this was their first year of coaching or not.

Table 57

Frequency of how prepared coaches felt to prevent injuries after taking the program

How much did you feel prepared to prevent injuries after taking the program?	First-time Coaches Frequency	%	Returning Coaches Frequency	%
Very prepared/Very much more prepared	0	0	2	13.33
A lot prepared/A lot more prepared	1	25	5	33.33
Somewhat prepared/Somewhat more prepared	3	75	7	46.67
Not prepared/Same as previous years	0	0	1	6.67
Total	4	100	15	100.00

Table 58

Frequency of how prepared coaches felt to handle emergency situations after taking the program

How prepared did you feel to deal with an emergency situation after taking the program?	First-time Coaches Frequency	%	Returning Coaches Frequency	%
Very prepared/Very much more prepared	0	0	4	26.67
A lot prepared/A lot more prepared	3	75	5	33.33
Somewhat prepared/Somewhat more prepared	1	25	5	33.33
Not prepared/Same as previous seasons	0	0	1	6.67
Total	4	100	15	100.00

Interest in a football specific injury prevention program was very high. Fourteen (73.68%) of the coaches responded that they would be interested in a football injury prevention program. The five (26.32%) coaches who were not interested in a football specific program did report that they were either satisfied (4) or very satisfied (1) with the program. Additionally those coaches reported that they utilized the information from the program on a regular basis. Table 59 presents the frequencies of how often those coaches who were not interested in a football specific injury prevention program utilized the knowledge gained from the program. Four of those five coaches reported that they were at least somewhat more prepared to prevent an injury and somewhat more prepared to handle an emergency (Tables 60 and 61).

Table 59

Frequency of how often the knowledge gained from PREPARE was used by coaches not interested in a football specific program

How often did you utilize the knowledge you gained	Frequency	%
< once a week	0	0
1-2 times a week	1	20
3-4 times a week	3	60
Daily	1	20
Total	5	100

Table 60

Frequency of how much more prepared they felt to prevent injuries from happening for those coaches not interested in a football specific program

Compared to previous seasons how much more prepared were you to prevent injuries from occurring after taking the P.R.E.P.A.R.E. program?	Frequency	%
Very much more prepared	1	20
A lot more prepared	2	40
Somewhat more prepared	1	20
Same as previous years	1	20
Total	5	100

Table 61

Frequency of how much more prepared they felt to handle emergency situations for those coaches not interested in a football specific program

Compared to previous seasons how much more prepared were you to deal with an emergency situation after taking the P.R.E.P.A.R.E. program?	Frequency	%
Very much more prepared	2	40
A lot more prepared	1	20
Somewhat more prepared	1	20
Same as previous years	1	20
Total	5	100

Coaches were asked on a scale of 1-10 to rank each of the seven modules in the program on their relative importance (1 = not important, 5 somewhat important, 10 very important). Table 62 exhibits the ranking of each module. Greater than 50% of coaches ranked Modules 1 (Emergency Planning), 2 (Heat and Cold Illnesses), 3 (Emergency

Recognition), and 6 (Head, neck and facial injuries) as very important. One coach ranked Module 2 as not important. For Modules 4 (Medical Conditions), 5 (Principles of first aid), and 7 (Warming up and cooling down) eight to nine (42.11%-47.37%) coaches reported the module as very important. The majority of the coaches felt that the material covered by the P.R.E.P.A.R.E. program was important to very important.

Table 62

Frequency of coaches' ranking of each Modules relative importance

	Frequency of Coaches Responses						
Rank	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
1	0	1	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	1	0	1	1	0	2
6	1	0	0	1	2	0	1
7	0	1	1	0	2	0	4
8	5	3	2	4	2	1	2
9	1	2	1	4	3	5	2
10	12	11	15	9	9	13	8
Total	19	19	19	19	19	19	19

PCs were given an opportunity to provide recommendations for the P.R.E.P.A.R.E. program. Only seven (36.84%) coaches provided recommendations. Those recommendations were:

> "Perhaps an on hand quick guide to carry in your coaches' bag."

> "Great program! However I got kicked out of the program three times on-line – not sure why."

"It is difficult to find time to complete this program during the season. Time is limited."

"More hands on!"

"Expand it to the entire league."

"Pre printed tests for modules instead of online."

"Better instructions on getting on site. Some test questions were not covered in material."

A few other coaches verbally conveyed some issues with the program. At least five additional coaches reported difficultly in accessing the web-site and logging into the program.

In summary, the coaches were satisfied with the P.R.E.P.A.R.E. program as a whole. All of the coaches preferred the web-based presentation over a traditional lecture style course. The majority of coaches learned some new information, utilized the information gained on a regular basis, and felt more prepared to prevent injuries and handle emergency situations.

Game Situation Data Sheet

Both PCs and NPCs completed the Game Situation Data Sheets (GSDS) twice during the season in order for a number of comparisons to be made. The first time they completed the GSDS was at the beginning of the season, prior to the PCs taking the P.R.E.P.A.R.E. program. The second time they completed the GSDS was at the end of the season. Comparisons were made between the PCs and NPCs for the first and second GSDS. The PCs responses for the first GSDS were compared to their responses on the second GSDS. Likewise, the NPCs responses for the first GSDS were compared to their responses on the second GSDS. Both GSDS were completed by 52 (92.86%) of the 56 coaches, 18 (90.00%) PCs and 34 (94.44%) NPCs. Only the data from those coaches who completed both of the GSDSs were used in the analyses.

First Game Situation Data Sheet

All of the coaches combined returned an injured athlete back to competition 36.28% of the time (Table 63). Coaches varied based upon game situations when deciding to return a starter. In a game in which the team was clearly winning six (11.54%) returned the athlete to competition. In a losing situation six (11.54%) returned those athletes to competition. But in a game in which the team was down by five points, 26 (50.00%) chose to return the starter to competition. In a clearly losing situation six (11.54%) returned a backup player, but in a clearly winning situation 11 (21.15%) returned the backup player. Similar to the close game situation with a starter 21 (40.38%) returned the backup player when it was a close game situation. Coaches' decisions to return a bench player to competition after an injury did not vary considerably based on the game situation. Ten (19.23%), 10 (19.23%), and 17 (32.69%) returned a bench player to competition in a clearly winning, clearly losing, and close winning game respectively.

Table 63

Frequency of PCs and NPCs Responses to the First Game Situation Data Sheet

Game Situation	PCs		NPCs		Total	
	Yes	No	Yes	No	Yes	No
Back up defensive tackle in a clearly losing situation	2 (11.11%)	16 (88.89%)	4 (11.76%)	30 (88.24%)	6 (11.54%)	46 (88.46%)
Starter in a clearly winning situation	3 (16.67%)	15 (83.33%)	3 (8.82%)	31 (91.12%)	6 (11.54%)	46 (88.46%)
Bench player in a clearly winning situation	3 (16.67%)	15 (83.33%)	7 (20.59%)	27 (79.41%)	10 (19.23%)	42 (80.77%)
Starter in a game that the team is down by 5 points	7 (38.89%)	11 (61.11%)	19 (55.88%)	15 (44.12%)	26 (50.00%)	26 (50.00%)
Bench player in a game that the team is down by 4 points	7 (38.89%)	11 (61.11%)	10 (29.41%)	24 (70.59%)	17 (32.69%)	35 (67.31%)
Backup center in a clearly winning situation	4 (22.22%)	14 (77.78%)	7 (20.59%)	27 (79.41%)	11 (21.15%)	41 (78.85%)
Starting QB in a clearly losing situation	0 (0.00%)	18 (100.00%)	6 (17.65%)	28 (82.35%)	6 (11.54%)	46 (88.46%)
Backup RB in a close winning situation	4 (22.22%)	14 (77.78%)	17 (50.00%)	17 (50.00%)	21 (40.38%)	31 (59.62%)
Bench player in a clearly losing situation	5 (27.78%)	13 (72.22%)	15 (44.12%)	19 (55.88%)	20 (38.46%)	32 (61.54%)
Total	35 (21.60%)	127 (78.40%)	88 (28.76%)	218 (71.24%)	123 (26.28%)	345 (73.72%)

Comparison of PCs and NPCs responses to the first GSDS. Coaches' responses to the first GSDS were compared based upon PROGRAM. Fisher's Exact Test was used to compare the GSDS responses based upon PROGRAM (Table 64 and Appendix AP). This statistic was chosen over Chi-Square because of the low cell values. There was a significant difference in coaches' response to situation eight: Backup RB in a close winning situation, more NPCs than expected returned the athlete to competition and more PCs than expected did not return the athlete to competition (Appendix AP). Further results of for GSDS Question 8 need to be examined with caution.

Table 64

Fisher's Exact Test the First GSDS by PROGRAM

Game Situation	Chi-Square Value	df	p*
Back up defensive tackle in a clearly losing situation	0.005	1	0.661
Starter in a clearly winning situation	0.709	1	0.339
Bench player in a clearly winning situation	0.117	1	0.521
Starter in a game that the team is down by 5 points	1.359	1	0.191
Bench player in a game that the team is down by 4 points	0.480	1	0.348
Backup center in a clearly winning situation	0.019	1	0.578
Starting QB in a clearly losing situation	3.591	1	0.066
Backup RB in a close winning situation	3.772	1	0.048**
Bench player in a clearly losing situation	1.328	1	0.198

* utilizing Fisher's Exact Test
** significant at the $p = 0.05$ level

Second Game Situation Data Sheet

All of the coaches combined, returned an injured athlete back to competition 30.98% of the time the second time they completed the GSDS. Table 65 depicts the PCs' and NPCs' responses to the second GSDS. Coaches varied based upon game situations when deciding to return a starter and a backup player. In a game that the team was clearly winning or losing, 12 (23.08%) of the coaches returned a starter back to competition, but in a game in which the team was down by five points 30 (57.69%) coaches chose to return the starter to competition. In a clearly winning situation, nine (17.31%) returned a backup player, in a clearly losing situation, nine (17.31%) returned a backup player. But in a close game situation 23 (44.23%) returned the backup player. Coaches' decisions to return a bench player to competition after an injury did not vary considerably based on the game situation. Thirteen (25.00%), 20 (38.46%), and 17 (32.69%) coaches returned a bench player to competition in a clearly winning, a clearly losing, and close winning game, respectfully. For situation five one coach did not choose to return or not return the bench player in the close game in which the bench player was replacing a tired starter. Instead the coach wrote a note to the researchers on what he/she would do: "Put the starter back in."

Table 65

Frequency of PCs and NPCs Responses to the Second Game Situation Data Sheet

Game Situation	PCs		NPCs			Total		
	Yes	No	Yes	No	NR	Yes	No	NR
Back up defensive tackle in a clearly losing situation	4 (2.22%)	14 (77.78%)	5 (14.71%)	29 (85.29%)	0 (0.00%)	9 (17.31%)	43 (82.69%)	0 (0.00%)
Starter in a clearly winning situation	4 (2.22%)	14 (77.78%)	8 (23.53%)	26 (76.47%)	0 (0.00%)	12 (23.08%)	40 (76.92%)	0 (0.00%)
Bench player in a clearly winning situation	5 (27.78%)	13 (72.22%)	8 (23.53%)	26 (76.47%)	0 (0.00%)	13 (25.00%)	39 (75.00%)	0 (0.00%)
Starter in a game that the team is down by 5 points	9 (50.00%)	9 (50.00%)	21 (61.76%)	13 (38.24%)	0 (0.00%)	30 (57.69%)	22 (42.31%)	0 (0.00%)
Bench player in a game that the team is down by 4 points	7 (38.89%)	11 (61.11%)	10 (29.41%)	23 (67.65%)	1 (0.33%)	17 (32.69%)	34 (65.38%)	1 (1.92%)
Backup center in a clearly winning situation	5 (27.78%)	13 (72.22%)	4 (11.76%)	30 (88.24%)	0 (0.00%)	9 (17.31%)	43 (82.69%)	0 (0.00%)
Starting QB in a clearly losing situation	3 (16.67%)	15 (83.33%)	9 (26.47%)	25 (73.53%)	0 (0.00%)	12 (23.08%)	40 (76.92%)	0 (0.00%)
Backup RB in a close winning situation	8 (44.44%)	10 (55.56%)	15 (44.12%)	19 (55.88%)	0 (0.00%)	23 (44.23%)	29 (55.77%)	0 (0.00%)
Bench player in a clearly losing situation	6 (33.33%)	12 (66.67%)	14 (41.18%)	20 (58.82%)	0 (0.00%)	20 (38.46%)	32 (61.54%)	0 (0.00%)
Total	51 (31.48%)	111 (68.52%)	94 (30.72%)	211 (68.95%)	1 (0.33%)	145 (30.98%)	322 (68.80%)	1 (0.21%)

Comparison of PCs and NPCs responses to the Second GSDS. Coaches' responses to the second GSDS were compared based upon PROGRAM. Fisher's Exact Test was used to compare the GSDS responses based upon PROGRAM (Table 66). This statistic was chosen over Chi-Square because of the low cell values. For situation five, one of the coaches did not choose to return or not return the injured bench player. For the analysis of situation five that particular coaches' response was not included because it would have made the cross tabulation table a 3X2. Fisher's Exact Test can only be computed on a 2X2 table. Chi-Square analysis could not be conducted if that coaches' response was included because it would have created an empty cell for the PCs, and Chi-Square Test cannot be computed with an empty cell. There were no significant differences in coaches' responses to the game situations when they completed the GSDS for the second time. Appendix AQ presents the observed and expected counts for the second GSDS by PROGRAM.

Table 66

Fisher's Exact Test the Second GSDS by PROGRAM

Game Situation	Chi-Square Value	df	p*
Back up defensive tackle in a clearly losing situation	0.465	1	0.375
Starter in a clearly winning situation	0.011	1	0.601
Bench player in a clearly winning situation	0.113	1	0.493
Starter in a game that the team is down by 5 points	0.667	1	0.300
Bench player in a game that the team is down by 4 points	0.930	1	0.375‡
Backup center in a clearly winning situation	2.109	1	0.143
Starting QB in a clearly losing situation	0.637	1	0.332
Backup RB in a close winning situation	0.001	1	0.605
Bench player in a clearly losing situation	0.306	1	0.403

* utilizing Fisher's Exact Test
‡ computed excluding the one no response

Comparison of First GSDS to Second GSDS for PCs.

PCs' responses to the second GSDS were compared to their responses on the first GSDS (Table 67). McNemar's Test was used to compare the two GSDSs. This statistic was chosen because the data were not independent as required by Fisher's Exact Test. McNemar's Test ignores the "yes, yes" and "no, no" responses and tests whether "yes, no" is as likely as "no, yes" (Table 68). Appendix AR depicts the observed and expected counts for the first GSDS compared to the second GSDS for PCs. McNemar's Test could not be computed for situation seven because all 18 coaches responded that they would not return the athlete to play on the first GSDS. Three (15.79%) PCs did return that athlete to competition on the second GSDS. There were no significant differences in PCs responses to the first and the second time they completed the GSDS.

Table 67

Frequency of PCs Responses to the First and Second Game Situation Data Sheets

Game Situation	First GSDS		Second GSDS		Total	
	Yes	No	Yes	No	Yes	No
Back up defensive tackle in a clearly losing situation	2 (11.11%)	16 (88.89%)	4 (2.22%)	14 (77.78%)	6 (16.67%)	30 (83.33%)
Starter in a clearly winning situation	3 (16.67%)	15 (83.33%)	4 (2.22%)	14 (77.78%)	7 (19.44%)	29 (80.56%)
Bench player in a clearly winning situation	3 (16.67%)	15 (83.33%)	5 (27.78%)	13 (72.22%)	8 (22.22%)	28 (77.78%)
Starter in a game that the team is down by 5 points	7 (38.89%)	11 (61.11%)	9 (50.00%)	9 (50.00%)	16 (44.44%)	20 (55.56%)
Bench player in a game that the team is down by 4 points	7 (38.89%)	11 (61.11%)	7 (38.89%)	11 (61.11%)	14 (38.89%)	22 (61.11%)
Backup center in a clearly winning situation	4 (22.22%)	14 (77.78%)	5 (27.78%)	13 (72.22%)	9 (25.00%)	27 (75.00%)
Starting QB in a clearly losing situation	0 (0.00%)	18 (100.00%)	3 (16.67%)	15 (83.33%)	3 (8.33%)	33 (91.67%)
Backup RB in a close winning situation	4 (22.22%)	14 (77.78%)	8 (44.44%)	10 (55.56%)	12 (33.33%)	24 (66.67%)
Bench player in a clearly losing situation	5 (27.78%)	13 (72.22%)	6 (33.33%)	12 (66.67%)	11 (30.56%)	25 (69.44%)
Total	35 (21.60%)	127 (78.40%)	51 (31.48%)	111 (68.52%)	86 (26.54%)	238 (73.46%)

Table 68

McNemar's Test comparing the First and Second GSDS for PCs

Game Situation	Exact Significance (2 sided)
Back up defensive tackle in a clearly losing situation	0.500
Starter in a clearly winning situation	1.000
Bench player in a clearly winning situation	0.687
Starter in a game that the team is down by 5 points	0.727
Bench player in a game that the team is down by 4 points	1.000
Backup center in a clearly winning situation	1.000
Starting QB in a clearly losing situation	NC
Backup RB in a close winning situation	0.219
Bench player in a clearly losing situation	1.000

NC = not computed

Comparison of First GSDS to Second GSDS for NPCs.

NPCs responses to the second GSDS were compared to their responses on the first GSDS (Table 69). McNemar's Test was used to compare the two GSDSs. This statistic was chosen because the data were non-parametric. McNemar's Test ignores the "yes, yes" and "no, no" responses and tests whether "yes, no" is as likely as "no, yes" (Table 70 and Appendix AS). There were no significant findings when comparing the first GSDS to the second GSDS for NPCs.

Table 69

Frequency of NPCs Responses to the First and Second Game Situation Data Sheet

Game Situation	First GSDS		Second GSDS			Total		
	Yes	No	Yes	No	NR	Yes	No	NR
Back up defensive tackle in a clearly losing situation	4 (11.76%)	30 (88.24%)	5 (14.71%)	29 (85.29%)	0 (0.00%)	9 (13.24%)	59 (86.76%)	0 (0.00%)
Starter in a clearly winning situation	3 (8.82%)	31 (91.12%)	8 (23.53%)	26 (76.47%)	0 (0.00%)	11 (16.18%)	57 (83.82%)	0 (0.00%)
Bench player in a clearly winning situation	7 (20.59%)	27 (79.41%)	8 (23.53%)	26 (76.47%)	0 (0.00%)	15 (22.06%)	53 (77.94%)	0 (0.00%)
Starter in a game that the team is down by 5 points	19 (55.88%)	15 (44.12%)	21 (61.76%)	13 (38.24%)	0 (0.00%)	40 (58.82%)	28 (41.18%)	0 (0.00%)
Bench player in a game that the team is down by 4 points	10 (29.41%)	24 (70.59%)	10 (29.41%)	23 (67.65%)	1 (0.33%)	20 (29.41%)	47 (69.12%)	1 (1.47%)
Backup center in a clearly winning situation	7 (20.59%)	27 (79.41%)	4 (11.76%)	30 (88.24%)	0 (0.00%)	11 (16.18%)	57 (83.82%)	0 (0.00%)
Starting QB in a clearly losing situation	6 (17.65%)	28 (82.35%)	9 (26.47%)	25 (73.53%)	0 (0.00%)	15 (22.06%)	53 (77.94%)	0 (0.00%)
Backup RB in a close winning situation	17 (50.00%)	17 (50.00%)	15 (44.12%)	19 (55.88%)	0 (0.00%)	32 (47.06%)	36 (52.94%)	0 (0.00%)
Bench player in a clearly losing situation	15 (44.12%)	19 (55.88%)	14 (41.18%)	20 (58.82%)	0 (0.00%)	29 (42.65%)	39 (57.35%)	0 (0.00%)
Total	88 (28.76%)	218 (71.24%)	94 (30.72%)	211 (68.95%)	1 (0.33%)	182 (29.74%)	429 (70.10%)	1 (0.16%)

Table 70

McNemar's Test comparing the First and Second GSDS for NPCs

Game Situation	Exact Significance (2 sided)
Back up defensive tackle in a clearly losing situation	1.000
Starter in a clearly winning situation	0.125
Bench player in a clearly winning situation	1.000
Starter in a game that the team is down by 5 points	0.625
Bench player in a game that the team is down by 4 points	1.000
Backup center in a clearly winning situation	0.453
Starting QB in a clearly losing situation	0.508
Backup RB in a close winning situation	0.774
Bench player in a clearly losing situation	1.000

CHAPTER V

Discussion

Purpose of Study

Two research hypotheses and three research questions guided this study. The first hypothesis proposed that the time-loss injury rate (TLIR) in the 2005 football season would be significantly less than the TLIR during the 2000-2004 baseline football seasons. The second hypothesis proposed that the non-time-loss injury (NTLIR) rate in the 2005 football season would be significantly less than the NTLIR during the 2000-2004 football seasons. The first research question examined the proficiency or lack of proficiency of coaches in the areas of first aid and injury prevention as measured by the P.R.E.P.A.R.E. examination. Examination of coaches' opinions of the P.R.E.P.A.R.E. program was the topic of the second research question. Lastly, the current study examined changes in coaches' decisions, as determined by the Game Situation Data Sheet (GSDS) data, to return an injured athlete to practice or competition after taking the P.R.E.P.A.R.E. program.

Injury Rates

The two research hypotheses proposed that the TLIR and NTLIR during the 2005 season would be significantly lower than the TLIR and NTLIR during the previous five years of data collection. Some differences in the injury rates (IR) were present during the 2005 season when compared to the previous five years of the study. Additionally, there were some differences in the IR in the current study when compared to similar studies.

These differences may be due to the coaches taking the P.R.E.P.A.R.E. program or to the teams adhering to the main elements of the P.R.E.P.A.R.E. program (emergency plan, gradual activity plan, proper water breaks, first aid kit, possession of signs/symptoms/management cards, and proper warm-up and stretching routines). All of the teams within the two towns that were studied conducted practices and games according to the six guidelines set forth in the P.R.E.P.A.R.E. program that were being stressed and monitored for adherence by the certified athletic trainers (ATC) collecting the data. All of the teams followed the six guidelines so that all of the children could benefit from the reduction of injuries related to those elements being implemented. Some of the literature on the topic of injury prevention has found a reduction in the injury rate of youth athletes when receiving an intervention over a control (Wedderkopp et al, 1999; Hewett et al., 1999; Heidt et al., 2000; Wedderkopp et al., 2000; Emery et al., 2004). The interventions used in those studies varied from preseason conditioning programs to proprioceptive training with a wobble board. Those studies were conducted on a female European team handball club, female soccer/volleyball/basketball players, and high school physical education students. The only other injury prevention study that has been conducted on football players was by Bixler and Jones (1992). A half-time warm-up and stretching intervention was found not to statistically reduce injury rates in high school football players. Direct comparison of the Bixler and Jones (1992) study and the current study should not be undertaken, due to the fact that there are a few differences between the Bixler and Jones (1992) study and this study. First, the Bixler and Jones (1992) study was conducted on high school football players. There are a number of distinct differences between high school football players and youth football players aged 8-14. Growth and maturation, strength, knowledge of the game, and development of skills are four such differences. Secondly, the Bixler and Jones (1992) study only utilized a halftime warm-up and stretching program. Within this study the coaches may have altered many different aspects of how they conducted the practices and games.

Time-Loss-Injury Rates

Comparison with Earlier Studies. The practice and game TLIRs in the current study were significantly higher than the practice and game TLIRs in the youth football study conducted by Turbeville et al. (2003) (Tables 71 and 72). The 2000-2004 athletes were over seven times as likely to suffer a practice time-loss (TL) injury when compared to the athletes in the Turbeville et al. (2003) study. Meanwhile the 2005 athletes were 650% more likely to suffer a practice TL injury as the Turbeville et al. (2003) athletes.

Table 71

Practice Time-Loss Injury, Athlete Exposure, Injury Rate, and Incidence Density Ratio Data for 2000-2005 Compared to Turbeville et al. (2003)

Season	Number of Practice TLI	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to Turbeville et al., 2003)
2000-2004	399	55,936	7.13 (6.47-7.87)	7.35 (5.10-10.60)*
2005	85	13,416	6.34 (5.13-7.83)	6.53 (4.35-9.81)*

* significant at the $p = 0.05$ level

Table 72

Game Time-Loss Injury, Athlete Exposure, Injury Rate, and Incidence Density Ratio Data for 2000-2005 Seasons Compared to Turbeville et al. (2003)

Season	Number game TLI	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to Turbeville et al., 2003)
2000-2004	181	11,520	15.71 (13.60-18.15)	1.78 (1.51-2.09)*
2005	29	2,684	10.81 (7.53-15.47)	1.22 (0.99-1.51)

* significant at the $p = 0.05$ level

The possible reason for the higher practice and game TL injuries in this study when compared to the Turbeville et al. (2003) study was a difference in the data collectors. In the first year of the Turbeville et al. (2003) study either an athletic trainer or a football coach completed an injury report, which possibly means that the number of injuries reported were less than the actual number of injuries that occurred. The authors do not state, "certified athletic trainer,"(ATC); therefore, one may question if these individuals were truly an ATC certified by the National Athletic Trainers Association (NATA). Individuals who are not ATCs may not accurately report the injuries due to a lack of understanding of injury pathology. They also may not have an understanding of the full gravity of an injury and may not withhold the athlete from competition when it is necessary. The other data recorders in that study were youth football coaches. Youth football coaches have many different matters needing their attention, including conducting practices with approximately 15-25 athletes, making sure that every child gets the minimum number of plays, and calling the plays. Therefore, it is likely that reporting injuries was low on the priority list of many coaches. Furthermore, most of the youth football coaches are volunteers with regular full time jobs and are likely not as invested in the reporting of injuries as ATCs. These youth coaches may not fully understand the reasons for documenting the injuries and may not see the importance of doing so. Additionally, due to time constraints, the youth coaches who have full time jobs may not have time to record those injuries. The typical youth football practice is two hours in length. As coaches, they have to be there at least 30 minutes prior to practice and usually stay at least 30 minutes afterwards. They may even stay longer if any parents are late in picking up their children from practice. By the time the youth coaches arrive back to their respective homes and eat dinner it is approximately nine o'clock at night. Volunteers who have put in an eight hour day at work and then coached youth football players for two plus hours probably do not want to spend additional time recording injury data. Reliability of coaches recording injuries probably is not as good as that of a person without any coaching responsibilities. The current study utilized ATCs, who were compensated for their time, as the data recorders. These individuals had no coaching responsibilities. They were there solely to record the number of athletes participating and the injuries suffered by those athletes. Thus, these individuals did not have the time constraints or burden of other responsibilities to distract them from the accurate recording of injuries.

The chance of an athlete in 2005 suffering a game TL injury was not significantly higher than the youth football players in the Turbeville et al. (2003) study. There was a significant difference in the game TLIRs of the 2000-2004 seasons but not the 2005 season. One possible explanation of this finding was that some of the coaches took the P.R.E.P.A.R.E. program. They may have utilized the knowledge gained leading to a reduction in the game TL injuries experienced by the youth football players. The information in the P.R.E.P.A.R.E. program contains suggestions on the prevention of acute, chronic, head, and neck injuries, adjustments to the heat, information about the benefits of a warm-up, cool down, and stretching routines, and suggestions for proper warm-up, cool down, and stretching routines. With an understanding of ways in which to prevent acute, chronic, head, and neck injuries, the youth coaches may have altered the way they conducted their practice and game routines. By following the adjustment to heat protocol, the youth football players may have been better adapted to the environment and were better able to handle the physical demands of the game. The coaches may have had a better understanding of how to conduct a proper warm-up to prepare their athletes for competition. Practices for the two youth football programs that participated in this study occurred from approximately 6-8 pm during the week. The games, though, could have occurred any time between 9 am and 6 pm, during which the temperature and the heat index may have been higher than that during practices. If the youth football players were not properly adapted to the heat from 6-8 pm, they would most likely have had a harder time with the heat and humidity during the hotter parts of game days.

Comparison of 2005 season with previous seasons. Examination of the overall TLIR revealed no significant differences between the 2000-2004 seasons and the current season. When the TL injuries were broken down by session (practice or game) and by town a significant finding was present. The game TLIR in Town B during the 2000-2004 seasons was significantly higher than the game TLIR in the 2005 season.

The reduction in the game TLIR, for town B, provides support that something that was altered during the 2005 season resulted in a reduction of TL injuries in town B. It is unclear whether the change was because some of the coaches took the P.R.E.P.A.R.E.

program and/or because all of the coaches implemented the six elements of the program that resulted in the reduction of injuries experience by the athletes. Similar to this study, the study conducted by Junge et al. (2002) found that coach and player education, rehabilitation, and a conditioning program decreased the injury rates in youth soccer players. In both the current study and the study conducted by Junge et al. (2002), there is an inability to tease out which aspect of the injury prevention programs lead to the decrease in injury rates. If a coach took the education seriously, then it would be expected that he/she would implement the suggested injury prevention tactics described in the program. In this study even if the coach did not take the P.R.E.P.A.R.E. program or took the program, to fulfill an obligation, he/she was required to institute at least a few of the recommendations from the program because they were being monitored for compliance. It is the hope of educational injury prevention programs that coaches are provided the information and that they utilize that information in how they conduct their practices and games. In the current study and the study by Junge et al. (2002), the coaches were monitored such that the recommendations were being applied. Thus, the information contained within these two programs, if instituted, resulted in a reduction of injuries in youth athletes.

Non-Time-Loss Injury Rates

The athletes during the 2000-2004 seasons were at 30% and 65% greater likelihood of suffering a practice and game NTL injury, respectively, when compared to the 2005 season. When the data were separated into the two towns, the significant difference in the practice NTLIR was no longer significant. With a lack of consistent significant differences in the practice NTLIRs, it cannot be said with certainty that the

P.R.E.P.A.R.E. program had any effect on reducing the practice NTLIR. Town B had significantly less game NTL injuries in the 2005 season. With the findings of significant differences in Town B, it can be concluded that the P.R.E.P.A.R.E. program may have an effect on reducing the game NTLIRs.

No other study has reported on the NTLIR in youth football, thus comparison of the findings concerning NTL injuries is impossible. One reason why the NTL injuries may have not been reported is due to the fact that the effects on the athletes are considerably less than TL injuries. What has not been considered is the demand upon a coach to care for and deal with those injuries. No matter if an injury is a TL or NTL injury, someone has to take time and evaluate and care for the injury and decide if the athlete is going to return to play. From the information gathered from this study, the majority of the injuries are NTL injuries. Thus, the coaches primarily have to deal with such injuries. Additionally if NTL injuries are not cared for and dealt with properly they can develop into more serious injuries that will result in a TL injury. So a reduction in NTL injuries is an important finding of this study, because of its impacts on the demands on the coaches and the effects on the youth athletes.

The difference in reduction in the injury rates between the two towns study may have been due in part to the leadership of the two programs. In addition to being the director of Town Bs program that individual was also the president of the league. Because the director of the Town B youth football program was also the president of the league, the coaches in Town B may have been monitored more closely for adherence to the rules set forth by the league to a greater extent than the coaches in Town A. Also since the program in Town B was smaller than the program in Town A, supervision of

the coaches was enhanced. In addition there was a difference in the philosophy of the two towns. Town B had more of a development and town-oriented philosophy than Town A. These differences may have led to the differences in the reduction of injuries seen in the 2005 season.

Overall injury rates

Because there was no distinction between TL and NTL in the study conducted by Radelet et al. (2002), a comparison of the findings from that study and the current study can only be made between the overall, practice, and game IRs (Table 73). When considering the 2000-2004 seasons athletes, were nearly 40% more likely to be injured than the Radelet et al. (2002) athletes. But the overall IRs in the 2005 season did not statistically differ than the IRs in the Radelet et al. (2002) study. The Radelet et al. (2002) study had a very broad definition of an injury; any injury that brought the coach onto the field, one in which the player was removed from participation, or one in which first aid was rendered to the athlete. So even injuries in which the athlete received a band-aid was to be recorded, or one in which an athlete just needed a breather was to be recorded. With such a broad definition of an injury a data recorder would be constantly occupied recording those injuries due to the sheer number of such injuries. Additionally, Radelet et al. (2002) utilized coaches as data recorders and in this study ATCs were the data recorders. As mentioned earlier the demands on youth football coaches are many and their ability to record the injuries may have been less than that of an individual without coaching responsibilities. Asking them to in addition to their coaching duties to record all of the injuries that occurred, no matter how minor, is problematic and most likely results in underreporting. Additionally, youth football coaches may not have the knowledge necessary to fully understand an injury and what actions need to be taken to care for such an injury. Thus, an injury in which they would allow the athlete to return to competition may have been an injury in which an ATC would have withheld the athlete.

Table 73

Overall Injury, Athlete Exposure, Injury Rate, and Incidence Density Ratio Data for 2000-2005 Compared to Radelet et al. (2002)

Season	Number of TL & NTL Injuries	Number of AE	Injury Rate (95% CI) per 1000 AE	IDR (95% CI) (compared to Radelet et al, 2002)
2000-2004	1427	67,456	21.15 (20.10-22.67)	1.39 (1.16-1.66)*
2005	258	16,100	16.02 (14.20-18.08)	1.05 (0.85-1.30)

* significant at the $p = 0.05$ level

Reason for Significant Findings

The reduction in game TL and NTL injuries may have been due to a number of reasons. As already mentioned, through the P.R.E.P.A.R.E. program coaches were taught the benefits of a proper warm-up and cool-down, how to conduct a warm-up and cool-down, proper stretching techniques, benefits of adequate rest, and prevention strategies for acute and chronic injuries. During the 2005 season all coaches were required to implement some elements of the P.R.E.P.A.R.E. program, even if they were in the NPC group. Additionally, all of the coaches were monitored for compliance by the ATC and the program administrators. The reason for having all of the teams follow the same protocols was that no harm was expected from compliance, but non-compliance may have resulted in athletes being put at a higher risk of injury. Research ethics mandated being concerned with reducing injury rates of all youth athletes.

Educational injury prevention techniques are only helpful if the information contained within those programs is actually implemented by the coaches. By having all of the coaches conduct their practices and games in accordance to the recommendations made by the P.R.E.P.A.R.E. program, the true effect of those recommendations could be realized. One of the "Es" of injury prevention is enforcement. Though it is more difficult to develop rules and regulations, and then enforce those rules and regulations, the result of such enforcement is greater than education alone. Thus, the effects of the combined education and the enforcement can be examined for its effects on injury prevention. This situation is a limitation of the current study, that there was enforcement of the suggested injury prevention techniques provided in the P.R.E.P.A.R.E. program. Coaches need the education to understand the enforcement of the rules. Some coaches do not know or realize the reasons behind some of the rules and regulations that are in place to protect the athlete. Through education such as the P.R.E.P.A.R.E. program the coaches are given insight into the rationales for the rules and regulations. With that understanding a coach is more likely to follow those rules.

All teams involved in this study followed the same stretching routine during the 2005 season. In previous years coaches would conduct their own stretching routine with varying stretching positions and techniques. During the 2005 season all coaches were given a folder with the stretching routine (with pictures) and guidelines to follow when stretching. The most notable change in the stretching routines was the length of time that each stretch was held. In the past, each stretch was held for approximately 10 seconds. During the 2005 season each stretch was to be held for 30 seconds. On a few occasions a few coaches needed to be reminded during the season on the length of time each stretch was to be held, but otherwise each team was compliant. By doing the proper stretches in the proper manner the youth football players were not placed at risk for an injury compared to previous seasons. Likewise, they were better prepared to do physical activity without injury due to improper warm-up or tight musculature.

During the 2005 season all teams followed a gradual activity plan, which dictated the length of time and the amount of exertion the coaches were to have the athlete participate. In previous years, the coaches were not given any guidance on how to gradually acclimate the athletes to the heat and activity. Instead, the coaches were given full reign on what to do and how to go about doing it. Observations from the ATCs that collected the data revealed that coaches did not know how to acclimate the athletes to the heat or activity. The two football programs studied were diligent in addressing what the football players should wear during the heat, but did not have a specific protocol for coaches to follow about how to gradually adjust the players to the activity and to being active in the heat. For instance when it was especially hot, they would have the players wear no pads just helmets. They may have even put restrictions on what the coaches could have the players do during practice, e.g., no sprinting allowed or taking mandatory water breaks every 15-30 minutes. Even though the intentions of these restrictions are good and are necessary, they are not enough. The coaches are not informed of how to gradually work their athletes into the activity. A heat illness can occur at almost any temperature; a heat index of 95-100 is not necessary for a youth athlete to suffer from a heat illness.

The coaches do not necessarily understand what gradual means. But when given the gradual activity plan during the 2005 season, the coaches had a direct tangible understanding of what they could and could not have their athletes do. The gradual activity plan put limits on how strenuous and how long the athletes were to practice. There was some initial resistance to the gradual activity plan. For example, the coaches saw on the first day of practice that they were to have the players only do light activity for 30 minutes. The coaches' response was "okay what do I do the other 90 minutes of practice." Once it was explained to the coaches that it was not 30 minutes of practice, but rather that each athlete should only do 30 minutes of activity, they understood how they could conduct practice. In other words if a team was doing a drill where 25 athletes were put in groups of five, and each group did a minute of activity, each athlete still had 29 minutes left of activity time even though at least five minutes of practice time was used.

Additionally the concept of light and moderate activity was introduced in the gradual activity plan. Previously the coaches were not restricted on how strenuous the activity could be for the youth athletes. The gradual activity plan recommends that for the first day the athletes only do 30 minutes of light activity. Coaches inquired about what constituted light activity. The example that a dead sprint was strenuous or 100%, and that a run at approximately 50-75% was moderate, and that a jog of about 25-50% was light was given as a practical guide for the coaches. Coaches understood the specific percentages a lot better than the idea of light, moderate, and strenuous. Additionally they were able to convey this concept to the athletes. The youth athletes understood what a sprint, run, and a jog were and the differences between those three. One may question that the kids would try extra hard even though the coaches instructed them to only jog, but due to league rules this concern was not an issue within this study. The two programs studied did not cut any athletes and the athletes knew about this rule. Thus, there was no threat of being cut because of performance, and the athletes really could go at the intensity that their coach stated.

Even though the athletes themselves were not asked about their opinions and thoughts of the gradual activity plan, some feedback was given. At least three parents from Town B's athletes approached the ATC collecting data in that town and asked what they were doing differently this season as opposed to the previous seasons. The parents reported that their kids were not as exhausted, sore, or were not complaining as much as previous seasons. Since the ATC collecting the data during the 2005 season had been working with that program for five years, she had experience with some of these children, she knew that those particular children were not the computer game playing or television watching type. These kids are ones that tried and stayed active throughout the year. If these athletes noticed a difference, it can be inferred that their non-active counterparts faired better also. Because the athletes felt better, they may have been at a reduced risk of injury due to fatigue. Fatigue is one of the potentially modifiable intrinsic risk factors of injury in youth athletes (Maffulli & Cane, 2005). Many have found that there is an increase in the injury rates in sports when the athlete is fatigued (Cahill & Griffith, 1978; Kerr & Minden, 1988; Pinto, Kuhn, Greenfield et al., 1999; Watson, 1984). If one is fatigued he/she may not be paying attention to his/her surroundings and be susceptible to injury, or he/she may be unable to react to avoid injury. Additionally, due to being fatigued his/her body may not be able to recover from minor injuries that may in the future lead to more serious injuries.

In epidemiology injury is the result of three forces (host, agent, and the environment) coming together at a particular point in time. It is the relationship of these three forces that contribute to the injury. Injury preventive measures can be instituted to alter any of the three forces at any point in the injury phase (pre-injury, injury, and post injury). Educational injury preventive methods such as the P.R.E.P.A.R.E. program are multi-pronged in that they provide suggestions to alter all three forces at all three phases of an injury. For example the host and the environment are altered by the changes made in the conditioning of the athlete. The environment (the actual conditioning drills) is altered because coaches are given information on how to better condition an athlete. Hosts are better able to withstand injury because they are better adapted to the environment and the activity. The P.R.E.P.A.R.E. program does not only try to prevent injury from occurring, but also attempts to lessen the severity of the injury once it does occur. For example, by providing coaches with knowledge on how to care for injuries, the likelihood of a minor injury escalating into a major injury is lessened. Any alterations, no matter how small, may have an effect to lessen the risk or severity of injury. Programs designed to make multiple alterations to enhance the overall experience are best suited to help reduce the injury rates seen in youth sports.

First Aid and Injury Prevention Knowledge

The first research question inquired about the first aid and injury prevention areas in which youth football coaches were proficient and deficient as measured by the P.R.E.P.A.R.E. examination. Of interest was the percentage of coaches who responded correctly to each question and if there was a difference in the number of coaches responding correctly based upon whether they took the P.R.E.P.A.R.E. program or not.

A higher percentage of P.R.E.P.A.R.E. coaches (PCs) (73.70%) passed the P.R.E.P.A.R.E. examination, the second time they took the exam, than non

P.R.E.P.A.R.E. coaches (NPCs) (47.22%). This finding should be expected because PCs had already taken the P.R.E.P.A.R.E. program and answered the questions previously. Of concern was that over 25% of PCs failed the examination three months after taking the program.

There were significant reductions in the module two, three, and seven scores for the PCs between the first time they took the P.R.E.P.A.R.E. examination and the second time they took the examination. Those modules contained information related to heat and cold related illnesses, emergency recognition, and warming up and cooling down. There was not only a loss of knowledge about those topics from PCs but there was a lack of knowledge by NPCs, as evident in the high percentage of both PCs and NPCs incorrectly answering the same questions in those modules.

If 25% of PCs failed the examination three months after taking the program a higher percentage could be expected to fail a year after taking the program. This finding supports yearly certification as suggested by Barron (2004). Currently, the National Center for Sports Safety (NCSS) does not offer a refresher course to the coaches who took the P.R.E.P.A.R.E. program. To aid in retention, the American Red Cross requires re-certification of first aid every three years. Apparently, if more than 25% of coaches are losing the necessary information within three months, surely more would lose the information over a year period. NCSS should consider offering a refresher course to all coaches who take the P.R.E.P.A.R.E. program. This program should either be free or cost less than the original one, or offer additional information. It is the goal of NCSS to launch a second level of the P.R.E.P.A.R.E. program. Currently this concept is in the design phase, but the results of this study support further web-based coaching education to assist coaches in obtaining and retaining the information.

The percentage of NPCs (47.22%) passing the examination was higher than the number of coaches passing similar examinations in previous investigations. Barron (2004) found that only 15 (5.17%) of 290 volunteer youth basketball, soccer, and football coaches passed the revised American Red Cross First Aid Assessment (FAA). That study has been the only other study that examined the first aid and injury prevention knowledge of volunteer youth coaches. Three studies examined the first aid and injury prevention knowledge of high school coaches. Ransone and Dunn-Bennett (1999) reported having a higher percentage of coaches passing the FAA than did Barron (2004). Thirty-eight (36%) of the 104 coaches who participated passed the FAA. Of those 104 high school coaches, 96 (92%) were currently certified in first aid, as required by California law. In 1986, Rowe and Robertson developed and administered a first aid test to Alabama high school coaches. Only 34 (27%) of the 127 coaches tested earned a passing score. In 1991, Rowe and Miller administered the same test to Georgia high school coaches. Fifty (38%) of the 130 Georgia high school coaches passed the first aid test, in light of 116 (89%) of the coaches having current first aid certification. The FAA not only covered first aid and injury prevention topics but also questioned coaches on proper CPR technique. The P.R.E.P.A.R.E. program lightly goes over what CPR is and in what instances one would use such techniques. The P.R.E.P.A.R.E. program states that they do not certify individuals in CPR and that teaching CPR is beyond the scope of the program. NCSS does recommend that coaches seek additional certification in CPR through either the American Red Cross or the American Heart Association. Also the percentage to pass the FAA and the exam used in the other studies was higher than the percentage needed to pass the P.R.E.P.A.R.E. examination. The FAA, as with all American Red Cross examinations, required that coaches earned an 80% or better on the test. To pass the P.R.E.P.A.R.E. examination a coach only needed to have a 70% or better for each of the modules. If the standard was raised to 80% to pass the P.R.E.P.A.R.E. examination, nine (47.37%) PCs and only three (8.33%) NPCs would have passed. The percentage of PCs passing the exam, at the 80% standard, was similar to the percentage of coaches passing the exam in the Ransone and Dunn-Bennett (1999) study. On a traditional 10 point grading scale a score of 70% is the lowest score to receive a grade of C. That scoring system is appropriate for most courses, but when dealing with lifesaving information a higher score should be necessary. One would not want a person to be performing first aid on him/her when that individual only knew 70% of the information necessary to perform such tasks. Even better yet what if the 30% that the individual did not know, pertained to the injury he/she has suffered. It is important to note the dramatic difference in the passing rate between the PCs and the NPCs when the standard is elevated to 80%. This difference testifies to the effect of the P.R.E.P.A.R.E. program on increasing the first aid and injury prevention knowledge of volunteer coaches.

There were nine questions from the P.R.E.P.A.R.E. examination that over 25% of both PCs and NPCs answered incorrectly. Those nine questions dealt with emergency planning when traveling, care for a lightning strike victim, signs of dehydration, ideal carbohydrate concentration of sports drinks, a way to treat a mild cold illness, the number of vital signs that can be easily checked, symptoms of hyperventilation, the first step that should be taken for an unconscious athlete suspected to have a concussion, and the order of warm-up stages. The fact that such a high percentage of both PCs and NPCs incorrectly answered these questions warrants further examination of those questions.

Even though 24 coaches, five (26.32%) PCs and 19 (52.78%) NPCs, incorrectly answered the question about emergency planning when traveling, some of those responded with a possible acceptable alternative. Eight, three (15.79%) PCs and five (13.89%) NPCs, provided a possible alternative, while the remaining 16, two (10.53%) PCs and 14 (28.89%) NPCs, provided an unacceptable response. The correct answer to this question would be to contact the other facility prior to the game and make adjustments to their own emergency plan. Eight coaches responded that they would obtain a copy of that facilities' emergency plan when they arrived. Now one can only assume that they were planning on reviewing the plan with their coaching staff and make adjustments to their plan. But that is not totally reasonable due to time constraints and demands of the coaching staff prior to a game. Prior to any competition coaches are always busy preparing, getting the athletes ready, and making last minute adjustments to their line up. The last thing that these coaches want to do or could do is to review an emergency plan. It is just unacceptable that 16 coaches responded that they would use the same plan that they normally would use at their facility. It is nearly impossible for coaches to use the same plan when they do not know the layout of the facility or who to contact on site if there is an emergency. An emergency plan is not universal, there can be a basic blue print but each site has unique qualities about it that need to be taken into consideration when planning an emergency plan. Two examples of aspects of an emergency plan that are not universal are who has keys to the gate that the ambulance will have to enter through and what is the best way to describe the location of the field. The coaches designated to stay with the injured athlete, call emergency medical services (EMS), or gather the other athletes for a team meeting would remain the same, but the specific details of the plan would be different for each site.

Even if a coach knows he/she has to activate the emergency plan, what is he/she to do if no plan has been developed? Coaches of each team were to develop an emergency plan for their team. They were even given an emergency plan template to aid in developing the plan. The fact was that only ten teams returned a copy of the emergency plan to one of the two researchers. That does not mean that the coaches did not discuss what they were going to do in case of an emergency, but the likelihood is very low. If the plan is not written down and given to everyone, how is everyone to know what they are responsible to do? Additionally, legally the coaches could be found negligent for not being prepared to handle an emergency situation if they do not have an adequate emergency plan. This area needs to be addressed by the two programs. Due to the demands on the youth coach it may not be wise to place an additional burden on them. Thus, the youth organization should develop an emergency plan for the whole program, have it in writing, and give it to all coaches. This general plan should be given to the coaches and each team of coaches should decide which coach is going to do the different aspects of the plan. For example, the overall plan can state that someone needs to inform the program director that an emergency situation has occurred and that EMS needs to be summoned. Additionally, the plan may call for a coach to meet the ambulance and direct them towards the location of the emergency. By having a general plan there is less of a burden placed upon the coaches. They can just follow the established plan step by step.

Twenty-one coaches, 5 (26.32%) PCs and 16 (44.44%) NPCs, incorrectly answered the question about caring for a victim of a lightning strike. The correct answer is to check the scene for safety. The two incorrect responses that those coaches gave were to move the victim to a safer location or evaluate airway, breathing, and circulation. These two responses seem reasonable until a situation presents itself in which the scene is unsafe. In that situation instead of there being one victim there would be two or more victims and possibly even more disastrous effects. Individuals, including coaches, see an individual who is injured and they want to help that individual. They forget the old saying of "safety first." Anyone who witnesses a person being struck by lightning, or any other serious trauma for that manner, will experience a rush of adrenaline often causing him/her to do the first thing that comes to his/her mind. Most likely the first thing would be to aid the person. But individuals who are trained in programs such as P.R.E.P.A.R.E. or American Red Cross (ARC) First Aid learn that they must first check the scene for safety. In fact, checking the scene for safety is the first topic covered in the ARC First Aid courses.

This question should have some meaning to some of these coaches because a youth athlete in the area was struck recently by lightening. In 2001, a mid-Michigan youth soccer player was struck by lightning while practicing. The coach of that athletes' team did not heed the warning signs of a nearby thunderstorm, but it must be remembered that lightning can strike from at least 6 miles away from the storm. The coach did not know what to do and in fact he had other athletes run to the nearby high school and alert the high school's athletic trainer. The coaches were unable to even send information concerning the athlete's condition to the athletic trainer. A lack of knowledge of what to do in that situation lead to a delay in the treatment services given to that athlete. After this incident people throughout the mid-Michigan area were provided information on how to care for a victim of a lightning strike via the local news. Apparently these coaches either did not receive the information or forgot what actions should be taken.

Some of the coaches in this study may also have thought that they would not face a situation where an athlete would be struck by lightning because of the league rules. The league rules state that at the first strike of lightning or clap of thunder that all of the athletes need to be off the field and in a safe location. Even with this rule in place, there is still a chance of an athlete being struck by lightning. Because some of the teams in this study practice at least 300 yards from the closest safe location, there is still the possibility of someone being struck by lightning as the team makes its way to the safe location. On a good note about this particular question was that at least none of those coaches responded that they would begin CPR, since there was no information provided that stated that the individual did not have a pulse.

Strikingly, 18 (7 PCs and 11 NPCs) coaches did not know that thirst, decreased performance, and cramps are all signs of dehydration. Nine (3 PCs and 6 NPCs) thought that thirst was not a sign of dehydration. Thirst is a definitive sign of dehydration, but should not be used as an initial indicator of dehydration. When individuals are thirsty they are already dehydrated and the likelihood of re-hydrating them during practice is not likely. As with all of the systems in the body, performance is decreased when in a state of dehydration (Murray, 1992 and 1995). Decreased performance is a sign of dehydration that coaches are able to detect without asking the athlete. Youth coaches need to be made aware of the signs of dehydration because the effects of dehydration can escalate into very serious health issues, for instance heat exhaustion or heat stroke.

The effects of a high percentage of both PCs and NPCs not knowing the proper carbohydrate concentration of fluid replacement solutions could cause illness to the athlete. Drinking fluids that are too high in carbohydrate concentration will cause a delay in gastric emptying and thus make less fluid available to the body. This delay in gastic emptying can cause further dehydration in the active athlete. The ideal carbohydrate concentration of fluid replacements should be in the range of 6-8% (Casa et al., 2000). Eighteen (5 PCs and 13 NPCs) coaches thought that the ideal carbohydrate concentration was 20-25%, 10 (1 PC and 9 NPCs) thought 12-15% was ideal, both of which would make an athlete very sick and increase the chance of dehydration. Coaches may buy appropriate fluid replacement powders to make a fluid replacement solution for their athletes, but the idea of more is better could cause the coach to put too much powder in too little water. Not all coaches make their own fluid replacement solution, but they may have the parents of the athletes provide halftime and post-game snacks/drinks. It is important for the coaches to know the appropriate snacks/drinks that the youth athletes should have so they can pass that information on to the parents, and the parents can provide appropriate snacks/drinks for the youth athletes.

One would expect that people in Michigan would know how to treat a mild case of cold illness, but only 14 (7 PCs and & NPCs) coaches knew that one viable treatment option was to blow hot breath on the area. That is not the only potential action but rather the only appropriate option from the choices provided on the exam. The remaining 41 coaches either thought to rub the area, put the area in water, or blow hot breath/rub/put the area in water collectively were the correct treatment options for a mild case of cold illness. Besides blowing hot breath on the area, one of the most common treatment options for a mild cold illness is to have the athletes either place the hands/fingers (most often affected areas) in their arm pits or to have the athletes slip their fingers into the top of their pants. The theory behind these treatment options is the affected area will re-warm by conduction but will not get burned, which is possible by placing the area in water. One could only speculate about what the results would have been if those two treatment options were given as options on the exam. These are not the best methods, but they are effective at re-warming the area. NCSS did not include these two treatment options in the P.R.E.P.A.R.E. program. It is understandable that NCSS might not mention slipping the hands/fingers into the pants because of the potential sexual connotations, but the placing of hands/fingers in the arm pits is very reasonable and should have been mentioned. NCSS should include this very acceptable and reasonable treatment of a mild case of cold illness in the P.R.E.P.A.R.E. program. At least offer this as an alternative to blowing hot breath onto the area.

There are nine vital signs that can be evaluated quickly on the field to help determine the status of an injured athlete. Only six (2 PCs and 4 NPCs) coaches knew the answer to that question. Seventeen (6 PCs and 11 NPCs) coaches thought there were seven signs and 32 (11 PCs and 21 NPCs) coaches thought that there were only five. If the coaches do not know how many vital signs there are, how can they be expected to know what the vital signs are? The majority, 19 PCs and 31 NPCs, of coaches knew that respiration, skin color, and temperature were three of the nine vital signs, because 19

(100%) PCs and 31 (86.11%) NPCs correctly answered another question inquiring about which of the following was not a vital sign: respiration, swelling, skin color, and temperature. One would hope that the coaches knew that circulation or pulse is another sign. But it cannot be assumed that the coaches knew that blood pressure, pupils, level of consciousness, movement, and reaction to pain are also vital signs. Hopefully, if an athlete has unequal pupils or was unconscious, the coach would notice something was wrong, but if a coach does not know what to look for, how can he/she look for it?

Only 11 (57.89%) PCs and 20 (55.56%) NPCs knew that numbness, tingling in the hands, and light headedness are all symptoms of hyperventilation. A high percentage of both PCs (36.84%) and NPCs (36.11%) thought that only light headedness was a symptom of hyperventilation. One possible reason for the coaches knowing that light headedness was a symptom is that light headedness is the first symptom that an individual hyperventilating will experience. The symptoms of hyperventilation progress from an individual experiencing light headedness to tingling and numbness in the hands. Thus, due to a lack of experience these coaches may not have known the other typical symptoms of hyperventilation.

Many coaches did not indicate they would activate an emergency plan for an unconscious athlete who has suffered a concussion. Twenty-four coaches, 6 PCs and 18 NPCs, thought to maintain the athlete's airway, breathing, and circulation was the first thing that should be done. It is not known what those coaches would have taken as their second step, but it is likely that they would have activated their emergency plan next. Seven coaches, 2 PCs and 5 NPCs, even indicated that they would question the athlete about time, place, person, and purpose to determine if there is any memory loss. The athlete is unconscious; he/she cannot respond to any questions. This scenario leads one to believe that those coaches did not understand what the word "unconscious" meant, nor did they understand that it is a medical emergency that needs to be handled by trained professionals. Or, those seven coaches may also not have been paying attention to the question on the exam. An earlier question asked what the care should be for an unconscious athlete who has a functioning airway, breathing, and circulation, but may have a neck injury. Only one coach, a NPC, incorrectly answered that question. Thus most of the coaches knew that in the case of an unconscious neck injury to activate EMS, and leave the injured athlete in the position found, and monitor ABCs until EMS arrives. Coaches are told over and over again in case of a suspected neck injury to leave athletes where they are and activate EMS. One may conclude that the coaches did not know what the word "unconscious" meant, and the fact that seven (12.73%) of the coaches did not know the meaning of unconscious is worrisome. Additionally, no matter what is suspected if a youth athlete is unconscious, EMS should be activated.

Coaches even with training were confused about the four stages of a warm-up. The majority of the coaches answered the question about the phase order of a warm-up based upon what they typically did during practice (jogging, stretching, gentle loosening exercises, then event specific training). The one phase of the warm-up that coaches had trouble instituting was the gentle loosening exercises prior to jogging and stretching. This concept was new to these coaches and they resisted the institution of that concept. More emphasis should have been placed and should be placed in the future on the correct order of the warm-up phases.

PCs and NPCs significantly differed in the number of coaches providing the correct answer on a few questions. Those questions dealt with length of time needed to adjust to the heat, the ideal carbohydrate concentration of replacement fluids, care for an athlete having a seizure, pressure point locations, where to keep a dislodged tooth, and length of a cool-down period. For the aforementioned questions, significantly less NPCs provided the correct answer than expected. At the beginning of this study there were significantly more PCs who were currently certified in First Aid and/or CPR than NPCs. It may be thought that the difference in the questions covering material that would be part of a First Aid course (the care to render a person having a seizure, the location of the pressure points, and where to keep a dislodged tooth) may be due in part to the difference in the number of PCs and NPCs that were currently First Aid certified. The difference in the number of PCs and NPCs who correctly answered the question concerning the pressure points was no longer significant when only the PCs and NPCs who did not have current first aid certified were compared. There still was a significant difference in the number of PCs and NPCs who correctly answered the questions concerning care for a person having a seizure and where to keep a dislodged tooth when only the PCs and NPCs that were not currently certified in First Aid were compared.

The correct length of time needed to adjust to the heat is 10-14 days. Fifteen (41.67%) NPCs thought that it only took 1-2 days to adjust to the heat and one (2.78%) thought that athletes do not need to adjust to the heat. Even though this study was conducted in mid-Michigan that part of the country does experience hazy, hot, and humid weather. In fact, at the beginning of the 2001 season, there was a heat wave the first week of practice. At that time, the heat index every day was around 100° F. Also during the 2002 and 2003 seasons there was very hot and humid weather. So it is important that even coaches in Michigan need to be aware of how long adjustment to the heat should take and how to adjust athletes to that heat. It was surprising that so many NPCs responded 1-2 days, when league rules require that the first eight hours (about 4 practices), for $4^{th}/5^{th}$ and 6^{th} grades, and six hours (about 3 practices), for 7^{th} and 8^{th} grades, of practice time be devoted to acclimation and conditioning. One of the directors of the football programs studied, the league president, has shared with ATC collecting data in that town some complaints from coaches about some of the league rules. A number of the complaints concern the acclimation and conditioning requirements during the first week of practice. A number of the coaches within this league do not have a full understanding of the reasons behind the acclimation and conditioning period. Because they do not have an understanding they are disgruntled about the rule. It was surprising that so many NPCs incorrectly answered this question because further restrictions, due to the gradual activity plan, were enacted during the 2005 season. One would think that since they were restricted even further on how strenuous and how long of a workout they could have the youth athletes do, that they would know that adjustment to the heat took longer than 1-2 days. This just even further highlights the fact that the majority of untrained youth coaches do not know the reasons behind the rules that are in place for the protection of the children.

PCs and NPCs significantly differed in their response to the question about what care should be rendered to an athlete having a seizure. When an individual is having a seizure, the appropriate treatment would be to remove objects from around the individual that may cause the person harm. A high percentage of NPCs thought that one should place a tongue depressor in the mouth of the athlete having a seizure. Anything placed in the mouth of a person having a seizure can become a choking hazard and possibly cause an obstructed airway. One would think that a person who suffers from seizures would not be allowed to play a sport such as football, but that is incorrect. First of all, if the person has his/her seizures under control, there are few restrictions on his/her life. Secondly, it may not be known that the person has problems with seizures, and the coaches may have to manage an athlete having his/her first seizure.

Coaches differed by group in knowing where to keep a dislodged tooth until the athlete could be seen by a dentist. Even though football players wear mouth guards, there is still a chance of a tooth being dislodged, whether from football or youth antics. During the 2000 season, two athletes were fooling around after practice; one ended up swinging his helmet into the face of the other, causing a tooth to chip. That injury happened on an evening in which the ATC had class and had left immediately after practice so she was not available to assist that athlete. The coaches wrapped the tooth in tissue and sent the athlete to the dentist with one of his parents. The best place to keep a dislodged or chipped tooth is in a glass of milk. The chances of having milk available at a football field are unlikely. They could have put the tooth in one of the empty containers (clean film containers) that was in their kit and then stopped by a grocery, convenience store, or even a fast food restaurant on their way to the hospital. Seventeen (47.22%) NPCs responded that they would place the tooth in a glass of cold water. They may have been thinking that for the majority of injuries ice is placed on the area, placing the dislodged tooth in cold water may be an extension of that thinking. The reason why the tooth should be placed in milk as opposed to water is that the milk will keep the tooth viable for placement back in the mouth, whereas water does not.

There were six additional questions in which over 25% of NPCs incorrectly answered, but the number of PCs and NPCs correctly answering did not significantly differ. Those six questions dealt with having enough change to make three phone calls in case of an emergency, the contents of a stocked first aid kit, signs of a moderate cold illness, signs and symptoms of a fracture, the effects of heat application, and what an athlete should do when stretching. There are two topics covered by those questions that need to be addressed. Those two topics pertained to having enough change to make three phone calls and the contents of a first aid kit.

It seems as though everyone today has a cell phone and that NCSS and the P.R.E.P.A.R.E. program are out of touch with the reality of cell phones. The point of having enough change for a public phone call is just in case a cell phone does not work. There are a number of reasons in which a cell phone would be unavailable. First of all some individuals do not have cell phones. At least one coach per team would probably have a cell phone, but if that coach were to be absent from practice on the day that the phone is needed the others would be stranded. Second, there is never a guarantee that there will be service in all areas. A team might travel to another facility where there are no cell towers close by, thus rendering the cell phone useless. Lastly, if a coach is using a land line phone the local EMS might be able to trace the call in case he/she is unaware of his/her exact location. EMS in the mid-Michigan area can trace cell phone calls to the caller, but cannot locate with any great amount of precision of where the call is coming from. One issue with relying on land lines is that the number of land lines has diminished over the past few years.

A moderate number of NPCs (30.56%) did not know that a properly stocked first aid kit should include all of the following: pocket mask, cutters, bags for ice, medical history card for each athlete, and medical release forms. Ten (27.78%) NPCs thought that all a kit needed was a pocket mask, cutters, and bags for ice. These coaches may have been thinking that they would carry the medical history cards and medical release forms with their other paper work. The problem with that line of thinking is that one may not be able to easily locate the necessary information when it is needed in a case of an emergency. Youth coaches are bombarded with paperwork such as sweatshirt orders, physicals, medical release forms, schedules, and directions to the various other facilities to name a few. Youth coaches need to keep the medical history cards and medical release forms separate from the other paperwork they have. Additionally these forms should be kept in the first aid kit, and the first aid kit should be kept with the football equipment. It is hard to play football without footballs, thus if the coach has the equipment he/she will have the necessary first aid supplies and materials.

Issues with the P.R.E.P.A.R.E. Program

There are a number of aspects of the P.R.E.P.A.R.E. program that need to be evaluated for completeness. Those aspects are biohazard containers, first aid supplies, diabetic coma and insulin shock, and causes of exercise induced asthma attacks.

Module one (Emergency Planning) informs the coaches that after caring for an athlete, contaminated gloves and gauze should be placed in a red biohazard container. This is great advice, but incomplete. There are not many youth organizations that have biohazard containers available for their use. Youth organizations help to develop the future high school athletes, and thus a relationship between the high school athletics and the youth athletic organizations should be developed. From such a relationship the youth organizations can benefit by being able to dispose of their biohazardous material in the biohazard container located in the high school athletic training room. This arrangement would not be a burden for the high school athletic training program, because the amount of biohazardous material that a youth organization produces is very minimal. An alternative to the relationship with the high school would be for there to be a relationship developed with the local hospital or doctor's office. As a return favor for allowing the youth organization to dispose of their biohazard material, the hospital or doctor could receive free publicity in the youth organization's athletic programs.

Also contained within the first module is a list of the suggested materials for a properly stocked first aid kit. The list is substantial, and could cost a youth organization a bit of money. Town A of this study had not been keeping an adequately stocked first aid kit for each team until the 2005 season. It cost Town A approximately $400 ($36.36 per team) to up-date their first aid kits with all of the items recommended by NCSS. Town B had been working each year to better their first aid supplies and spent approximately $250 a year ($31.25 per team). A possible suggestion would be for the youth organization to order their supplies with the high school. For some items, the more bought the less expensive it is (e.g., example tape). An alternative would be to form a relationship with a local doctor, or even a veterinarian. Those individuals order supplies such as gloves, band aids, and gauze that youth organizations also need.

Module four (Medical Conditions) covers the concerns with athletes with diabetes. The program discusses the causes, signs, and symptoms of a diabetic coma and insulin shock. The program also informs the coaches of what to do if a diabetic athlete should start to suffer from either of those conditions. It also makes a very good suggestion for coaches to follow, "*When in doubt, give sugar. If the athlete does not respond to treatment, call 911 and* ***Activate your emergency plan.***" Even though this suggestion is made, more attention should be drawn to it by increasing the font size. Additionally, in the exam the coaches are questioned about the cause of a diabetic coma, but nothing about insulin shock. An athlete is more likely to experience insulin shock, low blood sugar, during activity than a diabetic coma, high blood sugar. Attention should also be drawn to this fact.

Module four also provides information about asthma. Clearly, from the high percentage of both PCs and NPCs correctly answering the asthma-related questions, the causes and the signs and symptoms of an asthma attack are known well. This knowledge might be due to the high lifetime prevalence of asthma (11.9%) (Centers for Disease Control, 2004). What was not as well known was the other contributing factors of exercise-induced asthma attacks. Five (26.32%) PCs and 10 (27.78%) NPCs did not know that high pollen counts can cause an exercise-induced asthma attack. This lack of knowledge should raise some concern since there is also a high prevalence, 15-20% (Storms & Joyner, 1997) of the general public that suffers from exercise induced asthma.

There is one other web-based program that covers the topic of first aid and injury prevention. The Gold Level Certified Coach Online Course is offered by the National Youth Sports Coaches' Association (NYSCA). That course covers eight key topic areas:

Philosophy & Ethics, Sports Safety and Injury Prevention, Physical Preparation and Conditioning, Growth & Development, Teaching & Communication, Organization & Administration, Skills & Tactics, and Evaluation. Due to the amount of material that the NYSCA program attempts to cover, there is a chance that the detail of the first aid and injury prevention material covered is not as detailed as the material covered by the P.R.E.P.A.R.E. program. Additionally, there is a substantial difference in the cost of the two programs. The NYSCA's course costs $60 in addition to a $20 membership fee. The P.R.E.P.A.R.E. program costs $28, and no membership fee.

Monitoring of Football Teams

The certified athletic trainer (ATC) in each town was responsible for monitoring that the six elements (emergency plan, gradual activity plan, water breaks, warm-up and stretching, first aid kit, and signs and symptoms cards) were being followed throughout the season. This type of monitoring could be considered one of the Es of injury prevention, enforcement. Because the coaches were being monitored for following the six elements, and if they did not follow the elements they were instructed to do so, they may have been more likely to conduct practice in accordance to those elements than if they were not being followed. Education is the most popular method of injury prevention, but enforcement is likely more effective. The problem is that it is easier to educate people about injury prevention techniques than it is to develop, approve, and enforce new rules and regulations. With that said, individual youth organizations can police themselves on the elements of the P.R.E.P.A.R.E. program. During this study the ATCs provided the monitoring. The programs can self-police by selecting one individual to monitor the teams. Due to the findings of this study, a reduction in some of the injury rates, it would be advantageous for the programs to continue with the P.R.E.P.A.R.E. program and its recommendations.

The element that was not followed well was the development of an emergency action plan. Every attempt, even going as far as to provide a blueprint of an emergency plan, was made to make it as easy as possible for the coaches to be compliant with developing an emergency plan. The coaches from each team had only to get together and fill in the blanks of the emergency plan and return it to the ATC on site. Failure to complete this task may indicate a few things. First of all these coaches may have relied on the presence of an ATC. For the past six years, including this year, these coaches have had the luxury of having an ATC on site to care for injuries and handle any emergency situations that may arise. Not many youth programs have this luxury, and they can only rely on the individuals that help run the program. Another reason for the low compliance to the development of an emergency plan may be in part to a "not me" syndrome. These youth coaches may think that situations will not arise that they will need an emergency plan. This type of thinking can result in legal issues, harm, and even death. The fact is that with participation comes the risk of injury, and some of those injuries may be serious. Coaches need to be made aware of the need to be prepared in case of an emergency.

EMS had to be summonsed to Town B three times during the 2005 season. One of those times there was an issue of preparedness and a distinct reliance on the ATC. Upon injury the ATC was called. The head coach remained with the injured athlete and the ATC. The other two coaches took the injured players' team down the field and continued to scrimmage another team. When it was decided that EMS would be called the head coach had to go to the other end of the field and inform the other coaches and ask for assistance. Things were a little chaotic at first but the ATC worked with the coaches on what to do and how to do it. Once all the necessary individuals had been placed in the appropriate locations, and everything had been completed for the arrival of EMS, the head coach tried to locate the necessary paper work, but was unsuccessful. The coach could not locate the medical release form, physical form, or parental contact information. Thankfully this situation happened at the end of practice and by the time EMS had placed the athlete into the ambulance the child's mother was present to pick up her athlete. Thankfully, the injury was just a neck strain, but it easily could have been more life threatening.

After having experienced a situation like the one above, most coaches then understand why it is important to have an emergency plan. Coaches need to learn from not only the experiences that they have, but also from the experiences of other coaches. That particular head coach vowed that he would never be so unorganized with his paperwork again. That head coach should meet with all of the other head coaches and tell of his experience and let them know first hand the importance of having an emergency plan. The other coaches are more likely to listen to one of their own, than someone that is not in their shoes.

There was an incidence that needs to be highlighted due to the impact it could have had on an athlete. The situation was that the head coach was arriving late to practice because of family issues, and he had all of the football equipment including the first aid kit. Because the team had no football equipment the assistant coaches had the athletes doing conditioning and hitting drills. Traditionally, this would not have been an issue, except there was an athlete on that team with asthma and needed his inhaler, which was in that team's first aid kit. This particular athlete was a seventh grader who has had asthma for a considerable amount of time. The athlete was not suffering from an asthma attack, but knew if he continued practicing he would run the risk of having an attack. No harm was done to the athlete, because the ATC had the athlete sit out of the drills until the head coach arrived with the football equipment, the first aid kit, and his inhaler. The ATC talked to the coaches about the issue and explained that this is the precise situation that needed to be avoided and that they were fortunate enough that the athlete was not suffering a full blown asthma attack. It is a great suggestion that the first aid kit be kept with the football equipment, so that when they are practicing they have the kit. The only problem is in a situation such as the one that happened if the equipment is not present and the team still practices. There are no other great alternatives to preventing this issue. Even though the athlete is the one who suffers from asthma attacks, it should not be left up to him to remember to bring his inhaler everyday to practice. He was responsible enough to bring it and give it to the coach for safe keeping. Because the assistant coaches knew that the head coach had the equipment and that he might be late, one of the assistant coaches should have stopped by the head coach's house prior to coming to practice to pick up the equipment and first aid kit. Hindsight is 20/20, but this is another issue that should be shared with the other coaches as to show the importance of having all of the equipment, even the first aid kit, when practicing.

P.R.E.P.A.R.E. Evaluation

Research question two inquired about the coaches' opinion of the P.R.E.P.A.R.E. program. After taking the program the PCs were asked a number of questions related to their satisfaction and opinions about the program. Lastly, the coaches were given an opportunity to make recommendations to better the program.

The PCs were satisfied with the P.R.E.P.A.R.E. program. All of the coaches preferred the web-based presentation method to a traditional lecture style course. The majority of the coaches learned some new information, utilized the information gained on a regular basis, and felt more prepared to prevent injuries and handle emergency situations.

The P.R.E.P.A.R.E. program is one of the few web-based first aid and injury prevention programs available to youth coaches. This method was greatly appreciated by the coaches. Because all of the coaches who participated in this program were volunteers, they valued being able to take the program when it suited them best. They did not have to set aside four hours on a weekend or week night to attend a class.

The league in which this study was conducted has in the past offered (free of charge) for four coaches from each town to attend the Program for Athletic Coaches Education (PACE) offered by Institute for the Study of Youth Sports at Michigan State University. There are over 25 towns within the league, so when offered at least 100 coaches could attend this program. Typically, there were approximately 20 coaches that would attend. The major complaint about the PACE program was that it lasted a full weekend and did not fit into their schedules.

The P.R.E.P.A.R.E. program also provides individualized learning to each coach. Coaches are free to back track within a module if they are unclear about something that was just covered. In a classroom setting, some people will not speak up if they are confused about something. Because the P.R.E.P.A.R.E. program is web based and there is no chance of feeling ashamed for not understanding something, learning may be enhanced. The downside of this program is that due to the set up of the program, once a module is completed a coach cannot look back at it to refresh his/her memory, because the coach is blocked on returning to that module.

The majority of the PCs reported learning some new information from the program. Even coaches who were an emergency room nurse, a paramedic, and a police officer reported learning some new information from the program. These findings suggest that something can always be learned from taking this course no matter the training background of the individual. And ultimately the youth athletes benefit from their coaches' new knowledge.

One of the recommendations made by the PCs was to have a quick guide to the signs, symptoms and management of the most common injuries, to be carried with the equipment. Thus, a coach can have a reference guide while he/she is on the field. This recommendation was great and NCSS should consider offering a quick reference guide for coaches to purchase after completing the program or provide it free with purchase of the program. Topics that should be included in this reference guide are the signs, symptoms, and management of the most common injuries. Development of this reference guide would not be hard because there are sections that contain this information already within the program. A suggestion would be to put the signs, symptoms, and management of the various injuries on laminated cards that are bound together for easy access during an emergency situation. The drawback of this recommendation was that all of the coaches actually had this information contained in the folder they were given at the beginning of the season. This folder contained the gradual activity plan, the stretching program, recommended first aid kit supplies, an emergency action plan template, and the signs/symptoms and management cards. The coach that made this suggestion may have misplaced the folder or did not realize that information was covered in the folder. Even though the information was given to the coaches, perhaps a dedicated laminated flip style manual would be a better method of supplying such information to the coaches. This manual should easily fit into the first aid kit. This recommendation will be made to NCSS.

The other major recommendation that was either reported on the P.R.E.P.A.R.E. Coaches Evaluation Form or verbally to the researchers was to enhance the ease of taking the program. Many coaches reported having difficulty accessing the site, registering for the program, or being kicked off the site. If only one or two coaches reported these problems, it may have been due to the internet connection they were using. But there were a number of coaches reporting these difficulties, and thus NCSS needs to address this issue.

Game Situation Data Sheet

Coach's decisions to return an injured athlete to competition are dependent upon the game situation and the player involved (starter, backup, or bench player). The first time the youth coaches took the Game Situation Data Sheet (GSDS), they were likely to return an injured starter to competition 11.54%, 11.54%, and 50% when the game situation is that their team is clearly winning, clearly loosing, or in a close competition, respectively. In a clearly winning situation or clearly losing situation 21.15% and 11.54% of coaches, respectively returned a backup player. While in a close game situation, 40.38% of coaches would return the backup player. When dealing with a bench player 10, (19.23%), 20 (38.46%), and 17 (32.70%) of coaches returned a bench player in a clearly winning, clearly losing, or close game situation, respectfully. The results of the first GSDS in this study were similar to the results reported by Barron (2004) and Flint and Weiss (1992).

In a close game, coaches were more apt to return an injured starter and back up to the game than an injured bench player. A reason for these decisions by the coaches could be due to a role conflict. Many coaches feel that it is their main responsibility to win the game, and they would do anything to succeed at that goal. Coaches want their best athletes on the field at the time when the game is in the balance. That is most likely the reason why coaches would return an injured starter or back up while keeping an injured bench player out in a close game situation.

A coach has many responsibilities; such as ensuring the safety and well being of his/her athletes, winning the competition, and to enhance the skills of lesser players. In a clearly losing situation youth coaches are more likely to return an injured bench player than a starter or first substitute. A clearly losing situation is a perfect opportunity to allow the players with less skill a chance to have game experience and refine their skills in a game situation.

The youth coaches in this study differed from the youth coaches in the Barron (2004) study in their decisions to return athletes to competition in a game situation that they are clearly winning. These youth coaches tended to act similarly to high school coaches (Flint & Weiss, 1992) who were more likely to return an injured bench player than a backup player or starter in a clearly winning situation. A good reason for doing so is not to put the starters in a situation where they may further injure themselves when the game is already determined.

Coaches' decisions to return the athletes to competition were not significantly different the second time they took the GSDS when compared to the first time they took the GSDS. This finding was true for both the PCs and the NPCs, thus there was no effect of taking the P.R.E.P.A.R.E. program on coaches' decisions to return an athlete to competition. A limitation of this finding was that the coaches completed the second GSDS at the end of the season as opposed to after completing the P.R.E.P.A.R.E. program. It was the original intention of this study to have the coaches take the GSDS three times during the season, but due to the demands on the coaches and coaches' compliance this was not able to be completed as planned. A lot was asked of the coaches that participated in this study; taking the GSDS, taking the P.R.E.P.A.R.E. program, and instituting the six elements to name a few. The addition of the third GSDS would have provided interesting information, but not enough for the inconvenience that it would have imparted on the coaches.

Prior to the PCs taking the P.R.E.P.A.R.E. program there was one significant difference in whether a coach would return an injured backup running back in a close winning situation between the PCs and NPCs. After taking the program there were no differences in returning this athlete based upon PROGRAM. Ironically, a higher percentage of PCs returned the injured running back to competition on the second GSDS than on the first GSDS and a lower percentage of NPCs did not return the injured running back to competition the second time they took the GSDS. The increase in the number of PCs who returned the back up running back may, or may not, have done so because they felt more comfortable due to their increased first aid and injury prevention knowledge. The PCs completed the first GSDS prior to taking the P.R.E.P.A.R.E. program and the second GSDS at the end of the season. Because the PCs did not take the second GSDS right after they took the program, it cannot be concluded that they returned this particular athlete at a higher rate because of the knowledge gained from the program. Perhaps those coaches returned the athlete to competition because of an increase in coaching experience gained throughout the season. To determine whether or not taking the P.R.E.P.A.R.E. program conclusively alters a coach's decision to return an injured athlete to competition the coach would have to take the GSDS right before and right after taking the program. That situation was intended in the current study, but due to unexpected issues and complications the coaches did not complete the GSDS right after they took the program. NPCs were also similar in their decisions to return injured athletes back to competition at the end of the season as compared to the beginning of the season.

Ultimately the decision to return an athlete to competition should be based upon the injury and its effects on the athlete. Four of the nine game situations indicate that the athlete was impaired in some manner (limp, minor discomfort, moving fairly well, or not a great deal of problems). Interestingly, for the situation in which they were down by five, and a starter was injured and in minor discomfort, half of the coaches returned the athlete to participation. But when in a clearly losing situation and a starter was injured but was moving fairly well, only 11.54% of the coaches returned the athlete. The athletes who participated in this study were aged 8-14; winning should not be the first thing that comes across the mind of the coach. If an athlete is impaired he/she should be withheld from competing. That impairment may cause a more serious injury to result.

Summary

Injury preventative measures can be enacted for the host, agent, or environment and during any of the three phases of injury (preinjury, injury, post injury). Educational strategies, such as the P.R.E.P.A.R.E. program, that are multi-pronged are the most effective in reducing injuries, because of the multiple levels at which the injury preventive measures can be applied. The issue is whether individuals will utilize the education that they have been given.

A combination of education and enforcement of that education has resulted in a reduction of the injury rates in the two towns studied. Education is the first line of defense in injury prevention. If individuals are not encouraged to use the knowledge gained from education, the education itself is useless. Typically the second line of defense in injury prevention is enforcement of rules and regulations. Though it is not the most popular choice, it has been proven to help reduce the injury rates found not only in this study, but other studies on injury prevention. Additionally, guidelines for coaches to follow, about returning an injured athlete to competition, need to be developed and instituted.

Education is never ending, but rather an on going process. Apparently there is a loss of information after three months of taking a first aid and injury prevention program. Refresher courses need to be offered to youth coaches on an ongoing basis to keep the topics covered fresh in their minds. Additionally, treatment procedures are always changing and being up dated. What was done ten to twenty years ago may have been found to be inadequate, and thus the treatment procedures have been altered. Youth coaches need to keep up with these changes for the health and safety of the athletes they coach.

Coaches that took the P.R.E.P.A.R.E. program were satisfied, preferred the web-based approach, felt more capable of handling emergency situations and preventing injuries, and were interested in taking a football specific injury prevention program. NCSS has been developing sport specific first aid and injury prevention programs for the past four years. Apparently there is a need for such programs and NCSS needs to finish developing these programs and offer them to the general public.

Future Research

The results of this study indicate a reduction in youth football injuries as a result of either the P.R.E.P.A.R.E. program or its elements. Future research needs to evaluate which aspect, the P.R.E.P.A.R.E. program or its elements, is responsible for the reduction of injuries. Additionally, further research needs to be conducted to determine if there is a reduction in the injuries in other youth sports.

The results of this study have shown that there was a significant loss of knowledge in the areas of heat and cold illness, emergency recognition, and warming up and cooling down. Future first aid and injury prevention programs need to place emphasis on these topics to help reduce the loss of information. Additional evaluation of the effects of taking the P.R.E.P.A.R.E. program on coaches' first aid and injury prevention knowledge needs to be conducted to further determine the areas that youth coaches are lacking. The P.R.E.P.A.R.E. examination also needs to be evaluated for its psychometric properties.

A number of different studies have examined when coaches would return an injured athlete to competition, but to date no study has examined why coaches chose to return or not return an injured athlete. A qualitative study examining the decisions of youth coaches in regard to the GSDS needs to be undertaken. Like the P.R.E.P.A.R.E. examination the GSDS needs to be evaluated for its psychometric properties.

EVALUATION OF AN INJURY PREVENTION PROGRAM

VOLUME II

By

Mary J. Barron

A DISSERTATION

Submitted to
Michigan State University
In partial fulfillment of the requirements
For the degree of

DOCTORATE OF PHILOSIPHY

Department of Kinesiology

2006

APPENDICES

APPENDIX A

Coaches Consent Form

Relationships Among Player Risk Factors and Injuries In Youth Football

Coach Informed Consent Form

For questions regarding this study, Please contact:

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For questions regarding your rights as a research participant, please contact:

Peter Vasilenko, Ph.D.
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Dear Coach:

Hello! My Name is John W. Powell, PhD, ATC, Assistant Professor of Kinesiology and Certified Athletic Trainer (ATC) at Michigan State University. Mary J. Barron, MS, ATC, Maggy Moore, MS, ATC, and I are working on a research study entitled, "Relationships Among Player Risk Factors and Injuries in Youth Football." This year will be the 6th year of the project. The continuation of this study allows us to provide athletic training services for the junior football team you are coaching. Dr. Jeff Kovan, The Director of Sports Medicine at MSU, is also a consultant on the project. The study will continue to monitor injury patterns in youth football and the relationship between player variables such as skill, maturity, and players' perception of risk.

This year of the study we are also interested in evaluating coaches' decisions on the return to play of an injured athlete and the effects of an injury prevention and first aid program on injuries to youth football players. Coaches' decisions on whether or not to return an injured athlete to play will be evaluated using the Game Situation Data Sheet (GSDS). The injury prevention and first aid program that will be offered is the P.R.E.P.A.R.E. program, developed by the National Center of Sports Safety.

The GSDS presents nine game situations in which you have to decide whether or not to return an injured athlete to competition. You will have to check yes or no on whether you would return the athlete to play. You will be given the GSDS three times during the season.

Coaches will be offered to take the P.R.E.P.A.R.E. (Pre-Plan, Recognize, Emergency Plan, Principles of First Aid, ABCs, Return to Play, Enjoy) program free of charge. P.R.E.P.A.R.E. is an on-line coaching educational program. You will learn injury prevention and first aid skills that will aid you in during the football season. There are seven modules to the P.R.E.P.A.R.E. program. After completion of each module there is an exam. If you score less than 70% you will be prompted to retake the exam. After completion of all seven modules you will earn a certificate of completion. NCSS will be contacted to verify that you have earned certification and gain access to the results of the examinations.

There are eight elements of the PREPARE program that the directors of your youth football organization have agreed to stress and monitor during the football season. The eight elements are: development of an emergency action plan, proper first aid kit, gradual activity plan, scheduled water breaks, proper warm up and stretching routine, possession of sign/symptoms/management of typical sports related injuries, and the last two elements deal with learning the proper method for glove removal, C-spine, and spine boarding of an injured athlete. Coaches will be provided with the necessary tools to complete these eight elements. The eight elements will be monitored by the ATC on site through daily observation and check off sheets.

You have a number of options on your participation level in this study. You may wish to either participate by only completing the GSDS or you can participate by taking the P.R.E.P.A.R.E. program and completing the GSDS. Your time commitment will depend upon what aspects of the study you are willing to complete. Completion of the GSDS should take no more than 10 minutes, and the P.R.E.P.A.R.E. program takes approximately 2 hours to complete, if taken all at once.

Whether you chose to only complete the GSDS or the GSDS and the P.R.E.P.A.R.E. program, after signing the consent form, you will be asked to complete a demographic sheet and fill out the GSDS. The demographic sheet will inquire about your age, educational level, coaching history, and first aid training.

If you are going to take the P.R.E.P.A.R.E. program, after you signed the consent form, filled out the demographic sheet and the GSDS, you will be given an access code. With this access code you can log on to the web-site. You can either complete the program all at once or you can bookmark your spot and return to it at a later time. If you do not have internet access you, will be provided with a location with internet access at a time that is convenient for you. You will be asked to complete the program within the first two weeks of practice.

All participating coaches will be asked to fill out the GSDS two other times during the season. You will be asked to complete the GSDS approximately 3-4 weeks into the season and at the end of the season.

If you choose to take the P.R.E.P.A.R.E. program you will be asked to complete a questionnaire designed to learn more about your thoughts regarding the P.R.E.P.A.R.E. program. This questionnaire will take about 10 minutes to complete, and will be conducted during practice time when it is convenient to you.

In order to evaluate the relationship between player's skill level and injury, head coaches will be asked provide to their opinion of each child's skill level on a sheet that we provide. This process should not take you more than 10 minutes. Your assessments

provided to us will remain confidential and neither the child nor parents will see this information.

A Certified Athletic Trainer (ATC) will be present at all practices and games throughout the season. Throughout the season, the ATC assigned to each program will document information concerning injuries that occur during practices and games. This information will include the severity, type of injury, the position played, activity performing when hurt, etc. Additionally, with your permission, we will ask you to recount any injuries that occur during away games at which the ATC may not be present.

All identities and recorded information collected during this study will remain confidential and will be replaced and analyzed with individual identification numbers. Participants will remain anonymous in any reporting of the data from this study, and your privacy will be protected to the maximum extent allowable by law.

Your participation is voluntary and you may discontinue your participation at any time. Any questions concerning participation in this study should be directed to John W. Powell, Assistant Professor of Kinesiology (517) 432-5018. If you have any additional questions concerning your rights in this research study, please feel free to contact Peter Vasilenko, Ph.D, Michigan State University's chair of the Committee on Research Involving Human Subjects at (517) 355-2180.

INFORMED CONSENT:
This section indicates that you are giving your informed consent.

I have read and agree to participate in this study as described above.

____
Please Print Your Name

______________________________   _____/______/_____
Your Signature   *Date*

Please check which aspects of the study you are willing to participate in:

☐ Game Situation Data Sheet & P.R.E.A.P.A.R.E. examination

☐ Game Situation Data Sheet, P.R.E.P.A.R.E. program, & P.R.E.A.P.A.R.E. examination

APPENDIX B

Parental Consent Form

Relationships Among Player Risk Factors and Injuries In Youth Football

Parental Informed Consent Form
(Injury Surveillance and Surveys)

For questions regarding this study, Please contact:
John W. Powell, PhD, ATC
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105 IM Circle
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Fax: 353-2944

For questions regarding your rights as a research participant, please contact:
Peter Vasilenko, Ph.D.
Chair Person
Committee on Research Involving Humans
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202 Old Hall
East Lansing, MI 48824
ucrihs@msu.edu
Phone: 517-355-2180
Fax: 432-4503

Dear Parents & Guardians:

Hello! My Name is John W. Powell, PhD, ATC, Assistant Professor of Kinesiology and Certified Athletic Trainer at Michigan State University. Mary J. Barron, ATC and Maggy Moore, ATC, and I are working on a research study entitled, "Relationships Among Player Risk Factors and Injuries in Youth Football." This year will be the 6th year of the project, and the second year that the project will be funded with a grant from the National Football League Charities (NFL). The continuation of this study allows us to provide athletic training services for the junior football team your child is participating on. Dr. Jeff Kovan, The Director of Sports Medicine at MSU, is also a consultant on the project. The study will continue to monitor injury patterns in youth football and the relationship between maturity status and players' perception of risk.

The study will involve your child's participation throughout the football season. At the beginning of the season we will measure your child's height and weight. Height and weight will be measured as part of equipment handout process and will take less than 10 minutes. At the end of the season we will ask them to complete a questionnaire designed to learn more about their thoughts regarding injury risk in football. This questionnaire usually takes about 10 minutes to complete, and will be conducted during practice time. Included with this consent form is a questionnaire regarding your child's previous experience in youth sports and if and what type of injuries they might have had. This questionnaire should also takes about 10 minutes or less to complete. Additionally, at the end of the questionnaire, we ask that you provide the heights of both biological parents. In total, we ask for about 20-30 minutes of your child's and your time to complete this form and the questionnaires.

The height of your child plus the heights of both biologic parents allows us to estimate your child's maturity status. We can then compare the maturity status of players to the injury rates for each age group to determine if maturity is a factor for injury.

Throughout the season, the Certified Athletic Trainer assigned to your child's team will document information concerning injuries that occur during practices and games. This information will include the severity, type of injury, the position played, activity performing when hurt, etc. Additionally, with your permission, we may discuss the injury with your child, and or contact you by phone to obtain additional information about the injury.

All identities and recorded information collected during this study will remain confidential and will be replaced and analyzed with individual identification numbers. Participants will remain anonymous in any reporting of the data from this study, and your privacy will be protected to the maximum extent allowable by law.

In order for us to allow your child to participate in the study, we will need your written consent in the spaces provided below. Your child's participation is voluntary and you or your child may discontinue their participation at any time. If your child's participation is discontinued, their data will not be used in our study.

Any questions concerning participation in this study should be directed to John W. Powell, Assistant Professor of Kinesiology (517) 432-5018. If you have any additional questions concerning your child's rights in this research study, please feel free to contact Peter Vasilenko, Ph.D, Michigan State University's chair of the Committee on Research Involving Human Subjects at (517) 355-2180.

INFORMED CONSENT:
This section indicates that you are giving your informed consent.

I have read and agree to allow my child, ______________________________
Please Print Your Child's Name
to participate in this study as described above.

____
Please Print Your Name

____
Your Signature

_____/_____/_____
Date

APPENDIX C

Participant Consent Form

Relationships Among Player Risk Factors and Injuries In Youth Football

Participant Informed Consent Form

(Injury Surveillance and Surveys)

For questions regarding this study,
Please contact:

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For questions regarding your rights as a research participant, please contact:

Peter Vasilenko, Ph.D.
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ucrihs@msu.edu
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This study is designed to assess the thoughts you have concerning being injured when playing sports. This study will help us understand the things that might lead to injury in youth football.

For this study, you will be asked to complete a questionnaire regarding your thoughts on being injured in youth football. This questionnaire will take about 10 minutes to complete and you will have time during practice to complete it. We will also measure your height and weight at the beginning of the season during equipment handout. Also, a certified athletic trainer will record information about injuries you may have throughout the season. If you are injured, we will ask you additional questions like how it happened and what position you were playing.

All the information you provide, and the results of the study will be confidential and anonymously reported. You will be assigned a coded identification number that will be used on all information you provide. All the questionnaires and information you provide will be stored in a locked file cabinet inside a locked office that is accessible only to the investigators of this project. Only group data will be reported and group data will be provided to you at your request. Your participation in this study is voluntary. You may choose to quit and refuse to answer any questions at any time without penalty. Your information will remain anonymous in any reporting of the data from this study, and your privacy will be protected to the maximum extent allowable by law.

Any questions you may have concerning your participation in this study should be directed to Dr. John W. Powell at the Department of Kinesiology at Michigan State University, 517-432-5018. If you have additional questions or concerns about your rights in this research study, please feel free to contact Peter Vasilenko, Ph.D, Michigan State University's Chair of the Committee on Research Involving Human Subjects at 517-355-2180.

Thank you for you time and cooperation.

I have read or have had read to me, the above description of the study and agree to participate.

Please Print Your Name: ____

First Name Middle Initial Last Name

______________________________ ______________________

Sign Name Here Date

APPENDIX D

Height & Weight Recorder

Height & Weight Recorder

Town:__________
Grade:__________

Number	First Name	Last Name	Height	Weight	Date

APPENDIX E

Coaches Demographic Sheet

Coaches Demographic Sheet

Name: ______________________________ **How old are you?** ____________________

Is this your first year as a coach?
No
Yes

If no, how many years have you been a youth sports coach? ____________________

Is this your first year as a youth football coach?
No
Yes

If no, how many years have you been a football coach? ________________________

Highest Degree Attained
- o High School Diploma
- o High School Equivalent
- o Associates Degree
  (major) __________________________
- o Bachelors Degree
  (major) __________________________
- o Masters Degree
  (major) __________________________
- o Doctoral Degree
  (major)__________________________
- o Other (please specify)
  ____

Have you ever had any formal first-aid training? If yes, please fill in circle of all that apply and provide approximate date of certification (month/year).
- o American Red Cross First Aid ___/___
- o American Red Cross CPR ___/___
- o American Heart Association CPR ___/___
- o EMT (Emergency Medical Technician Training) ___/___
- o Paramedical Training ___/___
- o Other (please specify) _______________ ___/___

Are you currently first aid certified? (completed the course or a refresher course in the last 3 years)
- o Yes
- o No

If yes please write the date that your certification will expire. _______________

Are you currently CPR certified? (completed the course or a refresher course in the last year)
- o Yes
- o No

If yes please write the date that your certification will expire. ______________

Your Gender
- o Male
- o Female

Coaching Location
- o Saint Johns
- o Holt

Grade Currently Coaching
- o 4^{th}-5^{th} grades
- o 6^{th} grade
- o 7^{th} grade
- o 8^{th} grade

Grade(s) Previously Coached (check all those that apply)
- o 4^{th}-5^{th} grades
- o 6^{th} grade
- o 7^{th} grade
- o 8^{th} grade
- o 9^{th} grade
- o 10^{th} grade or higher

Sports Coached in the last 10 years(check all those that apply)
- o Basketball
- o Football
- o Tee-Ball
- o Baseball
- o Softball
- o Wrestling
- o Swimming
- o Ice Hockey
- o Volleyball
- o Other

APPENDIX F

Youth Football Player Demographic Sheet

Youth Football Player Demographic Sheet

Child's:______________________________ Grade: 4^{th}-5^{th} 6^{th} 7^{th} 8^{th}
Date of Birth: _________________________
Today's Date: _________________________

How old was your child when he/she began to play on an organized sports team that practiced and played a regular schedule of games or competitions? Organized sports means that there was an assigned coach for the team or sport. Examples include swimming, t-ball, football, basketball, etc
______________________________ years old

What was the first organized sport that your child played? ____________________
Years played? _______

What other organized sports has your child played and how many years has he played each sport?

Sport Years Played

____
____
____
____
____
____

In evaluating the height and weight of your child, it is important to know the size of the biological parents. Please report the height of both biological parents to the nearest ¼ without shoes.

Father's Height __________
Mother's Height _________

Please continue on the next page ⟶

Has your child ever been injured during a sport practice or during a game/competition?
Yes No If yes, please list the one or two most serious injuries and answer the questions

INJURY ONE

What specific body part was injured?

Head/neck	Face	Shoulder	Forearm-wrist-hand	
Trunk	Hip-thigh-leg	Knee	Ankle-foot	other

What type of injury was it?

Sprain/Strain Fracture Laceration General Trauma

Did your child receive treatment? YES NO If yes, was he/she treated at:

An Emergency Room	YES	NO
A Doctor's Office	YES	NO
At Home	YES	NO

Did your child miss any games, competitions or practices due to this injury?
YES NO

INJURY TWO

What specific body part was injured?

Head/neck	Face	Shoulder	Forearm-wrist-hand	
Trunk	Hip-thigh-leg	Knee	Ankle-foot	other

What type of injury was it?

Sprain/Strain Fracture Laceration General Trauma

Did your child receive treatment? YES NO If yes, was he/she treated at:

An Emergency Room	YES	NO
A Doctor's Office	YES	NO
At Home	YES	NO

Did your child miss any games, competitions or practices due to this injury?
YES NO

APPENDIX G

Game Situation Data Sheet

Game Situation Data Sheet

Game Situations	Return to Game	
1. During the last 10 minutes in the game with your team clearly losing, your 14th player (usually 3rd into the game) gets a hand in the way of a hard pass and hyperextends an elbow. It is checked and taped. The player is eager to get back on the field.	____ Yes	____ No
2. One of your starters, during a game you are winning easily, suffers a dislocated finger. After reduction (being returned to its normal position) the finger is checked for fractures. It doesn't appear as if there are any fractures present. The finger is given some support and the player asks to return to the game.	____ Yes	____ No
3. One of the bench players, who rarely sees the floor, finally gets a chance to play during a game you are winning easily. After two minutes on the field the player suffers a hamstring strain. It doesn't appear to be a serious problem after some treatment on the bench. The player is eager to return and shows that the muscle injury only causes a minor limp.	____ Yes	____ No
4. In a game in which you are only down by 5 points, your starting quarterback goes down with a sprained ankle. It appears to be a mild sprain and taping has given it some support. The player assures you everything is fine and can perform cuts and turns with only minor discomfort.	____ Yes	____ No
5. The game is close and your team is down by 4 points. You have a "bench player" on the field replacing a tired starter when the bench player begins hyperventilating. After being helped at the bench, the player indicates everything is okay.	____ Yes	____ No
6. Your team is winning handily when your backup center is blocking when he steps awkwardly on a teammate's foot. It appears as if the center has a strained Achilles tendon. After being check and a mild strain indicated, taping is used for support. The player appears eager to play again.	____ Yes	____ No
7. Your starting quarterback dives to get the first down and bruises their right kneecap. The game is far out of your team's reach at this point. The knee is slightly stiff and is showing some signs of a bruise, but the player can move fairly well without too much problem. The player indicated a readiness to return to the game.	____ Yes	____ No
8. With 10 minutes to go in a close game, and your team up by only 3, your starting running back needs a rest. The backup player at that position had gone out with a strained lower back muscle. The backup player has been moving around behind the bench and appears fine. It appears to be only a mild strain and isn't causing the player a great deal of problems. The backup player wants to play again in the game.	____ Yes	____ No
9. In a losing cause, you want to platoon in the 5 of the players who have seen less than 2 minutes in the game. Your 16th player had played very briefly early in the game, but suffered a "groin pull". The muscle strain appears to be mild and isn't causing more than some minor discomfort at this point. The player wants a chance to play more in the game.	____ Yes	____ No

APPENDIX H

Injury Report Form

Injury Report Form

Name____________________ Date__________

Athletic Session

Game: Warm-up 1st Quarter 2nd Quarter 3rd Quarter 4th Quarter

Practice

Position of injured player: Offense__________Defense__________

Type of surface: _____ Natural _____ Artificial

Surface condition: _____Dry _____Wet _____Muddy _____Frozen

Weather conditions: _____Hot_____Warm_____Cool_____Cold_____Rain_____Snow

Point in Season____

Action Taken:_____Removed from participation and returned immediately

_____Removed from participation and returned after resting

_____Removed from remainder of participation

_____Taken to hospital by parent

_____Taken to hospital by ambulance

Clinical Impression

Injured Part of Body:

Head Neck Shoulder Upper Arm Elbow Forearm Hand Wrist Finger Thumb

Hip Thigh Knee Shin Calf Ankle Foot Toe(s)

Back Chest Abdomen Other

Type of Injury:

Sprain Strain Fracture General Trauma Neurotrauma

Laceration Overuse Other

Perceived severity of Injury: Mild Moderate Severe

Summary of Evaluation:____

____

____

____

APPENDIX I

P.R.E.P.A.R.E. Program Recommended Stretches

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P.R.E.P.A.R.E. Program Recommended Stretches

Neck Flexibility
From a standing position perform the following:
Look to the right as far as possible.

Look to the left as far as possible.

Look up as far as possible.

Look down as far as possible.

Move the head around in a circular motion in both directions.

Shoulder Flexibility
In a standing position with the arms straight out to the sides, move the arms in a circular motion.

Start with small circles and work up to large circles.

Perform the exercise in a clockwise and counter clockwise manner.

A stretch should be felt in the shoulder region.

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Lower Back Flexibility
While lying on your back, bend the knees and place feet flat on the ground.

Alternate pulling one knee at a time to the chest.

Stretch should be felt in the lower back region.

After alternating knees several times, pull both knees to the chest at the same time for a few repetitions.

Hip and Groin Flexibility
From a seated "Sitting Bull" position, place the elbows on the knees and grasp the ankles.

Lean forward and press the elbows against the knees.

Stretch should be felt in the groin area.

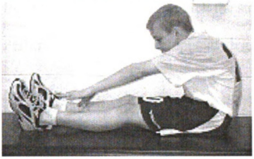
Hamstring Flexibility
Sit with the legs straight.

Keep the knees extended and reach forward.

Bend at the waist maintaining an upright upper body.

Stretch may be done with both legs or one leg at a time.

The stretch should be felt in the back of the thigh in the hamstring region.



Quadriceps Flexibility
From a standing position, bend the left knee.

Grasp the left foot with the left hand and pull the lower leg toward the buttocks.

Perform the stretch on the opposite leg.

Stretch should be felt in the anterior thigh at the quadriceps region.

Calf Flexibility
From a standing position, lean against a wall with one leg positioned further back than the other.

Maintain heel contact with the ground.

Lean forward until a stretch is felt in the calf region.

Maintain extension of the knee to stretch the calf muscle.

Bend the knee in order to stretch the smaller muscle under the calf muscle.

Perform the stretch on the opposite leg.

APPENDIX J

Recommended First Aid Kit Contents

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Recommended First Aid Kit Contents

Non-powdered barrier gloves
Resuscitation mask/face shield
Ice bags
Bandage strips
Patch bandage
4" elastic wrap
6" elastic wrap
2" kling roller gauze
Eye dressing kit (eye patch and clear medical tape)
Eyewash
Adhesive tape
Antibiotic ointment
Anti-septic wipes
Alcohol wipes
Triangular bandage for sling
Insect sting ointment
Hydrocortisone cream
Sun block (spf 30)
Insect repellant
Scissors
Tape cutter
Single use plastic tweezers
2" x 2" sterile gauze pads
3" x 3" sterile gauze pads
Telfa non-stick pads
Q-tip swab

APPENDIX K

Injury Signs, Symptoms, and Management Cards

Dehydration Warning Signs

Basic signs of dehydration are:

Thirst	Dizziness
Irritability	Cramps
Headache	Nausea
Weakness	Decreased performance

Risk Factors for Dehydration

The following are risk factors for heat illness. An athlete experiencing one or more of these should be closely monitored while engaged in physical activity in high heat and humidity.
Dehydration or previous heat problems

Physical barriers to evaporation - *(includes athletic equipment or wearing excessive or dark colored clothing)*

History of Illness - *(Sickness involving sweating, vomiting, and diarrhea increases susceptibility to heat related illnesses.)*

Overweight

Poor physical conditioning

Lack of adjustment to the heat

Medications and drugs - *(Some medications result in a dehydrating effect. Also alcohol and caffeine can cause an increased loss of body fluids.)*

Fluid imbalance - *(This can result from not replacing fluids from a previous exercise session or from vomiting or diarrhea.)*

Signs & Symptoms of Heat Cramps

Excessive loss of bodily fluids from sweating.

Involuntary muscle contractions or cramping, usually in the calf but may occur elsewhere. In severe cases, cramping will occur in multiple places due to excessive loss of fluid and sodium.

Management of Heat Cramps

Replacement of fluids

Stretching of the involved muscle

Application of ice over cramping muscle(s) in conjunction with stretching

Replace sodium

Signs & Symptoms of Heat Collapse (Syncope)

Rapid fatigue when exercising in high temperatures.

Weakness

Faintness

Especially after exercising or standing in the heat.

Management of Heat Collapse

Activate the emergency plan

Place athlete in a cool and shaded area

Elevate the legs above the head

Monitor vital signs (see Module 3)

Replenish athlete's fluids if the athlete is conscious and coherent

Signs & Symptoms of Heat Exhaustion

Inadequate replacement of fluids.

Headache
Weakness
Confusion/disorientation
Profuse sweating
Nausea

Pale skin
Cool, clammy skin
Dizziness
Rapid weak pulse
Core body temperature of 98-104 degrees F

Management of Heat Exhaustion

Activate emergency plan.

Remove excess clothing from athlete

Move athlete to a cool and shaded area and reduce body temperature by fanning and placing ice or ice bags in contact with her body

Replace the fluid in the athlete if she is able to drink

Signs & Symptoms of Heat Stroke

Severe rise in temperature caused by failure of the body's cooling mechanisms. This is a life threatening condition!

Altered mental function with possible collapse and loss of consciousness
Hot red skin
Not sweating or no longer sweating

Core body temperature approximately 104 degrees F
Rapid strong pulse
Shallow breathing

Management of Heat Stroke

Activate emergency plan

Lower body temperature as quickly as possible by fanning and placing ice towels or ice bags in the groin, neck, and armpit—areas where major blood vessels are located

Move athlete to a cool and shaded area, remove equipment and clothing, ensure proper breathing

Immerse athlete in ice water, a particularly effective means to lower body temperature and save lives

Monitor vital signs

Signs & Symptoms of Mild Cold Injury

Most often noticed by others first

Skin is soft to touch and appears initially red, then white and is usually painless

Cold, painless areas that may peel or blister in 24-72 hours

Management of Mild Cold Injury

Cover the effected area with gloves, mittens, ear coverings, ski mask, etc

Blow hot breath on the spot

Warm fingertips under armpits

Signs & Symptoms of Moderate Cold Injury

Skin is firm to touch, but tissue beneath is soft and appears initially red and swollen

Blister formation in affected area

Numbness

Skin color is white or waxy in nature

Management of Moderate Cold Injury

Remove from cold

Do not rub the area

Seek immediate medical attention

Signs & Symptoms of Severe (Frostbite) Cold Injury

Skin is
Hard

Numb

Shows white, yellow-gray, or blue-gray blotches

Management of Severe Cold Injury

Seek immediate medical attention

Remove from cold

Do not rub the area

A key component in the management of moderate and severe cold injuries is *re-warming*. However, there is a specific way to re-warm a body part in order to have the least amount of damage and this should be done in a controlled setting where re-warming temperature can be *monitored by a professional.*

Signs & Symptoms of Seizures (Convulsions)

The most common type of seizure in athletes results from epilepsy, a neurological disorder that has no known cause.

Seizures include unconsciousness and uncontrolled severe muscle contractions lasting several seconds to a few minutes for major episodes.

Management of Seizures

Activate the emergency plan

Protect the athlete from a self inflicted injury

To protect an athlete from injuring herself during a seizure, the following steps should be taken:

Help the athlete to the ground if she feels a seizure coming on

Remove objects that may cause harm to the athlete and ask people to stand away

Protect the athlete's arms and legs but do not restrain him

Loosen clothing

Do not put anything in the athlete's mouth

Record the length of the seizure

Allow the athlete to awaken normally after the seizure

Assess the athlete's airway, breathing, and circulation (ABCs)

Transport the athlete by EMS to a medical facility or refer him immediately to his physician or other responsible party

Signs & Symptoms of Asthma

Asthma is a condition in which the air passages in the lungs get smaller, thus interfering with normal breathing. An asthma attack can be brought on by an allergy, respiratory infection, exercise, irritants such as smoke, smog, etc., heightened emotions, and rapid weather changes.

An athlete having an asthma attack will have

Difficulty breathing	Anxious appearance
Chest tightness	Bent over body appearance
Sweating	Coughing
Paleness	Wheezing

Management of Asthma

Athletes with asthma have prescribed inhalers that normally provide immediate relief. Insist that these be brought to all practices and games.

Additional ways to manage an asthma attack include:

Reassure the athlete

Encouraging the athlete to breath slowly and deeply

Removing known environmental causes of the asthma attack or removing the athlete from the area

Activating the emergency plan if other procedures are unsuccessful.

A medical emergency must be declared when a known asthmatic experiences an attack and (1) does not have an inhaler or (2) uses an ineffective inhaler. The emergency plan should then be activated.

Signs & Symptoms of Allergic Reactions

The most common allergic reactions in athletes are caused by insect bites or stings. Chemicals used to treat the playing field may also cause a reaction.

The severity of the signs and symptoms depend upon the extent of the reaction to the allergen. General characteristics are...

Itching and burning

Hives

Swelling of the lips, tongue and airway

Chest tightness

Difficulty breathing

Occasionally, respiratory failure

Management of Allergic Reactions

Activate your emergency plan for an athlete having an allergic reaction.

Signs & Symptoms of Diabetic Coma

Cause: Too little insulin Result: High blood sugar

Signs and Symptoms (not all may be present):

Deep forceful breathing (puffing and blowing).
Fruity-smelling breath
Nausea and vomiting
Thirst
Dry mouth
Flushed skin
Mental confusion or unconsciousness followed by coma

Management* of Diabetic Coma

Insulin should be given at the onset of symptoms. Injection must be performed by the athlete himself or by a parent or guardian.

Activate emergency plan.

When in doubt, give sugar. If the athlete does not respond to treatment, call 911 and* ***activate your emergency plan.*

Signs & Symptoms of Insulin Shock

Cause: Low blood sugar

Signs and Symptoms (not all may be present):

Tingling in mouth, hands or other body parts
Physical weakness
Headaches
Abdominal pain

Abnormal or shallow breathing

Rapid heartbeat
Confusion and dizziness

Management* of Insulin Shock

Give candy, orange juice, or sugar at the onset of symptoms.

When in doubt, give sugar. If the athlete does not respond to treatment, call 911 and* ***Activate your emergency plan**.*

Additionally, the athlete should be allowed to check his blood sugar if the means are available.

Signs & Symptoms of Fractures & Dislocations

Fracture	Dislocation
Possible deformity Pain Loss of function Swelling	Obvious deformity Swelling Pain Loss of movement
Bruising	Marked loss of normal joint movement (locked joint)
Heard or felt a "pop" or "snap" at time of injury	A dislocation generally results in stretching or tearing of the ligaments around the joint and can result in an unstable joint.
Grinding or grating sound, like two bones rubbing together Possible false motion (movement where there should not be)	

Management of Fractures & Dislocations

If.	Then .
You suspect a fracture or dislocation	Activate emergency plan (see Module 1).
There is obvious deformity	Activate emergency plan. Do Not move the body part!
There is an open fracture	Activate emergency plan. Take blood and body fluid precautions. Control bleeding with direct pressure or pressure points if necessary.

Signs and Symptoms of an Acute Injury

The general signs and symptoms that are present after an acute injury include:
Swelling
Redness
Heat
Pain
Possible loss of function

Caused by the body's response to injury, these signs and symptoms are normal and necessary to localize, protect, and prepare the body for healing. The magnitude of these signs and symptoms will increase as the severity of injury increases.

Management of Acute Injuries

Apply ice and elevate the injured extremity.

Do not allow bearing weight or movement if it increases the pain.

An acute injury may result in ...
a large amount of swelling,
pain that does not get better in 20-30 minutes,
inability to bear weight or move the injured body part without increasing the pain, and/or
Numbness or tingling sensation in a body part.

An athlete with an acute injury with the above symptoms should be sent immediately to a physician.

Signs and Symptoms of a Chronic Injury

The general signs and symptoms of an overuse injury are:
Swelling
Pain
Muscle spasm
Some loss of function

Possible grating or grinding can be heard or felt with movement of the injured body part
The symptoms of an overuse injury could possibly last for months or even years.

Overuse injuries are usually caused by constant and repetitive stresses, from forcing the joint into extreme range of motions, or prolonged strenuous activity.

Management of Chronic Injuries

A chronic injury is an injury in which ...
The pain does not go away or improve

Pain increases with activity

Numbness or tingling exists in the injured body part

Athletes with chronic injuries should be sent to a physician as soon as possible.

Many acute injuries can become chronic if they are not treated appropriately as an acute injury.

Signs & Symptoms of Head Injuries

Dizziness	Blurred vision
Headache	Draining of blood or clear fluid from athlete's nose, mouth, or ears
Ringing in the ears	Bump or deformity and/or bleeding at site of blow
Nausea	Pupils not responsive to light
Confusion/disorientation	Seizure
Loss of memory	Slurred Speech
Decreasing level of consciousness	Breathing and pulse irregularities
Loss of consciousness	

Management of Head Injuries

Conscious Athlete	**Unconscious Athlete**
Question the athlete about time, place, person, and purpose to determine if there is any memory loss	Activate emergency plan
Ask the athlete if he has neck pain and if he is able to move his extremities	Maintain and monitor ABCs
Ask the athlete if he is dizzy, feels nauseous, has a headache, and if his ears are ringing	Stabilize neck (see section on neck injuries in this module)
Look for any of the signs listed on the previous page	Treat any other life threatening injuries, such as major bleeding
A sign not initially present may become noticeable some minutes later	Treat an unconscious athlete as if he has a neck injury
An athlete suffering a concussion should be monitored for worsening conditions	

Signs and Symptoms of Neck Injuries

Inability to move arms, legs, fingers or toes

Inability to feel your touch

Possibility of breathing difficulties

Hand grip strength is significantly unequal

Neck pain

Numbness and/or tingling in the arms, legs, fingers or toes

Management of Neck Injuries

Activate emergency plan

Do not move the athlete

Monitor and maintain ABCs

Monitor vital signs

Reassure athlete

Leave the athlete in the position found if ABCs are satisfactory

An unconscious athlete must be treated as if he has a head or neck injury.

Signs and Symptoms of Foreign Body in Eye

Red, watery eye

Blurred vision

Possible sensitivity to light

Eye pain

Burning sensation

Management of Foreign Body in the Eye

Do not allow athlete to rub the eye

Have athlete remove contact lenses if applicable

Wash eye out with water

Use the corner of a sterile gauze pad to remove a foreign body that can be seen

Cover the eye with a patch if symptoms persist and refer athlete immediately to a physician

In some instances, the foreign body can become lodged under the upper or lower eyelid. To inspect, pull the lower lid out and away from the eye and invert the upper lid.

Signs and Symptoms of Eye Abrasion

Red, watery eye

Blurred vision

Sensitivity to light

Intense eye pain

Burning sensation

Management of Eye Abrasions

Do not allow athlete to rub the eye.

Cover with a patch a painful eye that is sensitive to light and send the athlete directly to a physician.

Facial Laceration

Characterized by profuse bleeding, a facial laceration is usually caused by a direct blow (getting hit by another athlete or with a piece of equipment). This type of injury should be seen immediately by a physician to determine if stitches are needed to reduce the severity of scarring.

Signs and Symptoms

Visible laceration of the skin

Profuse bleeding

Pain

Management of a Facial Laceration

Direct pressure

Cover with sterile bandage

Refer to a physician

Nose Bleed

Usually caused by a direct blow, a nose bleed may also result from a dry nasal cavity or high blood pressure, particularly if occurrence is spontaneous.

Signs and Symptoms

Bleeding from nostril(s)

Possible deformity

Pain

Management of a Nose Bleed

Have athlete sit with head forward

Pinch upper portion of the nose to apply direct pressure

Apply ice to nose area

Refer to a physician if bleeding does not stop

Prohibit nose blowing which may cause further bleeding

Broken Nose

Caused by a direct blow to the nose.

Signs and Symptoms

Swelling

Possible deformity

Bleeding

Difficulty breathing through nasal passages

Pain

Management of a Broken Nose

Have athlete sit with head forward

Pinch upper portion of nose to apply direct pressure

Apply ice to nasal area

Prohibit nose blowing

Refer to physician

Chipped Tooth

This is characterized by a crack or break in part of a tooth, generally the result of a direct blow.

Signs and Symptoms

Part of tooth missing or cracked

Possible bleeding depending on depth and gum involvement

Possible pain depending on depth

Sensitive to heat, cold, and pressure depending on depth

Management of a Chipped Tooth

Have athlete sit with head forward to allow blood to drain from mouth

Apply pressure with sterile gauze to areas of bleeding

Refer to a dentist as quickly as possible

Dislodged Tooth

Characterized by the tooth being dislodged from its socket usually from a direct blow.

Signs and Symptoms

Bleeding

Tooth dislodged

Gum swelling

Pain

Management of a Dislodged Tooth

Immediately place tooth in milk or saline solution
If neither is available, cold water can be used as a substitute or have the athlete hold the tooth in his mouth

Place wet gauze over the empty space where the tooth was

Have athlete lean forward to allow blood to drain from the mouth

Send athlete immediately to dentist (tooth may be saved if a dentist treats the athlete within an hour of injury)

APPENDIX L

Emergency Plan Template

Phone Location
What phone will be used? ______________________________
Where is the phone located? ______________________________
If a cell phone, what is the back up phone? ______________________________

Contacting Emergency Medical Services
______________________________ will make the call to 911.
Caller should have the following information:
Name, address of current location and phone number of caller
Phone Number of caller: ____
Directions to location: ____
____
____

Type of emergency situation
Number of victims
Suspected injury/symptoms
Condition of athlete(s)
Current assistance being given

Contacting the Parents
The team phone list is located ______________________________.
______________________________ will be responsible for calling the parents.

Staying with Athlete(s)
______________________________ will be responsible for staying and assisting the injured athlete(s).

Meeting the Ambulance
______________________________ will be responsible for meeting the ambulance and directing EMS to the site of the injured athlete(s).
If there are any locked gates/doors that EMS will have to go through, where are the keys?
____

Medical Records
The medical records are kept ____

Control of the Scene
______________________________ will be responsible to control the scene.

APPENDIX M

Daily Check-Off Sheet

Daily Check-off Sheet

Date: ______

Team	Grade	Warm-up	Stretch	Water Breaks (Every __ minutes)	Comments

APPENDIX N

Gradual Activity Check-off Sheet

Gradual Activity Check-off Sheet

Date: ______

Grade	Team	Amount of Time & Amount of Exertion

APPENDIX O

First Aid Kit Check-off Sheet

First Aid Kit Check-off Sheet

Date: ______

Non-powdered barrier gloves											
Resuscitation mask/face shield											
Ice bags											
Bandage strips											
Patch bandage											
4" elastic wrap											
6" elastic wrap											
2" kling roller gauze											
Eye dressing kit (eye patch and clear medical tape)											
Eyewash											
Adhesive tape											
Antibiotic ointment											
Anti-septic wipes											
Alcohol wipes											
Triangular bandage for sling											
Insect sting ointment											
Hydrocortisone cream											
Sun block (spf 30)											
Insect repellant											
Scissors											
Tape cutter											
Single use plastic tweezers											
2" x 2" sterile gauze pads											
3" x 3" sterile gauze pads											
Telfa non-stick pads											
Q-tip swab											

APPENDIX P

NCSS P.R.E.P.A.R.E. Examination

Name: ______________________________

Please circle the answer that you feel is correct

Module 1

1. An effective emergency plan suggests enough change to make how many phone calls from the pay phone?
    A. One
    B. Two
    C. Three or more

2. An emergency plan should be written and reviewed by:
    A. All responsible for the care of athletes
    B. The head coach only
    C. The athlete and his or her parents only
    D. The team physician only

3. Which of the following should be kept immediately available for use in providing information to 911 or the local emergency service?
    A. The athlete's insurance card
    B. The first aid kit
    C. The athlete's medical history/information and medical release forms
    D. The athlete's social security number

4. How should you dispose of contaminated gauze and gloves after caring for an injured/bleeding athlete?
    A. Nearby park trash can
    B. Clearly marked hazardous waste bag
    C. Dumpster
    D. Any plastic bag

5. When traveling to another facility, what action should be taken concerning your emergency plan?
    A. Do not worry about it, they probably have an emergency plan already established
    B. When you arrive for the game, obtain a copy of their emergency plan
    C. Use the same plan you would normally use if you were at your own facilities
    D. Contact the opposing team in advance to obtain a copy of their emergency plan and adapt your plan as needed.

6. What is the easiest and most convenient means of determining the distance to a lightning flash?
    A. Bang-to-Flash
    B. Bang-to-Bang
    C. Flash-to-Flash
    D. Flash-to-Bang

7. How often should coaches and staff review the emergency plan?
    A. One every four years
    B. At least once every year
    C. Only one time, when the person becomes a coach or is hired to a staff position
    D. The emergency plan does not need to be reviewed by coaches and staff

8. Which of the following is NOT included in the list of information a rescuer should be prepared to give to the Emergency Medical Services when a call is made?
    A. Exact location of emergency
    B. Full medical history of athlete
    C. Condition of the athlete
    D. Current assistance being given to athlete

9. What is the first step in the first aid procedure for managing victims of a lightning strike?
    A. Survey the scene for safety
    B. Move the victim with care to a safer location
    C. Begin CPR
    D. Evaluate airway, breathing and circulation

10. A properly stocked first aid kit should include:
    A. Pocket mask, cutters, bags for ice
    B. Medical history card for each athlete
    C. Medical release forms
    D. All of the above

Module 2

1. Adjusting to the heat during practice should happen gradually over how many days?
    A. Approximately 1-2 days
    B. Approximately 10-14 days
    C. Approximately 20-25 days
    D. Athletes do not need to adjust to the heat

2. How often should athletes drink to maintain hydration?
   A. Every 10-20 minutes
   B. When they are thirsty
   C. At least twice during a practice that is 1 hour long
   D. Every 30-45 minutes

3. Which is NOT a sign of dehydration?
   A. Thirst
   B. Decreased performance
   C. Cramps
   D. Skin is hard to touch

4. Which of the following is not a risk factor for heat illness?
   A. Physical barriers to evaporation
   B. Obesity
   C. Poor physical conditioning
   D. All are risk factors for heat illness

5. The carbohydrate concentration in the ideal fluid replacement solution should be in the range of:
   A. 20-25%
   B. 2-4%
   C. 6-8%
   D. 12-15%

6. How many ounces of water or sports drink should be consumed every 10-20 minutes of exercise?
   A. 1-3 ounces
   B. 7-10 ounces
   C. 25-30 ounces
   D. 48 plus ounces.

7. Disorientation, profuse sweating, and a rapid weak pulse are symptoms of which of the following?
   A. Heat exhaustion
   B. Sprain or strain of the ankle
   C. Heat cramps
   D. Hypothermia

8. An athlete, whose skin is red and hot and unable to perspire, is probably suffering from which of the following?
   A. Respiratory arrest
   B. Heat cramps
   C. Choking
   D. Heat stroke

9. What is one way to treat a mild case of cold illness?
    A. Blow hot breath on the spot
    B. Rub the area
    C. Put the area in water
    D. All of the above

10. What type of cold injury does an athlete have if his skin is firm to the touch, but the tissue beneath is soft and appears red and swollen at first?
    A. Mild
    B. Moderate
    C. Severe
    D. None of the above

Module 3

1. Which is NOT a technique in managing a victim in shock?
    A. Maintain ABCs
    B. Manage bleeding or any other injury
    C. Give them something to drink or eat
    D. Activate emergency plan

2. How many vital signs does the body have that indicate changes in body function and are able to be quickly checked?
    A. 9
    B. 7
    C. 12
    D. 5

3. What is the normal pulse range for a person 10 years or older?
    A. 80-140
    B. 30-70
    C. 60-100
    D. 100-190

4. Which of the following is not listed as a vital sign?
    A. Respiration
    B. Swelling
    C. Skin color
    D. Temperature

5. Which of the following is a symptom of hyperventilation?
    A. Numbness
    B. Tingling in hands
    C. Light headedness
    D. All of the above

6. If you suspect an athlete has paralysis and all vital signs are good, you should:
   A. Not move the athlete or remove equipment
   B. Gently move the athlete off the field
   C. Take the athlete immediately to the hospital
   D. Gently take off all headgear

7. If a conscious athlete has paralysis on one side of the body this may indicate:
   A. Broken arm
   B. Brain injury, stroke, or pinched nerve
   C. Respiratory arrest

8. An athlete with which symptom should not return to play until permitted by a medical professional?
   A. Blurred or loss of vision
   B. Ringing in the ears
   C. Swelling
   D. All of the above

9. The two most common areas to take the pulse are:
   A. The artery at the wrist and the artery behind the knee
   B. The artery in the ankle and the artery at the wrist
   C. The artery in the neck and the temple
   D. The artery at the wrist and the artery in the neck

10. Signs and symptoms of shock include all of the following EXCEPT:
   A. Rapid, weak pulse
   B. Ringing in the ears
   C. Pale skin
   D. Dilated Pupils

Module 4

1. Medical conditions can be detected in a yearly . . .
   A. Conference call with parents
   B. Pre-participation exam
   C. Discussion with school nurse
   D. None of the above

2. Which of the following should be done to protect an athlete suffering a seizure?
   A. Remove objects that may cause injury and ask people standing close by to move back
   B. Place a tongue depressor in the athlete's mouth
   C. Hold the athlete tight
   D. Place straps securely around the athlete's feet

3. After a seizure, you should:
   A. Record the length of the seizure
   B. Assess the athlete's airway, breathing and circulation
   C. Transport by EMS
   D. All of the above

4. Asthma can be triggered by many things, including:
   A. Allergy
   B. Exercise
   C. Rapid weather change
   D. All of the above

5. Signs and symptoms of an athlete experiencing an asthma attack include:
   A. Coughing and wheezing
   B. Vomiting
   C. Blood draining from nose
   D. Abdominal cramps

6. During an asthma attack, care for the athlete may include:
   A. Elevating the athlete's legs above his heart
   B. Having the athlete take slow, deep breaths
   C. Covering the athlete with blankets
   D. None of the above

7. In addition to physical exertion, exercise induced asthma can be caused by:
   A. Slow stretches
   B. High pollen counts
   C. High blood sugar
   D. None of the above

8. If an athlete has an allergic reaction requiring the use of an epinephrine pen (epi), it should be administered by
   A. A teammate
   B. Trained individual
   C. The head coach
   D. The athlete having the allergic reaction

9. A diabetic coma is caused by:
   A. Too much insulin
   B. Too many candy bars
   C. Environmental factors
   D. Too little insulin/high blood sugar

10. Which of the following conditions prohibit an athlete from returning to play until examined and cleared by a medical professional?
    A. Concussion
    B. Loss of movement
    C. Severe bleeding
    D. All of the above

Module 5

1. What type of wound results from a sharp object penetrating the skin?
    A. Laceration
    B. Abrasion
    C. Avulsion
    D. Puncture

2. What type of care should be given to an athlete with an abrasion?
    A. No care needed, just a scratch
    B. Clean with soap and water, hydrogen peroxide, apply ointment and dressing and change the dressing daily
    C. Cover the abrasion with a gauze applying pressure
    D. Non of the above

3. This type of bleeding is bright red and spurts under pressure in time with the heart. Although no commonly seen in sports, this type of bleeding is very serious and life threatening.
    A. Arterial
    B. Venous
    C. Capillary

4. An athlete has suffered an injury from a collision with another player. There are no visible injuries, but she complains of nausea and hardness to her abdomen to touch. As a rescuer, you might suspect that she is suffering from with of the following:
    A. Cardiac arrest
    B. A fractured leg
    C. A blister
    D. Internal bleeding

5. If direct pressure and elevation do not control severe bleeding, which two pressure points are not most commonly used to control the bleeding?
    A. The arm and the leg (groin area)
    B. The bottom of the foot and the arm
    C. The knee and neck
    D. The leg and side of chest area

6. Which phrase best describes a dislocation?
   A. A break in the continuity of a bone
   B. A life-threatening injury that occurs inside the body and is not visible to the eye
   C. Total disruption of a joint where the bones are no longer in alignment
   D. An injury where the skin is torn completely from its attachment

7. What is the primary reason a coach would place ice on an injury?
   A. To keep the bone from fracturing
   B. To reduce swelling, pain and muscle spasms
   C. To increase circulation to the injury
   D. To prevent a puncture wound

8. An athlete slides into first base and suffers an injury to his lower leg. The athlete says he heard a popping sound and complains of severe pain and loss of function in his leg. You notice a slight deformity in his leg. Which type of injury might this athlete have?
   A. A fracture
   B. A dislocation
   C. An abrasion
   D. A chronic injury

9. An athlete with tennis elbow has what type of injury?
   A. Overuse
   B. Acute
   C. Fracture
   D. Avulsion

10. What type of care increases circulation, improves stretching ability of tissues, reduces pain, and relieves muscle spasm in an overuse injury?
    A. Application of heat
    B. Application of ice
    C. Dressing the wound
    D. None of the above

Module 6

1. The best place to keep a dislodged tooth until the athlete can be seen by a dentist is:
   A. A glass of cold water
   B. In a sports drink
   C. In a glass of milk
   D. In a carbonated drink

2. Which of the following steps should be taken to prevent head injuries?
    A. Enforce the rules of the game
    B. Use face shields on helmets when appropriate
    C. Use properly fitted head gear
    D. All of the above

3. Swelling, possible deformity, bleeding, difficulty breathing and pain are all signs of which injury?
    A. Nose bleed
    B. Facial laceration
    C. Broken nose
    D. Dislodged tooth

4. Ringing in the ears and blurred vision most likely indicate what type of injury?
    A. Dislocation
    B. Head injury
    C. Hyperventilation
    D. Broken arm

5. How should you care for an unconscious athlete who has functioning airway, breathing, and circulation, but may have a neck injury?
    A. Roll him over to make sure he is breathing properly
    B. Remove his helmet
    C. Leave him in position and monitor ABCs until EMS arrives
    D. Wait until the athlete becomes conscious, then roll him over

6. According to the Eight Rules for a Suspected Neck Injury, you should do all the following EXCEPT:
    A. Allow teammates to help the athlete up
    B. Activate emergency plan if the athlete is unconscious
    C. Do not move the athlete
    D. Monitor ABCs

7. Steps to help prevent neck injuries include:
    A. Doing proper strengthening exercises for the neck
    B. Using correct techniques (for example, tackling with the shoulder)
    C. Wearing properly fitting equipment
    D. All of the above

8. To properly remove a foreign body from the eye, you should:
    A. Ask the athlete to rub her eye
    B. Tell athlete to blink several times
    C. Gently pull down the upper or lower lid and attempt to get it out with the tip of your finger
    D. Wash eye out with water

9. Management of a nose bleed includes all the following EXCEPT:
   A. Asking the athlete to blow her nose
   B. Applying ice to the nose area
   C. Applying direct pressure by pinching upper portion of the nose
   D. Have athlete sit with head forward

10. If you suspect that an unconscious athlete has suffered a concussion, the first thing that you should do is:
   A. Maintain her airway, breathing, and circulation
   B. Activate your emergency plan
   C. Monitor the athlete to make sure her condition does not worsen
   D. Question the athlete about time, place, person, and purpose to determine if there is any memory loss

Module 7

1. All of the following are benefits of a proper warm-up EXCEPT:
   A. Risk of injury is reduced
   B. Body returns to a resting state
   C. Heart is prepared for physical exercise
   D. Athlete is able to rehearse sport-specific movements and skills

2. Which is the correct order for the four stages of warm-up?
   A. Gentle loosening exercise, jogging, stretching and event-specific exercises
   B. Jogging, stretching, gentle loosening exercises and even-specific exercises
   C. Event specific exercises, gentle loosening exercises, stretching and jogging
   D. Stretching, event-specific exercises, jogging and gentle loosening exercises

3. A baseball player throwing and catching a ball or hitting a few ground balls is in what stage of warm-up?
   A. Stretching
   B. Jogging
   C. Event-specific
   D. Gentle loosening

4. Which of the following is the primary reason that cool-down periods are important to incorporate into your practices and games?
   A. To prepare the body for an upcoming event
   B. To help improve performance during the practice or game
   C. To increase the blood flow to the muscles
   D. To allow the body to return to a resting state

5. During a cool-down period, an athlete should:
   A. Perform event-specific drills
   B. Stretch the major muscles or tight muscles
   C. Sprint from one end of the field to the other
   D. Work to increase his heart rate

6. How long should a cool-down period last
   A. At least one hour
   B. 1 to 5 minutes
   C. 30 to 45 minutes
   D. 5 to 10 minutes

7. How long should the warm-up period last?
   A. 3 to 4 minutes
   B. 4 to 5 minutes
   C. 10 to 15 minutes
   D. 45 minutes

8. The warm-up period for distance runners may comprise:
   A. Jogging that may last as long as 10 to 20 minutes
   B. Jogging that may last 60 minutes
   C. Anaerobic exercises
   D. Working on field events such as the discus

9. During a stretch, the athlete should:
   A. Bounce every 2 seconds
   B. Continue with the stretch even if it is painful
   C. Never bounce
   D. None of the above

10. A basketball player doing layups is in which stage of warm-up?
    A. Event-specific
    B. Stretching
    C. Jogging
    D. Gentle loosening.

APPENDIX Q

P.R.E.P.A.R.E. Program Coaches Evaluation Form

PREPARE Program Coaches Evaluation Form

Name:____________________________________	**Coaching Location :** Saint Johns Holt

1. Overall How satisfied were you with the P.R.E.P.A.R.E. program?

- o Very satisfied
- o Satisfied
- o Somewhat Satisfied
- o Unsatisfied
- o Very Unsatisfied

2. How much did you learn from the P.R.E.P.A.R.E. program?

- o A lot of new things
- o Some new things
- o A few new things
- o Nothing I already did not know

3. Would you be interested in taking an injury prevention and first aid program designed specifically for the sport of football?

- o Yes
- o No

4. In your opinion would you have preferred a lecture based program?

- o Yes
- o No

5. On a scale of 1-10 rank each of the modules in the P.R.E.P.A.R.E. program on their relative importance. (1=not at all important, 5=somewhat important, 10=very important

_____ Module 1: Emergency action plans

_____ Module 2: Weather related illnesses and hydration recommendations

_____ Module 3: ABCs (Airway, Breathing, and Circulation)

_____ Module 4: Special Situations (Seizure/Asthma/Allergic Reaction/Diabetes)

_____ Module 5: Wound and injury recognition and care

_____ Module 6: Head, neck, and facial injuries

_____ Module 7: Warming-up, stretching, and cooling-down

Please continue on next page →

6. After taking the P.R.E.P.A.R.E. program, how often did you utilize the knowledge you gained?

- o Daily
- o Less than once a week
- o 1-2 times a week
- o 3-4 times a week
- o >5 times a week
- o Did not use any information from the P.R.E.P.A.R.E. program

If this is your first year of coaching answer questions 7 & 8. If this is not your first year of coaching answer questions 9 & 10.

7. After taking the P.R.E.P.A.R.E. program how much did you feel prepared to prevent injuries from occurring?

- o Very prepared
- o A lot prepared
- o Somewhat prepared
- o Not prepared

8. After taking the P.R.E.P.A.R.E. program how prepared did you feel to deal with an emergency situation?

- o Very prepared
- o A lot prepared
- o Somewhat prepared
- o Not prepared

9. Compared to previous seasons, how much more prepared were you to prevent injuries from occurring after taking the P.R.E.P.A.R.E. program?

- o Very much more prepared
- o A lot more prepared
- o Somewhat more prepared
- o Same as previous years

10. Compared to previous seasons, how much more prepared were you to deal with an emergency situation after taking the P.R.E.P.A.R.E. program?

- o Very much more prepared
- o A lot more prepared
- o Somewhat more prepared
- o Same as previous years

11. What recommendations do you have for the PREPARE program?

____
____
____
____
____
_____

APPENDIX R

Practice and Game Athlete Exposure Data for 2000-2004 Seasons by Year, Town, and Grade

Practice and Game Athlete Exposure Data for the 2000

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	2,143	453	1,486	306	3,629	759
6^{th}	1,150	240	1,265	260	2,415	500
7^{th}	1,567	332	1,320	288	2,887	620
8^{th}	1,156	291	0	0	1,156	291
Total	6,016	1,316	4,071	854	10,087	2,170

Practice and Game Athlete Exposure Data for the 2001

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	2,022	419	1,664	326	3,686	745
6^{th}	1,529	336	1,203	246	2,732	582
7^{th}	1,089	266	1,556	303	2,645	569
8^{th}	1,346	292	0	0	1,346	292
Total	5,986	1,313	4,423	875	10,409	2,188

Practice and Game Athlete Exposure Data for the 2002

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	2,157	471	1,922	406	4,079	877
6^{th}	1,264	258	1,344	279	2,608	537
7^{th}	1,524	348	1,235	282	2,759	630
8^{th}	1,032	220	0	0	1,032	220
Total	5,977	1,297	4,501	967	10,478	2,264

Practice and Game Athlete Exposure Data for the 2003

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	2,110	480	1,709	340	3,819	820
6^{th}	1,633	377	1,271	248	2,904	625
7^{th}	1,407	304	1,474	315	2,881	619
8^{th}	1,725	430	0	0	1,725	430
Total	6,875	1,591	4,454	903	11,329	2,494

Practice and Game Athlete Exposure Data for the 2004

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	2,399	436	2,730	471	5,129	907
6^{th}	1,618	223	1,385	219	3,003	442
7^{th}	2,049	397	1,479	288	3,528	685
8^{th}	1,973	370	0	0	1,973	370
Total	8,039	1,426	5,594	978	13,633	2,404

APPENDIX S

Practice and Game Time-Loss Injury Data for the 2000-2004 Seasons by Year, Town, and Grade

Practice and Game Time-Loss Injury Data for the 2000

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	14	5	9	4	23	9
6^{th}	13	7	2	2	15	9
7^{th}	21	8	21	9	42	17
8^{th}	14	7	0	0	14	7
Total	62	27	32	15	94	42

Practice and Game Time-Loss Injury Data for the 2001

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	10	9	6	2	16	11
6^{th}	17	2	13	4	30	6
7^{th}	5	6	10	8	15	14
8^{th}	18	9	0	0	18	9
Total	50	26	32	14	79	40

Practice and Game Time-Loss Injury Data for the 2002

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	9	9	5	1	14	10
6^{th}	12	3	8	1	20	4
7^{th}	6	3	8	1	14	4
8^{th}	13	6	0	0	13	6
Total	40	21	21	3	61	24

Practice and Game Time-Loss Injury Data for the 2003

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	3	4	11	1	14	5
6^{th}	11	4	10	6	21	10
7^{th}	15	4	8	3	23	7
8^{th}	23	6	0	0	23	6
Total	52	18	29	10	81	28

Practice and Game Time-Loss Injury Data for the 2004

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	16	3	3	1	19	4
6^{th}	12	3	7	4	19	7
7^{th}	9	16	15	5	24	21
8^{th}	22	15	0	0	22	15
Total	59	37	25	10	84	47

APPENDIX T

Practice and Game Non-Time-Loss Injury Data for the 2000-2004 Seasons by Year, Town, and Grade

Practice and Game Non-Time-Loss Injury Data for the 2000

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	16	6	18	8	34	14
6^{th}	9	4	8	8	17	12
7^{th}	16	6	15	32	31	38
8^{th}	15	2	0	0	15	2
Total	56	18	41	48	97	66

Practice and Game Non-Time-Loss Injury Data for the 2001

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	16	11	22	23	38	34
6^{th}	20	10	34	15	54	25
7^{th}	2	8	24	20	26	28
8^{th}	18	13	0	0	18	13
Total	56	42	80	58	136	100

Practice and Game Non-Time-Loss Injury Data for the 2002

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	4	1	19	10	23	11
6^{th}	7	3	9	6	16	9
7^{th}	4	3	35	8	39	11
8^{th}	7	2	0	0	7	2
Total	22	9	63	24	85	33

Practice and Game Non-Time Loss Injury Data for the 2003

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	15	4	25	18	40	22
6^{th}	14	6	18	11	32	17
7^{th}	16	6	5	10	21	16
8^{th}	9	7	0	0	9	7
Total	54	23	48	39	102	62

Practice and Game Non-Time Loss Injury Data for the 2004

	Town A		Town B		Total	
Grade	Practice	Game	Practice	Game	Practice	Game
4^{th}-5^{th}	14	5	20	5	34	10
6^{th}	10	2	23	8	33	10
7^{th}	18	4	24	15	42	19
8^{th}	13	5	0	0	13	5
Total	55	16	67	28	122	44

APPENDIX U

Results of Module 1 by Question

Module 1		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	12 (63.16)	7 (36.84)
	No PREPARE	22 (61.11)	14 (38.89)
Question 2	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 3	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	34 (94.44)	2 (5.56)
Question 4	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	32 (88.89)	4 (11.11)
Question 5	PREPARE	14 (73.68)	5 (26.32)
	No PREPARE	17 (47.22)	19 (52.78)
Question 6	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	27 (75.00)	9 (25.00)
Question 7	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	36 (100.00)	0 (0.00)
Question 8	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	33 (91.67)	3 (8.33)
Question 9	PREPARE	14 (73.68)	5 (26.32)
	No PREPARE	20 (55.56)	16 (44.44)
Question 10	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	25 (69.44)	11 (30.56)

APPENDIX V

Frequencies of Responses to Module 1 Questions

Question 1:An effective emergency plan suggests enough change to make how many phone calls from the pay phone?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
One	2	10.53	5	13.89
Two	5	26.32	9	25.00
Three	12	63.16	22	61.11
Total	19	100.01*	36	100.00

* total exceeds 100 because of rounding

Question 2: An emergency plan should be written and reviewed by:

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
All responsible for the care of athletes	19	100.00	35	97.22
The head coach only	0	0.00	0	0.00
The athlete and his or her parents only	0	0.00	0	0.00
The team physician	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 3: Which of the following should be kept immediately available for use in providing information to 911 or the local emergency service?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
The athlete's insurance card	0	0.00	1	2.78
The first aid kit	0	0.00	1	2.78
The athlete's medical history/information and medical release forms	19	100.00	34	94.44
The athlete's social security number	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 4: How should you dispose of contaminated gauze and gloves after caring for an injured/bleeding athlete?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Nearby park trash can	0	0.00	0	0.00
Clearly marked hazardous waste bag	19	100.00	32	88.89
Dumpster	0	0.00	0	0.00
Any plastic bag	0	0.00	4	11.11
Total	19	100.00	36	100.00

Question 5: When traveling to another facility, what action should be taken concerning your emergency plan?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Do not worry about it, they probably have an emergency plan already established	0	0.00	0	0.00
When you arrive for the game, obtain a copy of their emergency plan	3	15.79	5	13.89
Use the same plan you would normally use if you were at your own facilities	2	10.53	14	38.89
Contact the opposing team in advance to obtain a copy of their emergency plan and adapt your plan as needed	14	73.68	17	47.22
Total	19	100.00	36	100.00

Question 6: What is the easiest and most convenient means of determining the distance to a lightning flash?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Bang-to-Flash	1	5.26	5	13.89
Bang-to-Bang	2	10.53	1	2.78
Flash-to-Flash	0	0.00	2	5.56
Flash-to-Bang	16	84.21	27	75.00
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 7: How often should coaches and staff review the emergency plan?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Once every four years	0	0.00	0	0.00
At least once every year	19	100.00	36	100.00
Only one time, when the person becomes a coach or is hired to a staff position	0	0.00	0	0.00
The emergency plan does not need to be reviewed by coaches and staff	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 8: Which of the following is NOT included in the list of information a rescuer should be prepared to give to Emergency Medical Services when a call is made?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Exact location of emergency	0	0.00	2	5.56
Full medical history of athlete	19	100.00	33	91.67
Condition of the athlete	0	0.00	1	2.78
Current assistance being given to athlete	0	0.00	0	0.00
Total	19	100.00	36	100.01

Question 9: What is the first step in the first aid procedure for managing victims of a lightning strike?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Survey the scene for safety	14	73.68	20	55.56
Move the victim with care to a safer location	2	10.53	4	11.11
Begin CPR	0	0.00	0	0.00
Evaluate airway, breathing, and circulation	3	15.79	12	33.33
Total	19	100.00	36	100.00

Question 10: A properly stocked first aid kit should include:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Pocket mask, cutters, bags for ice	2	10.53	10	27.78
Medical history card for each athlete	0	0.00	0	0.00
Medical release forms	0	0.00	1	2.78
All of the above	17	89.47	25	69.44
Total	19	100.00	36	100.00

APPENDIX W

Results of Module 2 by Question

Module 2		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	20 (55.56)	16 (44.44)
Question 2	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	30 (83.33)	6 (16.67)
Question 3	PREPARE	12 (63.16)	7 (36.84)
	No PREPARE	25 (69.44)	11 (30.56)
Question 4	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	34 (94.44)	2 (5.56)
Question 5	PREPARE	12 (63.16)	7 (36.84)
	No PREPARE	10 (2.78)	26 (72.22)
Question 6	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	30 (83.33)	6 (16.67)
Question 7	PREPARE	19 (100)	0 (0.00)
	No PREPARE	33 (91.67)	3 (8.33)
Question 8	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	36 (100)	0 (0.00)
Question 9	PREPARE	7 (36.84)	12 (63.16)
	No PREPARE	7 (19.44)	29 (80.56)
Question 10	PREPARE	15 (78.95)	4 (21.05)
	No PREPARE	24 (66.67)	12 (33.33)

APPENDIX X

Frequencies of Responses to Module 2 Questions

Question 1: Adjusting to the heat during practice should happen gradually over how many days

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Approximately 1-2 days	1	5.27	15	41.67
Approximately 10-14 days	18	94.73	20	55.56
Approximately 20-25 days	0	0.00	0	0.00
Athletes do not need to adjust to the heat	0	0.00	1	2.78
Total	19	100.00	36	100.10*

* total exceeds 100 because of rounding

Question 2: How often should athletes drink to maintain hydration?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Every 10-20 minutes	17	89.47	30	83.33
When they are thirsty	1	5.26	1	2.78
At least twice during a practice that is 1 hour long	0	0.00	2	5.56
Every 30-45 minutes	1	5.26	3	8.33
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

Question 3: Which is NOT a sign of dehydration?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Thirst	3	15.79	6	16.67
Decreased performance	4	21.05	4	11.11
Cramps	0	0.00	1	2.78
Skin is hard to touch	12	63.16	25	69.44
Total	19	100.00	36	100.00

Question 4: Which of the following is not a risk factor for heat illness?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Physical barriers to evaporation	0	0.00	2	5.56
Obesity	0	0.00	0	0.00
Poor physical conditioning	1	5.26	0	0.00
All are risk factors for heat illness	18	94.74	34	94.44
Total	19	100.00	36	100.00

Question 5: The carbohydrate concentration in the ideal fluid replacement solution should be in the range of:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
20-25%	5	26.32	13	36.11
2-4%	1	5.26	3	8.33
6-8%	12	63.16	10	27.78
12-15%	1	5.26	9	25.00
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 6: How many ounces of water or sports drink should be consumed every 10-20 minutes of exercise?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
1-3 ounces	1	5.26	6	16.67
7-10 ounces	18	94.74	30	83.33
25-30 ounces	0	0.00	0	0.00
48 plus ounces	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 7: Disorientation, profuse sweating, and a rapid weak pulse are symptoms of which of the following?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Heat exhaustion	19	100.00	33	91.67
Sprain or strain of the ankle	0	0.00	0	0.00
Heat cramps	0	0.00	2	5.56
Hypothermia	0	0.00	1	2.78
Total	19	100.00	36	100.10*

* total exceeds 100 because of rounding

Question 8: An athlete, whose skin is red and hot and unable to perspire, is probably suffering from which of the following?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Respiratory arrest	1	5.26	0	0.00
Heat cramps	0	0.00	0	0.00
Choking	0	0.00	0	0.00
Heat stroke	18	94.74	36	100.00
Total	19	100.00	36	100.00

Question 9: What is one way to treat a mild case of cold illness?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Blow hot breath on the spot	7	36.84	7	19.44
Rub the area	1	5.26	15	41.67
Put the area in water	1	5.26	0	0.00
All of the above	9	47.37	14	38.89
Unanswered	1	5.26	0	0.00
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

Question 10: What type of cold injury does an athlete have if his skin is firm to the touch, but the tissue beneath is soft and appears red and swollen at first?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Mild	3	15.79	4	11.11
Moderate	15	78.95	24	66.67
Severe	1	5.26	8	22.22
None of the above	0	0.00	0	0.00
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

APPENDIX Y

Results of Module 3 by Question

Module 3		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	30 (83.33)	6 (16.67)
Question 2	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	4 (11.11)	32 (88.89)
Question 3	PREPARE	12 (63.16)	7 (36.84)
	No PREPARE	18 (50.0)	18 (50)
Question 4	PREPARE	19 (100)	0 (0.00)
	No PREPARE	31 (86.11)	5 (13.89)
Question 5	PREPARE	11 (57.89)	8 (42.11)
	No PREPARE	20 (55.56)	16 (44.44)
Question 6	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	33 (91.67)	3 (8.33)
Question 7	PREPARE	19 (100)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 8	PREPARE	19 (100)	0 (0.00)
	No PREPARE	31 (86.11)	5 (13.89)
Question 9	PREPARE	19 (100)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 10	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	30 (83.33)	6 (16.67)

APPENDIX Z

Frequencies of Responses to Module 3 Questions

Question 1: Which is NOT a technique in managing a victim in shock?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Maintain ABCs	1	5.26	2	5.56
Manage bleeding or any other injury	1	5.26	2	5.56
Give them something to drink or eat	17	89.47	30	83.33
Activate emergency plan	0	0.00	2	5.56
Total	19	99.99*	36	100.01*

* total does not equal 100 because of rounding

Question 2: How many vital signs does the body have that indicate changes in body function and are able to be quickly checked?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
9	2	10.53	4	11.11
7	6	31.58	11	30.56
12	0	0.00	0	0.00
5	11	57.89	21	58.33
Total	19	100.00	36	100.00

Question 3: What is the normal pulse range for a person 10 years or older?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
80-140	6	31.58	15	41.67
30-70	0	0.00	2	5.56
60-100	12	63.16	18	50.00
100-190	0	0.00	0	0.00
Unanswered	1	5.26	1	2.78
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 4: Which of the following is not listed as a vital sign?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Respiration	0	0.00	0	0.00
Swelling	19	100.00	31	86.11
Skin color	0	0.00	3	8.33
Temperature	0	0.00	1	2.78
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 5: Which of the following is a symptom of hyperventilation?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Numbness	0	0.00	0	0.00
Tingling in hands	1	5.26	2	5.56
Light headedness	7	36.84	13	36.11
All of the above	11	57.89	20	55.56
Unanswered	0	0.00	1	2.78
Total	19	99.99*	36	100.01*

* total does not equal 100 because of rounding

Question 6: If you suspect an athlete has paralysis and all vital signs are good, you should:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Not move the athlete or remove equipment	18	94.74	33	91.67
Gently move the athlete off the field	0	0.00	0	0.00
Take the athlete immediately to the hospital	0	0.00	2	5.56
Gently take off all headgear	0	0.00	0	0.00
Unanswered	1	5.26	1	2.78
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 7: If a conscious athlete has paralysis on one side of the body this may indicate:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Broken arm	0	0.00	0	0.00
Brain injury, stroke, or pinched nerve	19	100.00	35	97.22
Respiratory arrest	0	0.00	0	0.00
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 8: An athlete with which symptom should not return to play until permitted by a medical professional?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Blurred or loss of vision	0	0.00	4	11.11
Ringing in the ears	0	0.00	0	0.00
Swelling	0	0.00	0	0.00
All of the above	19	100.00	31	86.11
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 9: The two most common areas to take the pulse are:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
The artery at the wrist and the artery behind the knee	0	0.00	0	0.00
The artery in the ankle and the artery at the wrist	0	0.00	0	0.00
The artery in the neck and the temple	0	0.00	0	0.00
The artery at the wrist and the artery in the neck	19	100.00	35	97.22
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 10: Signs and symptoms of shock include all of the following EXCEPT:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Rapid, weak pulse	0	0.00	0	0.00
Ringing in the ears	16	84.21	30	83.33
Pale skin	2	10.53	3	8.33
Dilated pupils	1	5.26	2	5.56
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

APPENDIX AA

Results of Module 4 by Question

Module 4		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	31 (86.11)	5 (13.89)
Question 2	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	21 (58.33)	15 (41.67)
Question 3	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	34 (94.44)	2 (5.56)
Question 4	PREPARE	19 (100)	0 (0.00)
	No PREPARE	36 (100)	0 (0.00)
Question 5	PREPARE	19 (100)	0 (0.00)
	No PREPARE	36 (100)	0 (0.00)
Question 6	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	33 (91.67)	3 (8.33)
Question 7	PREPARE	14 (73.68)	5 (26.32)
	No PREPARE	26 (72.22)	10 (27.78)
Question 8	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	31 (86.11)	5 (13.89)
Question 9	PREPARE	13 (68.42)	6 (31.58)
	No PREPARE	31 (86.11)	5 (13.89)
Question 10	PREPARE	19 (100)	0 (0.00)
	No PREPARE	34 (94.44)	2 (5.56)

APPENDIX AB

Frequencies of Responses to Module 4 Questions

Question 1: Medical conditions can be detected in a yearly . . .

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Conference call with parents	1	5.26	1	2.78
Pre-participation exam	17	89.47	31	86.11
Discussion with school nurse	0	0.00	0	0.00
None of the above	1	5.26	4	11.11
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

Question 2: Which of the following should be done to protect an athlete suffering a seizure?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Remove objects that may cause injury and ask people standing close by to move back	18	94.74	21	58.33
Place a tongue depressor in the athlete's mouth	1	5.26	14	38.89
Hold the athlete tight	0	0.00	1	2.78
Place straps securely around the athlete's feet	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 3: After a seizure, you should:

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Record the length of the seizure	0	0.00	0	0.00
Assess the athlete's airway, breathing and circulation	1	5.26	2	5.56
Transport by EMS	0	0.00	0	0.00
All of the above	18	94.74	34	94.44
Total	19	100.00	36	100.00

Question 4: Asthma can be triggered by many things, including:

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Allergy	0	0.00	0	0.00
Exercise	0	0.00	0	0.00
Rapid weather change	0	0.00	0	0.00
All of the above	19	100.00	36	100.00
Total	19	100.00	36	100.00

Question 5: Signs and symptoms of an athlete experiencing an asthma attack include:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Coughing and wheezing	19	100.00	36	100.00
Vomiting	0	0.00	0	0.00
Blood draining from nose	0	0.00	0	0.00
Abdominal cramps	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 6: During an asthma attack, care for the athlete may include:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Elevating the athlete's legs above his heart	0	0.00	0	0.00
Having the athlete take slow, deep breaths	16	84.21	33	91.67
Covering the athlete with blankets	0	0.00	0	0.00
None of the above	3	15.79	3	8.33
Total	19	100.00	36	100.00

Question 7: In addition to physical exertion, exercise induced asthma can be caused by:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Slow stretches	1	5.26	2	5.56
High pollen counts	14	73.68	26	72.22
High blood sugar	0	0.00	0	0.00
None of the above	4	21.05	8	22.22
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

Question 8: If an athlete has an allergic reaction requiring the use of an epinephrine pen (epi), it should be administered by

Response	PCs		NPCs	
	Frequency	%	Frequency	%
A teammate	0	0.00	0	0.00
Trained individual	16	84.21	31	86.11
The head coach	0	0.00	1	2.78
The athlete having the allergic reaction	3	15.79	4	11.11
Total	19	100.00	36	100.00

Question 9: A diabetic coma is caused by:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Too much insulin	5	26.32	4	11.11
Too many candy bars	0	0.00	0	0.00
Environmental factors	0	0.00	0	0.00
Too little insulin/high blood sugar	13	68.42	31	86.11
Unanswered	1	5.26	1	2.78
Total	19	100.00	36	100.00

Question 10: Which of the following conditions prohibit an athlete from returning to play until examined and cleared by a medical professional?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Concussion	0	0.00	1	2.78
Loss of movement	0	0.00	0	0.00
Severe bleeding	0	0.00	1	2.78
All of the above	19	100.00	34	94.44
Total	19	100.00	36	100.00

APPENDIX AC

Results of Module 5 by Question

Module 5		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	30 (83.33)	6 (16.67)
Question 2	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	31 (86.11)	5 (13.89)
Question 3	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	32 (88.89)	4 (1.11)
Question 4	PREPARE	19 (100)	0 (0.00)
	No PREPARE	36 (100)	0 (0.00)
Question 5	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	22 (61.11)	14 (38.89)
Question 6	PREPARE	19 (100)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 7	PREPARE	19 (100)	0 (0.00)
	No PREPARE	36 (100)	0 (0.00)
Question 8	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	26 (72.22)	10 (27.78)
Question 9	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	33 (91.67)	3 (8.33)
Question 10	PREPARE	15 (78.95)	4 (21.05)
	No PREPARE	26 (72.22)	10 (27.78)

APPENDIX AD

Frequencies of Responses to Module 5 Questions

Question 1: What type of wound results from a sharp object penetrating the skin?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Laceration	2	10.53	6	16.67
Abrasion	0	0.00	0	0.00
Avulsion	0	0.00	0	0.00
Puncture	17	89.47	30	83.33
Total	19	100.00	36	100.00

Question 2: What type of care should be given to an athlete with an abrasion?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
No care needed, just a scratch	1	5.26	1	2.78
Clean with soap and water, hydrogen peroxide, apply ointment and dressing and change the dressing daily	16	84.21	31	86.11
Cover the abrasion with a gauze applying pressure	2	10.53	1	2.78
None of the above	0	0.00	3	8.33
Total	19	100.00	36	100.00

Question 3: This type of bleeding is bright red and spurts under pressure in time with the heart. Although not commonly seen in sports, this type of bleeding is very serious and life threatening.

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Arterial	18	94.74	32	88.89
Venous	1	5.26	1	2.78
Capillary	0	0.00	2	5.56
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 4: An athlete has suffered an injury from a collision with another player. There are no visible injuries, but she complains of nausea and hardness to her abdomen to touch. As a rescuer, you might suspect that she is suffering from which of the following:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Cardiac arrest	0	0.00	0	0.00
Fractured leg	0	0.00	0	0.00
A blister	0	0.00	0	0.00
Internal bleeding	19	100.00	36	100.00
Total	19	100.00	36	100.00

Question 5: If direct pressure and elevation do not control severe bleeding, which two pressure points are most commonly used to control the bleeding?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
The arm and the leg (groin area)	18	94.74	22	61.11
The bottom of the foot ban the arm	1	5.26	6	16.67
The knee and neck	0	0.00	3	8.33
The leg and side of chest area	0	0.00	4	11.11
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 6: Which phrase best describes a dislocation?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
A break in the continuity of a bone	0	0.00	1	2.78
A life-threatening injury that occurs inside the body and is not visible to the eye	0	0.00	0	0.00
Total disruption of a joint where the bones are no longer in alignment	19	100.00	35	97.22
An injury where the skin is torn completely from its attachment	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 7: What is the primary reason a coach would place ice on an injury?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
To keep the bone from fracturing	0	0.00	0	0.00
To reduce swelling, pain and muscle spasms	19	100.00	36	100.00
To increase circulation to the injury	0	0.00	0	0.00
To prevent a puncture wound	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 8: An athlete slides into first base and suffers an injury to his lower leg. The athlete says he heard a popping sound and complains of severe pain and loss of function in his leg. You notice a slight deformity in his leg. Which type of injury might this athlete have?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
A fracture	17	89.47	26	72.22
A dislocation	2	10.53	10	27.78
An abrasion	0	0.00	0	0.00
A chronic injury	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 9: An athlete with tennis elbow has what type of injury?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Overuse	17	89.47	33	91.67
Acute	2	10.53	2	5.56
Fracture	0	0.00	0	0.00
Avulsion	0	0.00	0	0.00
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 10: What type of care increases circulation, improves stretching ability of tissues, reduces pain, and relieves muscle spasm in an overuse injury?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Application of heat	15	78.95	26	72.22
Application of ice	4	21.05	8	22.22
Dressing the wound	0	0.00	0	0.00
None of the above	0	0.00	2	5.56
Total	19	100.00	36	100.00

APPENDIX AE

Results of Module 6 by Question

Module 6		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	19 (52.78)	17 (47.22)
Question 2	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	33 (91.67)	3 (8.33)
Question 3	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	34 (94.44)	2 (5.56)
Question 4	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	34 (94.44)	2 (5.56)
Question 5	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 6	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	34 (94.44)	2 (5.56)
Question 7	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 8	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	35 (97.22)	1 (2.78)
Question 9	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	29 (80.56)	7 (19.44)
Question 10	PREPARE	10 (52.63)	9 (47.37)
	No PREPARE	13 (36.11)	23 (63.89)

APPENDIX AF

Frequencies of Responses to Module 6 Questions

Question 1: The best place to keep a dislodged tooth until the athlete can be seen by a dentist is:

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
A glass of cold water	1	5.26	17	47.22
In a sports drink	0	0.00	0	0.00
In a glass of milk	17	89.47	19	52.78
In a carbonated drink	1	5.26	0	0.00
Total	19	99.99*	36	100.00

* total does not equal 100 because of rounding

Question 2: Which of the following steps should be taken to prevent head injuries?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Enforce the rules of the game	0	0.00	1	2.78
Use face shields on helmets when appropriate	0	0.00	0	0.00
Use properly fitted head gear	1	5.26	2	5.56
All of the above	18	94.74	33	91.67
Total	19	100.00	36	100.00*

* total exceeds 100 because of rounding

Question 3: Swelling, possible deformity, bleeding, difficulty breathing and pain are all signs of which injury?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Nose bleed	0	0.00	2	5.56
Facial laceration	2	10.53	0	0.00
Broken nose	17	89.47	34	94.44
Dislodged tooth	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 4: Ringing in the ears and blurred vision most likely indicate what type of injury?

Response	PCs Frequency	PCs %	NPCs Frequency	NPCs %
Dislocation	0	0.00	0	0.00
Head injury	19	100.00	34	94.44
Hyperventilation	0	0.00	2	5.56
Broken arm	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 5: How should you care for an unconscious athlete who has a functioning airway, breathing and circulation, but may have a neck injury?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Roll him over to make sure he is breathing properly	0	0.00	1	2.78
Remove his helmet	0	0.00	0	0.00
Leave him in position and monitor ABCs until EMS arrives	19	100.00	35	97.22
Wait until the athlete becomes conscious, then roll him over	0	0.00	0	0.00
Total	19	100.00	36	100.00

Question 6: According to the Eight Rules for a Suspected Neck Injury, you should do all the following EXCEPT:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Allow teammates to help the athlete up	19	100.00	34	94.44
Activate emergency plan if the athlete is unconscious	0	0.00	0	0.00
Do not move the athlete	0	0.00	0	0.00
Monitor ABCs	0	0.00	1	2.78
Unanswered	0	0.00	1	2.78
Total	19	99.99*	36	100.00

Question 7: Steps to help prevent neck injuries include:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Doing proper strengthening exercise for the neck	0	0.00	0	0.00
Using correct techniques (for example, tackling with the shoulder)	0	0.00	1	2.78
Wearing properly fitting equipment	0	0.00	0	0.00
All of the above	19	100.00	35	97.22
Total	19	100.00	36	100.00

Question 8: To properly remove a foreign body from the eye, you should:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Ask the athlete to rub her eye	0	0.00	0	0.00
Tell athlete to blink several times	2	10.53	1	2.78
Gently pull down the upper or lower lid and attempt to get it out with the tip of your finger	0	0.00	0	0.00
Wash eye out with water	17	89.47	35	97.22
Total	19	100.00	36	100.00

Question 9: Management of a nose bleed includes all of the following EXCEPT:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Asking the athlete to blow her nose	18	94.74	29	80.56
Applying ice to the nose area	1	5.26	0	0.00
Applying direct pressure by pinching upper portion of the nose	0	0.00	1	2.78
Have athlete sit with head forward	0	0.00	6	16.67
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 10: If you suspect that an unconscious athlete has suffered a concussion, the first thing that you should do is:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Maintain her airway, breathing, and circulation	6	31.58	18	50.0
Activate your emergency plan	10	52.63	13	36.11
Monitor the athlete to make sure her condition does not worsen	1	5.26	0	0.00
Question the athlete about time, place, person, and purpose to determine if there is any memory loss	2	10.53	5	13.89
Total	19	100.00	36	100

APPENDIX AG

Results of Module 7 by Question

Module 7		Number Correct (%)	Number Incorrect (%)
Question 1	PREPARE	16 (84.21)	3 (15.79)
	No PREPARE	31 (86.11)	5 (13.89)
Question 2	PREPARE	11 (57.89)	8 (42.11)
	No PREPARE	18 (50.00)	18 (50.0)
Question 3	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	30 (83.33)	6 (16.67)
Question 4	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	35 (97.22)	1 (2.78)
Question 5	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	34 (94.44)	2 (5.56)
Question 6	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	29 (80.56)	7 (19.44)
Question 7	PREPARE	19 (100.00)	0 (0.00)
	No PREPARE	32 (88.89)	4 (11.11)
Question 8	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	27 (75.00)	9 (25.0)
Question 9	PREPARE	17 (89.47)	2 (10.53)
	No PREPARE	27 (75.00)	9 (25.0)
Question 10	PREPARE	18 (94.74)	1 (5.26)
	No PREPARE	28 (77.78)	8 (22.22)

APPENDIX AH

Frequencies of Responses to Module 7 Questions

Question 1: All of the following are benefits of a proper warm-up EXCEPT:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Risk of injury is reduced	0	0.00	1	2.78
Body returns to a resting state	16	84.21	31	86.11
Heart if prepared for physical exercise	0	0.00	0	0.00
Athlete is able to rehearse sport-specific movements and skills	3	15.79	4	11.11
Total	19	100.00	36	100.00

Question 2: Which is the correct order for the four stages of warm-up?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Gentle loosening exercise, jogging, stretching and event-specific exercises	11	57.89	18	50.00
Jogging, stretching, loosening exercises and event-specific exercises	6	31.58	9	25.00
Event specific exercises, gentle loosening exercises, stretching and jogging	2	10.53	1	2.80
Stretching, event specific exercises, jogging, and gentle loosening exercises	0	0.00	8	22.22
Total	19	100.00	36	100.00

Question 3: A baseball player throwing and catching a ball or hitting a few ground balls is in what stage of warm-up?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Stretching	0	0.00	0	0.00
Jogging	0	0.00	0	0.00
Event-specific	19	100.00	30	83.33
Gentle loosening	0	0.00	6	16.67
Total	19	100.00	36	100.00

Question 4: Which of the following is the primary reason that cool-down periods are important to incorporate into your practices and games?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
To prepare the body for an upcoming event	0	0.00	0	0.00
To help improve performance during the practice or game	0	0.00	0	0.00
To increase blood flow to the muscles	0	0.00	1	2.78
To allow the body to return to a resting state	19	100.00	35	97.22
Total	19	100.00	36	100.00

Question 5: During a cool-down period, an athlete should:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Perform event-specific drills	0	0.00	1	2.78
Stretch the major muscles or tight muscles	19	100.00	34	94.44
Sprint from one end of the field to the other	0	0.00	0	0.00
Work to increase his heart rate	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 6: How long should a cool-down period last

Response	PCs		NPCs	
	Frequency	%	Frequency	%
At least one hour	0	0.00	0	0.00
1 to 5 minutes	0	0.00	7	19.44
4 to 5 minutes	0	0.00	0	0.00
5 to 10 minutes	19	100.00	29	80.56
Total	19	100.00	36	100.00

Question 7: How long should the warm-up period last?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
3 to 4 minutes	0	0.00	1	2.78
4 to 5 minutes	0	0.00	1	2.78
10 to 15 minutes	19	100.00	32	88.89
45 minutes	0	0.00	2	5.56
Total	19	100.00	36	100.01*

* total exceeds 100 because of rounding

Question 8: The warm-up period for distance runners may comprise:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Jogging that may last as long as 10 to 20 minutes	18	94.74	27	75.00
Jogging that may last 60 minutes	1	5.26	1	2.78
Anaerobic exercises	0	0.00	7	19.44
Working on field events such as the discus	0	0.00	0	0.00
Unanswered	0	0.00	1	2.78
Total	19	100.00	36	100.00

Question 9: During a stretch, the athlete should:

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Bounce every 2 seconds	0	0.00	0	0.00
Continue with the stretch even if it is painful	0	0.00	2	5.56
Never bounce	17	89.47	27	75.00
None of the above	2	10.53	7	19.44
Total	19	100.00	36	100.00

Question 10: A basketball player doing layups is in which stage of warm-up?

Response	PCs		NPCs	
	Frequency	%	Frequency	%
Event-specific	18	94.74	28	77.78
Stretching	0	0.00	1	2.78
Jogging	0	0.00	1	2.78
Gentle loosening	1	5.26	6	16.67
Total	19.0	100.00	36	100.01*

* total exceeds 100 because of rounding

APPENDIX AI

Observed and Expected Counts for Select Module One Questions by PROGRAM

Question 1: Enough Change to Make How Many Phone Calls

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	22.0	14.0	36.0
	Expected Count	22.3	13.7	36.0
Yes	Count	12.0	7.0	19.0
	Expected Count	11.7	7.3	19.0
Total	Count	34.0	21.0	55.0
	Expected Count	34.0	21.0	55.0

Question 5: What to do When Traveling in Respect to Emergency Plan

PREPARE		Question Five		Total
		Correct	Incorrect	
No	Count	17.0	19.0	36.0
	Expected Count	20.3	15.7	36.0
Yes	Count	14.0	5.0	19.0
	Expected Count	10.7	8.3	19.0
Total	Count	31.0	24.0	55.0
	Expected Count	31.0	24.0	55.0

Question 6: Most Convenient Method to Determine Distance to a Lightning Flash

PREPARE		Question Six		Total
		Correct	Incorrect	
No	Count	27.0	9.0	36.0
	Expected Count	28.1	7.9	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	14.9	4.1	19.0
Total	Count	43.0	12.0	55.0
	Expected Count	43.0	12.0	55.0

Question Nine: First Step in Caring for a Victim of Lightning Strike

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	20.0	16.0	36.0
	Expected Count	22.3	13.7	36.0
Yes	Count	14.0	5.0	19.0
	Expected Count	11.7	7.3	19.0
Total	Count	34.0	21.0	55.0
	Expected Count	34.0	21.0	55.0

Table _

Question 10: What Should be in a Stocked First Aid Kit

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	25.0	11.0	36.0
	Expected Count	27.5	8.5	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	14.5	4.5	19.0
Total	Count	42.0	13.0	55.0
	Expected Count	42.0	13.0	55.0

APPENDIX AJ

Observed and Expected Counts for Select Module Two Questions by PROGRAM

Question One: Adjusting to the Heat Should Take How Many Days

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	20.0	16.0	36.0
	Expected Count	24.9	11.1	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	13.1	5.9	19.0
Total	Count	38.0	17.0	55.0
	Expected Count	38.0	17.0	55.0

Question Two: How Often Should Athetes Drink to Stay Hydrated

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	30.0	6.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Three: Which is NOT a Sign of Dehydration

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	25.0	11.0	36.0
	Expected Count	24.2	11.8	36.0
Yes	Count	18.0	7.0	19.0
	Expected Count	12.8	6.2	19.0
Total	Count	37.0	18.0	55.0
	Expected Count	37.0	18.0	55.0

Question Five: What is the Ideal Carbohydrate Concentration for Fluid Replacement

PREPARE		Question Five		Total
		Correct	Incorrect	
No	Count	10.0	26.0	36.0
	Expected Count	14.4	21.6	36.0
Yes	Count	12.0	7.0	19.0
	Expected Count	7.6	11.4	19.0
Total	Count	22.0	33.0	55.0
	Expected Count	22.0	33.0	55.0

Question Six: How Many Ounces Should be Drunk every 10-20 Minutes

PREPARE		Question Six		Total
		Correct	Incorrect	
No	Count	30.0	6.0	36.0
	Expected Count	31.4	4.6	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	16.6	2.4	19.0
Total	Count	48.0	7.0	55.0
	Expected Count	48.0	7.0	55.0

Question Nine: What is One Way to Treat a Mild Case of Cold Illness

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	7.0	29.0	36.0
	Expected Count	9.2	26.8	36.0
Yes	Count	7.0	12.0	19.0
	Expected Count	4.8	14.2	19.0
Total	Count	14.0	41.0	55.0
	Expected Count	14.0	41.0	55.0

Question Ten: Type of Cold Injury such that the Skin is Firm but Swollen

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	24.0	12.0	36.0
	Expected Count	25.5	10.5	36.0
Yes	Count	15.0	4.0	19.0
	Expected Count	13.5	5.5	19.0
Total	Count	39.0	16.0	55.0
	Expected Count	39.0	16.0	55.0

APPENDIX AK

Observed and Expected Counts for Select Module Three Questions by PROGRAM

Question One: How to Manage a Victim of Shock

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	31.0	6.0	36.0
	Expected Count	31.6	5.4	36.0
Yes	Count	16.0	2.0	19.0
	Expected Count	15.4	2.6	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Two: How Many Vital Signs Can be Quickly Evaluated

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	4.0	33.0	36.0
	Expected Count	4.0	33.0	36.0
Yes	Count	2.0	16.0	19.0
	Expected Count	2.0	16.0	19.0
Total	Count	6.0	49.0	55.0
	Expected Count	6.0	49.0	55.0

Question Three: What is the Normal Pulse of a Person 10 Years and Older

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	19.0	18.0	36.0
	Expected Count	20.2	16.8	36.0
Yes	Count	11.0	7.0	19.0
	Expected Count	9.8	8.2	19.0
Total	Count	30.0	25.0	55.0
	Expected Count	30.0	25.0	55.0

Question Four: Which is not a vital sign

PREPARE		Question Four		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	32.7	3.3	36.0
Yes	Count	19.0	0.0	19.0
	Expected Count	17.3	1.7	19.0
Total	Count	50.0	5.0	55.0
	Expected Count	50.0	5.0	55.0

Question Five: Which is a Symptom of Hyperventilation

PREPARE		Question Five		Total
		Correct	Incorrect	
No	Count	20.0	17.0	36.0
	Expected Count	20.9	16.1	36.0
Yes	Count	11.0	7.0	19.0
	Expected Count	10.1	7.9	19.0
Total	Count	31.0	24.0	55.0
	Expected Count	31.0	24.0	55.0

Question Eight: Symptoms that need to be evaulated by a medical professional

PREPARE		Question Eight		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	32.7	3.3	36.0
Yes	Count	19.0	0.0	19.0
	Expected Count	17.3	1.7	19.0
Total	Count	50.0	5.0	55.0
	Expected Count	50.0	5.0	55.0

Question Ten: Signs and symptoms of shock

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	30.0	6.0	36.0
	Expected Count	30.1	5.9	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	15.9	3.1	19.0
Total	Count	46.0	9.0	55.0
	Expected Count	46.0	9.0	55.0

APPENDIX AL

Observed and Expected Counts for Select Module Four Questions by PROGRAM

Question One: Medical conditions can be detected in a yearly. . .

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	31.4	4.6	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	16.6	2.4	19.0
Total	Count	48.0	7.0	55.0
	Expected Count	48.0	7.0	55.0

Question Two: Care for a person having a seizure

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	21.0	15.0	36.0
	Expected Count	25.5	10.5	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	13.5	5.5	19.0
Total	Count	39.0	16.0	55.0
	Expected Count	39.0	16.0	55.0

Question Three: What to do after a seizure

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	34.0	2.0	36.0
	Expected Count	34.0	2.0	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	18.0	1.0	19.0
Total	Count	52.0	3.0	55.0
	Expected Count	52.0	3.0	55.0

Question Six: Care for an athlete suffering an asthma attack

PREPARE		Question Six		Total
		Correct	Incorrect	
No	Count	33.0	3.0	36.0
	Expected Count	32.1	3.9	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	16.9	2.1	19.0
Total	Count	49.0	6.0	55.0
	Expected Count	49.0	6.0	55.0

Question Seven: Casues of exercise induced asthma

PREPARE		Question Seven		Total
		Correct	Incorrect	
No	Count	26.0	10.0	36.0
	Expected Count	26.2	9.8	36.0
Yes	Count	14.0	5.0	19.0
	Expected Count	13.8	5.2	19.0
Total	Count	40.0	15.0	55.0
	Expected Count	40.0	15.0	55.0

Question Eight: Who should administer an epinephrine pen if needed by an athlete

PREPARE		Question Eight		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Nine: Cause of a diabetic coma

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	28.8	7.2	36.0
Yes	Count	13.0	6.0	19.0
	Expected Count	15.2	3.8	19.0
Total	Count	44.0	11.0	55.0
	Expected Count	44.0	11.0	55.0

APPENDIX AM

Observed and Expected Counts for Select Module Five Questions by PROGRAM

Question One: Type of wound from sharp object penetrating skin

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	30.0	6.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Two: Type of care for an abrasion

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Three: Signs of arterial bleeding

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	32.0	4.0	36.0
	Expected Count	32.7	3.3	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	17.3	1.7	19.0
Total	Count	50.0	5.0	55.0
	Expected Count	50.0	5.0	55.0

Question Five: Care of severe bleeding

PREPARE		Question Five		Total
		Correct	Incorrect	
No	Count	22.0	14.0	36.0
	Expected Count	26.2	9.8	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	13.8	5.2	19.0
Total	Count	40.0	15.0	55.0
	Expected Count	40.0	15.0	55.0

Question Six: Phrase to describe a dislocation

PREPARE		Question Six		Total
		Correct	Incorrect	
No	Count	35.0	1.0	36.0
	Expected Count	35.3	0.7	36.0
Yes	Count	19.0	0.0	19.0
	Expected Count	18.7	0.3	19.0
Total	Count	54.0	1.0	55.0
	Expected Count	54.0	1.0	55.0

Question Eight: Signs and symptoms of a fracture

PREPARE		Question Eight		Total
		Correct	Incorrect	
No	Count	26.0	10.0	36.0
	Expected Count	28.1	7.9	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	14.9	4.1	19.0
Total	Count	43.0	12.0	55.0
	Expected Count	43.0	12.0	55.0

Question Nine: Classification of tennis elbow as an overuse injury

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	33.0	3.0	36.0
	Expected Count	32.7	3.3	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	17.3	1.7	19.0
Total	Count	50.0	5.0	55.0
	Expected Count	50.0	5.0	55.0

Question Ten: Effects of the application of heat

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	26.0	10.0	36.0
	Expected Count	26.8	9.2	36.0
Yes	Count	15.0	4.0	19.0
	Expected Count	14.2	4.8	19.0
Total	Count	41.0	14.0	55.0
	Expected Count	41.0	14.0	55.0

APPENDIX AN

Observed and Expected Counts for Select Module Six Questions by PROGRAM

Question One: Where to place a dislodged tooth

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	19.0	17.0	36.0
	Expected Count	23.6	12.4	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	12.4	6.6	19.0
Total	Count	36.0	19.0	55.0
	Expected Count	36.0	19.0	55.0

Question Two: Steps to prevent head injuries

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	33.0	3.0	36.0
	Expected Count	33.4	2.6	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	17.6	1.4	19.0
Total	Count	51.0	4.0	55.0
	Expected Count	51.0	4.0	55.0

Question Three: Signs and symptoms of a broken nose

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	34.0	2.0	36.0
	Expected Count	33.4	2.6	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	17.6	1.4	19.0
Total	Count	51.0	4.0	55.0
	Expected Count	51.0	4.0	55.0

Question Nine: Management of a nose bleed

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	29.0	7.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Ten: What to do first for unconscious athlete with a concussion

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	13.0	23.0	36.0
	Expected Count	15.1	20.9	36.0
Yes	Count	10.0	9.0	19.0
	Expected Count	7.9	11.1	19.0
Total	Count	23.0	32.0	55.0
	Expected Count	23.0	32.0	55.0

APPENDIX AO

Observed and Expected Counts for Select Module Seven Questions by PROGRAM

Question One: Benefits of a warm-up

PREPARE		Question One		Total
		Correct	Incorrect	
No	Count	31.0	5.0	36.0
	Expected Count	30.8	5.2	36.0
Yes	Count	16.0	3.0	19.0
	Expected Count	16.2	2.8	19.0
Total	Count	47.0	8.0	55.0
	Expected Count	47.0	8.0	55.0

Question Two: Stage order of a warm-up

PREPARE		Question Two		Total
		Correct	Incorrect	
No	Count	18.0	18.0	36.0
	Expected Count	19.0	17.0	36.0
Yes	Count	11.0	8.0	19.0
	Expected Count	10.0	9.0	19.0
Total	Count	29.0	26.0	55.0
	Expected Count	29.0	26.0	55.0

Question Three: Event-specific stage of warm-up for a baseball player

PREPARE		Question Three		Total
		Correct	Incorrect	
No	Count	30.0	6.0	36.0
	Expected Count	32.1	3.9	36.0
Yes	Count	19.0	0.0	19.0
	Expected Count	16.9	2.1	19.0
Total	Count	49.0	6.0	55.0
	Expected Count	49.0	6.0	55.0

Question Six: Length of a cool-down

PREPARE		Question Six		Total
		Correct	Incorrect	
No	Count	29.0	7.0	36.0
	Expected Count	31.4	4.6	36.0
Yes	Count	19.0	0.0	19.0
	Expected Count	16.6	2.4	19.0
Total	Count	48.0	7.0	55.0
	Expected Count	48.0	7.0	55.0

Question Eight: Warm-up for a distance runner

PREPARE		Question Eight		Total
		Correct	Incorrect	
No	Count	27.0	9.0	36.0
	Expected Count	29.5	6.5	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	15.5	3.5	19.0
Total	Count	45.0	10.0	55.0
	Expected Count	45.0	10.0	55.0

Question Nine: What to do during a stretch

PREPARE		Question Nine		Total
		Correct	Incorrect	
No	Count	27.0	9.0	36.0
	Expected Count	28.8	7.2	36.0
Yes	Count	17.0	2.0	19.0
	Expected Count	15.2	3.8	19.0
Total	Count	44.0	11.0	55.0
	Expected Count	44.0	11.0	55.0

Question Ten: Event-specific warm-up for basketball player

PREPARE		Question Ten		Total
		Correct	Incorrect	
No	Count	28.0	8.0	36.0
	Expected Count	30.1	5.9	36.0
Yes	Count	18.0	1.0	19.0
	Expected Count	15.9	3.1	19.0
Total	Count	46.0	9.0	55.0
	Expected Count	46.0	9.0	55.0

APPENDIX AP

Observed and Expected Counts for First Game Situation Data Sheet by PROGRAM

Back up defensive tackle in a clearly losing situation

PREPARE		Situation One No	Situation One Yes	Total
No	Count	30.0	4.0	34.0
	Expected Count	30.1	3.9	34.0
Yes	Count	16.0	2.0	18.0
	Expected Count	15.9	2.1	18.0
Total	Count	46.0	6.0	52.0
	Expected Count	46.0	6.0	52.0

Starter in a clearly winning situation

PREPARE		Situation Two No	Situation Two Yes	Total
No	Count	31.0	3.0	34.0
	Expected Count	30.1	3.9	34.0
Yes	Count	15.0	3.0	18.0
	Expected Count	15.9	2.1	18.0
Total	Count	46.0	6.0	52.0
	Expected Count	46.0	6.0	52.0

Bench player in a clearly winning situation

PREPARE		Situation Three		Total
		No	Yes	
No	Count	27.0	7.0	34.0
	Expected Count	27.5	6.5	34.0
Yes	Count	15.0	3.0	18.0
	Expected Count	14.5	3.5	18.0
Total	Count	42.0	10.0	52.0
	Expected Count	42.0	10.0	52.0

Starter in a game that the team is down by 5 points

PREPARE		Situation Four		Total
		No	Yes	
No	Count	15.0	19.0	34.0
	Expected Count	17.0	17.0	34.0
Yes	Count	11.0	7.0	18.0
	Expected Count	9.0	9.0	18.0
Total	Count	26.0	26.0	52.0
	Expected Count	26.0	26.0	52.0

Bench player in a game that the team is down by 4 points

PREPARE		Situation Five		Total
		No	Yes	
No	Count	24.0	10.0	34.0
	Expected Count	22.9	11.1	34.0
Yes	Count	11.0	7.0	18.0
	Expected Count	12.1	5.9	18.0
Total	Count	35.0	17.0	52.0
	Expected Count	35.0	17.0	52.0

Backup center in a clearly winning situation

PREPARE		Situation Six		Total
		No	Yes	
No	Count	27.0	7.0	34.0
	Expected Count	26.8	7.2	34.0
Yes	Count	14.0	4.0	18.0
	Expected Count	14.2	3.8	18.0
Total	Count	41.0	11.0	52.0
	Expected Count	41.0	11.0	52.0

Starting QB in a clearly losing situation

PREPARE		Situation Seven		Total
		No	Yes	
No	Count	28.0	6.0	34.0
	Expected Count	30.1	3.9	34.0
Yes	Count	18.0	0.0	18.0
	Expected Count	15.9	2.1	18.0
Total	Count	46.0	6.0	52.0
	Expected Count	46.0	6.0	52.0

Backup RB in a close winning situation

PREPARE		Situation Eight		Total
		No	Yes	
No	Count	17.0	17.0	34.0
	Expected Count	20.3	13.7	34.0
Yes	Count	14.0	4.0	18.0
	Expected Count	10.7	7.3	18.0
Total	Count	31.0	21.0	52.0
	Expected Count	31.0	21.0	52.0

Bench player in a clearly losing situation

PREPARE		Situation Nine		Total
		No	Yes	
No	Count	19.0	15.0	34.0
	Expected Count	20.9	13.1	34.0
Yes	Count	13.0	5.0	18.0
	Expected Count	11.1	6.9	18.0
Total	Count	32.0	20.0	52.0
	Expected Count	32.0	20.0	52.0

APPENDIX AQ

Observed and Expected Counts for Second Game Situation Data Sheet by PROGRAM

Back up defensive tackle in a clearly losing situation

PREPARE		Situation One		Total
		No	Yes	
No	Count	29.0	5.0	34.0
	Expected Count	28.1	5.9	34.0
Yes	Count	14.0	4.0	18.0
	Expected Count	14.9	3.1	18.0
Total	Count	43.0	9.0	52.0
	Expected Count	43.0	9.0	52.0

Starter in a clearly winning situation

PREPARE		Situation Two		Total
		No	Yes	
No	Count	26	8.0	34.0
	Expected Count	26.2	7.8	34.0
Yes	Count	14.0	4.0	18.0
	Expected Count	13.8	4.2	18.0
Total	Count	40.0	12.0	52.0
	Expected Count	40.0	12.0	52.0

Bench player in a clearly winning situation

PREPARE		Situation Three		Total
		No	Yes	
No	Count	26.0	8.0	34.0
	Expected Count	25.5	8.5	34.0
Yes	Count	13.0	5.0	18.0
	Expected Count	13.5	4.5	18.0
Total	Count	39.0	13.0	52.0
	Expected Count	39.0	13.0	52.0

Starter in a game that the team is down by 5 points

PREPARE		Situation Four		Total
		No	Yes	
No	Count	13.0	21.0	34.0
	Expected Count	14.4	19.6	34.0
Yes	Count	9.0	9.0	18.0
	Expected Count	7.6	10.4	18.0
Total	Count	22.0	30.0	52.0
	Expected Count	22.0	30.0	52.0

Bench player in a game that the team is down by 4 points

PREPARE		Situation Five		Total
		No	Yes	
No	Count	23.0	10.0	34.0
	Expected Count	22.0	11.0	34.0
Yes	Count	11.0	7.0	18.0
	Expected Count	12.0	6.0	18.0
Total	Count	34.0	17.0	52.0
	Expected Count	34.0	17.0	52.0

Backup center in a clearly winning situation

PREPARE		Situation Six		Total
		No	Yes	
No	Count	30.0	4.0	34.0
	Expected Count	28.1	5.9	34.0
Yes	Count	13.0	5.0	18.0
	Expected Count	14.9	3.1	18.0
Total	Count	43.0	9.0	52.0
	Expected Count	43.0	9.0	52.0

Starting QB in a clearly losing situation

PREPARE		Situation Seven		Total
		No	Yes	
No	Count	25.0	9.0	34.0
	Expected Count	26.2	7.8	34.0
Yes	Count	15.0	3.0	18.0
	Expected Count	13.8	4.2	18.0
Total	Count	40.0	12.0	52.0
	Expected Count	40.0	12.0	52.0

Backup RB in a close winning situation

PREPARE		Situation Eight		Total
		No	Yes	
No	Count	19.0	15.0	34.0
	Expected Count	19.0	15.0	34.0
Yes	Count	10.0	8.0	18.0
	Expected Count	10.0	8.0	18.0
Total	Count	29.0	23.0	52.0
	Expected Count	29.0	23.0	52.0

Bench player in a clearly losing situation

PREPARE		Situation Nine		Total
		No	Yes	
No	Count	20.0	14.0	34.0
	Expected Count	20.9	13.1	34.0
Yes	Count	12.0	6.0	18.0
	Expected Count	11.1	6.9	18.0
Total	Count	32.0	20.0	52.0
	Expected Count	32.0	20.0	52.0

APPENDIX AR

Observed and Expected Counts for First Game Situation Data Sheet Compared to Second Game Situation Data Sheet for PCs

Back up defensive tackle in a clearly losing situation

Second GSDS Situation One		First GSDS Situation One		Total
		No	Yes	
No	Count	14.0	0.0	14.0
	Expected Count	12.4	1.6	14.0
Yes	Count	2.0	2.0	4.0
	Expected Count	3.6	0.4	4.0
Total	Count	16.0	2.0	18.0
	Expected Count	16.0	2.0	18.0

Starter in a clearly winning situation

Second GSDS Situation Two		First GSDS Situation Two		Total
		No	Yes	
No	Count	13.0	1.0	14.0
	Expected Count	11.7	2.3	14.0
Yes	Count	2.0	2.0	4.0
	Expected Count	3.3	0.7	4.0
Total	Count	15.0	3.0	18.0
	Expected Count	15.0	3.0	18.0

Bench player in a clearly winning situation

Second GSDS Situation Three		First GSDS Situation Three No	Yes	Total
No	Count	11.0	2.0	13.0
	Expected Count	10.8	2.2	13.0
Yes	Count	4.0	1.0	5.0
	Expected Count	4.2	0.8	5.0
Total	Count	15.0	3.0	18.0
	Expected Count	15.0	3.0	18.0

Starter in a game that the team is down by 5 points

Second GSDS Situation Four		First GSDS Situation Four No	Yes	Total
No	Count	6.0	3.0	9.0
	Expected Count	5.5	3.5	9.0
Yes	Count	5.0	4.0	9.0
	Expected Count	5.5	3.5	9.0
Total	Count	11.0	7.0	18.0
	Expected Count	11.0	7.0	18.0

Bench player in a game that the team is down by 4 points

Second GSDS Situation Five		First GSDS Situation Five No	Yes	Total
No	Count	9.0	2.0	11.0
	Expected Count	6.7	4.3	11.0
Yes	Count	2.0	5.0	7.0
	Expected Count	4.3	2.7	7.0
Total	Count	11.0	7.0	18.0
	Expected Count	11.0	7.0	18.0

Backup center in a clearly winning situation

Second GSDS Situation Six		First GSDS Situation Six No	Yes	Total
No	Count	11.0	2.0	13.0
	Expected Count	10.1	2.9	13.0
Yes	Count	3.0	2.0	5.0
	Expected Count	3.9	1.1	5.0
Total	Count	14.0	4.0	18.0
	Expected Count	14.0	4.0	18.0

Starting QB in a clearly losing situation

Second GSDS Situation Seven		First GSDS Situation Seven		Total
		No	Yes	
No	Count	15.0	0.0	15.0
	Expected Count	15.0	0.0	15.0
Yes	Count	3.0	0.0	3.0
	Expected Count	3.0	0.0	3.0
Total	Count	18.0	0.0	18.0
	Expected Count	18.0	0.0	18.0

Backup RB in a close winning situation

Second GSDS Situation Eight		First GSDS Situation Eight		Total
		No	Yes	
No	Count	9.0	1.0	10.0
	Expected Count	7.8	2.2	10.0
Yes	Count	5.0	3.0	8.0
	Expected Count	6.2	1.8	8.0
Total	Count	14.0	4.0	18.0
	Expected Count	14.0	4.0	18.0

Bench player in a clearly losing situation

Second GSDS Situation Nine		First GSDS Situation Nine		Total
		No	Yes	
No	Count	10.0	2.0	12.0
	Expected Count	8.7	3.3	12.0
Yes	Count	3.0	3.0	6.0
	Expected Count	4.3	1.7	6.0
Total	Count	13.0	5.0	18.0
	Expected Count	13.0	5.0	18.0

APPENDIX AS

Observed and Expected Counts for First Game Situation Data Sheet Compared to Second Game Situation Data Sheet for NPCs

Back up defensive tackle in a clearly losing situation

Second GSDS Situation One		First GSDS Situation One No	Yes	Total
No	Count	27.0	2.0	29.0
	Expected Count	25.6	3.4	29.0
Yes	Count	3.0	2.0	5.0
	Expected Count	4.4	0.6	5.0
Total	Count	30.0	4.0	34.0
	Expected Count	30.0	4.0	34.0

Starter in a clearly winning situation

Second GSDS Situation Two		First GSDS Situation Two No	Yes	Total
No	Count	25.0	1.0	26.0
	Expected Count	23.7	2.3	26.0
Yes	Count	6.0	2.0	8.0
	Expected Count	7.3	0.7	8.0
Total	Count	31.0	3.0	34.0
	Expected Count	31.0	3.0	34.0

Bench player in a clearly winning situation

Second GSDS Situation Three		First GSDS Situation Three No	Yes	Total
No	Count	22.0	4.0	26.0
	Expected Count	20.6	5.4	26.0
Yes	Count	5.0	3.0	8.0
	Expected Count	6.4	1.6	8.0
Total	Count	27.0	7.0	34.0
	Expected Count	27.0	7.0	34.0

Starter in a game that the team is down by 5 points

Second GSDS Situation Four		First GSDS Situation Four No	Yes	Total
No	Count	12.0	1.0	13.0
	Expected Count	5.7	7.3	13.0
Yes	Count	3.0	18.0	21.0
	Expected Count	9.3	11.7	21.0
Total	Count	15.0	19.0	34.0
	Expected Count	15.0	19.0	34.0

Bench player in a game that the team is down by 4 points

Second GSDS Situation Five		First GSDS Situation Five		Total
		No	Yes	
No	Count	20.0	3.0	23.0
	Expected Count	16.7	6.3	23.0
Yes	Count	4.0	6.0	10.0
	Expected Count	7.3	2.7	10.0
Total	Count	24.0	9.0	33.0
	Expected Count	24.0	9.0	33.0

Backup center in a clearly winning situation

Second GSDS Situation Six		First GSDS Situation Six		Total
		No	Yes	
No	Count	25.0	5.0	30.0
	Expected Count	23.8	6.2	30.0
Yes	Count	2.0	2.0	4.0
	Expected Count	3.2	0.8	4.0
Total	Count	27.0	7.0	34.0
	Expected Count	27.0	7.0	34.0

Starting QB in a clearly losing situation

Second GSDS Situation Seven		First GSDS Situation Seven		Total
		No	Yes	
No	Count	22.0	3.0	25.0
	Expected Count	20.6	4.4	25.0
Yes	Count	6.0	3.0	9.0
	Expected Count	7.4	1.6	9.0
Total	Count	28.0	6.0	34.0
	Expected Count	28.0	6.0	34.0

Backup RB in a close winning situation

Second GSDS Situation Eight		First GSDS Situation Eight		Total
		No	Yes	
No	Count	12.0	7.0	19.0
	Expected Count	9.5	9.5	19.0
Yes	Count	5.0	10.0	15.0
	Expected Count	7.5	7.5	15.0
Total	Count	17.0	17.0	34.0
	Expected Count	17.0	17.0	34.0

Bench player in a clearly losing situation

Second GSDS Situation Nine		First GSDS Situation Nine		Total
		No	Yes	
No	Count	15.0	5.0	20.0
	Expected Count	11.2	8.8	20.0
Yes	Count	4.0	10.0	14.0
	Expected Count	7.8	6.2	14.0
Total	Count	19.0	15.0	34.0
	Expected Count	19.0	15.0	34.0

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