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Assessing Injury Prevention and Intervention Protocols for High Schools Within the Gateway Athletic Conference

by

Michael Zacheis

A Dissertation submitted to the Education Faculty of Lindenwood University

in partial fulfillment of the requirements for the

degree of

Doctor of Education

School of Education

Assessing Injury Prevention and Intervention Protocols for High Schools

Within the Gateway Athletic Conference

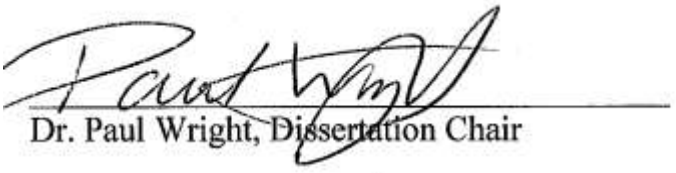
by

Michael Zacheis

This dissertation has been approved in partial fulfillment of the requirements for the degree of

Doctor of Education

at Lindenwood University by the School of Education



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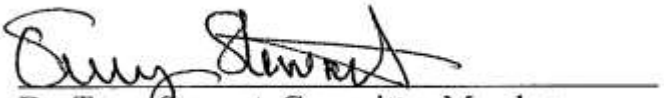
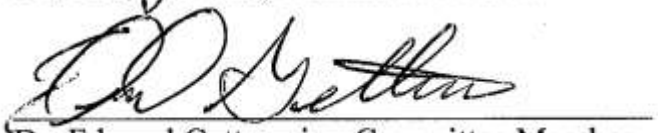


Dr. Terry Stewart, Committee Member — 10/9/2015 Date



Dr. Edward Gettemeier, Committee Member — 10/9/2015 Date

Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

Full Legal Name: Michael Christopher Zacheis

Signature: Michael Zacheis Date: 10/9/15

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Abstract

This study was the result of a quantitative methods research design, which assessed: athletic training services, injury prevention at the time of the study, and intervention protocols for high schools within the Gateway Athletic Conference (GAC). This study explored the impact of injuries and concussions on student athletes. The study also examined the types of athletic training facilities, resources for rehabilitation, and procedures for athletic training programs available at the high school level in the GAC. The study uncovered some significant findings between the groups who were surveyed. The participants surveyed represented athletic trainers, athletic directors, and coaches. There were differences in how these groups viewed emergency care procedures, injury policies, and protocols. The differences ranged from views of job descriptions, written policies and procedures for emergency transportation, reporting and submitting accident reports, and regular review of the effectiveness of athletic training services. The groups did agree on most legal duties and responsibilities, general policies and procedures, injury management protocol and procedures, training room facilities, and operation questions. Blood -borne pathogens were an area in which notable improvement is needed, and there were some concerns with some of the data reporting injury statistics. Overall, the participants agreed with one another, but there were some differences throughout the study, as reported in this dissertation.

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Chapter One: Introduction

Overview

This study focused on information designed to help local high schools promote a higher level of awareness concerning prevention, intervention, and treatment of athletic injuries. At the time of this writing, very little research had been conducted on this subject area, yet hundreds of student athletes failed to complete varsity athletic seasons due to injury every year. This researcher's investigation found there were no standard procedures, common protocols, or standards of practice specifically governing Missouri state high school athletic training programs, services, facilities, and equipment. Athletic trainers were customarily certified through the National Athletic Trainers Association (NATA) Board of Certification (Prentice, 2014, p.34). At the collegiate level, all athletic trainers must carry the NATA credential (Prentice, 2014). Most high schools also required this certification level for professionals working with high school athletes and sports teams. However, there was no national standard for many facets of athletic training, including such areas as facilities, training room space, equipment, policies and procedures, rehabilitation protocols, standards of practice, continuing education and training, emergency care preparedness, incident reporting, and prevention strategies. The intent of this study was to identify strengths, weaknesses, and best practices related to athletic training at the high school level for the Gateway Athletic Conference (GAC) schools. The approach for discovery was to use a triangulation of data collection. Specifically, this three-pronged methodology invited athletic directors, coaches, and athletic trainers to participate in the study. Triangulation of data collection was designed between the four populations to provide a comprehensive perspective regarding the

quality of athletic training programs and services at the Missouri high school level. Intuitively, one would expect a high level of consensus and agreement in evaluating the quality and specifics of their respective high school athletic training programs.

Rationale

In the United States many injuries occurred every year in youth sports. It was a concern to health care professionals that overuse injuries in youth sports presented a problematic situation, which should be put on notice (Valovich et al., 2011). Overuse injuries occurred as the result of reoccurring micro trauma and chronic sub maximal loading of tissues, which included stress fractures (Dalton, 1992). Research should be carried out to assist those involved in athletics to recognize the commonness, frequency, and economic cost of these types of injuries and to help avoid and treat the athletes who become injured (Federation Internationale de Medecine du Sport, 1998; Mountjoy et al., 2008). In order to conduct research, athletic trainers, physicians, and physical therapists need to develop and gather highly reliable data (Federation Internationale de Medecine du Sport, 1998; Mountjoy et al., 2008).

Over the past 20 years previous to this writing, athletic training services grew from a young profession to an increase at every level, especially the high school (Pryor et al., 2015). Athletic training services took many years to increase the amount of athletic trainers at the high school level, only 35% of high schools offered athletic training services in 1994 (Lynicki, Riggs, & Champion, 1999, p. 272). An article by Mihoces (2013) informed readers that data from the National Athletic Trainers Association estimated that in past years only 40% of high schools provided either full-time or part-time athletic training services (Mihoces, 2013, p. 8). At the time, there were more than

43,000 certified athletic trainers throughout the United States (Mihoces, 2013, p. 8). A study recent to the time of this writing, conducted by Pryor et.al. (2015) found that 70% of high schools around the United States were providing athletic training services at the high school level (p. 156). This data showed an increase of 35%, which was double the percentage of schools with athletic training services twenty years previous. According to this data athletic training services were trending in a positive direction. Training, conditioning, screening, and monitoring high school athletes can contribute to injury prevention.

Strength training will help athletes improve performance as long as it is being implemented and re-evaluated constantly with the athlete (Gauvin, 2010). Strength training also developed into an accepted way for athletes to boost their competitive edge on their competition throughout the off-season (Stabenow & Metcalf, 2009). The use of strength training helps to correct any shortcomings an athlete may experience to also help prevent injuries from occurring. The combination of strength training and functional movement screening (FMS) are significant if used together effectively. Functional movement screening is important in injury prevention, because it is a tool used by certified trainers and other medical personnel to establish movement patterns for possible injury risk (Gauvin, 2010; Pelot & Darmiento 2013; Schneiders, Horman, & Sullivan, 2011; Shultz, Anderson, Matheson, Marcello, & Besier, 2013; Sigismondo, 2010). FMS can help the trainer or medical professional identify an athlete's area of weakness, and then strength training may help to correct the deficiency. With a thorough assessment of the body movement pattern, using the FMS process, a proper set of training exercises can

be implemented (Gauvin, 2010). This combination may help the athlete to develop muscles around the weak area preventing possible injury in the future.

Another examination that can be performed is a pre-participation physical examination (PPE). A PPE is a way to screen an athlete for possible injury risks, or to help prevent an injury from occurring. The examination includes collecting the injury history of the athlete, build, age, joint stability, strength, and flexibility (American College of Sports Medicine, 1993; Caine, DiFiori, & Maffulli, 2006; Dalton, 1992; Hergenroeder, 1998). After the athlete has been screened, and if the screen shows any abnormalities, the screener should refer him to the appropriate medical professionals, such as certified athletic trainer, medical specialist, or physical therapist, in order to obtain the proper medical attention (American College of Sports Medicine, 1993; Hergenroeder, 1998). After the completion of a PPE exam, all of the information collected should be filed and documented to record any potential high risk areas (Almquist, McCleod, & Cavanna, 2008).

Another facet to injury prevention is developing programs intended to help athletes train and condition (Prentice, 2014). Athletes should take part in training programs throughout the preseason, along with in-season training, to reduce the risk of injury (Emery, Cassidy, Klassen, Rosychuk, & Rowe, 2005; Junge, Rosch, Peterson, Graf-Baumann, & Dvorak, 2002; Olsen, Myklebust, Engebresten, Holme, & Bahr, 2005). Athletes should consider participating in programs designed to help reduce injury. Coaches should also be involved in helping athletes prevent injuries. Coaches must become educated to identify warning signs or symptoms that their athletes may be showing signs of overuse injuries (Hodson, 1999; Lyman et al., 2001; Olsen, Fleisig,

Dun, Loftice, & Andrews, 2006). Coaches at the high school level should also have the proper knowledge or understanding of how to safely conduct workouts, train their athletes using techniques and skills that will not harm the athletes, understand the growth and development of the athletes, and they should know of any medical concerns with their athletes (Caine et al., 2006; Federation Internationale de Medecine du Sport, 1998; Ransone & Dunn-Bennett, 1999; Valovich, McLeod, McGaugh, Bouquiren, & Bay, 2008). Coaches are just as important to the health of an athlete as a trainer, and they should help aid the process of injury prevention.

Developing programs designed to help athletes train and condition also helps to prevent injury (Prentice, 2014). It is important for athletes to train in developed programs throughout the preseason, during the season, and after the season to reduce the risk of injury (Emery et al., 2005; Junge et al., 2002; Olsen et al., 2005). The athletic trainer is responsible in some cases that relate to high school sports for creating, implementing, and supervising the development and conditioning program for all of the athletes (Prentice, 2014). These programs include neuromuscular control, coordination, stability, flexibility, and strengthening the lower half of the body (Emery et al., 2005; Junge et al., 2002; Olsen et al., 2005). When an athlete is in physical shape he will reduce the possibility of sustaining an injury (Prentice, 2014). Therefore, it is important for coaches to work with athletic trainers to develop programs to implement during the offseason, preseason, and regular season to keep athletes in peak physical condition to further prevent injury from occurring year round (Prentice, 2014).

Purpose of the Study

The purpose of this study was to evaluate high school athletic training programs and services for high school athletes in the Gateway Athletic Conference, based in St. Charles County, Missouri. The goal of this study was to provide information that may contribute to improving athletic training services in Missouri high schools. Recent to the this writing, the Missouri State High School Athletic Association (MSHSAA) initiated a Committee on Injuries and Medical Information, called the Sports Medicine Advisory Committee (2011a, 2011b, 2012a, 2012b). This committee made an effort to advocate for baseline testing for concussions, promote the importance of having first aid and CPR training for all coaches, and make other policy and procedure recommendations aimed at protecting the safety of high school athletes competing in the state of Missouri. Despite this effort, there still remained little knowledge regarding the day-to-day challenges facing most Missouri high schools in regard to sports injuries and athletic training services. This study explored perceptions of coaches, athletic directors and athletic trainers working in one specific Missouri High School conference, the Gateway Athletic Conference.

Research Questions

The study was focused on these seven research questions:

1) To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?
2) To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?

3) To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?
4) To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?
5) To what extent is athletic training accepted as a major priority within high school athletic programs?
6) Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?
7) Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

Hypothesis

There will be a difference in one or more of the mean responses to survey prompts by athletic directors, athletic trainers, and coaches in the categories of Emergency Care Preparedness, Injury Management Protocol and Procedures, Training Room Facilities and Operation, and Athletic Training Personal Opinion.

Definition of Terms

Base Line Testing. Baseline testing enhances a clinician's assessment and ability to make return-to-play decisions, by allowing direct comparisons between an athlete's post-injury status and premorbid level of functioning. An important aspect of baseline testing is the measurement of symptoms commonly associated with concussions (Mrazik, Naidu, Lebrun, Game, & Matthews-White, 2013, p. 654).

Certified athletic trainer. A highly educated and skilled professional specializing in health care for the physically active (Prentice, 2014).

Concussion. Typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. It may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance, rather than a structural injury (McCrory et al., 2013, p. 269).

Gateway Athletic Conference. The Gateway Athletic Conference is an athletic conference in St. Charles County, Missouri. There were 17 schools involved in the conference, which consisted of St. Charles High, St. Charles West, Winfield, Warrenton, Orchard Farm, Francis Howell, Francis Howell Central, Francis Howell North, Fort Zumwalt North, Fort Zumwalt East, Fort Zumwalt West, Fort Zumwalt South, Holt, Timberland, Liberty, Troy, and Washington.

High school standard. An accepted level of attainment exists in the quality of care for all student athletes which includes acceptable athletic training services, training facilities, training equipment, policies and procedures (Prentice, 2014).

Intervention protocols. The purpose of an intervention protocol is to provide prevention of injury. Protocols also include clinical diagnosis, therapeutic intervention, and rehabilitation of injuries (Casáis & Martínez, 2012).

Sports injury. Sport injury is the result of acute trauma or recurring strain that is commonly associated with athletic activities. Sport injury affects the bones or soft tissues such as ligament, muscles, and tendons in athletes who participate in various sports (Beers & Berkow, 2004).

Sports medicine. A broad field of health care related to physical activity and sport, encompassing specialized aspects dealing with athletes and performance enhancement, injury care, and health management (Prentice, 2014).

Conclusion

This study gathered information in an attempt to answer the listed research questions, and to give more insight into the status of athletic training services in a select athletic conference in the state of Missouri. A position statement made by this researcher is provided at the conclusion of this study report, to point out issues that may need to be further addressed or clarified.

Chapter Two: Literature Review

Introduction

Injuries plagued students, athletes, coaches, parents, administrators, athletic trainers, and other medical personnel in sports for many years. Unfortunately, injuries in athletics were a part of competitive sports at all levels. The main focus of this study was procedures of the Gateway Athletic Conference (GAC).

This literature review includes information about the state of affairs, current at the time of this writing in high school athletics, the issues surrounding concussions, and how athletic directors, athletic trainers, coaches, and parents helped injured student athletes once they were injured. The review also includes how to assess an injured student athlete, rehabilitate the injury, and return him healthy and safely to the playing field. The literature also describes the history and evolution of the athletic trainer's role in helping student athletes, coaches, and parents over time. The questions and hypothesis related to this study and literature review follow:

Research Questions

1) To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?
2) To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?
3) To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?
4) To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?

5) To what extent is athletic training accepted as a major priority within high school athletic programs?
6) Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?
7) Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

Hypothesis

There will be a difference in one or more of the mean responses to survey prompts by athletic directors, athletic trainers, and coaches in the categories of Emergency Care Preparedness, Injury Management Protocol and Procedures, Training Room Facilities and Operation, and Athletic Training Personal Opinion.

History of Athletic Training

Athletic trainers evolved over time and became much more than someone who takes care of an injured athlete on the field during a game or practice. This section includes a background and history of how athletic trainers evolved into what they were at the time of this study. Athletic trainers not only took care of injured athletes, but they also helped athletes recover from those injuries, kept records of their patients, communicated with everyone involved in the athletic process at the high school, researched new training techniques, counseled athletes about their injuries, and provided health and safety information to athletic directors, coaches, athletes, and parents.

In the United States, the National Athletic Training Association (NATA) was linked to the evolution and development of athletic training (O'Shea, 1980). Before the development of NATA, the drive to participate in sports was an important part of many

early societies. Evidence showed that Greek and Roman cultures participated in athletic completion (Prentice, 2014). These civilizations had coaches, athletes, trainers, and physicians, such as Hippocrates and Galen (Prentice, 2014). These early roles in athletic competition helped to pave the way for how athletes are physically trained and medically treated in the world in times more recent (Prentice, 2014). Athletic trainers went through a period of historical development and professionalism. Prentice (2014) stated,

> Athletic training as we know it came into existence during the late nineteenth century with the firm establishment of intercollegiate and interscholastic athletes in the United States. Because the first athletic trainers of this era possessed no technical knowledge, their athletic training techniques usually consisted of a rub, the application of some type of counterirritant, and occasionally the prescription of various home remedies and poultices. (p. 3)

Athletic trainers have achieved the status of being considered well -qualified medical professionals who work with other medical professionals to help enhance the lives of the athletes in their care (National Athletic Trainer's Association [NATA], 2010).

Athletic training progressed over a period of time and athletic trainers played a much larger role in health care by providing assistance to athletes and various patient populations in the general public (Prentice, 2014). After World War I, the role of the athletic trainer evolved rapidly, within intercollegiate sports (Prentice, 2014). During this time period when trainers became more specialized in preventing and managing injuries, Bilik (1917), a physician, wrote a major text on athletic training called *The Trainer's Bible*.

In the early 1920s, the Cramer family from Gardner, Kansas, who owned a chemical company, started to produce a liniment for treatment of ankle sprains (Prentice, 2014). The Cramer family realized the potential for resources for injured athletes and helped develop the market for athletic training supplies. They also created a publication named *First Aider,* in 1932 (Prentice, 2014). Members of the Cramer family were influential in the beginning stages of the athletic training profession, and the family also played a large role in educating future athletic trainers (O'Shea, 1980).

By the late 1930s, several colleges and athletic trainers at universities made an effort to create a national organization of trainers, called the National Athletic Trainers' Association (NATA) (Prentice, 2014). During the time period of World War II (1938 – 1945), NATA struggled to gain support, and almost disappeared during this time (Prentice, 2014). After the war, by the late 1940s and into the 1950s, trainers at the university level once again began to organize themselves into regional conferences that would later become narrowed down further into district level organizations within NATA (Prentice, 2014). NATA formed in 1950, and the reason NATA formed was to have a primary focus on establishing professional standards for athletic trainers to follow (O'Shea, 1980; Prentice, 2014).

Since 1950, athletic training grew into a large profession. When membership was first counted in 1974 there were 4,500 members. The 1970s represented the greatest period for growth in athletic training programs (Delforge & Behnke, 1999, p. 55). At the time of this writing, there were as many as 34,000 members (Prentice, 2014, p. 4). Most of the members were current trainers practicing in the United States, while there were more than 400 trainers practicing in 25 countries around the world. The majority of the

trainers who practiced outside of the United States worked in Japan and Canada (Ferrara, 2006; Prentice, 2014, p. 4). Even though membership grew over the 50 years previous to this writing, in athletic training there were many positive milestones achieved that helped to shape the future of the athletic trainer. Some of these achievements were

> the establishment of a certification exam, recognition of athletic trainers as health care providers, increased diversity of practice settings, the passage of the practice act that regulates athletic trainers in most states, third party reimbursement for athletic training services, and ongoing reevaluation, revision, and reform of athletic training educational programs. (Prentice, 2014, p. 4)

In the early years of athletic training, during the 1930s, many athletic trainers were found working at colleges, universities, and secondary schools in the athletics departments, where services were primarily focused on athletes (Prentice, 2014). Athletic training began to change in the 1950s with the development of NATA and the leadership of Newell. Newell was the leader of the committee on gaining recognition, the focus of this committee was to advance the profession of athletic training (Delforge & Behnke, 1999). The committee's initial focus was to develop a model curriculum to prepare future athletic trainers (Delforge & Behnke, 1999).

It was only in the first decade of the 21st century that athletic trainers started to work in different areas of the health care industry, providing their services to clinics and hospitals, or working under a physician helping patients (Prentice, 2014). This expansion of health care helped change the way athletic trainers were educated in their profession, because they were viewed as universal

medical professionals who could help the general public in multiple settings (Prentice, 2014). Athletic trainers were in place to help athletes, but would gain more training and in different areas which would further cement their positions in providing a healthcare service.

Role of the Athletic Trainer

The athletic trainer had an intimate role when it came to the prevention and health care of athletes (Prentice, 2014). Providing effective health care for an athlete it required multiple support avenues for the athlete to fully recover (Brukner & Kahn, 2010). During the process of rehabilitation the athletic trainer was the person with the athlete the whole time (Prentice, 2014). In a sports program, the athletic trainer was responsible for every stage of health care. This included providing an initial response and management of an injured athlete, evaluating the extent of the injury, and creating a plan to successfully help the athlete fully recover in a timely manner (Prentice, 2014). In order for an athletic trainer to be effective, he must be knowledgeable in all areas under the umbrella of sports medicine (Prentice, 2014). The athletic trainers' role and responsibilities were also determined by the environment or situation they are involved in (Board of Certification, 2010). Table 1 provides a list of categories included in the umbrella of sports (Prentice, 2014).

Table 1

Sports Umbrella

Performance Enhancement	**Injury Care & Management**
Exercise Psychology	Practice of Medicine
Biomechanics	Athletic Training
Sport Psychology	Sports Physical Therapy
Sports Nutrition	Sports Massage Therapy
Strength and Conditioning	Sports Dentistry
Coaching	Osteopathic Medicine
Personal Fitness	Orthotics/Prosthetics
	Sports Chiropractic
	Sports Podiatry
	Emergency Medical Technician

Note: Source: Prentice, 2014.

The athletic trainer had many responsibilities, but also maintained an organized office and working area. Athletic trainers ordered equipment, helped to establish policies, kept accurate records, counseled patients, and stayed up to date on current research practices (Arnold, VanLunen, & Gansneder, 1996; Prentice, 2014). In order for the athletic trainer to manage the facility effectively, he needed to understand how to maintain a budget to ensure the right supplies were available for the athletes in his care (Prentice, 2014). If the athletic trainer did not have a large budget to order everything needed, then creativity was necessary concerning how they organized and dispersed their supplies (Prentice, 2014). Even if the athletic trainer was creative and could find a way to utilize what he could access, he still needed to have an ice machine, a taping and treatment table, and some free weights (Prentice, 2014). If the athletic trainer had access to more tools in the facility, they still needed to know how to effectively use the tools. It did not make a positive impact on athletes if the tools were there and the trainer did not know how to use them (Prentice, 2014).

The trainer was also responsible for keeping and maintaining records of every athlete treated (Arnold et al., 1996). Having up-to-date records with detailed information, which included the athlete's medical history, pre-participation examinations, injury reports filed, treatment records, and rehabilitation programs instituted were vital to protecting the athletic trainer against possible malpractice or negligence legal action (Prentice, 2014). The Athletic Trainers' Committee (ATC) also wanted the athletic trainers to have written policies and procedures to ensure that the trainers were holding themselves accountable, and also to protect themselves from being accused of inappropriate professional behavior or improper medical procedures **(**Almquist et al., 2005).

Record keeping was time consuming, especially if the athletic trainer was treating multiple athletes a day, but it was important to make sure everything was documented and filled out (Prentice, 2014). It should also be noted that the training facility should follow policies and procedures developed and implemented to prevent the possibility of infectious diseases from spreading to multiple athletes **(**Almquist et al., 2005; Prentice, 2014). The policies and procedures were to be followed each time an athlete was injured and the athlete was to be referred to the proper place for the specific injury (Prentice, 2014). Policies and procedures were to be followed in the event of inclement weather or purchasing items for the training room facility (Prentice, 2014).

The athletic trainer may also be needed in the role as a counselor to the athletes, coaches, parents, and administrators. The athletic trainer needed to take on the responsibility of properly explaining to the parents and coaches what the specifics of the injury were and how the injury would affect the athlete's ability to compete in a

competition (Prentice, 2014). It was vital to communicate with parents after their child suffered an injury or illness (NATA, 2010). Along with providing the athlete with preventative, rehabilitative, and treatment care, the trainer should also take the time to council and advise the athlete about any other concerns that may help the athlete (Misasi, Davis, & Morin, 1996; Moulton, Molstad, & Turner, 1997). When athletic trainers took the time to be personable with parents and athletes helped to create positive relationships which may help them in the future (NATA, 2010). The most satisfying quality of being an athletic trainer may have been the relationships developed with the athletes (Prentice, 2014). Athletic trainers were often put into situations in which they were surrounded by the athletes on a daily basis. This allowed the athletic trainer to personally know the athletes in their care (Prentice, 2014). The relationships that the athletic trainer developed with the athletes helped them create respect and trust with the athlete (Prentice, 2014). The role of the athletic trainer as an advisor or counselor should not be considered unimportant. There may be a time when an athlete feels comfortable enough to share important or sensitive information with the athletic trainer, and it would then be the responsibility of the trainer to listen to the issue, offer some suggestions, and then let the athlete decide on his own (Prentice, 2014; Rock & Jones, 2002; Scriber & Alderman, 2005).

With the growth of the medical profession, athletic trainers needed to expand their knowledge of athletic training in order to gain continued credibility throughout the medical field (Turocy, 2002b). Athletic trainers could expand their knowledge by researching and writing published materials about athletic training (Turocy, 2002b). It should be noted that not every athletic trainer was expected to conduct research within

the job, and some athletic trainers did conduct research, but most of the research was conducted by athletic training program directors, faculty members, or students in doctoral programs at universities, which lead to published articles about athletic training (Prentice, 2014; Starkey & Ingersoll, 2001). As the number of educators and students grew, the athletic training community needed to create their own library of knowledge on the subject (Pittney, 1998). The athletic training field was improving its research, and the field was transitioning to an evidence-based practice. Moving forward, it would be essential that athletic training professionals become more familiar with the process of evidence-based practice, because eventually this process would become the standard in athletic training practice (Manspeaker & VanLunen, 2011).

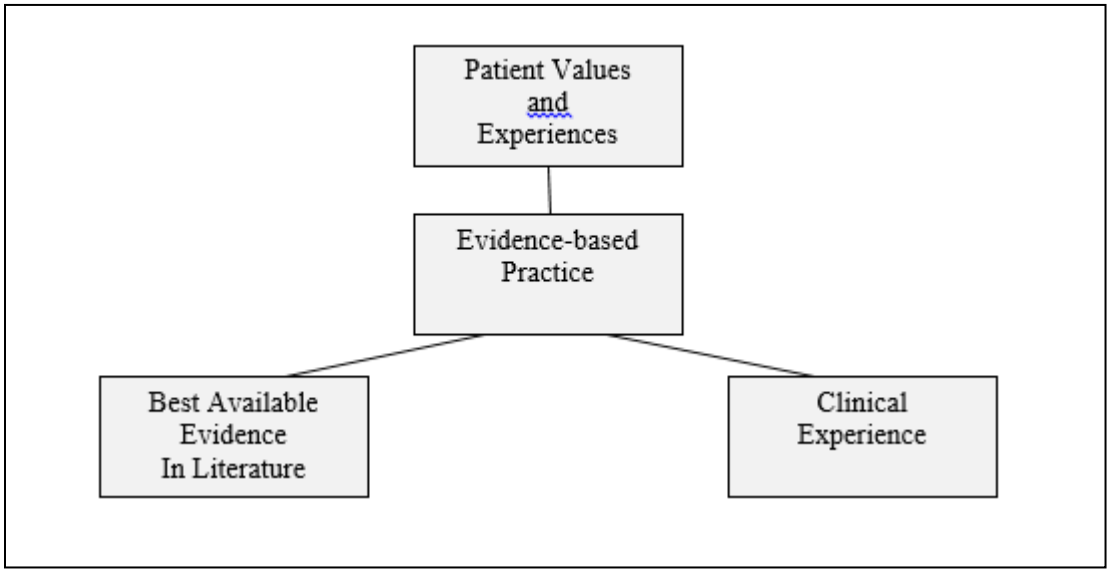

Figure 1. The Evidence-Based Practice Model. Source: Prentice, 2014.

Evidence based practice is "making decisions about the clinical care of individual patients based on the current best available evidence in the professional literature" (Ingersoll, 2006; Prentice, 2014, p. 20; Steves & Hootman, 2004). In order for the athletic trainer to incorporate an evidence-based practice model it is important that the

athletic trainer integrate current research evidence and apply it within his own training philosophy, while still focusing on the patient's needs (Prentice, 2014).

Athletic trainers acquired expertise in athletic training by practicing on patients and using research-based knowledge (Raina, Massfeller, & Macarthur, 2004). It was important that the athletic trainer consider and implement external clinical research. External clinical research is derived from basic sciences or medicine. It is also centered on clinical research based on patients, in order to produce the following techniques: therapeutic, preventative, and rehabilitative. (McKeon, Medina, & Hertel, 2006). The evidence-based method was a process for athletic trainers to follow to ask questions that related to specific evaluative tests, rehabilitation practices, or how useful therapeutic modalities were (Casa, 2005). When athletic trainers used external scientific proof it helped show why previous techniques and treatments should no longer be used, and the scientific evidence further proved that newer techniques and treatments were more effective and appropriate for patient care (Vesci, 2010). It was important that an athletic trainer use the most current and best practices available, because if current practices were not used, then the medical practice could be in danger of becoming out of date, which could lead to a negative result in patient care (Hertel, 2005). There were five steps an athletic trainer followed when using an evidence-based practice. The steps were: (1) develop a clinical question; (2) search the literature to find the best evidence; (3) evaluate the strength of that evidence; (4) apply the evidence in the literature to clinical experience and specific patient needs; and (5) assess the outcome or effectiveness of the treatment (Prentice, 2014; Steves & Hootman, 2004).

The first step of evidence-based practice was developing a clinical question. The clinical question consisted of a format called PICO and was based on three or four detailed components (Steves & Hootman, 2004). PICO stands for patient condition, interventions that may be used as possible treatment options, comparison of different options that may be used in the intervention, and the outcome that is desired from the patient (Steves & Hootman, 2004). The second step was researching the proper literature using databases with bibliographic sources, such as Articles Plus, Google Scholar, PubMed/MEDLINE, CINAL, SPORTDiscus, and EBSCO host (Prentice, 2014, p. 21). In order for an athletic trainer to use research as an effective tool he must search these databases using the correct phrases for which he is trying to research. For example, if the athletic trainer wanted to look up using ultrasound as an effective way to treat ankle sprains, he should enter the phrase, ultrasound, and/or ankle sprains. This would allow the search engine to look for articles with these terms in them (Prentice, 2014, p.21; Rosenberg & Donald, 1995).

An athletic trainer should also realize that when evaluating the strengths of the research it is important to know and understand that there are different types of research that have both positive and negative strengths (Knight, 2010). The athletic trainer should also realize that the type of study may become affected by the value of the evidence that was found in the study that related to the original clinical question (Prentice, 2014). In order to further validate the information from a literature review, there were three main questions to ask: “(1) Are the results valid, and did the study measure what it was supposed to measure? (2) Are the results reliable and can they be reproduced? (3) Are the results clinically applicable to the original research questions?” (Prentice, 2014, p. 21).

When assessing clinical evidence, “Critical appraisal papers (CAPs) or critical appraisal topics (CATs) are scholarly papers that analyze the level of quality of the evidence of a specific research study or topic, that is developed and written based on these three questions” (McKeon, 2009; Prentice, 2014, p. 21).

When the athletic trainer implements a clinical treatment technique supported by researched evidence, an assessment should take place to determine the effectiveness of the treatment (Prentice, 2014). Once a treatment was conducted it was important to research what the outcome of the treatment was, in order to understand the importance or irrelevance of the clinical method (Prentice, 2014). An example of examining results in athletic training was to study specific tests, evaluate the injured athlete, treatment techniques, or how effective therapeutic procedures were (Prentice, 2014).

Athletic Training Supplies and Equipment

Table 2 provides examples of athletic training supplies for use in the field, suggested for athletic trainers to carry with them. The table is broken into different categories such as field kit supplies, bruise bag, sideline emergency supplies for the physician, items for the field, and seasonal supplies (Prentice, 2014).

In addition to the list of supplies provided for the field kit in Table 2, Table 3 describes a suggested list of supplies for the training room. The topics covered for suggested supplies in the training room are tape, bandages, wraps, foam, felt, braces, splints, paper products, modalities, first aid, taping accessories, sharps, inhalants, antiseptics, skin treatments, eye treatment, teeth treatment, oral medications crutches, water, and other supplies (Prentice, 2014).

Table 2

Athletic Training Supplies: Field Kit Supplies

Field Kit Supplies	EpiPen	Ice Bags: 10	IV starter kit
Adhesive Bandages:	Contact Lens Solution	Air casts: right large, right x-large, left large, left x-large (1 each)	IV bag solution
Regular (Medium, Large, X-Large)	CPR Mask		Solution set (IV line)
Knuckle	Antiseptic hand cleaner	Ace wraps: 2-inch, 4-inch, 6-inch, (1 ea)	Latex gloves
Patch	Sunscreen	Back wraps: large, x-large (1 each)	18-gauge IV catheter
Sterile Strips	Ace wraps: 2-inch, 3-inch, 4-inch, 6-inch, double 4-inch, double 6-inch	Lace-up ankle braces: right large, right x-large, left large, left x-large (1 each)	14-gauge IV catheter
Tape Cutters	Alcohol	Turf toe steel plates: right and left sizes: 14 and 10 (2 each)	20cc syringe
Scissors	Cramergesic	Foam padding: 24 inch x 24 inch roll	Epinephrine
Eye Cover	Flex-wrap	Philadelphia collar	Items for the Field
Save-A-Touch	Adhesive foam	Neck roll	6-10 gallon coolers for water & electrolyte drink
Pseudoephrine (Bottle & Dose)	Adhesive felt	AC pads: 1 right, 1 left, 2 Lax pads	4 pitchers
Acetominophen (Bottle & Dose)	Moleskin	Soft neck collar	Ice bags & ice chest with ice for ice bags
Pepto-Bismol tablets	Penlight	Tape cutter: 2	Field kit
Imodium AD caplets	Stethoscope	Thigh sleeves: large, x-large, xx-large (2 each)	Bruise bag
Ibuprofen tablets	Ear thermometer	Spenco arch supports: size 5, size 3 (2 each)	Spine board
Diphenhydramine	Pens; Self-stick notes	Spenco insoles: size 14, 11 (2 each)	Crutches
Dramamine	Polysporin ointment	Wrist splints: right and left, large, x-large (2 each)	Flatbed cart
Hydrocortisone cream	Tongue forceps	Thigh pads: 2	Personal kits (fanny packs)
A & D Ointment	Tweezers	Knee pads: 2	Emergency kit with oxygen
Petroleum Jelly	Eye patch	Sideline Emergency Supplies for physician	Physio-Dyne
Scalpels	Dental sponges	Automatic electric defibrillator (AED)	Vacuum splints
Razor Blades	Ventolin inhaler	Battery charger	Water bottles
Dacriose sterile eye irrigating solution	Contact lens cases	Bag mask resuscitator with oxygen tube	Towels
Latex gloves	Contact lens wetting solution	Pocket mask	Water hose
Oral screw	Scalpel blades		Extension cords
QDA spray	Bruise Bag		Seasonal Supplies
Skin lube	Adhesive foam: 1 sheet, 18 inch x 11 in.		Ice towels
Gauze pads: 2x2, 3x3, or 4x4	Adhesive felt: 1 sheet, 18 inch x 11 inch		7-gallon coolers
Heel Cup	Knee Sleeves: large, x-large, xx-large (2 each)		Port-a cools with needed supplies
Sling	Elbow sleeves: large, x-large, xx-large (2 each)		Ice cans
Hex-a-lite	Knee brace: 2 lateral hinge		Electrolyte drink
Betasept	Mouth guards: 25 moldable		2 10-gallon coolers for electrolyte drink
Titralac antacid			Cups
Hydrogen peroxide			7-gallon cooler with ice towels
Finger splints			2 extra pitchers
Cotton-tipped applicators			Bee & Wasp spray
Tongue Depressors			Extra Trash Bags
Flex All Lotion			

Table 3

Athletic Training Supplies: Training Room

Bandages
Coverlet, 1 ½ x 2
Coverlet, 2 x 3
Coverlet knuckle
Coverlet strips
Telfa, 2 x 3
Telfa, 3 x 4
Band-Aid Clear Patches
Gauze, 4 x 4
Gauze, 3 x 3
Gauze, 2 x 2
Gauze cling, 4-inch (sterile)
Steri Strips, 1/8 inch
Steri Strips, ¼ inch
Steri Strips, ½ inch
Adaptic Dressing

Wraps
Ace wraps, 3-inch
Ace wraps, 4-inch single
Neoprene shorts
Thigh sleeves pro (small, medium, large, x-large, xx-large)
Ace wraps, 4-inch double
Ace wraps, 6-inch single
Ace wraps, 6-inch double
½ inch felt
¼ inch felt
¼ inch adhesive felt
Collodion
2% miconazole
10% hydrocortisone
Baby powder

Coolers (3, 7, 10 gal)
Chest
1/8 inch adhesive felt
1/8inch adhesive foam
1/8inch firm foam (gray)
1/8inch firm foam (black)
¼ inch firm foam (black)
Moleskin
½ inch blue memory foam
¼ inch adhesive foam
½ inch vinyl foam
¼ inch vinyl foam
¼ inch vinyl adhesive

Braces and Splints
Finger splints
Toe splints
Foam padded finger, ¾ inch
Wooden splints
Skin lube, 25-lb tub
Gray T-band
Black T-band
Heat packs (medium, large)
Air-splint, leg
Air-splint, foot
Velcro, 1-inch (both sides)
Knee immobilizers
Foot boot (medium, large)
Aircast, left
Aircast, right
Hexalite, 4-inch

Scalpel blades, #10, #11 (sterile)
Scissors bandage
Scissors, small
Tweezers
Cervical collar (small, medium, large)
Toe caps
Heel cups (medium, large)
Patella strap, large
Fibrifoam Patt strap
Fibrifoam wrist/hand strap
Wrist immobilizer (left, right, universal)
Ankle braces (xx-small, x-small, small, medium, large, x-large)
Triangular bandage
Slings
Nose guard
Elbow sleeves
Back support (x-small, small, medium, x-large)
Moldable back supports
Knee sleeves (x-small, small, medium, large, x-large)
Knee brace post-op
Splint cement
Silicone rubber adhesive
Silicone, 1lb
Cramerol
Readi-cast
Cotton roll, 4-inch
Stockinet, 3-inch

Cepastat
Elastomer kits
Tweezers (Sterile)
Chlorpheniramine, 4mg
Diphenhydramine
Paper Products
Towels (cases)
Cups (cases)
Scrub pants
Pillowcases
Tampons

Modalities
Ultrasound gel, 5lb
Flex All, 1 gal
Cramergestic, 5-lb tub
Skin lube, 5-lb tub
Heat packs, neck
Standard terry cover
Neck terry cover
Fluorimethane
Cold spray
Ice bags

Antiseptics
Triadine
Peroxide
Rubbing alcohol
Betasept, small bottles
Betasept, 1 gal jug
Antimicrobial skin cleaner
Super Quinn 9
Zorbicide Spray

Skin Treatments
Polysporin
Bacitracin
1% tolnaftate powder
Lamisil
1% hydrocortisone
Second skin

Continued

Table 3 continued.

Athletic Training Supplies: Training Room

Baby powder	First Aid	Suture sets	25mg
Tincture of benzion	Cotton rolls (nose plug)	Tweezers (Sterile)	Ibuprofen bottle
Ice bags, Cramer		Suture sets	Ibuprofen, 2pk
Kwik-heat pack	Tongue depressors	Nail clippers (large, Small)	Imodium AD
Cramer Atomic Rub Down	Pocket masks		Pepto-Bismol tabs
Flexi-wrap (small, Large)	Cotton tip applicators	Tape cutters	Q-fed pkg
	Cotton tip applicators (sterile)	Stethoscopes	Sudodrin, 2pk
Flexi-wrap handlers		Shark refill blades	Titrlac
Lotion, 1 gal.	Sani clothes		Robitussin DM
	Latex gloves	Inhalants	
Eye Treatment	Cotton balls	Afrin	Crutches
Docriose Irrigation	Skin-preps	Foam and Felt	Large
Saline	Save-A-Touch	1-inch felt	Medium
Eye wash	Penlights	foam	Small
ReNu contact cleaning agent	Biohazard bags		Large aluminum
Penlights	Safety goggles	Teeth Treatment	
	Taping Accessories	Blue mouth guards 25/box	Other
Water	Heel and lace pads		Stools
Bottle carriers	Tape adherent spray	Clear mouth guards 25/box	Spray bottles
Water bottles	Tape remover		Bucket
10% hydrocortisone	Sharps	Oral Medications	Cloth towels
	Stainless steel blades	Acetaminophen bottle	
		Acetaminophen, 2pk	

Note:(Source: Prentice, 2014

Athletic trainers were professionally licensed medical care providers, who specialized in the prevention, recognition, managing, and rehabilitation of athletic injuries (Prentice, 2014). Athletic trainers served as a crucial link between all medical physicians and administrators, coaches, players, and parents (Prentice, 2014). It is significant to understand why trainers became a vital part of athletics, and in order to understand this historical evidence from the time before athletic trainers became an important part of high school sports must be mentioned.

Employment Settings for Athletic Trainers

Table 4 shows the different settings that athletic trainers were working in at the time of this writing.

Table 4

Employment Settings for Athletic Trainers

Clinic

Hospital Based (employed by hospital; work in clinic)

- General patient care
- Health/wellness/performance enhancement
- Occupational/industrial (100%/split)
- Administration

Outpatient/ambulatory/rehabilitation clinic

- General patient care
- Health/wellness/performance enhancement
- Occupational/industrial (100%/split)
- Administration

Physician owned clinic (patient care or administration)

- Orthopedic
- Primary care
- Family practice
- Pediatric
- Physiatry
- Other

Secondary school/clinic (employed by clinic; work in school)

- Secondary school (100%)
- Secondary school (split)

Clinic

- Other

Hospital (work in a hospital but not in a hospital-based clinic)

- Administration
- Emergency department
- Orthopedics
- Other

Industrial/occupational (work-on-site at an industrial or occupational facility)

- Clinic

College University

- Professional staff/athletics/clinic
- Faculty/academic/research
- Split appointment
  Division 1
  Division 1AA
  Division 2
  Division 3
- Administration

Two-year institution

- Professional staff/academic/research
- Faculty/academic/research
- Split appointment
- Administration

Secondary school

- High school (teacher/clinical/split)
  Public
  Private
- Middle school (teacher/clinical/split)
  Public
  Private

Professional sports

- Baseball (men)
- Basketball (men, women)
- Football (men)
- Hockey (men)
- Soccer (men, women)
- Lacrosse (men)
- Softball (women)
- Golf (men, women)
- Tennis (men, women)
- Wrestling
- Boxing
- Rodeo

Continued

Table 4 continued.

Employment Settings for Athletic Trainers

Corporate (work for company that sells to the profession or in patient care for the company)
- Business/sales/marketing
- Ergonomics
- Health/wellness/fitness
- Patient care
- Auto racing (NASCAR, Indy Car)

Performing arts
- Dance
- Theater
- Entertainment industry (Disney, casinos, tour bands)

Amateur/recreational/youth sports
- Amateur (work for NGB, USOC, or amateur athletics)
- Recreational (work for municipal or recreational league or facility)
  Youth sports (AAU)

Military/law enforcement/government
- Military (Air Force, Army, Navy, Marines, Coast Guard, Merchant Marines, National Guard)
  Active Duty
- Academy
- Administration
- Hospital/clinic
- Other
- Law enforcement
  Local department or agency (police/fire/rescue)
  State department or agency (police/investigation)
  Federal department or agency (FBI, CIA, ATF)
- Government
  Local
  State
  Federal (Senate, House, judicial)
  Agencies (NASA, FDA)

Health/fitness/performance enchancement clinics/clubs (work for franchise chain, or independent club)

Independent contractor (work for themselves and are not employees)

Note: Modified from National Athletic Trainers' Association. Source: Prentice, 2014 p.8.

Table 4 is broken into the following categories: clinics, hospital, industrial/occupational, corporate, college/university, two-year institute, secondary school, professional sports, amateur/rec/youth sports, performing arts, military/law enforcement.

Table 4 supports that athletic trainers were becoming more viable to the industries displayed. Athletic trainers had more employment opportunities in a diverse field than previously offered to professionals in the field (Kirkland, 2005).

Even though athletic trainers were receiving more opportunities to make a difference in the medical health profession, this study was focused on the difference athletic trainers could make at the secondary education level. In the United States, there were more than 44,000 high schools both in the public and private sectors of education (Prentice, 2014, p. 11). At the high school level, athletes needed medical attention and it was to the athlete's benefit if they had access to an athletic trainer (Lynicki et al., 1999). Unfortunately there were cases in which having an athletic trainer could have helped to prevent injury or having a proper medical diagnosis could have prevented further injury to the athlete (Berry, 1998). There were also cases in which an athlete's injury was improperly managed or they did not receive any care from an athletic trainer, because the athlete did not have access to an athletic trainer (Berry, 1998). When an athletic trainer was hired by a high school, the trainer usually fulfilled another role on the faculty staff, as well as being the athletic trainer (Pittney, 2010). When an athletic trainer was hired for a training/faculty position he received compensation for both of the faculty and training duties (Kahanov & Andrews, 2001). Another option for secondary schools was to hire a certified graduate student from a nearby university. This created a benefit for both the trainer and the school. The graduate student would receive a graduate assistantship and also receive a paid stipend from the secondary school, while the school received the benefits of having a trainer in the building (Prentice, 2014; Stiller-Ostrowski & Ostrowski, 2009). In some cases school districts realized that employing a certified athletic trainer, who was centrally located and was either full-time or part-time, was an effective way to help the athletes, but it also created a disadvantage in that one person alone could not provide quality service to an entire school (Prentice, 2014).

A consensus statement was published in 2008 by NATA, and the statement helped to establish recommendations for athletic care, prevention, and providing appropriate medical administration of athletic related sport injuries for high school athletes (Almquist, 2008). The statement also acknowledged that having an athletic health care team and appropriate medical care recommendations were important to helping high school athletes (Almquist et al., 2008). Another important aspect of the consensus statement included the definition of a certified athletic trainer, which was stated as:

> An allied health care professional who, upon graduation from an accredited college or university, and after successfully passing the NATABOC certification examination, is qualified and appropriately credentialed according to state regulations to work with individuals engaged in physical activity in the prevention of injuries and illnesses, the recognition, evaluation and immediate care of injuries and illnesses, the rehabilitation and reconditioning of injuries and illnesses, and the administration of this health care system. This individual must have current certification in CPR and be qualified in first aid and blood borne pathogens. Other health care professionals with equivalent certification and or licensure would also meet this standard (Almquist, 2008, p. 2)

Rehabilitation

When an athlete is recovering from an injury, the athletic trainer should assume the role of overseeing the process of rehabilitating the athlete back to a full recovery (Prentice, 2014). The athletic trainer should also work with the team physician to design

a program that would use the appropriate rehabilitation exercises to help the athlete get back on the field (Prentice, 2014). It was up to the athletic trainer to explain the importance of specific treatments or interventions in order to help an athlete maximize the potential to recover (Buschbacher, Prahlow, & Dave, 2009). In order for the athletic trainer to design a rehabilitation program he needed a knowledgeable background in anatomy, because without this background the trainer would not know how to properly assess the injury, and if the injury was not properly assessed the athlete would not receive the proper treatment (Prentice, 2014). The athletic trainer needed to be aware of the history of the athlete, for example any health issues from the past, current medications, previous surgeries, or other physical ailments which could hinder the rehabilitation process (Buschbacher et al., 2009). It was imperative for the athletic trainer to know and understand specific therapeutic procedures and techniques to incorporate into the rehabilitation process (Prentice, 2014). The next phase of the rehabilitation process was for the athletic trainer to set goals that were short and long term, for the injured athlete to meet. While the athlete was rehabbing, the trainer was constantly assessing how the rehabilitation process was working, and if needed the trainer may have adjusted the process to meet the goals (Prentice, 2014). While the athlete was rehabilitating there was a crucial open line of communication going on between the coaches, parents, administrators, and other healthcare professionals to provide current and up to date information about how the student athlete was progressing (Prentice, 2014). There were other factors to consider when an athlete was rehabbing from an injury. The athletic trainer should be there for emotional support, just in case the athlete did not have a strong support system at home (e.g., parents) (Buschbacher et al., 2009).

Therapeutic modalities were also important for athletic trainers to incorporate into the rehabilitation process, and they could be simple techniques. For example, using an ice pack as a form of first-aid for an acute injury, or a more complex technique of using electrical currents to stimulate the nerves and muscle tissues (Prentice, 2014). In order for these techniques to be effective the athletic trainer needed knowledge about the scientific basis of the methods, and the trainer needed to know when and where to use them on the athletes in his care to help provide a safe return to the playing field (Prentice, 2014). Therapeutic modalities should be used as a way to help accommodate the rehabilitation process, and they were a key to providing a successful rehabilitation by forcing the injured area of the body to perform its normal function (Prentice, 2014).

When an athletic trainer is rehabilitating a student athlete using research they have studied, the athletic trainer needs to determine the level of recommendation and evidence for the technique in order to incorporate that technique into clinical practice (Sexton, 2011). It was also the responsibility of the athletic trainer to understand the practice and techniques of the research in order to correctly apply them to the athlete's rehabilitation process (Sexton, 2011). When the athletic trainer knows specifically what the athlete is suffering from, and has asked the athlete about past injuries or existing issues, he can then better assess the situation and prepare an effective treatment process (Prentice, 2014). When treating an athlete, the athletic trainer should use the best available information to integrate into the management of the rehabilitation process (MeKeon, Medina, McKeon, Mattacola, & Latterman, 2011). It was important in athletic training to link the distance between research and rehabilitation decision-making, to provide athletes with the most favorable treatments available (Prentice, 2014). To support the process of

linking research and rehabilitation, research-based information should be incorporated into the rehabilitation process to ensure there were no delays between research and clinical practice (Haynes & Haines, 1998).

High School Sports: Missouri State High School Athletic Association

The Gateway Athletic Conference (GAC) was a conference with affiliation to the Missouri State High School Athletic Association (MSHSAA). MSHSAA recognized the need to provide health and safety information for athletic directors, athletic trainers, coaches, and student athletes. The information provided by MSHSAA showed its concern in helping to ensure the safety and health of all student athletes participating in high school level sports. The MSHSAA website provided a link to an information page which contained resources for athletic trainers, athletic directors, coaches, student athletes, medical professionals, and parents (Missouri State High School Athletic Association [MSHSAA], 2014a).

The MSHSAA Sports Medicine website offered resources that include pre-participation physical evaluation forms, the sports medicine advisory committee, emergency action planning, and information concerning athletic trainers (MSHSAA, 2014a). The website also provided heat/hydration and conditioning recommendations for all athletic personnel to follow. Heat and hydration can occur during physical activity especially in warm weather training settings which can cause an athlete to become dehydrated (Sawka et al., 2007). The MSHSAA website contained detailed information about concussions and provides videos and a yearly report on youth sports brain injury. MSHSAA also provided a set of position statements and general news for all sports personnel, as well as other useful links with information about sports medicine.

MSHSAA has developed and formed a committee called the MSHSAA Sports Medicine Advisory Committee, which consists of medical physicians and athletic trainers (MSHSAA, 2014b). The committee was formed to help create policies and procedures for all participating high schools to become familiar with and abide by (MSHSAA, 2014b).

All athletes participating in high school athletics were required to have a prior pre-participation physical examination completed by a licensed medical professional in order to participate in practices or competitions (MSHSAA, 2014c). The pre-participation physical examination history form detailed information for every athlete who participated in a MSHSAA sanctioned sport (MSHSAA, 2014b). In addition to having a physical examination each athlete must have met a conditioning requirement for participation in any high school level competitions, and they must have participated in fourteen practices on fourteen separate days in order to be eligible to play (MSHSAA, 2014c).

It was also important for athletic directors, athletic trainers, and coaches to know and understand the importance of their players' safety as it related to weather and heat-related issues. Lightning guidelines and procedures provided from the MSHSAA website, and established by NATA Guidelines, presented a course of action for all athletic personnel, in order to make the proper decision when dealing with lightning. The guidelines set forth a need to have a contact person who was in charge of removing the athletes from an activity (NATA, 2014). Someone must also be in charge of watching the weather and monitoring the future forecasts (NATA, 2014). If athletes needed to be removed from the field, there should be a designated area for them to seek shelter from

the severe weather (NATA, 2014). Athletic play could resume after there was a 30-minute period of no signs of lightning or thunder (NATA, 2014).

Heat acclimatization was another important part of high school athletics for participants in outdoor competitions. The primary cause of preventable death in high school sports was exertional heatstroke (EHS) (Sports Medicine Advisory Committee, 2012a). MSHSAA took steps to help athletic trainers, athletic directors, and coaches determine when it was safe to have their athletes out on the field in hot weather conditions. Athletes were at the greatest danger of becoming overheated when they were participating in practices which consisted of high-intensity daily workouts in the heat (Sports Medicine Advisory Committee, 2012a). MSHSAA recommended that if the heat index was between 95 and 105 degrees, all practices and competitions be altered, and if the heat index exceeded 105 degrees, all practices and competitions be delayed or rescheduled (Sports Medicine Advisory Committee, 2011a). According to the National Center for Catastrophic Sports Injury Research there were 35 deaths related to EHS concerning high school football players between the years of 1995 to 2010 (Sports Medicine Advisory Committee, 2012a, p. 1).

The Sports Medicine Advisory Committee (2012a) created a list of fundamental plans for heat acclimatization that include the following: (1) coaches should slowly introduce the athletes to physical fitness building up their tolerance to the heat; (2) all athletes' individual levels of conditioning should be kept in mind and physical activities should be adjusted accordingly; (3) the workouts should be adjusted and the athletes should be given rest periods determined by what the weather conditions consist of; (4) all athletes should be properly hydrated before they participate in any physical training; (5)

recognition of early signs of heat illness with the adjustment of the training exercise to accommodate, as well as not delaying first aid if necessary; (6) recognizing more serious symptoms of heat illness, which include stumbling, dizziness, collapse, or any other signs an athlete is not responding normally. Immediate action should be taken to stop all activities and seek medical attention; and (7) an emergency action plan should be followed and planned ahead of time (Sports Medicine Advisory Committee, 2012b).

In relation to heat acclimatization, hydration is a way to help athletes combat the warm weather elements. The Sports Medicine Advisory Committee (2011a) believed it was important for all athletes to hydrate before, during, and after any physical training, and it was a healthy way for an athlete to avoid becoming affected by the warm weather. The most effective way for an athlete to hydrate was to drink water, because water was quickly absorbed, helped to quench thirst, and was cost effective (Sports Medicine Advisory Committee, 2011a). Sports drinks were also used as a way to hydrate, but they needed to be used in the proper way. Traditional sports drinks that had a suitable carbohydrate and sodium formulation offered an added benefit to the athlete in the following scenarios: (1) an activity which lasted longer than 45 continuous workout minutes; (2) repeated intense exertion; and (3) warm or humid weather conditions (Sports Medicine Advisory Committee, 2011a). Sports drinks should not be used solely to hydrate before, during, or after physical training or competition (Sports Medicine Advisory Committee, 2011b).

The Sports Medicine Advisory Committee (2012b) also established an Emergency Action Plan (EAP). An EAP was recommended for every school with athletics, which should be written and practiced (MSHSAA, 2014d). High schools that

host athletic competitions needed to create and develop an EAP to provide the appropriate level of care to each athlete on the field (Andersen, Courson, Kleiner, & McLoda, 2002). A designated chain of command was to be established by the school's administrators to help with medical decisions, and a developed protocol was expected for providing safe transportation for an injured athlete (MSHSAA, 2014d). The EAP should encompass such emergencies as severe weather, fire, electrical failure, bomb threat, criminal behavior, or other potential emergencies (MSHSAA, 2014d). Everyone involved in the sports competition should be aware that injuries could happen at any time throughout the competition and those designated people should be ready to implement the EAP if necessary (Andersen et al., 2002).

The objective of the EAP was to provide the best care possible to the injured athlete (Andersen et al., 2002). The EAP consisted of the following components: personnel, communication, equipment, emergency medical care, information, game day, catastrophic incident plan (MSHSAA, 2014d). It was expected that the proper personnel should have defined roles; they should be available and visible at all times during athletic activities (MSHSAA, 2014d). Along with having the right personnel, it was important for everyone to communicate effectively. The proper communication consisted of having a list of emergency numbers, knowing the facilities to assist medical emergency medical service (EMS) professionals, notifying local hospitals, and effectively contacting the athlete's family to make them aware of the situation (Andersen et al., 2002; MSHSAA, 2014d).

The EAP should also include a list of equipment that would assist an injured athlete. The list of equipment should contain an Automated External Defibrillator

(AED), spine board, extremity immobilization, airway management, and facemask removal (Andersen et al., 2002; MSHSAA, 2014d). The proper emergency medical care was also vital to a successful EAP. The proper first aid and cardiopulmonary resuscitation (CPR) and AED protocols should be followed along with assisting all medical personnel and following the protocols in place (MSHSAA, 2014d). After an injury, it was imperative to keep up to date records of any injuries that occurred. The information that should be recorded consisted of a file that contained the athlete's medical records, which included past medical history, allergies, vaccinations, emergency contacts, and parental consent forms (MSHSAA, 2014d). Everyone involved in the athletic competition; coaches, administrators, and medical professionals, all shared the professional duties to create, apply, put into practice, and assess their school's EAP to ensure a safe environment if an injury occurred (Andersen et al., 2002).

While a practice or game was played there was always to be a presence of mind to remember the proper rules and procedures in case of an emergency (MSHSAA, 2014d). In case of a catastrophic incident, such as an injury which resulted in death or a permanent physical disability, there should be delegated school administrators to manage the situation (MSHSAA, 2014d). It was important for MSHSAA to have a set of protocols and procedures in place at the high school level. There were instances in which high school athletes were dying because they were not receiving the proper medical attention when they were participating in athletics (Brady, 2014).

In 2014, at a high school in western New York, a high school football player died three days after taking multiple hits to his head in a game (Brady, 2014). The National Center for Catastrophic Sport Injury Research at the University of North Carolina

provided the information that eight high school athletes' deaths were directly linked to high school football (Brady, 2014, p. 7). The data also included that five of those players died of head and spinal injuries (Brady, 2014, p. 7). During the same season at the professional, semi-professional, college, and youth football levels, there were no fatalities directly related to football (Brady, 2014).

This raised an interesting question of why high school football athletes dying of these injuries and other competitive levels of football sports were not experiencing fatalities. According to a study reported by the *American Journal of Sports Medicine* in 2007, data showed high school football players suffered three times the number of catastrophic injuries as college players (Brady, 2014). The types of catastrophic injuries listed were deaths, permanent disability injuries, neck fractures, and serious head injuries (Brady, 2014). At the high school level there were 1.1 million football players, compared to only 100,000 combined National Football League (NFL), college, junior college, arena league, and semi-professional players (Brady, 2014, p. 13). According to U.S. football estimates, three million kids played youth football (Brady, 2014, p. 13). In 2013, the catastrophic injury center calculated a death rate of 0.19 per 100,000 athletes and for the 4.2 million combined football players, and they also calculated a death rate of 0.73 per 100,000 high school football athletes (Brady, 2014, p. 13).

According to Brady (2014), there were multiple reasons for the high number of deaths at the high school level. These included lack of the proper equipment, the development of the teenage brain, and the ability of high schools to employ athletic trainers. There were some football players, who were not wearing certified helmets, which helped to reduce brain injuries (Brady, 2014). Compared to youth-level football

players, high school players had the ability to create greater velocity contact with other players, but their brains were not fully developed, leaving them more vulnerable to second-impact syndrome (Brady, 2014). According to Guskiewicz, 95% of second-impact syndrome deaths happen to athletes under the age of 18 (as cited in Brady, 2014, p. 15). According to NATA, only 37% of public high schools across The United States employ full-time athletic trainers (as cited in Brady, 2014, p. 16). Athletic trainers were prepared to identify concussions, which kept athletes from returning to the field (Brady, 2014). According to Guskiewicz, some of the deaths at the high school level could have been prevented, but when high schools did not employ athletic trainers to recognize potential dangers with athletes, accidental deaths occurred (as cited in Brady, 2014).

State of Affairs – Injury Prevalence

The information provided by MSHHAA helped to show the state of affairs in high school athletic competition current at the time of this writing. At that time, the high school varsity level in athletics experienced multiple types of injuries, which included concussions, sprains, soft tissue bruising, broken bones, ligament damage, and other sport-related injuries. These injuries were happening more often because of multiple factors. Participation in high school sports grew over the years, which contributed to a larger number of sports injuries (Valovich et al., 2011). Another cause for an increase in sports related injury resulted from the pressure to win, with academic and athletic scholarships at stake (Evans, 2013). An article by Valovich et al. (2011) also stated that, even though pediatric athletes aged between six and 18 years used athletics as a way to improve their health and avoid obesity, this practice contributed to higher numbers in sport related injuries. The same article also speculated that more than half of the injuries

these young adults sustained could have been avoided with simple preventative approaches (Valovich et al. 2011).

In a related article on youth sports injuries, Witkowski (2013) agreed that physical activity was essential for a young child or adult to grow and develop. This same article mentioned when the activity level became too great over a small time frame, tissues began to break down and injuries occurred (Witkowski, 2013). In another article, Evans, (2013) reported it is estimated by the U.S. Centers for Disease Control that 30 million young adults and children participated in youth sports. The same article also mentioned that an estimated two million high school athletes suffered injuries (Evans, 2013, p. 6). Since the year 2000 there was a significant increase in the number of shoulder and elbow injuries in youth baseball and softball players (Evans, 2013).

Another major contributor to the increase in sports injury was the fact that among the younger athletes there was more of an emphasis on playing the same sport all year long (Evans, 2013). When young athletes played a sport year round, it did not give their muscles and joints time to recover from the micro trauma that took place during their practices and games (Evans, 2013). The article by Witkowski (2013) on youth sports injuries showed that young adults who participated in organized athletics in the United States, experience more than 3.5 million injuries every year (p. 2). Witkowski (2013) also agreed with Evans' (2013) statement, because one of the biggest contributors to the increase in youth sports injuries was related to more intense, repetitive, and specialized sports exercise that occurred year-round at younger ages.

Evans' (2013) article indicated the increase in injuries was happening during highly competitive organized sports. Young athletes were becoming stronger, and

because of this were being presented with more opportunities to play at higher levels sooner (Evans, 2013). With the high rates of youth sports injuries, there was a need for more research dedicated to advancing the understanding of prevalence, incidence, and economic cost of injuries among young athletes in the United States (Valovich et al. 2011). There was also a need to focus to prevent and treat the overuse of these injuries (Valovich et al. 2011).

Assessments of Athletes/ Injury Prevention

There were programs in existence to help student athletes prevent possible injury. These programs included FMS, concussion testing, muscle imbalance, assessment, and strength training. These programs were designed to help student athletes prevent future injuries by identifying potential problem areas within their body movements. There were also rehabilitation programs, which existed to help student athletes recover from their injuries and provided for a safe return-to-play and a safe return to the educational environment.

Injuries are unfortunately part of athletics. Coaches, athletic trainers, players, parents, administrators, and other medical professionals could do their part to help decrease the amount of injuries. Assessing the functional capacity of an athlete by trying to prevent injury would help keep more student athletes on the field. If a student athlete is injured, the proper first aid and CPR/AED protocols should be followed (MSHSAA, 2014d). This has helped the student athlete make a faster recovery to attend school and safely return to the playing field.

In the United States many injuries occurred every year in youth sports. It was a concern that overuse injuries in youth sports were presenting a noteworthy alarm to

health care professionals (Valovich et al., 2011). Overuse injuries were the result of reoccurring micro trauma and chronic sub maximal loading of tissues, which included stress fractures (Dalton, 1992). Research should be conducted to help those involved in athletics understand the frequency and economic cost of these injuries, to help prevent and treat the athletes who become injured (Federation Internationale de Medecine du Sport, 1998; Mountjoy et al., 2008). In order to conduct research, athletic trainers, physicians, and physical therapists need to develop and gather highly reliable data (Federation Internationale de Medecine du Sport, 1998; Mountjoy et al., 2008).

The athletic trainer must try to prevent the possibility of injury occurring in a competitive environment by educating everyone responsible for the athlete's health care, either directly or indirectly (Prentice, 2014). According to Prentice (2014), in order to help minimize the risk of injury the athletic trainer should:

> (1) Conduct pre-participation exams; (2) ensure appropriate training and conditioning of the athlete; (3) monitor environmental conditions to ensure safe participation; (4) select, properly fitting, and maintained protective equipment; (5) make certain that the athlete is eating properly; and (6) make sure the athlete is using medications appropriately, while discouraging substance abuse. (Prentice, 2014, p. 14)

In most cases, young athletes tended to be healthy and only received a physical checkup during the pre-season, before the sport activity began, which puts a lot of importance on these types of check-ups (Buschbacher et al., 2009).

Another aspect of assessment should concern the athletic trainer. In order to gain an understanding about an athlete's medical history the athletic trainer should obtain a

copy of the athlete's medical records, with the cooperation of the team physician in order to conduct a pre-participation physical exam that will help to identify any areas of health risks or concerns to the athlete (Buschbacher et al., 2009; Prentice, 2014). Before an athlete began any new sports season they were required to go through an examination checkup, to make sure they were physically fit to play. The examination should include general information about the athlete such as height, weight, blood pressure, and body composition of the athlete, as well as the physician examination concentrating on the cardiovascular, respiratory, abdominal, genital, dermatological, ear, nose, and throat systems. The examination may also include blood work and urinalysis (Buschbacher et al., 2009; Prentice, 2014). A brief orthopedic evaluation of the athlete should include the range of motion, muscle strength, and functional tests to assess joint stability (Prentice, 2014). Once all of these physical examinations have taken place the athletic trainer would then know the signs and symptoms of the athletes in his care, which would help him to identify and give the proper corrective procedures to any physical problems an athlete may have during the course of the season (Prentice, 2014).

When an athlete was injured the first person contacted was the athletic trainer, and it was up to the athletic trainer to evaluate the athlete, recognize what the injury was, provide the athlete with the proper medical attention, and then refer the athlete to another certified medical professional, if further care is needed (Prentice, 2014). Before the athletic trainer treated the athlete he needed to assess the situation and prepare for the possibility of what the athlete was emotionally going through at that time (Buschbacher et al., 2009). There was a range to the severity of the injury from minor to major, and this could affect the athlete's emotions (Buschbacher et al., 2009). Once the athletic

trainer assessed the situation and treated the injured athlete, he needed to know what the injury was and take notes on the situation, because he may need that information for another time, in case the injured area became masked by the swelling and pain the athlete was suffering from (Prentice, 2014). After the athlete was evaluated, the athletic trainer should re-evaluate the athlete again, off the field. Off the field examinations by the athletic trainer should include (1) giving a brief background of medical history, according to what the athlete stated; (2) observing the athlete; (3) examining the athlete for pain; (4) conducting tests, which helped to examine the athlete's range of motion, muscle strength, and joint stability (Prentice, 2014). Once the examination was complete the athletic trainer documented everything that took place during the evaluation (Prentice, 2014).

Even after the athletic trainer examined, evaluated, and diagnosed the athlete, the trainer should still regularly recommend him to a physician for another evaluation to confirm the original diagnosis (Prentice, 2014). The athletic trainer should also help the athlete to make appointments with other physicians, if the athlete needed further medical attention (Prentice, 2014). It is also important that if the trainer was going to help make arrangements for athletes to other physicians, he should already have a list and access to different agencies in the surrounding community that were health and medical based (Prentice, 2014). The athlete would have a developed plan with a better chance to complete a full recovery with the support of the trainer and the local medical community (Prentice, 2014). The athletic trainer must also be aware that after an athlete become injured, he may be filled with the uncertainty of how long he will be hurt, how long the injury will take to heal, and what rehab he will have to do (Buschbacher et al., 2009).

The majority of the time the athletic trainer was the person at every game or practice during the season, and in order to be effective he must know how to assess multiple scenarios in which an injury occurs, plus recognize potential life-threatening injuries (Prentice, 2014). With the need for athletic trainers' awareness of life threatening injuries, all athletic trainers must be certified and know how to use an AED (Prentice, 2014). Athletic trainers have the certification to use an AED, but some trainers have taken a further step in becoming certified as an emergency medical technician (EMT). This certification gives the athletic trainer further knowledge of how to provide proper medical care to an injured athlete (Prentice, 2014). Athletic trainers should also create and establish a well thought out EAP with local community hospitals or rescue squads to provide emergency treatment for the athletes in their care (Potter, 2006). This helps to provide the athlete and their parents with options for receiving professional medical care, where they need to go, and it helps to eliminate concerns that may arise after an injury occurs (Prentice, 2014).

The athletic trainer was playing a larger role in athletics at the time of this writing. The athletic trainer must not only help with assessing athletes, but must also take part in helping to screen athletes prior to the start of a season. It was established in the past that during the pre-season athletes were screened prior to their involvement in athletic competitions (Schneiders et al., 2011). Pre-season screening usually involved identifying potential risk factors in athletes that may lead to injury and illnesses, such as heart condition problems, head injuries, or musculoskeletal issues (Schneiders et al., 2011). Even though these screening methods did not consist of movements, they could still help to identify potential risks for athletes, and medical professionals may even be able to

create a program for the athletes to follow that could help them reduce their risks of injury (Schneiders et al., 2011). There were efforts made to close the gap between pre-participation medical screenings and performance testing created by Chorba, Chorba, Bouillon, Overmyer, and Landis, (2010) to develop a Functional Movement Screen (FMS).

Functional Movement Screening

Another example of a pre-season assessment tool is a functional movement screening (FMS) test. FMS was a technique used to determine an athlete's flexibility. A FMS test was designed to assess the degree of painful, dysfunctional, and irregular movement patterns in athletes (Shultz et al., 2013). FMS is an "instrument which evaluates selective fundamental movement patterns to determine potential injury risk" (Schneiders et.al., 2011, p. 75). In a related article about injury prevention, Sigismondo (2010) mentioned that in order to have a successful season it was important to properly take care of any injuries, and even more important to establish a strategy to help prevent future injuries from occurring. All of the visual inspections the athletes go through factor into the prevention or recurrence of injuries in all athletes in every sport (Valovich et al., 2011). It was also noted by Sigismondo's (2010) article that during the off-season or in-season training it was important to try and reverse any impaired movements of an athlete, such as muscle imbalances or different recruitment patterns.

The FMS process consisted of seven specific movement tests intended to quickly recognize restrictions or alterations of regular movement in an athlete (Chorba et al, 2010). The FMS test included a "deep squat, hurdle step, in-line lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotary stability" (Chorba et.

al., 2010, p. 49). FMS was important in athletics, because it was an instrument used by certified trainers and other medical physicians to determine movement patterns for potential injury risk (Gauvin, 2010; Pelot & Darmiento, 2013; Schneiders et al., 2011; Shultz et al., 2013; Sigismondo, 2010). With a thorough assessment of the body movement pattern using the FMS process, a proper set of training exercises could be implemented (Gauvin, 2010; Sigismondo, 2010). Using FMS allowed the athletic trainer or medical physician to identify muscle flexibility and strength (Cook, Burton, & Hoogeboom, 2006a). For every student athlete flexibility was a way to help increase muscle strength and avoid injury (Ching, 2014).

The FMS screening process scored from a range of zero to three; three was the best possible score. The athlete received one point if he was unable to complete the test. If the athlete scored two points, it meant he was able to demonstrate the movement without feeling pain. If the athlete sensed pain, he scored a zero. The primary goal of a FMS test was to "evaluate the body's kinetic chain system, where the body is evaluated as a linked system of interdependent segments, which often work in a proximal to distal direction to initiate movement" (Schneiders et al., 2011, p 76). The information the FMS test provided was an indication of whether an athlete had an issue with stabilization or mobility (Schneiders et al., 2011). The number for an estimated increased level of injury was a cutoff of 14 (Chorba et. al., 2010; Pelot & Darmiento, 2013). This value was determined "in a study done with professional football players by using information from a Reciever Operator Characteristic (ROC) curve which maximzed the sensitivity and specificity of the test" (Schneiders et al., 2011, p. 76). An article from Pelot and Darmiento (2013) researched by Kiesel, Plisky, and Voight (2007), viewed three different

studies. In the first study 46 professional football players participated; the players who scored equal to, or less than 14, were 11 times more probable to sustain an injury throughout their professional season than players who scored a 15 or greater (Pelot & Darmiento, 2013, p. 2). The second study in the article from Pelot and Darmiento (2013) researched by Chorba et al. (2010), found that female college athletes who scored equal to or less than 14 had a 4-fold increase for a possible injury. It was also noted in the study that 69% of the female athletes who scored equal to or less than 14 sustained an injury during the course of the study (Pelot & Darmiento, 2013, p. 2).

Another study conducted using the FMS screening test contained 874 marine officers; if they scored equal to or less than 14 it doubled the chances of each marine's injury chances (O'Connor, Deuster, Davis, Pappas, & Knapik 2011; Pelot & Darmiento 2013, p. 2). It should also be noted that in Pelot and Darmiento's (2013) article the authors stated,

> It is important to note that unlike the other aforementioned studies, this study also looked at physical test scores (consisting of pull up and 1.5 mile test) and found that these scores were just as predictive of injury as the functional movement screen test. (p. 2)

FMS could also be a source of a baseline for athletes (Pelot & Darmiento, 2013). FMS can be used as a baseline test to film the athlete executing specific movements of the FMS during fitness testing (Pelot & Darmiento, 2013).

The FMS test was also conducted to show possible restrictions or asymmetries within an athlete's movement. FMS can help to fix the restrictions an athlete may have, to help them improve their mobility and help to prevent future injuries (Cook et al.,

2006a). Using FMS also helped to replace traditional measurement methods and could help to promote muscle flexibility and strength (Cook et al., 2006a). A related article by O'Connor et al. (2011), showed that in order to help improve athletic performance and reduce the risk of injury, the process of screening the athlete for any signs of immobility could help forecast or reduce future injuries. The use of an FMS score could further predict the possibility of injury over a physical fitness exam (O'Connor et al., 2011). According to Kiesel et al. (2011) the FMS test could also assess neuromuscular impairments, which suggested the FMS test could also be used for muscular flexibility and strength.

Strength Training

Strength training is another way for student athletes to help prevent future injuries. Strength training may help to improve athletic performance, as long as it is being implemented and re-evaluated continuously with the athlete (Gauvin, 2010). Strength training was another practice for helping to improve athletic performance and increase efficient muscle movement in athletes (Gauvin, 2010). Strength training became a popular way for athletes to increase their competitive edge during the off-season (Stabenow & Metcalf, 2009). An article by physical therapist Gauvin (2010) stated that during physical therapy sessions it was noticed that a patient was not experiencing muscle burn in precise areas intended to increase strength, and over time the exercise did not improve the area it was meant to strengthen. It was an on-going struggle to make sure athletes condition themselves to peak performance levels to insure they were getting the full affects from the desired exercises performed (Gauvin, 2010).

If designed effectively, strength and conditioning programs can improve athletic performance (Stabenow & Metcalf, 2009). A study conducted by Stabenow and Metcalf (2009), found that using a well-designed program to increase strength can improve an athlete's overall power by 30% to 50% after eight to 12 weeks of training (p. 223). Completing a FMS process for various movements to identify areas of weakness, will allow for the design of a successful strength training program to prevent future injury to the athlete (Sigismondo, 2010).

There were various reasons for athletes to become interested in strength training, but the main reason was to increase athletic technical ability (Stabenow & Metcalf, 2009). Strength training programs helped an athlete's overall strength, but these programs also improved the athlete's bone density, stability, and personal self-esteem (Conroy, et al., 1993; Faigenbaum et al., 1997; Fripp & Hodgson, 1987; Sailors & Berg, 1987; Weltman, Janney, Rians, Strand, & Katch, 1987). According to the Council on Sports Medicine and Fitness (2008), Cahill (1988), Faigenbaum et al. (1996), Faigenbaum and Michelli (1998), and Schafer (1991), when implementing strength training in athletics, the environment should be safe and effective for every athlete to train. It was important for athletes to use the entire range of joint movement during strength training exercises to properly increase strength and promote flexibility (Blimkie, 1993; Faigenbaum et al., 1996; Webb, 1990). A FMS process can help an athletic trainer or strength and conditioning coach to identify potential injury areas, but strength training can be introduced as a way to improve an athlete's overall performance.

With a thorough assessment of the body movement pattern using the FMS process, a proper set of training exercises can be implemented (Gauvin, 2010). Gauvin

(2010) reported an example of a case study profiling a specific athlete. The patient was a runner who experiencing lower leg pain while running (Gauvin, 2010). When this patient was evaluated using the FMS process it was found that he was not using his gluteus maximus while he was running, and this caused pain in his lower leg (Gauvin, 2010). Once this patient learned that he needed to start using his glutes, he started performing specific training exercises to strengthen his hip flexors and core, while leaving the lower core and gluteus maximus alone (Gauvin, 2010). The results were that he successfully balanced his muscle movement to prevent the pain he was having before (Gauvin, 2010).

Another example from Gauvin (2010) was a 13-year old swimmer and gymnast who suffered from knee pain in her plica band. "Her issue was that when her swimming coach discovered she was having knee pain she was put on a squat program to improve her lower body strength and flip turn" (Gauvin, 2010, pp. 12-13). Eventually, while she was squatting, it started to overload her knees and at the same time not strengthen her lower body (Gauvin, 2010). She eventually had her plica band removed through surgery and was sent to physical therapy to rehab from the surgery (Gauvin, 2010). She showed the same signs of dysfunctional movement patterns that were discussed in the previous case, as well as showing signs of a weak lower core and repressed gluteus maximus (Gauvin, 2010). The reason the squats were not helping her was she also lacked dorsiflexion in her ankles, which caused her to collapse her lower extremity during the squats (Gauvin, 2010). She also lacked core stability, which led to further dysfunction while she attempted to correct the issue with squats (Gauvin, 2010). In order to correct these issues she had to perform assisted squats, to help her sit back to activate the posterior muscle chain of the squat, and she was also correcting her ankle issues by calf

stretching, massaging, and adding a lift under her heel while she performed the squat exercises (Gauvin, 2010). Evidence from these stories suggests FMS can help to identify issues with athletes and strength training can help to correct the issues that these athletes were having. It should also be noted that a continual evaluation of the athlete should take place to ensure the physical therapy is effective. If the therapy is not effective the therapy should be altered.

Flexibility

FMS is a technique to help identify potential areas of weakness, but it is also used to determine an athlete's flexibility. Using (FMS) allowed the athletic trainer or medical physician to identify muscle flexibility and strength weaknesses (Cook, Burton, & Hoogenboom, 2006b). For every student athlete, flexibility was a way to help increase athleticism and avoid injury (Ching, 2014). Athletic trainers and other certified medical professionals used various techniques to help athletes improve flexibility. Athletes who used foam cylinders (foam rollers) as a way to self-massage their muscle tissue reduced risk of injury by relieving muscle tightness and encouraging myofascial release (Ching, 2014). In order to successfully use a foam cylinder the athlete used their body weight as they rolled over the cylinder; this created a self-massage of the muscles (Ching, 2014). In athletic training, foam cylinders became a popular piece of exercise equipment, and were also used in strength and conditioning programs (Ching, 2014).

It was important for athletic trainers, coaches, and strength and conditioning coaches to know the principles of training and conditioning as they related to flexibility, cardio-respiratory function, and endurance (Arnheim & Prentice, 1997). Muscle flexibility occurred when the muscle was lengthened, which allowed the joint an

increased range of movement (Zachezewski, 1989). Harting and Henderson (1999) showed when athletes increased their flexibility, the rate of injury decreased from 29% to 17% (p. 1), which was a decrease supported by other researchers, as well (Amako, Oda, Masuoka, Yokoi, & Campisi, 2003; Hilyer, Brown, Sirles, & Peoples, 1990).

A technique to help increase flexibility was to release fascial limitations, which was one reason flexibility was hindered (Barnes, 2007; MacDonald et al., 2012). The fascia was a part of the body which connects structures and surrounds blood vessels, nerves, and muscles (Ching, 2014). The fascia becomes restricted by disease, injury, or inactivity which causes inflammation that confines the fascia and decreases flexibility, strength, motor coordination and endurance that causes physical pain (Drake, Bittenbender, & Boyles, 2011). In athletics it was important for every athlete to prevent an injury from occurring, and a way to help prevent an injury was for the athlete to become more flexible (Ching, 2014). Muscle flexibility occurs when the muscle is lengthened, which allows the joint an increased range of movement (Zachezewski, 1989). When an athlete is flexible he has a better chance to react to certain situations that occurred during an athletic contest to help avoid injury.

When coaches, athletic trainers, athletes, and strength and conditioning coaches take an active interest in the principles of how to properly train athletes it will help to decrease the risk of injury to their athletes (Arnheim & Prentice, 1997). Athletes should also condition themselves in the different phases of the athletic calendar year. Competitive athletes at the varsity high school level are active during the season, post-season, pre-season, and during their off- season and it is important for every athlete to

include some rest periods into their workout regimen. This way the athlete can avoid overtraining (Ching, 2014).

Another important aspect of injury prevention was to include a proper warm-up and cool down before and after each workout. During the warm-up the athlete's body temperature increases, the muscles become more flexible, and the muscles and ligaments are allowed to stretch (Arnheim & Prentice, 1997). After a workout the cool down helps the athlete recover by returning blood flow to the heart for oxygenation, and it helps to decrease the pool of blood that forms in the athlete's muscles and arms (Arnheim & Prentice, 1997). Injury prevention practice should always be a part of all athletic training, because improving and preserving flexibility will help an athlete react and recover to all awkward or uncoordinated muscle movements (Arnheim & Prentice, 1997).

An athlete's flexibility may help reduce the possibility of an injury occurring during a workout or competition. Flexibility was mostly associated with the range of motion of an athlete (Arnheim & Prentice, 1997). Range of motion can be put into two different categories of active and passive movement. When measuring an active range of motion the athlete showed dynamic flexibility, and the passive range was measured by static flexibility (Ching, 2014). Athletes must have a sufficient passive range of motion, along with muscle strength and stamina to help prevent injury (Ching, 2014). Muscle strength was determined by how much power was produced to overcome resistance, and muscular endurance was determined by performing the same muscular contractions against a force during a specific amount of time (Arnheim & Prentice, 1997). Cardiorespiratory stamina was significant to reduce fatigue, which may lead to an athletic injury (Ching, 2014). Cardiorespiratory stamina reduced injury and allowed athletes who

were performing to use their whole body and their large muscles over an extended amount of time (Arnheim & Prentice, 1997).

Stretching

Using a foam roller helps muscles stretch, lengthens fascia, and develops flexibility (MacDonald et al., 2012). Stretching will increase flexibility, reduce muscle stiffness, and allow for a shorter recovery timeline (Ching, 2014). Wiktorsson-Moeller, Oberg, Ekstrand, and Gillquist (1983) recommended that in order to increase flexibility in lower extremity joints effectively, stretching must be conducted. An article from Magnusson, Simonsen, Aagaard, and Kjaer (1996) suggested that to increase flexibility the athlete must increase stretching tolerance. Muscle tissue is adaptable and stretching improves flexibility and tolerance by adding sarcomeres (Chan, Hong, & Robinson, 2001). Muscle flexibility is determined by length and number of sarcomeres. Muscles enhanced stretching ability and tolerance when the correct mechanical and physiological alterations were made (Chan et al., 2001).

There were three major variables in stretching: duration, intensity, and frequency. Athletes should only use low impact and gentle stretches, and as a result they should not feel discomfort or pain from stretching (Zito, Driver, Parker, & Bohannon, 1997). It was necessary for athletes to warm up before they begin stretching and the warm up should take place right before the start of a competition or practice (Ching, 2014). Athletes should also understand that overstretching may lead to possible tears in ligaments or muscle (Ching, 2014).

Stretching encompasses three different approaches that included ballistic, static, and proprioceptive neuromuscular (PNF). Stretching was described as stretching a

muscle to the longest length and holding it there for an amount of time (Anderson & Burke, 1991; Beaulieu, 1981). Static stretching was a slow, tender stretch until the muscle tightens, but the athlete should not experience pain in the muscles (Beaulieu, 1981).

Static stretching should be included in all warm-up or cool-down activities during the course of any training or rehabilitation program (Chan et al., 2001). When an athlete's muscle tissues begin to stress they can, over-time, remodel through a biomechanical reaction, which permanently increases the range of motion (ROM) and plastic deformation of the muscle tissue (Chan et al., 2001). In a study conducted by Chan et al., (2001), there was no difference in using 15 second stretches compared to a 2 minute stretch. Their study consisted of 40 athletes in good physical shape, volunteers (24 males and 16 females), with two treatment groups of stretching and two control groups. Each group completed their assigned regimen over a set period of time. The first group stretched their hamstrings in one set of 30 seconds for three times a week over an eight week period. The second group completed two sets of stretches with a one minute rest period between the sets; this also continued for three times a week but only lasted for four weeks. The last two groups consisted of the control groups (Chan et al., 2001, p. 81).

The results of the study conducted by Chan et al. (2001) showed that group one increased their ROM by an average of 11.2 degrees after the eight-week training period, group two increased their ROM by 8.9 degrees (p. 83). The control groups showed no significant change, but both protocols increased hamstring flexibility (Chan et al. 2001). After four weeks of training the passive resistance in the hamstrings and the highest joint

angle improved, but there was no change after the eight-week period (Chan et al. 2001). A total duration of 9000 seconds would not alter the movement angle (Magnusson et al., 1996). There was no added benefit to stretching longer, stretches should be held no longer than 30 seconds in each position (Beaulieu 1981).

In another study conducted by Bandy, Irion and Briggler (1997), it was shown that stretching once a day for 30 seconds improved flexibility and stretching for 30 seconds was just as effective as stretching for 60 seconds, but each of these time frames were still better than not stretching. In another related study on stretching, a research team led by Power reported a 10% improvement in ROM in the hip flexor right after a workout (Power et al., 2004, p. 5). Another study on the ROM in hip flexors showed no significant increase (Power et al., 2004). There was also evidence that static stretching in short time frames of 5-30 seconds helped to increase ROM and would also help to reduce muscle and tendon stiffness (Bandy et al., 1997; Kay & Blazevich, 2008). McHugh and Cosgrave (2010) agreed that to reduce the possibility of a muscle strain it was important to stretch before any workout or exercise.

Kay and Blazevich (2012) found when a stretch was maintained to a total of 2 minutes, there was a decrease in strength following 60 seconds of the stretch. Kay and Blazevich (2012) also discovered when the stretch lasted less than 45-seconds, athletic performance was not affected by the loss of strength, power, or speed. Other groups led by Fowles, Kokkonen, and Nelson all found that too much stretching caused diminished power output (Fowles, Sale, & McDougall, 2000; Kokkonen, Nelson, & Cornwell, 1998; Nelson, Allen, Cornwell, & Kokkonen, 1998). The research conducted by Kay and

Blazevich (2008) found nothing to show a significant decrease in maximum strength, and they were the only group to find no significant decrease in strength.

Stretching helped to increase flexibility, and it should not be long-drawn-out or too short. The best time frame to use for stretching was between 30 and 45 second intervals. If the stretch was too short the muscles would not benefit from the stretch. If the stretch was too long it would reach a point where it would no longer help the athlete, and it could decrease strength and performance.

Sit and Reach Test

It is important for an athlete to increase his reach and stride to reduce energy levels of starting and stopping motions, which allow the muscles to turn on and off less, creating a reduced risk in injury (Barlow et al., 2004). The sit and reach test was a way to measure an athlete's flexibility and was included in different fitness tests sequences (Council of Europe, 1993). The purpose and design of the sit and reach test was to measure an athlete's ability to reach while he is in a seated position; by measuring the athlete's reach it can be determined the flexibility of the hamstring muscles and the lower back alignment (Warmbrodt, Rissman, Freyling, & Lee, 1999).

The sit and reach test was the most regularly used flexibility assessment in epidemiological studies (Hui & Yuen, 2000). The test was a dependable gauge of lower back and hip flexibility and is also a gauge used to determine the length and flexibility of the hamstring (Wells & Dillon, 1952). The test was measured by the athlete reaching slowly forward as far as he could reach and was then recorded in centimeters (Ortega et al., 2008).

When an athlete experiences muscle pain in the lower back and hamstrings it can be from muscle tightness. The tightness reduced the range of movement at the joint where muscles are connected, which leads to muscle stiffness (Hui & Yuen, 2000; Quinn, 2010; Zachezewski, 1989). Having the proper flexibility and support in the hamstrings and lower back helped the athlete to avoid problems with lower back, musculoskeletal injury, postural abnormality and limitations, and decreased the possibility of failing (Baltaci, Un, Tunay, Besler, & Gerceker, 2003). It was important for the athlete to have muscle flexibility for overall health and fitness (Duncan, Woodfield, & Al-Nakeeb, 2006). In athletics at the high school, college, and professional levels, hamstring injuries made up the majority of critical musculoskeletal injuries (Canale, Cantler, & Sisk, & Freeman, 1981; Marshall, Hamstra-Wright, Dick, Grove, & Agel, 2007; Price, Hawkins, Hulse, & Hodson, 2004; Shankar, Fields, Collins, Dick, & Comstock, 2007).

Training and Conditioning Programs

Another aspect to injury prevention was developing programs designed to help athletes train and condition (Prentice, 2014). Athletes should take part in training programs throughout the preseason, along with in-season training to further reduce the risk of injury (Emery et al., 2005; Junge et al., 2002; Olsen et al., 2005). In some cases related to high school sports, the athletic trainer was fully responsible for creating, implementing, and supervising the development and conditioning program for all of the athletes (Prentice, 2014). These programs included neuromuscular control, coordination, stability, flexibility, and strengthening the lower half of the body (Emery et al., 2005; Junge et al., 2002; Olsen et al., 2005). When an athlete was fit and able to physically handle the strain of competitive competition on the practice field or game field, he would

reduce the possibility of sustaining an injury (Prentice, 2014). Therefore, it was important for coaches to work with athletic trainers to develop programs to implement during the offseason, preseason, and regular season to keep athletes in peak physical condition to further prevent injury from occurring year round (Prentice, 2014). The athletic trainer needed to identify the areas of sustaining a reliable level of fitness which included; applying the psychology of exercise, mainly with regard to strength training, flexibility, enhancement of cardio respiratory fitness, preservation of body composition, weight control, and nourishment (Prentice, 2014). Athletic trainers should also help to provide a safe and hazard-free playing area for athletes to compete (Prentice, 2014). Other areas of concern for a safe playing environment included removing objects that may cause injury on the playing field, for example: rocks, trash, and track and field equipment from the surrounding playing area (Prentice, 2014).

Injury prevention could also be strengthened with the proper equipment that fits each athlete and protected them accordingly (Prentice, 2014). The athletic trainer needed to work with coaches to select and maintain the proper equipment that will help to protect every athlete (Prentice, 2014). It should be noted that even though athletic equipment could take up most of a budget, the equipment purchased should still be to the benefit of the athlete's health and safety (Prentice, 2014). Nutrition was another important area of concern for an athlete to consider in injury prevention. When an athlete makes an effort to eat a good diet and supply his body with the appropriate nutrients, he will perform at the highest level associated with the sport, and by eating healthy he will allow his body to recover faster (Prentice, 2014). Nutrition was an important aspect to a healthier lifestyle for athletes and would help prevent injury by allowing the athlete to perform at a higher

level. The athletic trainer did not have to be an expert on nutrition; he just needed to be knowledgeable of basic principles of nutrition (Turocy, 2002b).

Coaches

Coaches, at the time of this writing, must also take an active part in trying to reduce injuries from happening, and they needed to be educated about how to help their athletes reduce injury risks. As mentioned previously, MSHSAA started to create a priority for coaches to be more involved in the health and safety of their student athletes. Coaches needed to be educated and able to identify warning signs or symptoms, since their athletes may be displaying signs of overuse injuries (Hodson, 1999; Lyman et al., 2001; Olsen et al., 2006). Coaches at the high school level should also have the proper knowledge or understanding of how to safely conduct workouts, train their athletes using techniques and skills that will not harm the athletes, understand the growth and development of their athletes, and they should know of any medical concerns with their athletes (Caine et al., 2006; Federation Internationale de Medecine du Sport, 1998; Ransone & Dunn-Bennett, 1999; Valovich et al., 2008). When high school athletes are competing in an organized setting an adult should be supervising them for possible signs of overuse (American College of Sports Medicine, 1993; Federation Internationale de Medecine du Sport, 1998). It was important for coaches to know and understand their role in youth athletics to make sure they were helping their athletes.

Coaches at the youth level in sports were also becoming more involved in the health and safety of their young athletes, which included concussion awareness. Coaches were there every day with their athletes, and they were the first to see what takes place on the field. The issue with coaches not being able to identify concussion symptoms was

similar to that of athletes and athletic trainers, since the hidden signs of concussion symptoms make it difficult to detect the injury (Covassin, Elbin, & Sarmiento, 2012). Coaches may not have the proper educational training to identify and understand the symptoms of a concussion; plus they did not have the benefit of having a trained medical professional with them at the youth level (Covassin et. al., 2012). Youth coaches may also have a tendency to overlook a blow to the head, because they are coaching the game and did not notice it or they wanted their player out on the field for the next play. Coaches may be just as competitive as the athletes they coach, and they want to have their best team on the field to win games. What is important about these situations is that coaches take the time to learn about the dangers of concussions. Each year between 1.6 and 3.8 million concussions occurred that were sports related (Covassin et. al., 2012, p. 233). There were many instances in youth sports where a trainer or the proper medical clinician was not available on the sidelines to help in the case of a concussion injury. Concussions were difficult to identify, and if a coach was not aware of the symptoms the player may continue to play at a greater risk of serious brain trauma. Therefore, it became even more important that a coach at the youth level became more aware of the signs and symptoms of a concussion, and they must also know how to react if one of their players was suspected of having a concussion (Covassin et al., 2012).

It became apparent that everyone involved in coaching youth sports should be aware of concussions. It made a difference when someone was able to detect if an athlete had a concussion, and if trainers, coaches, athletes, and parents were more informed the chances of reducing the effects of a concussion would increase. A concussion survey was sent out to 340 youth sports coaches, and only 34% responded to the survey

(Covassin et. al., 2012 p. 233). These coaches were given materials about concussions that gave them a better understanding about concussions. The materials also helped coaches improve identification of concussions and how to properly respond to a concussion (Covassin et. al., 2012). Six months after the concussion materials were sent out the same coaches were given the survey about concussions. The results from the 34% of coaches who completed the survey were as follows: Seventy-seven percent of youth sport coaches reported their awareness of concussions improved, and they were more equipped to identify athletes who may have a concussion. Fifty percent of those same coaches reported having learned something new about concussions after evaluating the information (Covassin et. al., 2012, p. 233). Sixty-three percent of the youth sport coaches understood that concussions were serious, while 72% of coaches reported they began educating others on concussions (Covassin et. al., 2012, p. 233). According to this study it made a difference to educate coaches about the dangers of concussions. The right information helped them understand the effects of a concussion and what to look for in case they suspected one of their athletes had become concussed. Concussions were no longer thought to occur only at the professional and college levels in sports; they can occur at all levels of sports. Coaches must learn to remove athletes from competitions if they show signs consistent with concussions, or if the athlete was observed having changes, such as mental confusion (McCrory et al., 2013).

Athletes

Coaches and trainers were not always to be blamed for improperly assessing an athlete. The reason for this was sometimes athletes themselves may not be honest in their own assessment. A concussion research study was conducted by Register-Mihalik et al.

(2013) between November 2008 and February 2010, with 167 high school athlete participants in six sports, which consisted of 97 male athletes, 55 female athletes, and five athletes who did not indicate their sex (p. 646). This study showed 89 athletes (53.3%) remembered having at least one potential concussion, or 'bell ringer' event. Of these 89, only 15 (16.9%) reported experiencing a concussive 'bell ringer' to a coach or a medical professional (Register- Mihalik et al., 2013, p. 646). Athletes wanted to be out there competing to help their team win the game and they did not want to come out. They may not give a truthful response when questioned. This was another reason to make sure athletes were given the proper training and knowledge about the dangers of concussions (Register-Mihalik et al., 2013). Knowledge and attitudes about concussions played a role in athletes reporting them, because they may have felt it was not a big deal, or they were not sure what was happening to them. If they continued to play they could put themselves at a greater risk, if they received another blow to the head (Register-Mihalik et al., 2013). This situation brings up the question, do athletes report their injuries honestly and correctly? In a study completed by McCrory et al., (2013) researchers examined high school football players and reported only 47.3% of players who sustained a concussion actually reported their injury to a medical clinician. The study also went on to find that 66.4% who did not report an injury did not think it was serious enough to report; 41% said they did not want to be held out of the competition; and another 36.1% did not even think their symptoms resembled or felt like a concussion (McCrory et al., 2013, p. 270). It was also noted that most concussions in high school athletes were undocumented, and it was also important to know that the athlete's attitude and knowledge towards concussions played a role in reporting the concussions (Register-

Mihalik et al., 2013). The study from Register- Mihalik et al., (2013) identified how many concussions, within their study, go unreported and helped to give insights into what athletes knew about concussions and what they thought were symptoms of concussions. In the article, the difference between the athletes remembering having a concussion or having their bell rung emphasized the misunderstanding of an athlete's knowledge about concussions and their ability to distinguish between the two (Register-Mihalik et al., 2013).

The problem with the overall analysis of concussions in athletes was when an injury was mild or the symptoms were somewhat unnoticeable the concussion went unreported (McCrory et al., 2013). Education about concussions would help to improve the ability to recognize a concussion, and by educating athletes and other individuals responsible for the safety of all athletes it would help to further prevent the damages of a concussion (Harmon et al., 2013). There was not enough information to distinguish between one athlete's ability to become concussed over another athlete's ability to become concussed. What was known was an athlete who sustained a concussion was at a greater risk for further damage to the brain right after a concussion (McCrory et al., 2013). In a related study using data from the National High School Sports-Related Injury Surveillance System, Marar, McIlvain, Fields, and Comstock, (2012) showed younger athletes were at greater risk to sustain a concussion than older athletes. Once an athlete is concussed they should seek out immediate medical attention to help determine the severity of the injury. If they did not receive the proper medical opinion they could be at risk for another more serious brain injury. The study conducted by Register-Mihalik et al. (2013) from November 2008 to February 2010 did uncover the fact that there were a

high number of unreported concussions in athletes, and a difference would be made in the amount of reportable concussions if these athletes were given the proper knowledge about concussions.

Baseline Testing

Baseline testing offered another screening method for athletes before the season began to help determine normal brain activity. Baseline testing can help a trainer determine if an athlete was concussed during the course of a game or practice. Baseline testing became an important module in concussion management (Mrazik et al., 2013). Baseline testing could also help medical professionals measure and establish an athlete's regular performance prior to becoming concussed, which offered information the medical professional could use to assist an athlete recovering from a concussion (Guskiewicz et al., 2004). Baseline testing was also a way to manage and evaluate a then-current concussion with other variables, such as attention deficit disorder, learning disabilities, the age of the athlete, and their education. This also included previous concussions sustained by the athlete (Guskiewicz et al., 2004). Assessments also included any injury prevention programs for athletes. Coaches, trainers, and other medical staff should also be taught how to assess potential risks their athletes may encounter on the playing field. It was important to consider identification of the risk factor involved when a student athlete is playing a particular sport.

When determining the severity of a concussion injury and the recovery process, it was important to have data from a baseline test to help determine the athlete's pre and post-injury status, related to cognitive function, postural strength, and post-concussion signs and symptoms (Aubry et.al., 2002; Erlanger et al., 2001; Guskiewicz & Cantu,

2004; Lovell et al., 2003; McCrea et al., 2003). Baseline testing gave an athletic trainer a base comparison to retest an athlete after he received a concussion, to support a decision to clear him to play again. The definition of baseline testing, according to Mrazik et al. (2013), also agreed with the statement of Guskiewicz and Cantu (2004). Mrazik et al. (2013) stated, "Baseline testing enhances a clinician's assessment and ability to make return-to-play decisions by allowing direct comparisons between an athlete's post-injury status and pre-morbid level of functioning" (p. 654). A significant facet of baseline testing was the measurement of warning signs commonly linked with concussions (Mrazik et al., 2013).

Clinicians used the original base line test as a means to determine if the concussed athlete regained the original base line in place before the concussion was sustained. If the athlete regained the original level he was cleared to resume athletic activities. Researchers needed to consider whether the athlete's fitness level affected the baseline. When an athlete was in better physical shape he had a tendency to reduce concussion symptoms (Mrazik et al., 2013). This meant a trainer or other medical professionals should consider an athlete's physical condition when performing a baseline test. Testing athletes before they were in physical condition to participate in sporting events could result in a baseline that was not totally accurate, therefore and athletes needed to be tested when they were physically conditioned (Mrazik et al., 2013). The athletes who were tested represented different sports, were from male and female groups who were considered to be in good physical condition, and scored lower on the tests (Mrazik et al., 2013). It is important to note that baseline testing generally occurred in the pre-season or in the off-season of the particular sport. This made it difficult to determine when an

athlete really received a concussion during the season, because the readings may look different when the athlete was in a better physical condition than when he or she was out of season. Along with baseline testing, a medical clinician could also test the athlete in the pre-season using the PPE, and should develop a plan in case there was an emergency with a concussed athlete (Harmon et. al., 2013). The purpose of a PPE was to gain information on past concussion history of an athlete. Questions might include how many concussions were sustained, how often a concussion occurred, the severity of the concussion, and how long the recovery period lasted (Harmon et al., 2013). The PPE should also include the mood of the athlete, how the concussion affected learning and attention, and if he experienced migraines as a result of the concussion (Harmon et al., 2013).

With the use of concussion assessment tools, athletic trainers would be able to precisely identify the injury for which the athlete was suffering from post-injury (Guskiewicz et al., 2004). The assessment of baseline testing would help the athletic trainer recognize the dangers of a concussed athlete and would allow the athletic trainer a better opportunity to care for the athletes by recognizing the potential health risks associated return of an athlete to the field of play too soon after they received a concussion (Guskiewicz et al., 2004). There were other helpful assessments which could help an athletic trainer identify if an athlete sustained a concussion. These assessments included testing for cognition, postural strength, and self-reported symptoms (Guskiewicz et al., 2004).

Background Concussions

In athletic events the majority of concussions occurred when there was no loss of consciousness or neurological signs (McCrory et al., 2013). The most common signs of a concussion included confusion, loss of balance, or loss of memory, and in the first 24 hours after an athlete was concussed the most common symptoms included headaches, nausea, dizziness and balance problems, blurred vision or other visual disturbance, confusion, memory loss, and fatigue (McCrory et al., 2013). In a journal article from the *American Journal of Sports Medicine* it was estimated that 300,000 sports-related concussions occurred in the United States each year (Marar et al., 2013, p. 747). It was also reported that sports were the second leading cause of concussions, with only motor vehicle accidents leading to a higher incidence (Marar et al., 2012). The definition of a concussion was formed by the Congress of Neurological Surgeons in 1964. They stated that a concussion is "a clinical syndrome characterized by immediate and transient impairment of neural function, such as alteration of consciousness, disturbance of vision, equilibrium etc., due to mechanical forces" (McCrory et al., 2013, pp. 268-269).

In years recent to this writing, the definition of a concussion was revisited. In 2002 the first International Conference on Concussion in Sport developed a new definition for concussions. They felt the old definition was too simplistic and failed to explain the common medical terms of a concussion (McCrory et al., 2013). The definition they decided on was:

> (A) typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously; (B) may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance

> rather than a structural injury; (C) results in a graded set of neurological syndromes that may or may not involve an loss of conciseness. Resolution of the clinical and cognitive features typically follows a sequential course; (D) is typically associated with grossly normal structural neuro-imaging studies. (McCrory et al., 2013, p. 269)

In the following days after the person has been concussed, he may experience sensitivity to light, feel tired, nervous, or even struggle to sleep (McCrory et al., 2013). In the period after a concussion there is a recovery time in order to fully regain all senses. As soon as an athlete is identified as having a concussion he should be taken out of the game immediately and examined by a trained professional to evaluate his status.

Over the years, it was established that an athlete who sustained a concussion was at a greater risk for further damage to the brain right after the concussion (McCrory et al., 2013). This was not the case in in conclusions reported in an article by the *British Medical Journal*, published in 2003 by the same author. The article mentioned that at that time when there was no evidence that having multiple concussions over a career would necessarily result in lasting brain damage (McCrory, 2003). As the years passed, with more research completed it was established that multiple concussions to the brain were very serious. It was also known that multiple concussions prolonged the recovery time and symptoms, along with the heightened risk for future concussions (Covassin, Moran, & Wilhelm, 2013). It was also known that youth athletes may take a longer time to recover from a concussion and they were more susceptible to a catastrophic injury than other athletes (Harmon et al., 2013).

When the brain develops in a youth athlete, the process is much different from a mature adult brain. Harmon et al. (2013) stated,

> The developing brain differs psychologically from the adult brain when comparing the adult brain when comparing the brain water content, degree of myelination, blood volume, blood-brain barrier, cerebral metabolic rate of glucose, blood flow, number of synapses and geometry and elasticity of the skulls structure. Developmentally younger brains have less-established engrams and may have less-cognitive reserve than more mature brains. (p. 18)

These differences may lead to the increased recovery time needed for youth athletes (Harmon et al., 2013).

The importance of researching concussions was becoming more relevant every day. In the United States, high school participation in athletics had been growing for years, and during the 2009-2010 school year, 3.1 million girls and 4.2 million boys participated in a sport (Marar et al., 2012, p. 747). According to a study reported by the *American Journal of Sports Medicine* researchers stated, soccer girls had a higher rate of concussion, 3.4 per 10,000 athletic experiences, than boys' 1.9 and concussions symbolized a greater proportion of total injuries among girls, 15.4%, than boys at 11.1% (Marar et al., 2012). However, these differences were not significant. Among both boys and girls, the activity most often connected with concussion was heading the ball, 31.1% for girls and 27.7% for boys (Marar et al., 2012, p. 749). . Additionally, 60.8% of injuries sustained while heading the ball were concussions (Marar et al., 2012, p. 749). Reported information represents how concussions occurred on the field; while heading the ball a result of

> player-player contact boys: 74.2%; girls: 58.1%, player-equipment contact boys: 12.9%; girls: 34.9%, and player-playing surface contact boys: 12.9% girls: 7.0%. Overall, player-player contact resulted in a greater proportion of concussions in boys 76.7% than girls 52.8%. Conversely, player-playing surface contact was girls: 18.2%; boys: 7.8%, and player-ball contact was girls: 26.4%; boys 15.5% resulted in a greater proportion of concussions in girls than boys. (Marar et al., 2012, p. 749)

This study showed that the majority of concussions occurred when players had to use their head to play the ball, while another player on the other team was present.

Concussion Recognition

A concussion is difficult to recognize and manage and when they occur among a younger population such as high school athletes, concussions can increase the risk of multiple injuries to the brain (Register-Mihalik et al., 2013). It is not uncommon for a concussion to go unreported because athletes themselves will not report the incident or the symptoms will go undetected (Marar et al., 2012). When an athlete is suspected of having a concussion they should stop playing immediately and they should receive an evaluation from a licensed trainer or medical personal that is educated in concussions (Harmon et al., 2013). High school athletes are at the age in which their brains are still developing and a concussion should never be considered mild because the concussion can cause the athlete to experience neurocognitive deficits (Register-Mihalik et al., 2013). The issue with concussions again comes from the inability to properly report them. Research conducted by Register-Mihalik et al. (2013), has shown that more than 50% of concussions go unreported. It is important that a concussion is reported because athletes

need to be monitored for mental or physical signs of a concussion or they could risk further injury (Harmon et al., 2013). In sports there are situations in which concussions have been mistaken for a mild brain injury or the term getting your "bell rung." Having your "bell rung" meant that the athlete was hit in the head and dazed for a few moments, but was sent back into the field of play because it was just part of the game to have your bell rung. Even though a big hit has occurred and gets the attention of the medical staff it must be understood that the real impact of the hit may not be visible and not obvious (McCrory et al., 2013).

When studying neuropsychological deficits in concussions it is important to understand what they can do to the brain. A concussion can severely hinder the brain and normal motor skill functions. Some of the brain functions that can become affected are as follows: "(A) Reduced planning and ability to switch mental sets, (B) Impaired memory and learning, (C) Reduced attention and ability to process information, and (D) Slowed reaction times and increased variability of responses" (McCrory et al., 2013, p. 271). These are all signs and symptoms that coaches, trainers, and parents should look for after their child or athlete has sustained a blow to the head. Neuropsychological symptoms can become apparent immediately after the blow to the head or they can become noticeable over the course of the next days following the injury.

Concussion Management

Concussions are now considered to be one of the most difficult injuries in sports to diagnose properly and then they are just as difficult to assess the damages and manage (McCrory et al., 2013). There are practice guidelines that are recommended for a specified approach to managing concussions. The problem is that only a small number of

athletic trainers actually follow these guidelines (Rigby, Vela, & Houseman, 2013). In order to properly train athletic trainers to follow the guidelines it is important to understand a trainer's understanding and beliefs of the proper recommendations to handle a concussion. The theory that allows us to measure the planned behavior of an athletic trainer's beliefs about concussions is the (TPB) or Theory of Planned Behavior (Rigby et al., 2013). The (TPB) has four guidelines and they are stated as follows:

> (1) attitude toward the behavior (BA), or an individual's positive or negative evaluation of self-performance of a behavior and an individual's belief about the consequences of that behavior; (2) subjective norms (SN), or an individual's perception of what other persons think about the individual performing the behavior and the individual's motivation to comply; (3) PBC, or a perception that the individual has control over performing a behavior; and (4) BI, or the individual's intent to perform or not perform the behavior based on the weight of the first 3 constructs. (Rigby et al., 2013 p.637)

This process begins with the athletic trainer's perception of how much they want to use neuropsychological testing when a concussion has occurred (Rigby et al., 2013). The next perception the trainer has to overcome is how much they are influenced by the coaching staff. Then the trainer must decide if they have the resources to acquire the proper funds to do neuropsychological tests (Rigby et al., 2013). This theory gave more insight into what athletic trainers must overcome in order to properly diagnose and care for athletes with concussions.

Return-to-Play and How to help Student Athletes with Concussions

When an athlete is diagnosed with a sports related injury such as a concussion, he or she needs to receive the proper rehabilitation. The goal of recovery for a student athlete was for the student athlete to partake in pre-injury competition at the previous level prior to the concussion (Waeckerle, 2013). Before the athlete returned to playing in a physical setting they must be able to perform simple and normal mental activities without the signs that still indicate he or she has a concussion (Waeckerle, 2013). In a related article on concussions by McCrory et al. (2009), concussion management allowed the athlete time to rest until all of the symptoms disappeared. McCrory et al. (2009) also added that once the concussion signs regressed the athlete should go through a re-evaluation program of exercises before medically cleared to return to play. At the time of this writing, there were no legitimate standards to measure mental improvement of an athlete by gradual increases in cognitive activities (Waeckerle, 2013). In another related article about concussion timelines, it was noted that it was difficult for a team physician or athletic trainer to determine a precise prognosis for an athlete to return to play after the athlete sustained a concussion (McKeon et al., 2013). The protocol for return-to-play was a step-by-step process that helped an injured athlete proceed from one level to the next to show he fully recovered from the injury (McCrory et al., 2009). The protocol was also designed to push the athlete back steps, in case there was regression in the recovery process for the return-to-play program (McCrory et al., 2009). McKeon's (2009) article suggested that when an athlete was concussed, the proper recommended guidelines of return-to-play should be followed. Concussion symptoms generally resolved about seven to 10 days after the injury occurred (McCrory et al., 2009; McKeon et al., 2013). The

article also stated, “approximately 85% to 90% of athletes with concussions recover symptomatically within 1 to 2 weeks, and only a small percentage have symptoms lasting from weeks to months” (Marar et al., 2012, p. 836; McKeon et al., 2013).

Multiple articles specifically stated a graduated return-to-play protocol or set of guidelines that an athlete needed to complete successfully before he could return to the sport. The first step of the guidelines consisted of the athlete doing nothing after the injury; he simply needed to recover (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013). The next step allowed the athlete to do light aerobic, such as walking, swimming, or riding a stationary bike, with the objective of this step to increase the heart rate of the athlete (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013). The third guideline was to allow the athlete to do sport-related specific exercises that involved running, with no contact. The objective of this step was to add movement (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013). The fourth step allowed the athlete to participate in non-contact training drills; this step increased the level of effort from the athlete, with an objective of letting the athlete exercise, observe coordination, and cognitive load (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013). The fifth step was a full contact practice, once medical clearance was given to the athlete to participate. The objective of this stage was to help the athlete restore confidence and give coaches a chance to see how the athlete was performing on the field (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013). The last step in the process was allowing the athlete to return to play in a normal game (Faure, 2010; McCrory et al., 2009; Waeckerle, 2013).

A report from the *American Academy of Pediatrics* indicated that after a student-athlete suffered a concussion he must be eased back into daily academic schedule (as

cited by Toporek, 2013). This report inspected how concussions affected a student athlete's learning ability, and by releasing this article the medical association planned to offer directions to medical personnel, teachers, parents, and the student athletes about the best way to manage the post-concussion symptoms (Toporek, 2013). Some activities to reintroduce, in progression, to an athlete a sustained concussion are reading, playing board games, playing games to recall from memory, or playing video games for 30 minutes (Waeckerle, 2013). These activities should not cause the athlete to feel any symptoms such as nausea, headaches, or decreased frustration tolerance (Waeckerle, 2013). Students with a concussion who plan to return to school may require a cognitive test and may also need academic accommodations for the planned school day (Harmon et al., 2013). These accommodations included extending time for test-taking and reducing the students' workload while they are recovering from a concussion (Harmon et al., 2013). Waeckerle (2013) also agreed that when an athlete wanted to return to school, educational accommodations should be made if the athlete needed them. There should be a person that in charge of monitoring the progress of the student athlete throughout the day, and the person should also be in regular contact with teachers, physicians, trainers, and the student athlete's family (Waeckerle, 2013). The list of accommodations should include extra rest periods, a lesser amount of work and homework, reducing the amount of time the student athlete may spend on the computer at home, school, and in some cases the possibility of postponing national or merit testing, because the results of the tests may not reflect the student's actual abilities (Waeckerle, 2013).

When determining if an athlete may participate in a return-to-play protocol, the athlete must show no signs of concussion symptoms for at least 24 hours prior to

beginning the protocol (Waeckerle, 2013). After the athlete completes each step of the protocol he must again show no symptoms of a concussion still present (McCrory et al., 2009; Waeckerle, 2013).

A study researched by McKeon et al. (2013), which looked at return-to-play timelines over a two-year period from 2007 to 2009 involved 1,056 high school athletes who had concussions and who were assessed over a two-year period. The study showed that 19.2%, or 203, athletes had symptoms lasting longer than one week but less than one month. The same study showed that only 2.8%, or 30, athletes had post-concussion symptoms that lasted for more than one month (McKeon et al., 2013). These articles all agreed that return-to-play timelines vary from one athlete to another. They also agreed that concussions should be re-evaluated every 24 hours to determine if a student athlete is able to return to school or return to the playing field. The student athlete's return depends on his own progressions through the concussion symptoms.

Summary

The literature review provided a detailed overview of information about the state of injury prevention and protocols in athletics, current at the time of this writing. The role of the athletic trainer evolved over the past century to represent a person who with multiple responsibilities, who ensured the health and safety of the athletes in his care. At the time of this writing, athletic trainers had access to more supplies and equipment than they ever had before. The important question was: Were high school athletic trainers gaining access to these new supplies and equipment?

The athletic trainer played a large role in high school athletic programs. They were expected be able to assess, diagnose, and rehabilitate athletes who became injured.

There were ways in which an athletic trainer may help prevent injury. These included using a functional movement screen test, baseline test, strength training, stretching, sit and reach test, and making sure athletes were staying flexible.

The athletic trainer was there to assist each athlete in the program, but the trainer needed to also establish a positive working relationship with the coaches. Coaches needed to trust that the athletic trainer was doing his job effectively, and coaches should also needed to listen to the athletic trainer to ensure the health and safety of their athletes.

In the state of Missouri the organization responsible for creating all the guidelines for athletics in the state was called the Missouri State High School Athletic Association (MSHSAA). This organization set the rules and guidelines for all sports, and it became increasingly more prominent in disseminating information concerning concussion recognition and treatment. The topic of concussions came to the forefront in athletics. In order to properly identify a concussion, everyone involved must be honest about symptoms and consequences of injury, which included the player, coach, and athletic trainer. It was of the utmost importance that a concussion was diagnosed correctly in order to help ensure that the athlete received the proper medical attention. It was also important that every step of a concussion protocol plan was followed before an athlete returned to the playing field.

Chapter Three: Methodology

Introduction

The purpose of this study was to evaluate high school athletic training programs and services for high school athletes in the Gateway Athletic Conference, based in St. Charles County, Missouri. The goal of this study was to provide information that may contribute to improvement of athletic training services in Missouri high schools. Recent to the time of this writing, MSHSAA initiated a Committee on Injuries and Medical Information, referred to as the Sports Medicine Advisory Committee. The committee made an effort to advocate for baseline testing for concussions, promote the importance of first aid and CPR training for all coaches, and making policy and procedure recommendations aimed at protecting the safety of high school athletes competing in the state of Missouri (MSHSAA, 2015). Despite this effort, there still remained little knowledge regarding the day-to-day challenges facing most Missouri high schools in regard to sports injuries and athletic training services, as evidence by review of literature. This study explored perceptions of coaches, athletic directors, and athletic trainers working in one specific Missouri high school conference, Gateway Athletic Conference (GAC).

Rationale

The rationale for this study focused on information gathering designed to provide knowledge, which may help local high schools provide a higher level of awareness concerning prevention, intervention, and treatment of athletic injuries. At the time of this writing, very little research had been conducted on this subject area, and hundreds of student athletes failed to complete varsity athletic seasons due to injury every year. At

the time, there were no standard procedures, common protocols, or standards of practice specifically governing Missouri state high school athletic training programs, services, facilities, and equipment. Athletic trainers were customarily certified through the NATA Board of Certification (Prentice, 2014, p. 34). At the collegiate level, all athletic trainers must carry this NATA credential (Prentice, 2014). Most high schools also required this certification level for professionals working with high school athletes and sports teams. However, there was no national high school standard for many facets of athletic training, including such areas as facilities, training room space, equipment, policies and procedures, rehabilitation protocols, standards of practice, continuing education and training, emergency care preparedness, incident reporting, and prevention strategies. The intent of this study was to identify strengths, weaknesses, and best practices related to athletic training at the high school level for the GAC schools. The approach for discovery was use of a triangulation of data collection. Specifically, this three-pronged methodology contributed to a research design in which the researcher invited athletic directors, coaches, and athletic trainers to participate in the study. Intuitively, one would expect a high level of consensus and agreement in evaluating the quality and specifics of their respective high school athletic training programs. This research study attempted to provide data to either support or refute this expectation.

Research Questions

The study was focused on these seven research questions:

1) To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?

2) To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?
3) To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?
4) To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?
5) To what extent is athletic training accepted as a major priority within high school athletic programs?
6) Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?
7) Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

Null Hypothesis

There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the categories of Emergency Care Preparedness, Injury Management Protocol and Procedures, Training Room Facilities and Operation, and Athletic Training Personal Opinion.

Data Collection

The research data for this study was gathered by sending out surveys to athletic directors, athletic trainers, and coaches in the Gateway Athletic Conference, along with selected participants from different conferences, which included the Suburban South 12, Suburban North 12, Metro Catholic Conference, Greater Kansas City Suburban Conference, Archdiocesan Athletic Association Missouri River Valley Conference,

Midland Empire Conference, Kansas City Interscholastic, and Big 8. The survey was designed to collect data on what athletic directors, athletic trainers, and coaches knew about their athletic training facilities, along with procedures and policies in the athletic training area. The survey also included general information about the participants' schools, such as how many injuries were sustained throughout the preceding year, how many athletes played sports in the school, and a breakdown of male and female athlete participation in the conference, from each school.

The survey included a request for information on pre-assessment programs in place for athletes to provide data before an injury may occur. The survey also contained a request for information about prevention and intervention programs in place at each school. Respondents indicated the types of return-to-play strategies each school had for student athletes to allow return to the classroom and sports fields following injury. In addition, the survey asked each participant questions about the athletic training room and the supplies and equipment on site (see Appendix A).

Relationship of Researcher to Participants

The principal investigator was a varsity athletic coach at a GAC member school and also taught at a second GAC school. Participants in this study included athletic directors and other coaches from the 17 Gateway Athletic Conference high schools. Relationships were made between athletic directors in the schools of the Gateway Athletic Conference and coaches, including the researcher. Many coaching relationships were also established over past years through coaching. These relationships continued to grow and, at the time of this writing, helped to add to the resources of the study. The research also included participants from different conferences, which included the

Suburban North 12, Metro Catholic Conference, Greater Kansas City Suburban Conference, Archdiocesan Athletic Association Missouri River Valley Conference, Midland Empire Conference, Kansas City Interscholastic, and Big 8.

Viewpoint of Participants

The main objective of this study was to gain insight into the resources and operation of high school athletic training programs and services for high school athletes in the GAC. The assumption was that high school coaches cared about their players' health and safety. Another related idea was the hope that parents and coaches would want to know how and why injuries have an impact in high school athletics; not just their playing status, but on their everyday lives, as well. This study may also improve the understanding of the threat a concussion poses for the health of student-athletes and children, and concussion should be taken seriously. To protect the views of participants, the survey used to gather data gathered responses electronically, which allowed anonymity of responses and of the identity of those who participated. The study was conducted openly and honestly, with disclosure about its goals. Each participant in the study was treated with respect and privacy.

Research Setting

Table 5 describes a breakdown of the study participants' positions, athletic director, athletic trainer, and head coach, who agreed to be a part of the study by participating in the survey. There were 83 total participants, with 17 were athletic directors (21.79%); 35 athletic trainers (44.87%), and 31 coaches (37.35%).

Table 5

Study Sample Characteristics (N=83)

Role at High School	N	%
Athletic Director	17	21.79
Athletic Trainer	35	44.87
Head Coach	31	37.35

Note: N=83.

Table 6

Participating Schools in the Gateway Athletic Conference

GAC North	GAC Central	GAC South
St. Charles	Fort Zumwalt East	Francis Howell
St. Charles West	Fort Zumwalt North	Francis Howell Central
Winfield	Fort Zumwalt South	Francis Howell North
Warrenton	Holt	Fort Zumwalt West
Orchard Farm	Washington	Timberland
Liberty		Troy

Research Instrument

Data were collected using survey monkey, which provided an online survey used to gather the data from the participants. The survey included demographic information about who was taking the survey; for example, participants could choose a position of athletic director, athletic trainer, or coach. The survey (Appendix A) included question prompts about governing administrative procedures (22), emergency care preparedness (17), injury management protocols and procedures (5), training room facilities and operation (12), general program information (10) and Athletic Training Personal Opinion Questions (6). Other questions addressed policies and procedures, which included return-to-play, communication with staff members involved with the health and safety of an

athlete, paperwork management, and information regarding an emergency action plan (EAP). The general information about the high school programs included how many male and female athletes participated, the number of injuries, and how athletic directors, athletic trainers, and coaches viewed their athletic training programs. A combination of Likert scale, close-ended questions, and open-ended questions were used in building the survey. The survey was adapted from NATA (Almquist et al., 2005). The total number of questions asked was 72. The approximate time to complete was 20 minutes.

Procedures

The survey was completely confidential and voluntary. It was distributed to the schools in the GAC using an online survey tool (survey monkey). Coaches and athletic training staff were invited to participate by athletic directors at the GAC member schools. All participants were emailed a link to the survey site, in order to anonymously and confidentially respond to the survey questions. All data were collected through the online survey tool (survey monkey), keeping all survey participant identities anonymous.

Time Line, Data Collection, and Analysis Procedures

The timeline of events for the data collection took place in the spring of the 2014-2015 school year. The surveys were sent out electronically in April, and the participants were instructed to complete and return them by July 6th. Once the data were collected, information was organized into the three main categories of athletic directors, athletic trainers, and coaches. All of the data were organized into tables describing response rates to each question. To identify potential significant differences in agreement with survey prompts, the data were analyzed using the SPSS 21.0 statistical package for the social sciences.

Initial data analysis was confidential, presented through use of frequencies and descriptive statistical analysis for the purpose of data cleaning, and an examination of the overview of results. Respondents with incomplete data and missing values were not used in the data analysis. The comparisons for purposes of triangulation were made using Analysis of Variance (ANOVA) to determine whether statistically significant differences existed on the response rates to survey questions among the three study populations. Significant ANOVA analyses led to post hoc Least Squares Difference (LSD) tests to determine between which groups' differences existed. For categorized data and open-ended questions, basic frequency analysis was used, and data were recorded by survey sub-category as tables, presented in Chapter Four.

Summary

This study was intended to evaluate high school athletic training programs in the Gateway Athletic Conference. The purpose of the study was to provide information that could contribute to the improvement of athletic training services in high schools in the state of Missouri. The data for this study was collected and designed to share with each high school in the state, in order to promote an increase in awareness of the athletic training services available to all high school athletes.

The data collection took place at the end of the school year, which made it difficult to find participants to volunteer to participate. The difficulty was during the summer months of the school year most coaches, athletic trainers, and athletic directors were not as available during the day, due to vacations, or summer break. The researcher was able to obtain enough participation to conduct a study, but would have liked to have more participation.

The researcher was able to use contacts in the coaching industry to seek out participants to volunteer to take the survey. Every participant's identity was still kept confidential and anonymous. Contribution of the viewpoint by the participants was a way for them to openly assess how they felt about their athletic training services and facilities at their high schools, in the hope that their participation would lead to positive change at their high schools and the other high schools in the state.

The research setting was mainly conducted within the Gateway Athletic Conference, but there was some participation from other conferences in the area and state, as well. The survey consisted of a set of questions about athletic training services and facilities, which helped give the researcher a general sense of what the participants felt as he analyzed data from the survey. Each participant was emailed a link to the survey and could anonymously participate without the researcher knowing who they were. This was designed in hopes that the volunteers would respond as openly and honestly as possible. Data was collected between April and July of 2015, and analysis is reported in Chapter Four.

In the following chapters, the reader will find tables which display data and provide answers to the research and hypothesis questions. There are breakdowns of how athletic directors, athletic trainers, and coaches scored throughout the survey. There were some significant differences between the groups, and in some cases the groups are in agreement. Overall, the research suggests athletic training services and facilities need to be addressed and improved at the high school level in the state of Missouri.

Chapter Four: Results

Introduction

The purpose of this study was to evaluate athletic training programs and services for high school athletes in the Gateway Athletic Conference, based in St. Charles County, Missouri. The goal was to provide information that may contribute to improving athletic training services in Missouri high schools. The intent was to investigate if high school athletic training programs were a viable resource to help improve training services for high school athletes. The results may offer valuable information to all high schools, athletic training contractors, and MSHSAA. Research questions and the null hypothesis were:

Research Questions

1) To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?
2) To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?
3) To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?
4) To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?
5) To what extent is athletic training accepted as a major priority within high school athletic programs?
6) Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?

7) Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

Null Hypothesis

There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the categories of Emergency Care Preparedness, Injury Management Protocol and Procedures, Training Room Facilities and Operation, and Athletic Training Personal Opinion.

Descriptive and Statistical Results

Governing administrative policies and procedures

The data recorded in Table 7 shows the hiring category and certification status of the athletic trainers at the participating high schools. Only 17 schools, which represented 20.5% of the high schools, had a full-time trainer on staff. There were 14 schools that employed a part-time trainer. The majority of schools, 46 (55.4%), employed a trainer contracted out through an agency. Only six schools had a non-certified coach or staff member assigned to athletic training duties.

Table 7

Athletic Trainer Status at Participant Schools

Status	N	%
Full-Time NATABOC Certified Athletic Trainer	17	20.5
Part-Time NATABOC Certified Athletic Trainer	14	16.9
NATABOC Certified Athletic Trainer Contracted with Agency	46	55.4
Non-Certified Coach or Staff Member as Assigned	6	7.2

Note: N=83.

The data in Table 8 indicates the medical service availability at the participating schools. There were 50 (60.24%) participating schools with access to a doctor or general practitioner. There were 15 (18.07%) who had access to a chiropractor. Five (6.02%) schools had access to a nutritionist or dietician. Finally, there were 23 (27.71%) schools with access to a professional counselor and 33 (39.76%) schools that had access to a physical therapist.

Table 8

Medical Service Availability at Participant Schools

Medical Professional	N	%
Doctor or General Practitioner	50	60.24
Chiropractor	15	18.07
Nutritionist/Dietician	5	6.02
Professional Counselor	23	27.71
Physical Therapist	33	39.76

Note: N=83.

Table 9 displays the mean ranking and standard deviations for responses to survey question prompts ranked by the survey participants. The mean scores for these questions were based upon a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree. Thus, a mean score of 3.73 was a score that would register an average response between the choices of neutral and agree for a survey question prompt.

The researcher found that data taken from the survey question prompts recorded on Table 9 indicated that athletic directors, athletic trainers, and coaches scored a mean above neutral on each question in the category representing governing administrative policies and procedures.

Table 9

Legal Duties & Responsibilities

Question	Mean	Std. Dev.
Existing job descriptions define the responsibilities and legal duties of the Athletic Trainer	3.73	1.02
Athletic Director (N=17)	3.88	1.05
Athletic Trainer (N=35)	3.73	1.04
Head Coach (N=31)	3.65	1.02
Existing job descriptions define the responsibilities and legal duties of the Athletic Director	3.69	1.04
Athletic Director (N=17)	4.00	.94
Athletic Trainer (N=35)	3.47	.98
Head Coach (N=31)	3.74	1.12
Existing job descriptions define the responsibilities and legal duties of the Coaches	3.66	1.03
Athletic Director (N=17)	3.77	.90
Athletic Trainer (N=35)	3.56	.98
Head Coach (N=31)	3.71	1.16
The Athletic Trainer's responsibilities to student athletes is defined in their job description and consistent with state law	3.65	1.14
Athletic Director (N=17)	3.88	1.11
Athletic Trainer (N=35)	3.61	1.11
Head Coach (N=31)	3.58	1.20

Note: N=83.

The mean score for the prompt, 'Existing job descriptions define the responsibilities and legal duties of the athletic trainer,' was 3.73 for athletic directors, athletic trainers, and coaches, which registered a response between neutral and agree. Athletic directors scored 3.88, athletic trainers scored 3.73, and coaches scored a 3.65.

The second prompt, 'Existing job descriptions defining the responsibilities and legal duties of the athletic director,' had a mean score of 3.69 for the three groups of participants. Athletic directors scored highest, with a mean score of 4.0 which meant

they agreed with the job descriptions defining their responsibilities. Head coaches had a mean score of 3.74, and athletic trainers had the lowest score of 3.47.

The third prompt, 'Existing job descriptions defining the responsibilities and legal duties of the coaches,' had a mean score of 3.66. Athletic directors scored the highest mean score of 3.77. Coaches scored next with a mean score of 3.71, and athletic trainers again scored the lowest, with a mean score of 3.56.

The final prompt, 'The athletic trainer's responsibilities to student athletes is defined in their job description and is consistent with state law,' had a mean score of 3.65. Again, athletic directors had the highest mean score of 3.88 compared to athletic trainers' 3.61 and coaches' 3.58.

Table 10 shows athletic coverage was broken into the categories of full-time daily coverage 35.59% of the time, afternoon coverage 79.41%, and game coverage 75.44%.

Table 10

Athletic Trainer Coverage of High School Sports

Period of Coverage	Yes (%)	No (%)
Full-Time Daily Coverage	35.59	64.41
Afternoons only Coverage	79.41	20.59
Game Coverage Only	75.44	24.56

Note: N=83.

Table 11 indicates that only baseline concussion testing was being completed at a higher rate, in comparison to the other categories. Baseline concussion testing was being completed at most of the high schools. There were 14 respondents who did not conduct pre-season screening, which was 17.28% of the participants. Only three respondents (3.70%) conducted a functional movement screen test, and only two high schools (2.47%) conducted the sit and reach flexibility screen.

Table 11

Pre-Season Screening for Student Athletes

Screening	N	%
Baseline Concussion Testing	62	76.54
Concussion Certification	17	20.99
No Pre-Season Screening	14	17.28
Functional Movement Screening	3	3.70
Sit & Reach Flexibility	2	2.47

Note: N=83.

Table 12 provided information about the types of evaluations taking place at the participating high schools. Respondents at each high school indicated a 'Medical physical examination' and 'Parent/guardian consent signature' was required. One person did not indicate that medical authorization for participation was required. Almost all respondents (95.18%) indicated a medical history was required prior to athletic participation.

Table 12

Pre-Participation Evaluation

Evaluation Protocol	N	%
Medical Physical Examination	83	100.00
Parent/Guardian Consent Signature	83	100.00
Medical Authorization for Participation	82	98.80
Medical History	79	95.18

Note: N=83.

Table 13 displays which medical examinations were completed, along with the type of medical professional providing the results. Most high schools used a medical doctor or general practitioner 68 (81.93%). The next medical professional listed was a chiropractor or licensed doctor used by 55 (66.27%) high schools. Some high schools also used a nurse practitioner; 42 (50.60%). A physician assistant was also used by 36 (43.37%) high schools, and five (6.02%) used other medical professionals.

Table 13

Medical Examination Completion

Medical Professional	N	%
Medical Doctor/General Practitioner	68	81.93
Chiropractor/Doctor Licensed	55	66.27
Nurse Practitioner	42	50.60
Physician Assistant	36	43.37
Other	5	6.02

Note: N=83.

The data shown on Table 14 reports that 95.18% of the respondents indicated they required informed consent to play sports. Informed consent is defined as permission granted by a parent or guardian for a child to play inter-school sports at the high school. Emergency cards on file were also required by 92.77% of the respondents, and the emergency cards included a list of information items about the student athlete in case he would become injured or need medical attention while involved in a sports event. The list of the informational items high schools required included a list of allergies (87.50%), contact or parent home phone (96.34%), contact or parent work phone (87.65%), consent for emergency treatment (90%), hospital preference (64%), and medical insurance information (80.25%). The last item on Table 14 records the answers participants provided when asked if medical history or examinations were required and indicates that 98.78% replied with ‘yes.’

Table 14

Form Requirements for Student Athlete Participation

Form	Yes (%)	No (%)
Informed Consent	95.18	4.82
Emergency Information Card	92.77	7.23
List of Allergies	87.50	12.50
Contact Parent Home Phone	96.34	3.66
Contact Parent Work Phone	87.65	12.35
Consent for Emergency Treatment	90.00	10.00
Hospital Preference	64.00	36.00
Medical Insurance	80.25	19.75
Medical History/Examination	98.78	1.22

Note: N=83.

The next data table shows information about the staff member responsible for reviewing and organizing all of the athletes' records. Table 15 breaks down the staff members as follows: athletic trainer (64.29%), athletic director (75%), athletic administrative assistant (85.92%), activities director (56%), head coach (80.33%), and other staff members (20.83%). Study participants also indicated that principals, school nurses, and general secretarial staff might also review paperwork for student athletes.

Table 15

Staff Member Responsible for Reviewing and Organizing Records

Staff Member	Yes (%)	No (%)
Athletic Administrative Assistant	85.92	14.08
Head Coach	80.33	19.67
Athletic Director	75.00	25.00
Athletic Trainer	64.29	35.71
Activities Director	56.00	44.00
Other	20.83	79.17

Note: N=83.

The mean scores for survey prompts displayed in Tables 16 were based upon a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree. Thus, a mean score of 4.60 is one that would register an average response between agree and strongly agree for a survey question prompt.

Table 16 shows a series of Likert scale prompts that asked for the level of agreement about general policies and procedures. Athletic directors, athletic trainers, and coaches were close in agreement, with a mean score over 4.0 for each of the questions, except one. The first question, 'Pre-participation medical evaluation is required for all student athletes,' had a mean score of 4.60. With an athletic directors' mean score of 4.65, athletic trainers' 4.74, and coaches' 4.42.

The second question prompt was 'Format/content of medical examination meets accepted standards as per state athletic association guidelines.' The mean score for this prompt was 4.37. Athletic directors scored a mean of 4.47, athletic trainers scored 4.66, and coaches scored 4.00.

The next question scored the lowest mean score of the set. The prompt was 'Our school has a written emergency medical plan.' The overall mean score for this question was 2.80, which was slightly below neutral. Athletic directors scored a mean of 2.53, athletic trainers 2.89, and coaches 2.84.

The fourth question asked the participant's level of agreement with the statement, 'Our school has a written protocol for return-to-play for concussions.' The average mean score for the combined groups was 4.46. Athletic directors scored a mean of 4.53, athletic trainers 4.41, and coaches 4.48.

Table 16

General Policies & Procedures Questions

Question	Mean	Std Dev.
Pre-participation medical evaluation required for all athletes	4.60	.98
Athletic Director (N=17)	4.65	.99
Athletic Trainer (N=35)	4.74	.75
Head Coach (N=31)	4.42	1.18
Format/content of medical examination meets accepted standards as per state athletic association guidelines	4.37	.93
Athletic Director (N=17)	4.47	.62
Athletic Trainer (N=35)	4.66	.48
Head Coach (N=31)	4.00	1.29
Our school has a written emergency medical plan	2.80	1.61
Athletic Director (N=17)	2.53	1.50
Athletic Trainer (N=35)	2.89	1.91
Head Coach (N=31)	2.84	1.32
Our school has a written protocol for Return-to-Play for concussions	4.46	.92
Athletic Director (N=17)	4.53	.51
Athletic Trainer (N=35)	4.41	1.10
Head Coach (N=31)	4.48	.89
Our school follows Return-to-Play protocol for concussions	4.72	.63
Athletic Director (N=17)	4.65	.49
Athletic Trainer (N=35)	4.86	.36
Head Coach (N=31)	4.61	.88
Our school requires a minimum number of practices before athletes can formally begin competition	4.55	.93
Athletic Director (N=17)	4.71	.59
Athletic Trainer (N=35)	4.46	1.12
Head Coach (N=31)	4.58	.84

Note: N=83.

The fifth question, ‘Our school follows return-to-play protocol for concussions,’ was a follow up to the previous question about return-to-play. The question asked if the participant’s school followed the return-to-play protocol for concussions. The groups scored an average mean of 4.72. Athletic directors scored a mean of 4.65, athletic trainers 4.86, and coaches 4.61.

The last question in the set on Table 16 asked for level of agreement with ‘Our school requires a minimum number of practices before athletes can formally begin competition.’ The groups scored an average mean of 4.55. The athletic directors scored a mean of 4.71, athletic trainers 4.46, and coaches 4.58. There was no significant difference between the groups.

Emergency Care Preparedness

In the first set of questions relating to emergency care preparedness the data for Table 17 reports the participants’ responses of ‘yes’ or ‘no’ concerning completion of training in the following areas: ‘Cardiopulmonary resuscitation (CPR) training is a mandatory requirement,’ ‘basic emergency care training and first aid is a mandatory requirement,’ and ‘regular emergency care-in-service training sessions are held.’ Athletic trainers held the highest percentage of completion in every category, followed by coaches with the second highest percentage of completion in every category. Athletic directors’ training completion rates were 86.27, 79.17, and 56.82 in the respective categories listed.

Table 17

Emergency In-Service Training

Training Question	Yes (%)	No (%)
Cardiopulmonary resuscitation (CPR) training is a mandatory requirement for:		
Athletic Trainers	100.00	0.00
Athletic Directors	86.27	13.73
Coaches	95.24	4.76
Officials	34.48	65.52
Basic emergency care training and first aid is a mandatory requirement for:		
Athletic Trainers	98.39	1.61
Athletic Directors	79.17	20.83
Coaches	95.16	4.84
Officials	40.00	60.00
Regular emergency care in-service training sessions held for:		
Athletic Trainers	81.13	18.87
Athletic Directors	56.82	43.18
Coaches	66.67	33.33

Note: N=83.

For Table 18, the participants were asked about the topics covered in training sessions. The participants were asked to respond either ‘yes’ or ‘no’ to the coverage of the following topics in training: ‘Compliance with legal duties and responsibilities’ (yes 81.82%; no 18.18%); ‘use of emergency transportation’ (yes 67.92%; no 32.08%); ‘securing emergency transportation’ (Ex. 911 calls) (yes 74.07%; no 25.93%); ‘general management of emergency situations’ (yes 81.48%; no 18.52%); ‘emergency management of specific inquires/illnesses’ (yes 75.93%; no 24.07%); ‘notification of parent/guardian (yes 81.13%; no 18.87%); ‘completion and submission of injury/accident reports’ (yes 77.36%; no 22.64%). Every topic scored around 75% or higher, but no

topic went above 82%. The lowest topic, 'use of emergency transportation,' scored the lowest at 67.92%.

Table 18

Emergency Care In-Service Training Sessions

Topics for Training	Yes (%)	No (%)
Compliance with legal duties and responsibilities	81.82	18.18
Use of emergency transportation	67.92	32.08
Securing emergency transportation (Ex. 911 calls)	74.07	25.93
General management of emergency situations	81.48	18.52
Emergency management of specific injuries/illnesses	75.93	24.07
Notification of parent/guardian	81.13	18.87
Completion and submission of injury/accident reports	77.36	22.64

Note: N=83.

The set of data collected for Table 19 asked the participants for a 'yes' or 'no' response on how often they received emergency care-in-service training. Annual training (71.43%) was the most frequently chosen training option for in-service training. However, within this study population 30% of respondents still reported not having in-service training even once a year.

Table 19

Frequency of Emergency Care In-Service Training

Frequency of Training	Yes (%)	No (%)
Quarterly (four times a year)	2.86	97.14
Semi-annually (twice a year)	8.57	91.43
Annually (once a year)	71.43	28.57
Bi-Annually (every two years)	36.11	63.89

Note: N=83.

The data displayed in Table 20 asked the participants to respond either ‘yes’ or ‘no’ to the availability of the types of emergency/acute health care equipment. Respondents indicated that first aid equipment was available at all high school locations (100%). Encouragingly, there was also a positive response to the availability of other important emergency care equipment: automated external defibrillator (94.92%), gloves and personal protective equipment (98.21%), and crutches (94.64%).

Table 20

Emergency/Acute Health Care Equipment Availability

Type of Equipment	Yes (%)	No (%)
AED (Automated External Defibrillator)	94.92	5.08
Vacuum splints (or appropriate alternative)	76.47	23.53
Long spine board	56.86	43.14
Hard neck collars (Philadelphia Collars)	52.08	47.92
Face mask removal equipment (Trainer’s Angels)	78.00	22.00
Resuscitation mask	82.35	17.65
Shoulder immobilizers	63.04	36.96
Blankets	75.93	24.07
Crutches	94.64	5.36
Blood pressure cuff	76.00	24.00
Stethoscope	72.92	27.08
Gloves/Personal Protective Equipment	98.21	1.79
First aid kit	100.00	0.00

Note: N=83.

Table 21 presents a summary of responses to a set of questions that again asked the participants to respond 'yes' or 'no.' The set of questions were about staff member responsibilities in emergency preparedness. Disconcertingly, around 50% of the study sample indicated they had no access to emergency telephone numbers and information. On the positive side, approximately 90% of athletic trainers and athletic directors indicated that emergency equipment was readily accessible at all practices and games, compared a 78.85% response to 'yes' for coaches. Within the sample of respondents in this study, athletic trainers (96.49%) saw their responsibility as including filling out accident or injury reports, which was notably higher than athletic directors (73.47%) and coaches (85.19%).

Table 21

Staff Member Responsibilities in Emergency Preparedness

Question	Yes (%)	No (%)
During all practices and games, emergency equipment readily accessible to:		
Athletic Trainers	91.94	8.06
Athletic Directors	89.80	10.20
Coaches	78.85	21.15
Emergency telephone numbers and information issued to:		
Athletic Trainers	50.00	50.00
Athletic Directors	44.23	55.77
Coaches	56.90	43.10
Staff member responsible for filling out and Filing accident/injury reports:		
Athletic Trainers	96.49	3.51
Athletic Directors	73.47	26.53
Coaches	85.19	14.81

Note: N=83.

The mean scores for the question prompts recorded in Table 22 were based upon a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree.

Table 22

Participant Responses to Emergency Preparedness Questions

Question	Mean	Std. Dev.
Staff member(s) responsible for emergency care – trained in the use of all emergency care equipment available	3.80	1.05
Athletic Director (N=17)	4.20	.79
Athletic Trainer (N=35)	3.96	1.20
Head Coach (N=31)	3.48	1.12
Emergency information cards accessible during all practices	3.55	1.13
Athletic Director (N=17)	4.00	1.00
Athletic Trainer (N=35)	3.20	1.15
Head Coach (N=31)	3.69	1.05
Written policies/procedures exist for securing emergency transportation (ex. 911 calls) for both practice and games	3.87	.98
Athletic Director (N=17)	4.55	.69
Athletic Trainer (N=35)	3.88	1.05
Head Coach (N=31)	3.58	.90
Written policies exist for notification of parents and school administrators for serious injuries	3.90	.99
Athletic Director (N=17)	4.45	.52
Athletic Trainer (N=35)	3.84	1.18
Head Coach (N=31)	3.73	.87
Policies and procedures exist for completing and submitting accident reports	3.94	.97
Athletic Director (N=17)	4.63	.50
Athletic Trainer (N=35)	3.84	1.03
Head Coach (N=31)	3.73	.96

Note: N=83.

A possible concern in viewing the data from Table 22 might exist, since cumulatively across all three groups, no question on emergency preparedness averaged a score higher than 4.0 for any of the five questions, despite athletic directors perceiving higher scores on each question. This might suggest a possible incongruence across staff perceptions.

Table 23 displays results of application of an Analysis of Variance (ANOVA) data recorded in Table 22.

Table 23

ANOVA for Perceptual Difference on Emergency Preparedness

Question	SS	df	MS	F	Sig.
Written policies/procedures exist for Securing emergency transportation (ex. 911 calls) for both practices & games					
Between Groups	7.25	2	3.63	4.14	.021*
Within Groups	51.71	59	.87		
Total	58.96	61			
Policies and procedures exist for completing and submitting accident reports					
Between Groups	6.72	2	3.36	3.39	.026*
Within Groups	51.02	59	.87		
Total	57.74	61			

Note: N=83.

There was a significant difference in means for the comparison of responses between the three groups on the two questions related to policies and procedures (Table 22). The null hypothesis addressed with this data was: There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the category of Emergency Care Preparedness on the survey prompts of ‘written policies/procedures exist for securing emergency transportation (ex. 911 calls) for both

practices & games' and 'policies and procedures exist for completing and submitting accident reports.' The null hypothesis was rejected when comparing responses to both prompts among athletic directors, athletic trainers, and coaches ($\alpha = 0.05$; $p = 0.021$ and 0.026 respectively).

Data supports a significant difference in responses, therefore a post hoc analysis was run using a Least Squares Difference Test to determine where significant differences lay. It was found that the Athletic directors scored a more favorable response ($\mu = 4.55$) compared to athletic trainers ($\mu = 3.88$) and coaches ($\mu = 3.58$) for the question on written policy/procedures exist for securing emergency transportation for both practices and games. For the question on policies and procedures for completing accident reports, the athletic directors also scored more favorably ($\mu = 4.63$) than the athletic trainers ($\mu = 3.84$) and coach ($\mu = 3.73$).

Injury management protocol and procedures

Table 24 describes the types of forms and records usually kept by the athletics office. Initial assessment records received the highest percentage of a 'yes' response, with 'referrals to physicians', 'daily treatments', and 'injury rehabilitation' scoring average.

Table 24

Forms and Record Keeping

Category	Yes (%)	No (%)
Initial Assessment	89.58	10.42
Referrals to Physicians	76.09	23.91
Daily Treatment	78.72	21.28
Injury Rehabilitation	76.60	23.40

Note: N=83.

Table 25 shows who was responsible for allowing a student athlete to return to play at the school. Responses suggested that the primary responsibility for determining return-to-play fell with the athletic trainer (96.15%), with head coach (21.26%), and nurse (24.32%) chosen as decision-maker a notably smaller amount of time.

Table 25

Responsible Party for Determining Return to Sport Participation at School

Staff Member	Yes (%)	No (%)
Athletic Trainer	96.15	3.85
Head Coach	21.62	78.38
Nurse	24.32	75.68
Athletic Director	5.56	94.44
Other	5.00	95.00

Note: N=83.

The mean scores for the survey prompts listed in Table 26 were based upon a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree.

An ANOVA was applied for the Likert scale questions to determine if differences existed in mean responses between the three groups. The null hypothesis addressed with this data was: There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the category of Injury Management Protocol and Procedures on the survey prompts of 'Protocol and procedures exist for referral of injured/ill student athletes to physicians,' 'A written medical release from a MD or a DO required for an athlete to return to sports participation after injury,' and 'My school has a regular system to review the effectiveness of the Athletic Training Program in preventing injury or illness.'

Table 26

Opinion Questions Regarding Injury Management Protocol & Procedures

Question	Mean	Std Dev.
Protocol and procedures exist for referral of injured/ill student athletes to physicians (Ex. Contact AD, Contact parents, bridge between parents and other medical personnel)	3.53	1.24
Athletic Director (N=17)	3.86	1.07
Athletic Trainer (N=35)	3.59	1.26
Head Coach (N=31)	3.36	1.29
A written medical release from a MD or a DO required for an athlete to return to sports participation after injury	4.32	.81
Athletic Director (N=17)	4.57	.79
Athletic Trainer (N=35)	4.18	1.00
Head Coach (N=31)	4.39	.58
My school has a regular system to review the effectiveness of the Athletic Training Program in preventing injury or illness	3.21	1.24
Athletic Director (N=17)	3.43	.96
Athletic Trainer (N=35)	2.82	1.26
Head Coach (N=31)	3.52	1.24

Note: N=83.

The null hypothesis was not rejected when comparing responses to both prompts among athletic directors, athletic trainers, and coaches ($\alpha = 0.05$; $p = .635$, .484, and .146 respectively).

No significant difference in means was found, thus post hoc tests were not conducted. However, on the question, 'My school has a regular system to review the effectiveness of the Athletic Training Program in preventing injury or illness,' the cumulative average was only 3.21. Athletic trainers in this question responded a mean score of 2.82, suggesting a potential limitation for overall ongoing program assessment.

Training room facilities and operation

The mean scores for the survey prompts listed in Table 27 were based upon a 5-point Likert scale ranging from 1 representing strongly disagree to 5 representing strongly agree.

An ANOVA was applied for the Likert scale questions to determine if differences existed in mean responses between the three groups. The null hypothesis addressed with this data was: There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the category of Training Room Facilities and Operations on the survey prompts of 'there is adequate training room space available for pre-practice/Game preparation,' 'there is adequate training room space available for therapeutic management,' 'there is adequate training room space for injury rehab,' 'training room accessibility complies with the ADA,' 'the athletic training room has adequate heating and ventilation,' and 'the athletic training room is equally accessible at all times to both male and female athletes.' The null hypothesis was not rejected when comparing responses to both prompts among athletic directors, athletic trainers, and coaches ($\alpha = 0.05$; $p = .763, .478, .139, .460, .267, .291$, and $.770$ respectively).

No significant difference in mean results were found, thus post hoc tests were not conducted. However, some of the averages suggested potential athletic training problems or issues. The question concerning adequate training room space for injury rehabilitation only scored 3.13. Finally, for the important tandem of having adequate training room space for pre-practice and game preparation, the respondents' average score was 3.48.

Table 27

Opinion Questions Regarding Training Room Facilities and Operation

Question	Mean	Std Dev.
There is adequate training room space available for pre-practice/ Game preparation (Ex. Taping and wrapping)	3.48	1.39
Athletic Director (N=17)	3.57	1.14
Athletic Trainer (N=35)	3.73	1.52
Head Coach (N=31)	3.22	1.34
There is adequate training room space available for therapeutic management (treatment tables and therapeutic modalities)	3.13	1.44
Athletic Director (N=17)	3.29	.95
Athletic Trainer (N=35)	3.32	1.62
Head Coach (N=31)	2.91	1.41
There is adequate training room space for injury rehab.	3.08	1.45
Athletic Director (N=17)	3.14	1.07
Athletic Trainer (N=35)	3.18	1.65
Head Coach (N=31)	2.96	1.40
There is adequate training room space for admin. functions	3.35	1.28
Athletic Director (N=17)	3.14	1.07
Athletic Trainer (N=35)	3.55	1.37
Head Coach (N=31)	3.22	1.28
Training room accessibility complies with the ADA	3.89	1.02
Athletic Director (N=17)	3.71	1.60
Athletic Trainer (N=35)	4.00	1.02
Head Coach (N=31)	3.83	.84
The athletic training room has adequate HVAC (Heating and Ventilation)	3.74	1.09
Athletic Director (N=17)	3.57	1.62
Athletic Trainer (N=35)	3.87	1.08
Head Coach (N=31)	3.65	.93
The athletic training room is equally accessible at all times to both male and female athletes	4.19	.86
Athletic Director (N=17)	4.00	1.73
Athletic Trainer (N=35)	4.36	.58
Head Coach (N=31)	4.09	.73

Note: N=83.

Table 28 describes the types of equipment available in respondents' high school training rooms. Most schools self-reported having storage, training tables, and an ice-machine.

Table 28

Availability of Basic Training Room Equipment

Equipment	Yes (%)	No (%)
Desk/Chair	90.00	10.00
File Cabinet	72.92	27.08
Ice Machine	90.20	9.80
Refrigerator	59.18	40.82
Sink/Hand-washing Facilities	84.00	16.00
Whirlpools	63.27	36.73
Heat Packs	84.00	16.00
Treatment/Taping Tables	96.15	3.85
Storage Cabinets (For Tape, gauze, etc)	94.23	5.77

Note: N=83.

Table 29 describes the types of rehabilitation equipment available in participants' training rooms. Responses to this question suggested some schools were missing basic injury rehabilitation equipment.

Table 29

Availability of Basic Injury Rehabilitation Equipment

Equipment	Yes (%)	No (%)
Leg exercise device (Ex. Leg press/extension)	53.19	46.81
Shoulder exercise device (Ex. Wall pulley)	50.00	50.00
Free weights (Ex. Dumbbells and weight cuffs)	77.55	22.45
Rubber tubing (Ex. Elastic bands)	91.67	8.33
Proprioceptive devices (Ex. Wobble/slide board)	71.74	28.26
Cardiovascular equipment (Treadmill/Bike etc.)	65.96	34.04

Note: N=83.

Table 30 describes the types of risk factors controlled in participants' training rooms. 'Suitable floor surface,' 'ventilation or air conditioning,' 'controlled access to storage room or cabinets,' and 'controlled access to training room' were the most common items receiving a response of 'yes.'

Table 30

Control of Training Room Risk Factors

Risk Factor	Yes (%)	No (%)	Unsure (%)
Electrical safety (Ex. Ground Fault Interpreters)	66.00	6.00	28.00
Daily sanitation/cleanliness (Ex. Floor & surfaces)	66.67	13.73	19.61
Maintenance of therapeutic modalities	66.00	6.00	28.00
Maintenance of rehabilitation exercise equipment	68.00	6.00	26.00
Controlled access to training room	74.51	13.73	11.76
Controlled access to storage room/cabinets	76.47	11.76	11.76
Ventilation/air conditioning	74.51	5.88	19.61
Suitable floor surface	82.00	6.00	12.00

Note: N=83.

Table 31 describes the types of procedures and training for addressing the need to deal with blood-borne pathogens. Reviewing this data suggested that respondents were not confident in their respective school's exposure control plan for blood-borne pathogens. Only 61.22% of respondents indicated 'yes' to the existence of 'policies and procedures for reporting exposure incidents.' This prompt represented the highest percentage response of 'yes,' followed by the prompt, 'required annual training session for employees with occupational exposure,' at 60.0%. Respondents were most unsure about the prompt, 'provision of Hepatitis B vaccine to at-risk employees' (40.82%).

Table 31

Exposure Control Plan for Blood-Borne Pathogens

Risk Factor	Yes (%)	No (%)	Unsure (%)
Determination of occupational exposure (Ex. At-Risk personnel identified)	52.00	10.00	38.00
Required annual training session for employees with occupational exposure	60.00	14.00	26.00
Provision of Hepatitis B vaccine to "at risk" employees	46.94	12.24	40.82
Policies/procedures for reporting exposure incidents	61.22	6.12	32.65

Note: N=83.

Table 32 shows how well appropriate emergency controls were being used in participants' athletic training rooms. Although it was somewhat encouraging to see over 80% of respondents indicating PPE's, antiseptics, and disinfectants were being used in their respective training rooms, less than 60% of respondents suggested contaminated sharps containers, biohazard waste containers or disposal facilities for contaminated material existed.

Table 32

Establishment of Appropriate Emergency Controls

Risk Factor	Yes (%)	No (%)	Unsure (%)
Hand-washing facilities/antiseptic (Ex. Hand cleaner and towels available)	79.59	6.12	14.29
Contaminated sharps disposal container available	59.12	22.45	18.37
Regulated waste containers with biohazard label or color code available	59.18	20.41	20.41
Appropriate work practice controls established	71.43	4.08	24.49
Gloves/Personal Protective Equipment used regularly	84.00	2.00	14.00
Appropriate disinfectant (Ex. 10% Bleach) used to disinfect work and play surfaces	82.00	2.00	16.00
Proper disposal facilities for regulated waste	61.22	20.41	18.37
Proper disposal facilities available for contaminated sharps	58.33	18.75	22.92
Proper disposal facilities for contaminated laundry towels	57.14	24.49	18.37

Note: N=83.

General program information

Table 33 shows the general information for the participating high schools. There were large observable variances in the size of the training room facility, with data representing a minimum of 50 square feet to a maximum of 2500, as well as an observable difference in the minimum high school enrollment recorded as 250 and the maximum high school enrollment recorded as 2900. The number of male athletes compared to female athletes was recorded as the same maximum. The number of concussions recorded ranged from 2 to 55.

Table 33

Descriptive Statistics for General Program Information

Variable	Min.	Max.	Mean	Std. Dev.
Approximate Number of High School Students	250	2900	1143.55	130.45
Approximate Number of Male Sports	--*	25	9.57	3.77
Approximate Number of Female Sports	--*	30	9.02	4.16
Approximate Number of Male Athletes	--*	850	311.45	184.48
Approximate Number of Female Athletes	--*	850	261.50	173.67
Approximate Number of Minor Injuries	5	500	119.95	121.28
Approximate Number of Season-Ending Injuries	--*	20	7.00	4.76
Approximate Number of Concussions	2	55	17.43	13.25
Approximate Size of Training Room Facility	50	2500	490.14	521.61

Note: N=17. (--* Not Indicated)

Table 34 shows an average of how many on and off site locations were being used for athletic events at the participating high schools. The respondents suggested that each school used an average of five off-site locations for practices or games during the school year. This represented a challenge for the athletic trainer and schools that might not have a large budget for universal athletic training coverage at all athletics locations.

Table 34

Practice & Game Facilities

Sport Season	On-Site (Avg).	Off-Site (Avg).
Fall Sports	5	2
Winter Sports	3	1
Spring Sports	5	2

Note: N=17.

Athletic training personal opinion questions

The mean scores for the question prompts recorded in Table 35 were based upon a 7-point Likert scale ranging from 1 representing strongly disagree to 7 representing strongly agree.

ANOVA analysis was conducted for each question to assess whether perceptions between the three groups were statistically significantly different. The null hypothesis addressed with this data was: There will be no difference in mean response to survey prompts by athletic directors, athletic trainers, and coaches in the category of Athletic Training Personal Opinion Questions on the survey prompts of 'Athletic training is a major priority within the overall high school athletic program,' 'Athletic training is a significant budget item in the overall athletic department,' 'High school should require at least one full-time athletic trainer on staff,' 'Injury prevention and pre-season screening of athletes is a priority at our high school,' 'When an athlete gets injured playing high school sports, it is the primary responsibility of the athletic trainer to monitor them and plan their rehabilitation,' 'Overall the athletic training programs and services at our high school are acceptable.'

The null hypothesis was not rejected when comparing responses to both prompts among athletic directors, athletic trainers, and coaches ($\alpha = 0.05$; $p = .619$, .454, .159, .614, .411, and .383 respectively).

There were no significant ANOVA's, so post hoc analysis was not run. There were however, some significant insights gained from looking at average scores on some of the questions.

Table 35

Athletic Training Personal Opinion Questions

Question	Mean	Std Dev.
Athletic training is a major priority within the overall high school athletic program	5.69	1.31
Athletic Director (N=17)	6.14	1.86
Athletic Trainer (N=35)	5.58	1.21
Head Coach (N=31)	5.65	1.23
Athletic training is a significant budget item in the overall athletic department	4.59	1.97
Athletic Director (N=17)	5.43	2.37
Athletic Trainer (N=35)	4.58	2.04
Head Coach (N=31)	4.35	1.80
High school should require at least one full-time athletic trainer on staff	6.00	1.50
Athletic Director (N=17)	5.00	2.51
Athletic Trainer (N=35)	6.10	1.29
Head Coach (N=31)	6.22	1.20
Injury prevention and pre-season screening of athletes is a priority at our high school	5.33	1.52
Athletic Director (N=17)	5.86	1.68
Athletic Trainer (N=35)	5.26	1.48
Head Coach (N=31)	5.22	1.54
When an athlete gets injured playing high school sports, it is the primary responsibility of the athletic trainer to monitor them and plan their rehabilitation	5.45	1.50
Athletic Director (N=17)	5.00	2.08
Athletic Trainer (N=35)	5.79	1.55
Head Coach (N=31)	5.30	1.26
Overall the athletic training programs and services at our high school are acceptable	5.10	1.97
Athletic Director (N=17)	5.86	1.87
Athletic Trainer (N=35)	4.68	2.24
Head Coach (N=31)	5.22	1.76

Note: N=83.

Most notably, the average score on a question, 'Overall the athletic training programs and services at our high school are acceptable,' was a 5.10, with athletic trainers only scoring a 4.68. This is similarly problematic for the question, 'Athletic training is a significant budget item in the overall athletic department.' The cumulative average score on this question was 4.59, with athletic trainers and coaches scoring 4.58 and 4.35 respectively (out of a possible 7). Finally, on the question 'Athletic training is a major priority within the overall high school athletic program,' the overall average was a 5.69, and the athletic trainer average was a 5.58.

Summary

In this chapter the researcher provided data analysis to be used to answer the research and hypothesis questions. The data showed there were some differences between groups, and there were also instances in which the groups agreed with one another. The data showed there were some issues with emergency action planning, blood-borne pathogens, having a system to review the effectiveness of the athletic training program, having adequate space available for therapeutic management, injury rehabilitation, and administrative functions. The groups were neutral in their agreement that athletic training was a significant budget item and their athletic training programs at their schools were acceptable. There were also significant differences between groups when it came to views of written policies and procedures for emergency transportation and existing policies and procedures for completing and submitting accident reports. In Chapter Five the researcher will explain in detail the importance of these findings and how the data reflects upon the research questions and hypothesis.

Chapter Five: Summary and Discussion

Introduction

The purpose of this study was to evaluate high school athletic training programs and services for high school athletes in the Gateway Athletic Conference, based in St. Charles County, Missouri. The goal of this study was to provide information that may contribute to improving athletic training services in Missouri high schools. Recent to the this writing, the Missouri State High School Athletic Association (MSHSAA) initiated a Committee on Injuries and Medical Information, called the Sports Medicine Advisory Committee (2011a, 2011b, 2012a, 2012b). The committee made an effort to advocate for baseline testing for concussions, promote the importance of having first aid and CPR training for all coaches, and made other policy and procedure recommendations aimed at protecting the safety of high school athletes competing in the state of Missouri. Despite this effort, there still remained little knowledge regarding the day-to-day challenges facing most Missouri high schools in regard to sports injuries and athletic training services. This study explored perceptions of coaches, athletic directors, and athletic trainers working in one specific Missouri high school conference, the Gateway Athletic Conference.

The participants in this study included athletic directors, athletic trainers, and other coaches from the 17 Gateway Athletic Conference high schools. The research also included participants from different conferences, which included the Suburban South 12, Suburban North 12, Metro Catholic Conference, Greater Kansas City Suburban Conference, Archdiocesan Athletic Association, Missouri River Valley Conference, Midland Empire Conference, Kansas City Interscholastic, and Big 8.

In this chapter the researcher applied the statistical information from the survey and compared how athletic directors, athletic trainers, and coaches responded when asked specific questions about athletic training services and facilities at their high schools. The data was also analyzed within the context of the following research questions and hypothesis:

Research Questions

The study was focused on these seven research questions:

1) To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?
2) To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?
3) To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?
4) To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?
5) To what extent is athletic training accepted as a major priority within high school athletic programs?
6) Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?
7) Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

Hypothesis

There will be a difference in one or more of the mean responses to survey prompts by athletic directors, athletic trainers, and coaches in the categories of Emergency Care Preparedness, Injury Management Protocol and Procedures, Training Room Facilities and Operation, and Athletic Training Personal Opinion.

General Discussion

The breakdown of participants for this study was as follows: There were 83 total participants (Table 5). Out of those, 17 were athletic directors, 35 were athletic trainers, and 31 were coaches. Almost half of the participants were athletic trainers in this study. Even though the majority of the participants were athletic trainers, the data still provided the researcher with some significant insights.

Interestingly, only 17 out of the 83 schools had a full-time trainer on staff. There were 14 schools, or 16.90%, that employed a part-time trainer. The majority of schools, 46 or 55.40%, employed a trainer contracted out through an agency. Only six schools, or 7.20%, assigned a non-certified coach or staff member to athletic training duties. The research showed that most schools were contracting out their athletic trainers. This could be a result of saving money or lack of ability to secure a full-time NATA board-certified athletic trainer through the school district. This could also be a direct result of a lack of education to the school board on the importance of securing a full-time athletic trainer at the high schools. There were some school districts that used the same contracted athletic training service for each of their high schools.

Table 10 shows that athletic coverage was broken into the following categories: full-time daily coverage, 35.59% of the time; afternoon only coverage, 79.41%; and game

coverage only, 75.44%. The research showed there were athletic events going on without an athletic trainer present. This could present a possibly negative outcome at practices or games in which a student athlete could become injured. Athletic trainers should be available 100% of the time to provide assistance and care, in case a student athlete is injured.

Pre-season screening is another area in athletics which was important to assess for possible future injuries. Table 11 shows that only baseline concussion testing is being completed at the higher rate than other types of screenings. Baseline concussion testing was completed at most of the high schools surveyed, evidenced by the response rate of 76.54%. There were 14 respondents that did not conduct any pre-season screening, which was a rate of 17.28% of the participants. Only three respondents, or 3.70%, conducted a functional movement screen test, and only two high schools, or 2.47%, conducted the sit and reach flexibility screen.

Pre-season screening tools are important to help identify possible injuries, or in the case of a concussion, a baseline test may help an athletic trainer to identify if a student athlete becomes concussed. The functional movement screen test, along with the sit and reach test can help to determine flexibility and potential weaknesses that could cause injury to a student athlete's physical frame.

Pre-participation evaluations are also very important to screen student athletes in order to make sure they are physically fit to compete in high school sports. Table 12 provided information about the types of evaluations taking place at the participating high schools. Each participating high school had a 100% participation rate for medical physical examinations and parent/guardian consent signatures. Only one respondent did

not indicate use of medical authorization for participation, and only four respondents did not indicate use of a medical history, which left 95.18% of high schools that did use the medical history. Having 100% participation for medical physical examinations was very important in high school athletics. This shows that every participating high school was following this policy. It is important to have each of these categories at 100%, because this ensures that all student athletes were receiving the proper medical screening and permissions to participate in high school athletics. Unfortunately, a couple of these categories were not at 100% consensus.

The data from Table 8 shows the medical service availability at the participating schools. Over 60% of respondents (60.24%) from the participating schools had access to a doctor or general practitioner. Other medical professionals were under-represented in this study. These numbers should be higher in the regard that school districts and medical professionals should communicate more about helping the student athletes who are competing in the community. Most high schools should have access to an in-house professional guidance counselor, who should already be on staff and made available, in case he is needed.

The general program information is listed on Table 33. The range of the student populations was from 250 to 2,900 students in the GAC participating schools. There was also a maximum of 25 male sports and 30 female sports represented. The number of student athletes ranged from 0 to 850. The data listed here shows there were small schools that participated in the study, along with larger schools. There were also schools within the middle of this range that participated in the study. This helped to give the

researcher better insight into a wide range of school populations, as well as the student athlete population.

Medical examinations were completed by different medical professionals (Table 8). Most respondents indicated the use of a medical doctor or general practitioner (68), at a rate of 81.93%. The next most frequently selected medical professional was a licensed chiropractor or doctor (55), at a rate of 66.27%. Respondents also indicated the use of a nurse practitioner (42), at a rate of 50.60%. They also used a physician assistant (36), at a rate of 43.37%, and used other medical professionals (5), at a rate of only 6.02% of the time. For this question, the participants had student athletes receive medical examinations from multiple professionals. This was important so that a student athlete had options to make sure they were properly evaluated in the eyes of a medical professional.

The participants were also asked to give responses on forms required from student athlete participation. The data shown on Table 14 reported that 95.18% of the respondents indicated a required informed consent to play sports. Emergency cards were also required, as evidenced by 92.77% of the respondents, and the emergency cards included a list of information items about the student athlete, in case he would become injured or need medical attention. The list of informational items that high schools required included: list of allergies, 87.50%; contact of parent home phone, 96.34%; contact of parent work phone, 87.65%; consent for emergency treatment form, 90%; hospital preference, 64%a'nd medical insurance information, 80.25%. The last piece of data in Table 14 reported the responses given when participants were asked if medical history or examinations were required, and 98.78% replied with 'yes.' The majority of

these items were answered with high percentages of 'yes' responses regarding information required for a student athlete to receive the proper medical attention, although it would have been better to see numbers closer to 100%, if not actually 100%.

Table 15 showed information about which staff member was responsible for reviewing and organizing all of the records. Table 15 breaks down the responsibility list of different staff members as follows: athletic administrative assistant, 85.92%; head coach, 80.33%; athletic director, 75%; athletic trainer, 64.29%; activities director, 56%; and other staff members, 20.83%, as representing the division of responsibilities among staff. The data is showing that the athletic administrative assistant was the main person who took care of the records. The head coach also bore this responsibility, as well. Overall, the data showed that each of these staff members had some responsibility for handling student-athlete records. Accurate record keeping is imperative in a high school athletics program. The athletic office should know that every student athlete followed every MSHSAA rule along with the school's policies.

Summary of Results

Research Question One: To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures?

The researcher found that the data taken from the questions on Table 8 reported by athletic directors, athletic trainers, and coaches concerning governing administrative policies and procedures, scored a mean above neutral on each question. There were no notable differences, based upon respondent position, for any of the questions. The mean score for 'existing job descriptions define the responsibilities and legal duties of the athletic trainer' was 3.73, a response between neutral and agree. Athletic directors scored

a 3.88, athletic trainers scored a 3.73, and coaches scored a 3.65. For this prompt all the respondents were close in their assessment of agreeing with the question of job descriptions and responsibilities of the athletic trainer. It is important that these groups, for the most part, agreed on the athletic trainer's role at the high school. The groups also realized what the trainer should be doing on a daily basis.

The second prompt of 'job descriptions defining the responsibilities and legal duties of the athletic director' had a mean score of 3.69. Athletic directors scored the highest, with a mean score of 4.0, which meant that they agreed with the job descriptions defining their responsibilities. Head coaches had a mean score of 3.74, and athletic trainers had the lowest score of 3.47. It should be important to note on this question that athletic trainers were leaning towards neutral and that athletic directors agreed with the question concerning knowing their roles and responsibilities. Are athletic trainers seeing a different side to the role of the athletic director? They might possibly feel that the athletic director's job duties had not been clearly described to them, or they may feel that the athletic director was not doing enough to satisfy the needs of the athletic program.

The third prompt of job descriptions, 'defining the responsibilities and legal duties of the coaches,' had a mean score of 3.66. Athletic directors scored the highest mean score of 3.77. Coaches scored next with a mean score of 3.71, and athletic trainers again scored the lowest with a mean score of 3.56. Here the athletic trainers also scored lower than athletic directors and coaches. Again athletic trainers may possibly feel that the coach's duties and responsibilities were not clear enough to them.

The final prompt of the athletic trainer's 'responsibilities to student athletes is defined in their job description and is consistent with state law' had a mean score of 3.65.

Again, athletic directors had the highest mean score of 3.88 compared to athletic trainers at 3.61 and coaches at 3.58. It is interesting to note that the athletic directors had the highest mean scores for each of these questions. Even on this question, the athletic trainers were just barely leaning towards agreeing with the question. It seems obvious to the researcher in looking at the data from Table 9, that athletic directors and athletic trainers had different perceptions about the existing job descriptions and responsibilities of the members of the athletic department.

On Table 16, another series of Likert scale questions were asked about general policies and procedures. Athletic directors, athletic trainers, and coaches were close in agreement with a mean score over 4.0 for each of the questions, except one. The first question, 'pre-participation medical evaluation is required for all student athletes,' had a mean score of 4.60. With an athletic director's mean score of 4.65, athletic trainers at 4.74, and coaches at 4.42. Each of the groups answered the question leaning towards strongly agree. This is important to note, because each group strongly agreed that each student athlete should be evaluated before the season begins. This means that each group was looking out to make sure their student athletes were physically fit to participate in sports for the upcoming year.

The next question asked if the 'format/content of medical examination meets an accepted standard according to the state athletic guidelines.' The mean score for this question was 4.37. Athletic directors scored a mean of 4.47, athletic trainers 4.66, and coaches 4.00. There was a notable difference in the fact that athletic trainers were leaning towards strongly agree, while coaches only agreed with the question. This may be because athletic trainers more closely monitored accepted standards for athletics.

The next question scored the lowest mean score of the set. The question addressed 'if the participant's school had a written emergency medical plan.' The overall mean score for this question was 2.80, which was slightly below neutral. Athletic directors scored a mean of 2.53, athletic trainers 2.89, and coaches 2.84. Even though there was a difference in this question compared to the other questions in the set, there was still no notable difference between the groups. This is an important question to look at, because this shows that each group was just above disagreeing and neutral that their school had a written emergency medical plan. This could create a serious problem if a student athlete becomes severely injured or ill on the field, and the seriousness of the impairment could have been reduced if the school had a medical plan in place.

The next question in the category asked the participants 'if there school had a written protocol for return to play for concussions.' The average mean score between the groups was 4.46, which was between agree and strongly agree. Athletic directors scored a mean of 4.53, athletic trainers 4.41, and coaches 4.48. This question is important because this means that at least these groups were aware of a return-to-play protocol for concussions. Hopefully, these participating schools were following this protocol, because this was mandated through MSHSAA that any athlete who becomes concussed must follow this protocol.

The next question was a follow up to the previous question about return-to-play. The question asked 'if the participant's school followed the return-to-play protocol for concussions.' The groups scored an average mean score of 4.72. Athletic directors scored a mean of 4.65, athletic trainers 4.86, and coaches 4.61. This is a little discouraging, because all of the groups should be following to the letter the procedure of

return-to-play. Not only is it mandated through MSHSAA, each group has to watch a concussion video for certification each season, through MSHSAA, that specifically deals with concussions. The procedure is clearly laid out in detail in the video; there should be no excuse for not following this protocol. There needs to be more awareness for this policy.

The last question in the set reported on Table 16, asked the participants 'if their school requires a minimum number of practices before their athletes could formally begin competition.' The groups scored an average mean of 4.55. The athletic directors scored a mean of 4.71, athletic trainers 4.46, and coaches 4.58. This question should also have 100% agreement. Through MSHSAA, there is a requirement of 14 separate days of practices, in order to become eligible to play in an athletic contest. Every group should also be well aware of this rule, and the numbers should be higher. There also needs to be more awareness for this policy.

For the most part, the data supported the answer to the research question, To what extent does a Missouri high school best practice exist in athletic training for governing administrative policies and procedures? Each of the groups answered closely enough with one another that there were no notable differences on any question. There was only one question in which the groups all felt their school did not have a written emergency medical plan. The data collected from the groups showed that most of the time each group was leaning toward either agreeing with or strongly agreeing with each question prompt.

Research Question Two: To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness?

The data for best practices in athletic training for emergency care preparedness showed that, for the most part, there were no notable differences between the groups. However, when the participants were asked about 'written policies/procedures existing for securing emergency transportation for both practices and games' (Table 22) there was a significant difference. There was also a significant difference when the participants were asked 'about policies and procedures existing for completing and submitting accident reports' (Table 22). These are important to point out because there was an obvious difference between the groups. Athletic directors scored the highest on the responses for both questions compared to athletic trainers and coaches. This could be that athletic directors were required to complete these policies as part of their job, and athletic trainers and coaches did not have to worry about these policies as part of their job, or the athletic director was assuming that these policies were being followed.

In the first set of questions relating to emergency care preparedness the data for Table 22, participants were asked to respond either 'yes' or 'no' to questions. The data showed that all athletic trainers were receiving training for CPR, but the other representative groups were not. Coaches were close to 100%, which is a good response because they were on the field with their athletes at all times. Athletic directors also reported a high percentage, since they too were attending most athletic competitions. The officials scored very low with less than 40%, which was a possible concern for the future, because they were also our there for competitions in which athletes were competing.

When the groups were asked if emergency care training and first aid were a mandatory requirement, athletic trainers again scored the highest percentage of 'yes,' but they were still not 100%, which is concerning, because they were supposed to be trained

in first aid. Coaches were 95%, but first aid and CPR training should be a mandatory requirement for all school districts. Athletic directors scored almost 80%, which again is still a high number, but officials again scored at 40%, which is low. Reporting in this area needs to be better, because when student athletes are in staff members' care during athletic competitions, all staff members should know how to handle a situation in which an athlete may become seriously hurt or ill.

The last question for the Table 227 was if 'regular emergency care-in-service training sessions were held' for each of the groups mentioned, with the exception of officials. As expected, athletic trainers scored the highest with just over 80%, which is a high number, and it is important to note that most trainers were receiving regular training. Coaches were next with only about 65%, and athletic directors were a little lower than 60%. These numbers showed that over half of the respondents were participating in some sort of emergency care-in-service through the school district. However, these numbers could be better, because the more a staff member is trained and aware of how to treat an emergency situation, the higher the success rate will be for injured athlete treatments.

For Table 18 the participants were asked about the topics covered in training sessions. The participants were asked to respond either 'yes' or 'no' to each question. Every topic scored around 75% or higher, but the score for no topic went above 82%. The lowest scored topic was 'use of emergency transportation' at 67.92%. This is important because in Table 22 there was also a difference recorded with a question related to emergency transportation. The rest of the questions, according to the data, were mentioned regularly in training sessions. The use of emergency transportation is a

real issue with the respondents' school districts. All staff members should be made aware if there is a plan, or if there is no plan in place; then the school districts need to adapt a new emergency transportation plan.

The set of data collected for Table 19 asked the participants for a 'yes' or 'no' response on how often they received emergency care in-service training. The data showed that out of the majority of the participants, 71.43% received annual training, while 36.11% received training every other year. At least the majority of the participants were receiving emergency care training either yearly or every other year. This allowed these groups to stay current and provide the proper emergency care to their student athletes if they became injured. With proper and frequent training these groups will become aware of how to handle different situations in which an athlete in their care becomes ill or injured.

The data from Table 20 asked the participants to respond either 'yes' or 'no' to availability of the types of emergency/acute health care equipment. The data showed every item listed was available, as assessed by that at least 50% of respondents. The AED should be available in every training room, and the data showed that only 94.92% of respondents reported their training rooms had one. It could be possible that a couple of participants did not know what an AED was, which could suggest why the number was not 100%. The face mask removal was also very low with a 78% response rate. Most high schools supported football, or other sports in which athletes wear head gear with facemasks for protection. If an athlete is injured the trainer must be able to remove the facemask, in case resuscitation is necessary, or if the athlete has a possible neck injury and the helmet cannot be removed. Another item which scored low was the long spine

board with only 56.86% of respondents reporting one at their respective schools. This is important in case an injured athlete needs to be moved without the fear of damaging the neck or spinal cord. The long spine board should be made more accessible.

Table 21 displays a set of questions that asked the participants to respond 'yes' or 'no.' The set of questions are about staff member responsibilities in emergency preparedness. The first question should have had a higher percentage of coaches with access to emergency equipment during all athletic competitions. Coaches are always with their athletes during practices and games and should be able to access the proper equipment to help an impaired athlete. In regards to emergency telephone numbers and information, these reported percentages should also have been higher, as each group was only around 50% response rate of 'yes.' Again coaches and trainers should have numbers at 100% if they are primarily responsible for the care of the athletes. The data also showed that all three groups had a role in filling out and filing accident reports. Athletic trainers had almost a 100% role with accident reports which was encouraging to note, because they are the ones who take care of an injured athlete.

The last set of questions from the emergency care preparedness category are listed on Table 22. Two questions reported significant group differences. These two data questions were analyzed using an ANOVA, as illustrated in table 23. The data showed there was a significant difference between the groups on these questions. The questions that yielded significant differences were 'written policies and procedures exist for securing emergency transportation for both practices and games' and 'policies and procedures exist for completing and submitting accident reports.' This is a potential issue in these athletic programs, if there is no specific policy in place for emergency

transportation and correctly submitting and completing accident reports. There could be cases in which a student athlete who becomes injured could have receive emergency transportation sooner, therefore preventing possible further injury. The issue with not properly completing and submitting accident reports could lead to inaccurate medical records for an injured student athlete.

The other sets of questions on Table 22 did not have significant differences between the groups, but yielded some interesting results from the data. For instance the question of 'staff members responsible for emergency care – trained in the use of all emergency care equipment available' had athletic directors scoring a mean of 4.20, which is much higher than the coaches mean of 3.48. There is a difference to this question, because athletic directors were between agree to strongly agree, while coaches were between neutral to agree. This could possibly mean that athletic directors were more aware of what was in the training facilities, and they had had more opportunities to learn how to use the emergency equipment. Coaches may not be as concerned about emergency care equipment, because they may feel it is the athletic trainer's responsibility to take care of an injured athlete. There is also the possibility that coaches were not given the opportunity to learn how to use emergency care equipment, or did not know that it was available or what it was. Unfortunately, no one should just rely on one person to come and take care of an injured athlete. There may be a time when the trainer is busy or is at another part of the facility and cannot get there fast enough and the coach may need to start first aid or another form of medical care.

The next question was about 'emergency card information being accessible during all practices.' The data from this question showed that athletic directors had a mean

score of 4.00, which meant that they all agreed with this, but the athletic trainers leaned closer to neutral with a mean score of 3.20. Athletic directors could be assuming that emergency cards were available during practices and maybe athletic trainers were unaware if the cards were actually available or they knew that the cards were not accessible.

The last question on Table 22 is 'written policies exist for notification of parents and school administrators for serious injuries.' There was also a difference between athletic directors and the other two groups in examining the response to 'yes' rates for this prompt. Athletic directors scored a mean of 4.45 which is between agree and strongly agree, while athletic trainers (3.84) and coaches (3.73) were between neutral and agree. Athletic directors could have scored higher on this question because this was part of their job to make sure this policy was followed. Athletic trainers and coaches may not be aware of this simply because it was not part of their job, and therefore they were unaware of whether a policy exists. Training needs to be done to ensure coaches and athletic trainers are more aware of practices.

Overall it appears that there are some concerns raised in answering the research question. To what extent does a Missouri high school best practice exist in athletic training for emergency care preparedness? This does not mean to suggest that the athletes competing in high school sports are in danger, but the data showed that athletic directors, athletic trainers, and coaches had some differences when it comes to emergency care preparedness. This researcher firmly believes that those involved in high school sports still have the best interests of the athlete at all times. The athletic directors never scored below a mean of a 4.00 on any question on Table 22. The data suggested that

athletic directors were either very aware of the policies and procedures for emergency care preparedness or they were assuming everything was in working order. The athletic trainers and coaches had a different opinion, according to the data. They never had a mean score at, or above, 4.00. This suggests that they were either unsure of these policies or they felt they were not being properly utilized.

There were also some concerns with the types of emergency health care equipment available and that coaches did not have complete access to the equipment that was available during practices. Although, it was important to note that the majority of athletic directors, athletic trainers, and coaches were attending either annual or bi-annual training for first aid and CPR. The one disappointing result from the data session in the evaluation of school personnel showed that most officials did not attend a first aid or CPR training.

Research Question Three: To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures?

The data in Table 24 consisted of identifying the categories of forms and record keeping used. None of the categories scored above 90%. The different categories were initial assessment, referrals to physicians, daily treatments, and injury rehabilitation. The data showed that only about 75% of these records were being kept. This could be that the school did not have someone designated to file them, or in some cases a school may not have an athletic trainer to file medical documentation. Either way, the data should be closer to 100%, because it is important to know the history of an athlete. The athlete may not have the same athletic trainer during his entire high school career, and a new athletic trainer would not know the history of any athletes when he first starts his position.

According to the data in Table 25, the athletic trainer is primarily responsible for determining when an athlete can return to play. The data from table 25 was encouraging because 96.15% of participants agreed that the athletic trainer was responsible for returning athletes to the field. The next persons agreed upon to make the decision was the school nurse and head coach each with about 25%. The reason for a nurse or head coach deciding on an athlete returning could be that the school may not have a trainer and the nurse or coach is completing the responsibilities of the trainer.

The last set of questions for this section was comprised of opinion questions regarding injury management protocol and procedures. The data for these questions are displayed in Table 26. An ANOVA test was applied, and no significant differences were found between the groups. There were, however, differences between the responses for each question. The first question was 'protocol and procedures exist for referral of injured/ill student athletes to physicians.' Athletic directors, athletic trainers, and coaches reported responses between neutral and agree. Each group was not really sure that procedures did exist for referring athletes to physicians. This is very important in the event an athlete becomes injured and needs to see a specialized medical professional; not only for proper recovery, but that everyone is informed of the condition of the athlete.

The next question was a 'written medical release from a MD or a DO is required for an athlete to return to sports participation after an injury.' This question was rated the best response from the groups, with a mean score of 4.32, which is between agree and strongly agree. This is important, because each group of participants knows and understands that in order for an athlete to return to the field he must be cleared by a medical professional.

The last question asked was ‘my school has a regular system to review the effectiveness of the athletic training program in preventing injury of illness.’ This question had some differences between the groups. Athletic trainers scored a mean of 2.82, and athletic directors scored a mean of 3.43, with coaches scoring a 3.52. There were some differences to this question because athletic directors and coaches were between neutral and agree, while athletic trainers were between neutral and disagree. This could be because the athletic trainers were the ones actually working with the injured athletes and they knew whether or not there was a regular review of the effectiveness of the athletic training program. Athletic directors could think that they already did this on a regular basis, so there was no need for regular reviews. Coaches may just not know, or they think that this is completed by the athletic trainer. Either way there should be some sort of regular system in place to evaluate and review the overall athletic training program.

Overall there appeared to be some issues with the research question, To what extent does a Missouri high school best practice exist in athletic training for injury management protocol and procedures? Most of the questions that were asked had some differences according to the data, even though there were no significant differences. The numbers in regards to forms and record keeping should indicate better scores. It appears that record keeping is being completed, but it could be done at a higher rate. The return-to-play falls primarily on the athletic trainer with over 95% of the respondents reporting this is the responsible party for letting athletes return to the field. There was another notable finding; the athletic trainers responded that their high school did not do a good

job of reviewing the effectiveness of the athletic training program in the prevention of injury and illness.

Research Question Four: To what extent does a Missouri high school best practice exist in athletic training for training room facilities and operation?

The data from Table 27 in regards to training room facilities and operation showed no differences between groups in evaluating the training room. However, there were still some data to point out in relation to the opinions of athletic directors, athletic trainers, and coaches towards training room facilities and operation. Each of the groups scored a mean between neutral and agree that 'there was adequate training room space available for pre-practice/ game preparation.' This is an issue because this means that there was not really enough room for the athletic trainer to perform his or her job of treating student athletes effectively. Each group realized this, and the issue should be addressed with larger space for the training room.

The next question was 'there is adequate training room space available for therapeutic management.' This question scored even lower than the first question. All of the groups were closer to neutral, and coaches scored between disagree and neutral. There is a possibility that the coaches scored lower because they wanted their athletes treated so they could get back out on the field as soon as possible. If there was more space available, there would more likely be more equipment to rehabilitate from injury or athletes could receive treatment faster.

The next question asked 'was there is adequate training room space for injury rehab.' Each group scored closer to neutral, with the coaches again scoring below neutral. It appeared according to the data that each group felt that the training room

space could be improved for injury rehabilitation. Again, if there is more space then more athletes can be treated at one time, instead of some having to wait their turn.

The next question also has to do with space. The question was 'there is adequate training room space for administrative functions.' Each of the groups responded with a mean score between neutral and agree. Athletic trainers scored the highest mean of 3.55. The reason the athletic trainers could have scored higher is they were the ones using the space the majority of the time, and they may feel they had enough space to complete administrative duties. Overall the groups still felt neutral, since the administrative space was not adequate, which could be a possible problem. Athletic trainers do need space to complete administrative duties, along with caring for student athletes who come in for treatment.

The next question was 'if the groups felt that the training room complies with the ADA.' This data showed that the groups all scored between neutral and agree with athletic trainers scoring a mean of 4.00. Athletic directors and coaches also scored close to a 4.00. This is an encouraging sign that the groups felt that their training room facilities were compliant with ADA regulations.

The next question asked was whether 'the athletic training room has adequate HVAC.' All of the responses were between neutral and agree with the athletic directors scoring the lowest mean of 3.57. This could be that they had higher standards in which they wanted to make sure that the athletes in the programs were using a facility that was comfortable to receive medical treatment. It is interesting to note that athletic trainers scored the highest at 3.87. Again, the trainers are in the facility every day and they may

feel that the facility is closer to being comfortable and acceptable for them to treat athletes.

The last question on Table 27 was 'if the training room is equally accessible at all times to both male and female athletes.' The groups mean score was 4.17 and every group scored higher than a mean of 4.00. The data showed that each group had a mean score between agree and strongly agree. The numbers are encouraging in that each group felt that both male and female student athletes were receiving equal opportunities in the training room.

The last table of data on Table 28 asked a series of Likert scale questions based on the opinion of the three groups. Table 28 asked the groups about the different types of training room equipment they had in their training room. There were a few items that were interesting to note that some athletic training rooms did not have. Only about 90% of respondents reported their training rooms had an ice machine. This is important because having access to an ice machine in the training room allows the athletic trainer easy access to make ice packs for injured athletes or to use as treatment for athletes after practices or games. Ice is also used to keep water cooled in water jugs while athletes are competing. Additionally, if the training room has a whirlpool, athletes may take an ice bath to help their muscles recover after strenuous training or games. An ice machine serves multiple purposes in the training room, and each training facility should have one.

The next item showed that only 84% respondents reported their training rooms had sinks or hand-washing facilities. This also should be at 100%, for the sake of making sure the athletic trainer or anyone else that uses the room has a place to sanitize their hands. Another item that scored lower was use of a file cabinet, at 72.92%. This could

possibly be lower simply because of the use of computers to store information and keep it secure on a district server. The next item to score low was having a whirlpool which scored to indicate only 63.27% of training rooms had one. This could be due to not having enough space, which was alluded to earlier in the data; but it may also be a budget issue in which some schools may not be able to afford one.

The last item to score low on the survey was not having a refrigerator in the training room. Only 59.18% respondents reported their training rooms had one. This is also another important part of a training room. A refrigerator could be used for storing cold packs, medicine, sports drinks, or any other items that athletes could store for nutrition. This number should also be higher for the reason mentioned above. The rest of the items from the data included a desk/chair, heat packs, treatment/taping tables, and storage cabinets. All of these items were listed at higher percentages and available in most athletic training facilities.

The next set of items on Table 29 were related to the types of injury rehabilitation equipment available in the participants' trainings rooms. The highest scoring item was rubber tubing at 91.67%, which is relatively good since this type of equipment is good for rehabilitating numerous injuries, and it is small enough to store when the training room is limited on space. The data from earlier did suggest that most of the athletic training room facilities were smaller in size. The rest of the equipment items scored at 77% or less, and again this could be due to a couple of factors. The first could be limited space, and second these items may already be available in the school's weight room. There is also the possibility that these schools had no access to the following items: leg exercise

device, shoulder exercise device, free weights, proprioceptive devices, and cardiovascular equipment. Budget constraints could also be a factor.

The next set of data on Table 30 provided information on the control of training room risk factors. This question gave the participants an option to respond 'yes', 'no', or 'unsure.' The participants responded 'yes' between 66% and 82%; 'no' between 5% and 14%; and 'unsure' between 11% and 28% on questions concerning electrical safety, daily sanitation/cleanliness, maintenance of therapeutic modalities, maintenance of rehabilitation exercise equipment, controlled access to training room, controlled access to storage room/cabinets, ventilation/air conditioning, and suitable floor surface. For the most part, the data from Table 30 showed that there needs to be more awareness about these items to make sure they are being cleaned or their maintenance is brought up in training sessions with athletic trainers, athletic directors, and coaches. This way more participants would know in the future about these aspects of the training room.

The data for Table 31 focused on the exposure control plan for blood-borne pathogens in the training room. The information from Table 31 is concerning because it showed that only about 50 to 60% of the participants responded 'yes' while 25 to 40% of the participants responded 'unsure.' The four questions asked were: 'determination of occupational exposure,' 'required annual training session for employees with occupational exposure,' 'provision of hepatitis B vaccine to at risk employees', and 'policies/procedures for reporting exposure incidents.' The risk of spreading disease through blood-borne pathogens is a danger, which is a reason for being concerned about the questions in this table. Each group of participants should be more aware of the potential dangers and how to prevent the exposure to blood-borne pathogens.

The data from the last question related to training room facilities and operations. Table 32 asked the participants about the establishment of appropriate emergency controls. There are some concerns with the proper disposal of waste, contaminated sharps, and laundry towels. Only about 60% of the participants responded that there were controls for these items. This means that there is a higher potential for the spread of disease in the training room if waste is not being properly removed or managed.

There are some concerns with the training room practice, facilities, and operation. The data suggests that the groups of participants were at least neutral or they agreed with most of what was taking place in the training room facility. Although the groups felt there was not enough space when it came to providing injury rehabilitation, administrative functions, and treatment tables. This is an issue because these respondents felt their high school did not provide enough room for these services. This could be due to the lack of budget or space within the school. There are some concerns when it comes to the handling of discarded materials from the training room and the type of equipment available for the treatment of the athletes. There is also the potential that blood-borne pathogens could cause some harm to the individuals involved in the athletic training programs, because they may not know how to properly handle a situation in which blood is present. It is alarming that the participants had a low percentage rate of response to 'yes' with the questions regarding blood-borne pathogens. This needs to be addressed with specific training sessions geared toward the proper handling and procedures for dealing with blood-borne pathogens. The low response could indicate that maybe high schools overlooked the possibility of blood-borne pathogens occurring or maybe athletic

directors, athletic trainers, and coaches did not witness many instances in which they dealt with blood-borne pathogens, so they feel training is not a top priority.

Research Question Five: To what extent is athletic training accepted as a major priority within high school athletic programs?

The data from Table 35 provided insight into research question five. Table 35 contained a series of Likert questions on a 7-point scale ranging from 1 representing strongly disagree to 7 representing strongly agree about the personal opinion of athletic training at each participant's high school. The first question was 'athletic training is a major priority within the overall high school athletic program.' Athletic directors scored the highest between agree and strongly agree, while athletic trainers and coaches scored between somewhat agree and agree. This is interesting because athletic directors seemed to feel that athletic training was a major priority while trainers and coaches felt neutral on the subject. This could be that trainers and coaches were closely involved with their athletes and understood that they needed better care than they were receiving.

The next question was 'athletic training is a significant budget item in the overall athletic department.' Again athletic directors scored the highest between somewhat agree and agree; while athletic trainers and coaches scored between neutral and somewhat agree. This is important to note because the two groups who were working with the student athletes realized that there needs to be more resources allocated to the athletic training department. The athletic director is more familiar with the budget since he or she knows from year-to-year what the department is allowed to spend, and there are plenty of needs on a yearly basis for every sports program, including the training department.

There may not be enough funding to give the athletic departments what they need to help treat injured student athletes.

When the groups were asked if the high school should require at least one full-time athletic trainer on staff, the athletic director scored the lowest by somewhat agreeing with the question. The athletic trainer and coaches scored between agree and strongly agree. Each group at least acknowledged that fact that it would be good to have at least one full-time trainer on staff. Only the athletic trainers and coaches felt more strongly about the issue. This could be that the trainers and coaches realized that if there was someone at the school full-time they could provide a much better service to the student athlete population. This could include more pre-season screening of the athlete and, regular checkups the day after an athlete was injured. There would also be a better familiarity between the trainer and athlete, and the trainer would know the history from year-to-year of the athletes and parents he or she is treating and communicating with. The athletic director may not have the money to hire a full-time trainer, which could be the reason for only somewhat agreeing that there should be a full-time trainer.

The next question was 'injury prevention and pre-season screening of athletes is a priority at our high school.' Each group fell into the category of somewhat agree to agree on this question. This shows that some pre-season screening is happening, but this should be a better response. Every athlete is required to have a physical by MSHSAA and everyone involved in athletics must watch a concussion video. Athletes are also taking baseline tests to help detect if they receive a concussion in the future. More pre-season screening should be taking place with each athlete, but if the high school does not

have a full-time or even a part-time trainer it makes it very difficult to complete all of these tasks before the season begins.

The next question was ‘when an athlete gets injured playing high school sports, it is the primary responsibility of the athletic trainer to monitor them and plan their rehabilitation.’ Each group scored in the range between somewhat agree to agree, with the athletic trainers scoring the closest to agree. The athletic directors only somewhat agreed with this question. This could be that the athletic director felt it was not solely the responsibility of the trainer, but possibly the school nurse or coach’s duty to take care of the injured student athlete. The data shows that the athletic trainers scored the highest, and this most likely is the case because it was their job to take care of any injured athletes.

The last question was ‘overall the athletic training programs and services at our high school are acceptable.’ There was quite a difference between the athletic directors and athletic trainers. The trainers scored between neutral and somewhat agree, while athletic directors scored between somewhat agree and agree, leaning closer to agree. It is evident that there was a disagreement on this question. Again athletic trainers were working in the department everyday while the athletic director may possibly assume everything was okay. The athletic trainer would be the one to listen to, since he dealt with all aspects of training services at the high school. He would know if there was an issue and it appears that overall they felt that most of the athletic training programs were just okay, and not acceptable.

There were already differences in opinions between the athletic directors and athletic trainers and coaches. The research question of ‘athletic training is accepted as a

major priority within high school athletic programs,' according to the data, seems to be the opposite view from especially the athletic trainer. The data shows that there was a large disparity between how the athletic directors felt compared to the athletic trainers.

Research Question Six: Does a connection exist between quality athletic training programs and self-reports of athletic injury at the high schools?

According to the data from Table 33, each participant provided information about the number of injuries sustained in their athletic program during the past school year, 2014-2015. The range in minor injuries was from 5 to 500, the number of season ending injuries were 0 to 20, and the number of concussions were 2 to 55. The data from Table 33 shows that schools suffered quite a few minor injuries throughout the sports season. The concerning statistic is that one school had 55 concussions over the course of the year. That number is very high, even if they are a school who had the maximum number of male (850) and female (850) athletes, for a total of 1700. This created a concern for a possible link between quality athletic training, coaching, and injury. The athletes may need to be taught how to properly protect themselves to potentially reduce the risk of getting a concussion.

Research Question Seven: Is there is consensus agreement among athletic directors', athletic trainers', and coaches' responses on the quality of athletic training resources?

There is a connection on parts of the survey, in which each group disagrees with what the other group is answering. For example on Table 9 for the questions regarding legal duties and responsibilities, all three groups tended to agree with one another, creating a connection that for the most part indicated they were in agreement. On Table

16, all three groups were in agreement on the questions regarding general policies and procedures. This would also indicate a connection between the groups, based on the responses they gave.

On Tables 22 and 23 with regards to emergency preparedness there were two significant differences between the groups on questions regarding 'policies and procedures exist for emergency transportation for practices and games.' There was also a significant difference on the question regarding 'policies and procedures exist for completing and submitting accident reports.' The data from these tables showed there was a significant difference between the groups; what is not known is which groups were significantly different. Data from these tables would indicate that there is not a connection between the groups based upon the data collected.

The questions on Table 26 offer opinion-based responses from the participants. All of the groups responded similarly, except on the question regarding the 'effectiveness of reviewing the athletic training program on injury or illness.' On this question there was no significant difference, but athletic trainers scored a mean of 2.83 which was much lower than the athletic directors and coaches. This suggests that there was no connection between the groups on this particular question.

There is a connection between the groups on the questions related to training room facilities and operation found on Table 27, which suggests that there is a connection between the groups when it comes to training room facilities and operation. Athletic directors, athletic trainers, and coaches all scored relatively close enough to one another, there were no significant differences.

The data on Table 35 had a number of differences in opinion between the athletic directors and the athletic trainers, with the coaches either agreeing with one group or in the middle. Some of the questions on Table 35 that raise concerns are: the 'athletic training is a significant budget item in the overall athletic department'; the athletic directors scored much higher on this question compared to the athletic trainers and coaches. The next question is 'overall the athletic training programs and services at our high school are acceptable'; athletic trainers scored much lower than athletic directors and coaches on this question. The differences of opinion on these question would imply that there is really no connection between the groups.

Limitations

This study provided a quantitative, exploratory design for data collection and analysis, however in any study there are limitations that should be addressed. First, the study was limited to athletic directors, athletic trainers, and coaches in the Gateway Athletic Conference (GAC) with a few other select participants from surrounding conferences. The data gathered from this study showed a small sample size, compared to sending the survey out statewide. However, for an exploratory study, the population used was appropriate to build a foundation for future research on athletic training services at the high school level.

Secondly, data collection was based on electronic questionnaire surveys through e-mail communication. Although there was a large enough sample that completed surveys online, when compared to the number of athletic directors, athletic trainers, and coaches the response rate was low. Therefore, the results of the study were minimized as

much as possible within the control of the primary investigator. Future research on the topic of athletic training services should consider these limitations.

Recommendations for Future Research

As more young adults enter high school and decide to participate in athletics, there is going to be a need for athletic training services at the high school. The need to improve athletic training services at the high school has never before been greater. The research on the need to support athletic training services is imperative to contribute to the improvement of athletic training services for young athletes. The intent of this study was to investigate if high school athletic training programs were a viable resource to improve training services for high school athletes. The results of this study offer valuable information to all high schools, athletic training contractors, and the Missouri High School Athletic Association (MSHSAA).

Although this study provided informative data results about athletic training services at the high school level, there could have been more participation, not only from the members of the GAC, but from more participants from other conferences in the area and throughout the state of Missouri. With more participation, the data may have provided a more accurate picture of athletic training services at the high school level. Therefore, further research could be conducted using a larger sample size that includes members of every conference in the area, but also throughout the state of Missouri.

Triangulation of Results

The overall triangulation of results could have been strengthened with more time allowed for study and a larger amount of data collection. There was a low response rate to the survey; the researcher had hoped for a better response. There was a formal request

to MSHSAA to help with the study, but they were unable to help because they could not support private research not sanctioned or driven by their own Sports Medicine Committee. This is a policy for them; they would have liked to help, but would in turn have to help everyone who requested information and a research email database. Part of this study plan is to send MSHSAA a copy of results, in hopes of providing a foundation for a further look at athletic training services available to its members. MSHSAA is already recognizing in their concussion video that not all schools have athletic trainers, and it is the responsibility of the coach to take care of his athletes.

Conclusion

It is apparent that the data provided from this study indicated some glaring needs that must be focused on in the future with regards to emergency care procedures and policies, blood-borne pathogens, the number of concussions, season ending injuries, and the overall condition of athletic training services at the high school level. There is also reason to be concerned with the fact that a variety of questions indicated the three groups were not in agreement. There were questions on which they agreed, but maybe not for the best, which was the case in regards to the emergency medical plan or evacuations.

The overall purpose of the study was to find out information regarding athletic training services at high schools in the Gateway Athletic Conference (GAC) and to break down the differences in responses from athletic directors, athletic trainers, and coaches. This researcher was able to complete the task of gathering data and analyzing information to point out the positive and negative areas of athletic training services. There is work that needs to be done to address the issues uncovered in this study by making sure all athletic directors, athletic trainers, and coaches are made aware of the areas that need

improving. Hopefully these topics are addressed and all staff members receive the proper training associated with athletic training services.

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Appendix A

Survey

Governing Administrative Policies and Procedures

Please answer the following questions regarding Athletic Training at your High School.

1. **Which of the following best describes your role at the High School?**
   Athletic Director

   Athletic Trainer

   Head Coach

   Other (Please Specify): _____

2. **What best describes the status of the Athletic Trainer at your High School?**
   NATABOC certified athletic trainer(s) employed full-time.

   NATABOC certified athletic trainer(s) employed part-time.

   NATABOC certified athletic trainer(s) contracted through outside agency.

   Coach, Teacher, or other staff member performs athletic training duties.

   Other (Please Specify): _____

3. **To which of the following medical services does your high school have access to? (Please check all that apply)**
   Doctor or General Practitioner

   Chiropractor

   Nutritionist or Dietician

   Professional Counselor

   Physical Therapist

   Other (Please Specify): _____

4. **The existing job descriptions define the responsibilities and legal duties of the Certified Athletic Trainer (or comparable staff member)?**
   Strongly Disagree Disagree Neutral Agree Strongly Agree

5. The existing job descriptions define the responsibilities and legal duties of the Athletic Director or Athletic Administrator?

Strongly Disagree Disagree Neutral Agree Strongly Agree

6. The existing job descriptions define the responsibilities and legal duties of the Coaches?

Strongly Disagree Disagree Neutral Agree Strongly Agree

7. The Athletic trainer's responsibilities to student athletes is defined in their job description and consistent with state law?

Strongly Disagree Disagree Neutral Agree Strongly Agree

8. Which of the following coverage is provided by an athletic trainer? (Choose all answers that apply.)

	Yes	**No**
Full-time daily		
Afternoons only		
Game coverage only		

9. Which form of pre-season screening is performed on the athletes? (Choose all answers that apply.)

Functional Movement screen (FMS)

Sit and Reach/Flexibility

Base Line Testing (Concussion)

Concussion Certification

None

Other (Please Specify): _____

10. A pre-participation medical evaluation is required for all athletes.

Strongly Disagree Disagree Neutral Agree Strongly Agree

11. Pre-participation evaluation includes which of the following? (Choose all answers that apply.)

	Yes	**No**
Medical history		

Physical examination

Medical authorization for participation

Parent/guardian signature or authorization

12. The format/content of medical examination meets accepted standards as per state athletic association guidelines.
Strongly Disagree Disagree Neutral Agree Strongly Agree

13. The medical examination is conducted by which of the following? (Check all that apply.)
MD or DO

Physician Assistant

Nurse Practitioner

Doctor or Chiropractor

Other (please specify): _____

14. Is "informed consent" required in order to participate in high school sports?
Yes

No

15. Is emergency information card required?
Yes

No

16. Which of the following is included as emergency card information? (Check all that apply.)

	Yes	**No**
List of student's allergies		
Parent/guardian's home telephone number		
Parent/guardian's work telephone number		
Parent/guardian's consent for emergency medical treatment		
Hospital preference		

Comprehensive medical insurance required

17. Which of the following forms and records are submitted and on file before first practice (all sports)?

	Yes	**No**
Medical history/examination		
Informed consent or acknowledgment		
Verification of medical insurance		
Emergency information card		

18. Which staff members are responsible for reviewing and organizing records?

	Yes	**No**
Athletic Trainer		
Athletic director		
Athletic administrative assistant		
Activities director		
Coach		
Other (please specify): _____		

19. Our school has a written protocol for Return to Play (RTP) for concussions? (Ex. Each step requires 24 hours rest with no signs of concussion present 1. Nothing Athlete Recovers; 2. Light Exercise; 3. Sport Specific Exercise; 4. Participation in Non-Contact; 5. Return to Practice; 6. Full Contact Game Participation) (Faure, 2010; McCrory, et al., 2009; Waeckerle, 2013).
Strongly Disagree Disagree Neutral Agree Strongly Agree

If in agreement, describe the details of your school's written protocol.

_____

20. Our school follows Return to Play (RTP) protocol for concussions?
Strongly Disagree Disagree Neutral Agree Strongly Agree

21. Our school requires a minimum number of practices before athletes can formally begin competition?

Strongly Disagree Disagree Neutral Agree Strongly Agree

If yes how many?

22. Our school has a written emergency medical plan?

Strongly Disagree Disagree Neutral Agree Strongly Agree

Emergency Care Preparedness

Please answer the following questions related to Emergency Care Preparedness at your high school.

23. Cardiopulmonary resuscitation (CPR) training is a mandatory requirement for which of the following:

	Yes	**No**
Athletic		
Athletic Administrators		
Coaches (all sports)		
Officials		

24. Basic emergency care training and first aid (Ex. Red Cross) are a mandatory requirement for which of the following?

	Yes	**No**
Athletic Trainers		
Athletic Administrators		
Coaches (all sports)		
Officials		

25. Regular emergency care in-service training sessions are held for which of the following?

	Yes	**No**
Athletic Trainers		
Athletic Administrators		

Coaches (all sports)

26. Emergency care in-service training sessions include policies/procedures for which of the following?

	Yes	**No**
Compliance with legal duties and responsibilities		
Use of emergency transportation		
Securing emergency transportation (Ex. 911 calls)		
General management of emergency situations		
Emergency management of specific injury/illness (Ex. neck injuries		
Notification of parent/guardian		
Completion and submission of injury/accident reports		

27. Emergency care in-service training sessions for coaches/administrators are held for which of the following?

	Yes	**No**
Quarterly (four times a year)		
Semiannually (twice a year)		
Annually (every year)		
Biannually (every 2 years)		

28. Which of the following emergency/acute health care equipment available AND in good repair?

	Yes	**No**
AED (Automated external defibrillator)		
Vacuum Splints (or appropriate alternative)		
Long spine board		
Hard neck collars (Philadelphia collars)		
Face mask removal equipment (Ex. Trainer’s Angels)		

Resuscitation mask

Shoulder immobilizers

Blankets

Crutches

Blood pressure cuff

Stethoscope

Gloves/PPE

First aid kit

29. During all practices and games, emergency equipment is readily accessible to which of the following:

	Yes	**No**
Athletic trainer(s)		
Athletic administrator(s)		
Coaches (all sports)		

30. Staff member(s) responsible for emergency care are trained in the use of all emergency care equipment available.

Strongly Disagree Disagree Neutral Agree Strongly Agree

31. How many different practice and game facilities are used for all sports (ON-SITE)?

Fall Sports _____

Winter Sports _____

Spring Sports _____

32. How many different practice and game facilities are used for all sports (OFF-SITE)?

Fall Sports _____

Winter Sports _____

Spring Sports _____

33. Emergency telephone numbers and information (Ex. On wallet-sized cards) are issued to which of the following?

	Yes	**No**
Athletic trainer(s)		
Athletic administrator(s)		
Coaches (all sports)		

34. Emergency information cards are accessible during all practices?

Strongly Disagree Disagree Neutral Agree Strongly Agree

35. Written policies/procedures exist for securing emergency transportation (Ex. 911 calls) for both practice and games?

Strongly Disagree Disagree Neutral Agree Strongly Agree

36. Written policies exist for notification of parents and school administrators for serious injuries?

Strongly Disagree Disagree Neutral Agree Strongly Agree

37. Appropriate accident report forms are made available to coaches?

Strongly Disagree Disagree Neutral Agree Strongly Agree

38. Policies and procedures exist for completing and submitting accident reports?

Strongly Disagree Disagree Neutral Agree Strongly Agree

39. Staff members responsible for filling out and filing accident/injury reports include which of the following?

	Yes	**No**
Coach		
Athletic trainer(s)		
Administrator(s)		
Other: (please specify): _____		

Injury Management Protocol and Procedures

Please answer the following questions regarding Injury Management Protocol and Procedures.

40. Forms exist and are established for maintaining records regarding which of the following?

	Yes	**No**
Initial assessment		
Referrals to physicians		
Daily treatments (Ex. Cold heat, tape)		
Injury rehabilitation		

41. Protocol and procedures exist for referral of injured/ill student-athletes to physicians. (Ex. contact athletic director, contact parents, bridge gap between parents & other medical personnel)

Strongly Disagree Disagree Neutral Agree Strongly Agree

If in agreement, describe the details of your school's protocol and procedures.

_____

42. A written medical release from an MD or a DO is required for an athlete to return to sports participation after injury?

Strongly Disagree Disagree Neutral Agree Strongly Agree

43. In the absence of a physician, return to sport participation is typically determined by which of the following?

	Yes	**No**
Athletic trainer		
Coach		
Nurse		
Administrator		

Other: (please specify): _____

44. My school has a regular system to review the effectiveness of the athletic training program in preventing injury or illness?

Strongly Disagree Disagree Neutral Agree Strongly Agree

Training Room Facilities and Operation

Please answer the following questions regarding training room facilities and operation.

45. Adequate training room space is available for pre-practice/game preparation (Ex. Taping and wrapping).
Strongly Disagree Disagree Neutral Agree Strongly Agree

46. Adequate training room space is available for therapeutic management (Ex. treatment tables and therapeutic modalities)?
Strongly Disagree Disagree Neutral Agree Strongly Agree

47. Adequate training room space is available for injury rehabilitation?
Strongly Disagree Disagree Neutral Agree Strongly Agree

48. Adequate training room space available for administrative functions?
Strongly Disagree Disagree Neutral Agree Strongly Agree

49. Which of the following basic administrative/injury management equipment in the training room is available?

	Yes	**No**
Desk/chair		
File cabinet		
Ice machine		
Refrigerator		
Sink/hand washing facilities		
Whirlpools		
Heat packs		
Treatment/taping tables		
Storage cabinets (for tape, gauze, wraps, etc.)		
Other (please specify): _____		

50. Which of the following basic injury rehabilitation equipment for athletic training is available?

	Yes	**No**

Leg exercise device (Ex. Leg press, extension machine)

Shoulder exercise device (Ex. Wall pulley)

Free weights (Ex. Dumbbells and Weight cuffs)

Rubber tubing (Ex. Elastic bands)

Proprioceptive devices (Ex. Wobble Board, slide board, etc.)

Cardiovascular training equipment (Ex. Stationary bike, stair climber,

Treadmill, etc.)

Other (please specify): _____

51. Training room accessibility complies with the Americans with Disabilities Act (ADA)?

Strongly Disagree Disagree Neutral Agree Strongly Agree

52. The athletic training room has adequate HVAC (heating and ventilation)?

Strongly Disagree Disagree Neutral Agree Strongly Agree

53. The athletic training room is equally accessible at all times to both male and female athletes?

Strongly Disagree Disagree Neutral Agree Strongly Agree

54. Training room "risk factors" are controlled regarding which of the following:

	Yes	**No**
Electrical safety (Ex. Ground fault interrupters)		
Daily sanitation/cleanliness (Ex. Floor and surfaces)		
Maintenance of therapeutic modalities		
Maintenance of rehabilitation exercise equipment		
Controlled access to training room		
Controlled access to storage room/cabinets		
Ventilation/air conditioning		

Suitable floor surface

55. An exposure plan for bloodborne pathogens is established regarding which of the following?

	Yes	No
Determination of occupational exposure (Ex. "At-risk" personnel identified)		
Required annual training session for employees with occupational exposure		
Provision of Hepatitis B vaccine to "at-risk" employees		
Policies/procedures for reporting exposure incidents		

56. Appropriate emergency controls are established for which of the following?

	Yes	No
Hand washing facilities/antiseptic hand cleaner and towels available		
Contaminated sharps disposal container available		
Regulated waste containers with biohazard label or color code available		
Appropriate work practice controls established		
Gloves/PPE used regularly		
Appropriate disinfectant (Ex. 10% bleach solution) used to disinfect work and play surfaces		
Proper disposal facilities available for regulated waste		
Proper disposal facilities available for contaminated sharps		
Proper disposal facilities available for contaminated laundry towels		

General Program Information

Please answer the following questions to the best of your ability and knowledge. Please understand that all responses are anonymous and confidential.

57. What is the approximate total number of students at the high school?

_____

58. What is the approximate number of male sports supported by the high school?

_____

59. What is the approximate number of female sports supported by the high school?

_____

60. What is the approximate number of male student athletes supported by the high school?

_____

61. What is the approximate number of female student athletes supported by the high school?

_____

62. What is the approximate number of minor injuries across all sports in the last year? (Please answer to the best of your knowledge even if it is a rough estimate)

_____

63. What is the approximate number of season-ending injuries across all sports in the last year? (Please answer to the best of your knowledge even if it is a rough estimate)

_____

64. What is the approximate number of concussions across all sports in the high school last year?

_____

65. What is the approximate size of the high school training room facility? (square feet)

_____

66. What MSHAA conference does your high school participate in?

_____

Athletic Training Personal Opinion Questions

In this last section, please answer six questions regarding overall perceptions regarding athletic training at your high school. Questions are scaled on a 7-point Likert scale from Strongly Agree to Strongly Disagree. All responses are kept completely confidential.

67. Athletic training is a major priority within the overall high school athletic program.

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

68. Athletic training is a significant budget item in the overall athletic department budget.

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

69. High schools should require at least one full-time athletic trainer on staff.

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

70. Injury prevention and pre-season screening of athletes is a priority at our high school?

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

71. When an athlete gets injured playing high school sports, it is the primary responsibility of the athletic trainer to monitor them and plan their rehabilitation.

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

72. Overall the athletic training programs and services at our high school are acceptable.

Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree

Vitae

Michael Zacheis graduated from Webster University with an undergraduate degree in history and education. He completed a Master of Educational Leadership at Arkansas State University. He is a certified educator through the state of Missouri. His professional interests include leading, mentoring, and coaching youth student athletes. He is currently an industrial technology teacher at St Charles High School.