Are Coaches Trained to Manage Concussion? A Survey Driven Research Based on the Pennsylvania Youth Sports Safety Act

A THESIS

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by
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THESIS APPROVAL

Graduate Athletic Training Education

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INTRODUCTION

Prevalence of concussion awareness and treatment is increasing due to states adoption and enactment of concussion safety laws. 1.6 to 3.8 million athletes sustained a head injury in the recent years with the majority of those athletes participating in high school athletics.[1] In an effort to reduce these pathologies by increasing education, states are mandating that coaches take a concussion management certification training course annually.

Concussions have been recognized dating back to Hippocrates.[2] Participation in high school athletics has shown increase in concussions with contact sports.[2-4] Often athletes will not report concussive symptoms because they are unaware or do not recognize the symptoms. Additionally athletes do not want to miss playing time so they are reluctant to report symptoms. One study indicated that females are more vulnerable to concussions due to having weaker neck musculature than male subjects. Research has shown that stronger neck musculature can help alleviate some of the force transmitted to the brain.[4]

The biomechanics of a concussion have been studied throughout history. Current studies examine the brain's

motion to real time human impact.[5] Most often concussions will be a result of rapid acceleration and/or deceleration of the head causing the brain to contact the inside of the skull.

To fully understand the pathophysiology of a brain injury, animal models have been developed and studied. The lateral fluid percussion (LFP) brain injury model was developed by Grady, which produces a brain contusion and mimics a moderate brain injury.[4] An athlete who is not fully recovered can sustain prolonged dysfunction of the brain.[9]

Signs and symptoms of a concussion may occur directly after the hit or they may not be present for up to several hours after the initial hit.[4,6] Loss of consciousness may be a key sign for a concussion but it should not be the determination of the severity. A study by Grady found that only 10% of concussions have resulted in loss of consciousness.[4] Every concussion is different and the use of computerized concussion testing allows the practitioner to detect signs and symptoms that may not be physically visible.

In Pennsylvania the Safety in Youth Sports Act sets standards established for concussion management and traumatic brain injuries in student athletes. This law also identifies individuals who are qualified to remove an

athlete from play. The law states that when a student athlete exhibits any concussion symptoms they must be removed from play immediately by the official designated by the student athlete's school. Coaches are required by law to take an annual concussion management certification training, which is offered by four different sources. The four concussion management certification courses available to coaches are: the Centers for Disease Control and Prevention, the National Federation of State High School Associations or another provider approved by the Department of Health.[7]

Not all concussions are the same; therefore, a single standardized return-to-play protocol can not be developed. Once an athlete is asymptomatic, reaches normal physical test results, and normal cognitive test results the athlete can begin a return-to-play protocol.[8] Clinicians are now preferring that athletes utilize a step wise program which may reduce the risk of secondary impact syndrome.[6] Researchers have recommended that younger athletes should have more conservative return-to-play protocols due to their brain still developing.[6,8]

Once an athlete has been diagnosed with a concussion, a comprehensive medical plan should occur. Athletic trainers and emergency rooms have recently created home

instruction forms for both athletes and parents. The take home form includes signs and symptoms to look for, what to do, and what not to do.[3,9] There is limited research for the best diet an athlete should pursue.[3] It is universally recommended that athletes do not consume alcohol or eat spicy foods due to the increasing concussion like symptoms and delay of healing.[3,9]

Guskiewicz et al. suggest that athletes avoid medications containing aspirin or non-steroidal anti-inflammatories. These medications could increase the amount of intracranial bleeding which in return can disguise the severity of the concussion.[3]

Disqualifying a student athlete from a game or practice is normally determined the same day as the concussive episode. The literature indicates ~~clear~~ that an athlete is not to return-to-play if loss of consciousness occurs regardless of their symptoms.[6] Cantu suggests that if an athlete sustains three concussions within the same season, the remainder of the season should be terminated. Disqualifying an athlete for their career is not very concisely define in existing literature.[3,6]

Prevention of concussions is one of the largest debates in sports medicine. Literature indicates that there is no such thing as preventative equipment. Not piece of

equipment has demonstrated to have zero-risk of incidence for concussions.[10,11] Ongoing research is still investigating what is occurring within the brain and the injuries that can occur with head trauma. Therefore concussion management standards are constantly changing.[12] For one to better understand a concussion it helps to highlight the need for better diagnosis, treatment, and prevention.[13]

There is still more research needed to determine the most efficient way to return an athlete to play after sustaining a concussion. Concussion research is expanding rapidly and it is essential that coaches, athletes, and parents have the proper concussion education before a student athlete sustains a concussion. The purpose of this study is to examine if the concussion management certification courses in the State of Pennsylvania are effectively educating coaches.

METHODS

The primary purpose of this study was to determine if the concussion management certification training courses are effectively educating coaches on concussions. Through the use of a survey, the current concussion management certification training courses and the coach's level of concussion education were determined. These findings can help in identifying the most common and effective way for utilizing concussion management training courses.

Research Design

This research was a descriptive study. Data was collected using Survey Monkey™. The independent variable is the concussion management certification training course offered: 1) Centers for Disease Control and Prevention, 2) the National Federation of State High School Associations, or 3) another provider approved by the Department of Health. The dependent variable was the coach's knowledge of concussion management. Knowledge was measured using the information provided in the certification training course. This survey determined whether coaches are retaining and utilizing concussion information from the selected

concussion management certification training course. More specifically, this information can help bridge the gap between whether coaches are adequately equipped (with knowledge) to manage concussion according to the Youth Sports Safety Act.

Subjects

The subjects for this study were selected from all of the respondents to the survey. The survey was sent to all high school coaches within the Western Pennsylvania Interscholastic Athletic League. At the time of completing the study all subjects must have been 18 years of age or older and a current high school coach in the Western Pennsylvania Interscholastic Athletic League. Subjects also completed one of the concussion management certification training courses offered.

Informed consent was implied when the subjects completed and returned the survey to the researcher. The study was submitted and approved by the Institutional Review Board (Appendix C2, C3, C4) at California University of PA. Each participant's identity remained confidential and was not included in the study.

Instruments

This is an original survey that was approved by a panel of experts consisting of an assistant athletic trainer, athletic training program director, and assistant clinical professor (Appendix C). Questions 1-15 were the same for all respondents; these questions were created to obtain demographic information (gender, age, years of experience as a high school coach, current occupation, level of education, high school size, current sports coaching, level of sport coaching, and the access to a certified athletic trainer).

Following the previous questions if the coach selects the Heads Up Concussion in Youth Sports course SurveyMonkey™ directed subjects to questions specific to SSI—Concussion Wise five (5) questions pertaining to signs and symptoms; four (4) questions asking what should be done if one believes an athlete has sustained a concussion; three (3) questions relating to the prevention of concussions and the importance in recognizing and responding to a concussion; the last three (3) questions relate to the step-wise program described in the Heads up Concussion in Youth Sports course and if concussions affect people differently.

Following questions 1-15 if the coach selects the National Federation of State High School Association—Concussion in Sports course SurveyMonkey™ directed subjects to questions specific to SSI—Concussion Wise two (2) questions related to defining a concussion and how a concussion can occur; four (4) questions about signs and symptoms of a concussion. Three (3) questions relating to removal of an athlete from play and when parents should be notified; and lastly, two (2) questions regarding an athlete's return to play and how to prevent a concussion.

Following questions 1-15 if the coach selects the Sport Safety International--ConcussionWise™ course SurveyMonkey™ directed subjects to questions specific to SSI—Concussion Wise two (2) questions regarding the grading of a concussion and second impact syndrome; four (4) questions relating to signs and symptoms and who can diagnose a concussion; and finally, four (4) questions pertaining to an athlete's return to play following a concussion and long term effects of a concussion.

Following questions 1-15 if the coach selects The Approved Department of Health and Education Regional Concussion course SurveyMonkey™ directed subjects to questions specific to SSI—Concussion Wise four (4) questions pertaining to the recognition of concussion;

three (3) questions related to proper management if a coach suspects an athlete has a concussion; five (5) questions regarding signs and symptoms of a concussion; and lastly, four (4) questions pertaining to early detection of a concussion and return to play.

Procedure

The Institutional Review Board (IRB) of California University of Pennsylvania reviewed and approved (Appendix C4) the study prior to it being sent to any participants. Following approval from the IRB, the Western Pennsylvania Interscholastic Athletic League (WPIAL) sent the survey via email to all athletic directors in the State of Pennsylvania; the email contained a link to Survey Monkey. Athletic directors were instructed to distribute the survey link to all coaches at their high school. The first page of the survey (Appendix C2) included a cover page explaining the purpose of the study, information regarding the rights of the subjects, and instructions for proceeding with the survey. The survey took approximately 15 minutes to complete. Participants were allowed fourteen (14) days to complete the survey. On day seven (7) a reminder email was sent by the WPIAL to the athletic directors, who in return

contacted the coached reminding them to participate in the survey.

Hypotheses

The following hypotheses were based on the researcher's intuition and the comprehensive review of literature.

1. There will be a difference in coaches' knowledge of concussions based on the level of education completed.
2. There will a difference in the coaches' knowledge of concussion based on if the school has access to an athletic trainer.
3. There will be a difference in the coaches' knowledge of concussion based on the amount of years that he or she has coached at the high school level.
4. There will be a difference in the coaches' knowledge of concussion based on what the sports level he or she coaches.
5. There will be a difference in the coaches' knowledge of concussion based on sports that he or she coaches.

Data Analysis

All data was analyzed by SPSS version 14.0 for windows at an alpha level of 0.05. The research hypothesis was analyzed using a factorial ANOVA. Specifically, all questions after question 16 were given a point value, which will be added to create a raw score. If the coach answered the answer correctly they will receive one point. If the coach answers the question incorrectly they will receive zero points.

RESULTS

The purpose of this research was to determine if the concussion management certification courses currently being implemented in the state of Pennsylvania are properly educating coaches. Fifteen demographic items are used as the independent variables. Each coach completed a survey quiz, which is the demographic variable. Each individual survey has a different number of questions; but, all four surveys were scored the same. Each survey has correct and incorrect answers. For every correct answer the individual earned one (1) point and for every incorrect answer the individual received zero (0) points. The following section contains the data collected through the study and is divided into three subsections: Demographic Information, Hypotheses Testing, and Additional Findings.

Demographic Information

This research study utilized sampling of high school coaches in the Western Pennsylvania Interscholastic Athletic League (WPIAL). WPIAL is a region that consists of high schools located within the western region of Pennsylvania.

The concussion survey (Appendix D-G) was sent electronically to all athletic directors in the WPIAL. Athletic directors were directed to forward the email to all coaches. Coaches were contacted via email and provided the link to Survey Monkey™, which contained the concussion education survey. Coaches completed and submitted the survey online.

Sampling was conducted through the WPIAL Athletic Director public email list. The sample size is not determinable due to not knowing if all athletic directors received or sent the email.

Only those respondents who were high school coaches and whose school was a member of the WPIAL were kept in this sample. This sample consisted of 20 (n=20) respondents who completed the concussion education survey in its entirety. All subjects were asked to complete 15 demographic questions.

Nineteen subjects were male (n=18) and one subject was female (n=1) (see Table 1).

Table 1. Gender of Coaches

	Frequency	**Valid Percent**
Male	18	94.74
Female	1	5.26
Total	19	100.0

Table 2 shows the age range of the coaches who responded to the survey. One coach was omitted from the study because he or she indicated that he or she was under the age of 18.

Table 2. Age range of Coach

	Frequency	Valid Percent
<18*	1	5.0
31-40	5	25.0
41-50	6	30.0
51-60	4	20.0
>60	4	20.0
Total	20	100.0

*subject was disqualified from the study

Coaches were asked to indicate which WPIAL section they coached in. Table 3 indicates that seven coaches (n=7) are from section A, four coaches are from section AA (n=4), six coaches are from section AAA (n=6), and two coaches are from section AAAA (n=2).

Table 3. WPIAL Section of Coach

	Frequency	Valid Percent
A	7	35.0
AA	4	22.0
AAA	6	32.0
AAAA	2	11.0
Total	19	100.0

Twelve coaches reported that a certified athletic trainer was available for every event (n=12) and seven

coaches indicated that a certified athletic trainer was available 4-5 days per week (n=7) (Table 4).

Table 4. Coaches Accessibility to a Certified Athletic Trainer

	Frequency	Valid Percent
4-5 Days per week	7	36.84
Every Event	12	63.16
Total	19	100.0

One coach indicated that he or she is a coach for middle school athletes. Fifteen coaches responded that they coach varsity athletes (n=15). One coach responded stating that they coach middle school athletes, freshman athletes, junior varsity athletes, and varsity athletes (n=1). One coach indicated that they coach junior varsity athletes and varsity athletes (n=1). Lastly, one coach indicated that they coached both middle school athletes and varsity athletes (n=1) (Table 5).

Table 5. Level of Sports Coached

	Frequency	Valid Percent
Middle School	1	5.26
Varsity	15	78.96
Middle School, Freshman, Junior Varsity, Varsity	1	5.26

Junior Varsity and Varsity	1	5.26
Middle School and Varsity	1	5.26
Total	19	100.0

Table 6 shows the concussion course that the coaches took for their annual concussion course.

Table 6. Annual Concussion Course Completed

	Frequency	**Valid Percent**
Heads Up Concussion in Youth Sports	5	26.32
National Federation of State High School Association– Concussion in Sports	8	42.10
Sports Safety International– Concussion Wise	5	26.32
The Approved Department of Health and Education Regional Concussion Course	1	5.26
Total	19	100.0

Table 7 provides descriptive statistics indicating the sports that were coached by each subject.

Table 7. Sport Coached by Each Subject

	Frequency	Valid Percent
Baseball	1	5.26
Basketball-Girls	2	10.56
Basketball-Boys	3	15.80
Football	1	5.26
Softball	1	5.26
Volleyball	1	5.26
Wrestling-Boys	1	5.26
Baseball and Football	1	5.26
Basketball-Boys, Cross Country-Girls, and Cross Country- Boys	1	5.26
Softball and Wrestling-Boys	1	5.26
Cross Country-Girls, Cross Country-Boys, and Track and Field	1	5.26
Swimming and Diving and Volleyball	1	5.26
Basketball-Boys, Soccer-Boys, and Track and Field	1	5.26
Baseball, Basketball-Girls,	1	5.26

Basketball-Boys, Football, Softball		
Baseball and Basketball-Boys	1	5.26
Wrestling-Girls and Wrestling-Boys	1	5.26
Total	19	100.0

Hypothesis Testing

The following hypotheses were tested in this study. All hypotheses were tested with a level of significance set at $\alpha \leq 0.05$. A factorial ANOVA was calculated for the effect of concussion knowledge among high school coaches.

Hypothesis 1: There will be a difference in coaches' knowledge of concussions based on the level of education completed. Table 8 provides information on the Heads Up raw score based on the coach's level of education. The factorial ANOVA was found to be not significant ($F(1,3)=.200$, $p>.05$) suggesting that level of education does not play a factor in the knowledge of the Heads Up concussion education course.

Table 8. Heads Up Raw Score Based on the Coaches Level of Education

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**

Education	.050	1	.050	.200	.685
Total	1249.000	5			

Table 9 provides information on the NFHS raw score based on the coaches level of education. The factorial ANOVA was not significant ($F(2,5)=1.016$, $p>.05$) and level of education does not play a factor in the knowledge of the NFHS concussion education course.

Table 9. NFHS Raw Score Based on the Coaches Level of Education

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Education	.542	2	.271	1.016	.426
Total	905.000	8			

Table 10 provides information on the Sports Safety International raw score based on the coaches level of education. The factorial ANOVA was not significant ($F(1,3)=.000$, $p>.05$) and level of education does not play a factor in the knowledge of the Sports Safety International concussion education course.

Table 10. Sports Safety International Raw Score Based on the Coaches Level of Education

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Education	.000	1	.000	.000	1.000
Total	409.000	5			

Table 11 provides information on The Approved Department of Health and Education Regional Concussion

Course raw score based on the coaches level of education. The factorial ANOVA was not significant (F(0,0)=.000, p>.05) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the level of education's impact on knowledge of The Approved Department of Health and Education Regional Concussion Course.

Table 11. The Approved Department of Health and Education Regional Concussion Course Raw Score Based on the Coaches Level of Education

	Sum of Squares	df	Mean Square	F	Sig.
Education	.000	0	-	-	-
Total	225.00	1			

Hypothesis 2: There will a difference in the coaches' knowledge of concussion based on if the school has access to an athletic trainer. Table 12 provides information on the Heads Up raw score based on the availability of a certified athletic trainer (ATC). The factorial ANOVA was not significant (F(0,4)=.000, p>.05) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the impact of the availability of an ATC's impact on knowledge of the Heads Up concussion education course.

Table 12. Heads Up Raw Score Based on ATC Availability

	Sum of Squares	df	Mean Square	F	Sig.
ATC Availability	.000	0	-	-	-
Total	1249.00	5			

Table 13 provides information on the NFHS raw score based on the availability of a certified athletic trainer (ATC). The factorial ANOVA was not significant ($F(1,6)=.429$, $p>.05$) and the availability of an ATC does not play a factor in the knowledge of the NFHS concussion education course.

Table 13. NFHS Raw Score Based on ATC Availability

	Sum of Squares	df	Mean Square	F	Sig.
ATC Availability	.125	1	.125	.429	.537
Total	905.000	8			

Table 14 provides information on the Sports Safety International raw score based on the availability of a certified athletic trainer (ATC). The factorial ANOVA was not significant ($F(1,3)=.000$, $p>.05$) and the availability of an ATC does not play a factor in the knowledge of the Sports Safety International concussion education course.

Table 14. Sport Safety International Raw Score Based on ATC Availability

	Sum of Squares	df	Mean Square	F	Sig.
ATC Availability	.000	1	.000	.000	1.000
Total	409.00	5			

Table 15 provides information on The Approved Department of Health and Education Regional Concussion Course raw score based on the availability of a certified athletic trainer (ATC). The factorial ANOVA was not significant ($F(0,0)=.000$, $p>.05$) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the impact of the availability of an ATC on knowledge of The Approved Department of Health and Education Regional Concussion Course.

Table 15. The Approved Department of Health and Education Regional Concussion Course Raw Score Based on ATC Availability

	Sum of Squares	df	Mean Square	F	Sig.
ATC Availability	.000	0	-	-	-
Total	225.000	1			

Hypothesis 3: There will be a difference in the coaches' knowledge of concussion based on the amount of years that he or she has coached at the high school level. Table 16 provides information on the Heads Up raw score based on the years coached at the high school level. The

factorial ANOVA was not significant ($F(2,2)=.200$, $p>.05$) and the number of years coached at the high school level does not play a factor in the knowledge of the Heads Up concussion education course.

Table 16. Heads Up Raw Score Based on the Years Coached at the High School Level

	Sum of Squares	df	Mean Square	F	Sig.
Years Coached at High School Level	.133	2	.067	.200	.833
Total	1249.000	5			

Table 17 provides information on the NFHS raw score based on the years coached at the high school level. The factorial ANOVA was not significant ($F(4,3)=.455$, $p>.05$) and the number of years coached at the high school level does not play a factor in the knowledge of the NFHS concussion education course.

Table 17. NFHS Raw Score Based on the Years Coached at the High School Level

	Sum of Squares	df	Mean Square	F	Sig.
Years Coached at High School Level	.708	4	.177	.455	.769
Total	905.00	8			

Table 18 provides information on the Sports Safety International raw score based on the years coached at the

high school level. The factorial ANOVA was not significant ($F(2,2)=.600$, $p>.05$) and the number of years coached at the high school level does not play a factor in the knowledge of the Sports Safety International concussion education course.

Table 18. Sports Safety International Raw Score Based on the Years Coached at the High School Level

	Sum of Squares	df	Mean Square	F	Sig.
Years Coached at High School Level	1.500	2	.750	.600	.625
Total	409.000	5			

Table 19 provides information on The Approved Department of Health and Education Regional Concussion Course raw score based on the years coached at the high school level. The factorial ANOVA was not significant ($F(0,0)=.000$, $p>.05$) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the impact of the number of years coached at the high school level on knowledge of The Approved Department of Health and Education Regional Concussion Course.

Table 19. The Approved Department of Health and Education Regional Concussion Course Raw Score Based on the Years Coached at the High School Level

	Sum of Squares	df	Mean Square	F	Sig.

Years Coached at High School Level	.000	0	-	-	-
Total	225.000	1			

Hypothesis 4: There will be a difference in the coaches' knowledge of concussion based on what the sports level he or she coaches. Table 20 provides information on the Heads Up raw score based on the sports level coached. The factorial ANOVA was not significant ($F(1,3)=.200$, $p>.05$) and the sports level coached does not play a factor in the knowledge of the Heads Up concussion education course.

Table 20. Heads Up Raw Score Based on the Sport Level Coached

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Sport Level Coached	.050	1	.050	.200	.685
Total	1249.000	5			

Table 21 provides information on the NFHS raw score based on the sports level coached. The factorial ANOVA was not significant ($F(3,4)=.333$, $p>.05$) and the sports level coached does not play a factor in the NFHS concussion education course.

Table 21. NFHS Raw Score Based on the Sport Level Coached

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Sport Level	.375	3	.125	.333	.803

Coached		
Total	905.00	8

Table 22 provides information on the Sports Safety International raw score based on the sports level coached. The factorial ANOVA was not significant ($F(0,4)=.000$, $p>.05$) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the impact of the sports level coached on knowledge of the Sports Safety International concussion education course.

Table 22. Sports Safety International Raw Score Based on the Sport Level Coached

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Sport Level Coached	.000	0	-	-	-
Total	409.00	5			

Table 23 provides information on The Approved Department of Health and Education Regional Concussion Course raw score based on the sports level coached. The factorial ANOVA was not significant ($F=(0,0)=.000$, $p>.05$) (no F value was reported most likely due to low sampling size) since the F value could not be calculated, significance could not be determined regarding the impact of the sports level coached on knowledge of the Approved

Department of Health and Education Regional Concussion Course.

Table 23. The Approved Department of Health and Education Regional Concussion Course Raw Score Based on the Sport Level Coached

	Sum of Squares	df	Mean Square	F	Sig.
Sport Level Coached	.000	0	-	-	-
Total	225.000	1			

Hypothesis 5: There will be a difference in the coaches' knowledge of concussion based on sports that he or she coaches. Table 24 provides information on Heads Up raw score based on the sport coached. The factorial ANOVA was not significant ($F(3,1)=.200$, $p>.05$) and the sports coached does not play a factor in the knowledge of the Heads Up concussion education course.

Table 24. Heads Up Raw Score Based on the Sports Coached

	Sum of Squares	df	Mean Square	F	Sig.
Sports Coached	.300	3	.100	.200	.889
Total	1249.000	5			

Table 25 provides information on NFHS raw score based on the sport coached. The factorial ANOVA was not significant ($F(7,0)=.268$, $p>.05$) and the sports coached

does not play a factor in the knowledge of the NFHS concussion education course.

Table 25. NFHS Raw Score Based on the Sports Coached

	Sum of Squares	df	Mean Square	F	Sig.
Sports Coached	1.875	7	.268	-	-
Total	905.000	8			

Table 26 provides information on Sports Safety International raw score based on the sport coached. The factorial ANOVA was not significant (F(4,0).268, p>.05) and the sports coached does not play a factor in the knowledge of the Sports Safety International concussion education course.

Table 26. Sports Safety International Raw Score Based on the Sports Coached

	Sum of Squares	df	Mean Square	F	Sig.
Sports Coached	4.000	4	1.000	-	-
Total	409.000	5			

Table 27 provides information on The Approved Department of Health and Education Regional Concussion Course raw score based on the sports coached. The factorial ANOVA was not significant (F(0,0)=.000, p>.05) (no F value was reported most likely due to low sampling size) since

the F value could not be calculated, significance could not be determined regarding the impact of the sports coached on knowledge of The Approved Department of Health and Education Regional Concussion Course.

Table 27. The Approved Department of Health and Education Regional Concussion Course Raw Score Based on the Sports Coached

	Sum of Squares	df	Mean Square	F	Sig.
Sports Coached	.000	0	-	-	-
Total	225.000	1			

DISCUSSION

This study has produced findings regarding high school coaches' concussion education knowledge compared with highest level of education, access to an athletic trainer, amount of years that he or she has coached at the high school level, sports level he or she coaches, and what sports he or she coaches. This section will discuss these findings divided into the following subsections: Discussion of Results, Conclusions, and Recommendations.

Discussion of Results

The primary purpose of this study was to determine if the concussion management certification training courses have an effect on a coaches' knowledge of concussion. This research examined demographic information including; gender, age, highest level of education, years coaching at the high school level, PIAA class, PIAA district, sport(s) coached, level of sport(s) coached, access to a Certified

Athletic Trainer, and concussion course utilized. These variables were selected to gather information to determine if any specific variable directly affects concussion knowledge. The current study did not find any variable to be statistically significant and suggests that the independent variables do not affect coaches' concussion education knowledge scores. However, these findings cannot be generalized due to low rate of return. Therefore, it is recommended that more high school coaches be surveyed to increase generalizability.

Descriptive statistics revealed the majority of participants went to graduate school (70.0%), were between the ages of 41-50 years old (30.0%), predominantly male (95.0%), and single A schools (A) made up 35.0% of the participants. Given the findings of the study it is unknown if any single concussion education course properly educates or does a better job at educating coaches about concussions.

Conclusions

The results of this study suggest that the concussion education courses effectively educate coaches on concussions, though these findings are limited due to the

low number of respondents. The Safety in Youth Sports Act sets standards for managing concussions and traumatic brain injuries in student athletes, provides educational tools about concussions, assigns proper people to remove an athlete from play, and allows for penalties to take place. This law requires coaches to take a concussion education course annually and notes those athletes suspected of a concussion must be immediately removed from play. If a coach does not take the proper precautions for removing a student athlete from play penalties will take place.[7] There are three violations that can occur. The first violation would be suspension from coaching any athletic activity for the rest of the season. A second violation would be suspension from the current athletic season and for the following season. Lastly, a third violation would be a permanent suspension from coaching any athletic activity.[7]Coaches can go to informational meetings on concussions, receive posters about concussions, and utilize multiple online sources to help increase their knowledge of concussions.

Recommendations

This study has created additional opportunities for future research on both the Safety in Youth Sports Act and on additional concussion courses. The information found provides some information that could benefit the Pennsylvania Interscholastic Athletic Association for improvement on certain concussion education courses. In order to further determine if coaches are properly educated it may be beneficial to create a more well-rounded concussion quiz to assess their knowledge and understanding of a concussion. Further research for a better concussion quiz could include a before and after quiz. The participant would take the quiz before the survey to see determine their knowledge improvement upon completion of the course.

In addition, further research should be conducted to investigate the coaches' perception of these courses and if they feel they are beneficial as well as what can be improved for these courses. Additional research determining the protocols in other state concussion education requirements for coaches could help determine if there is a need for improvements or changes in concussion courses or the concussion laws. A larger scale study examining those variables mentioned could potentially help create a more well-rounded concussion education course for coaches.

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APPENDICES

APPENDIX A

Review of Literature

Introduction

In recent years concussion awareness and treatment has begun to evolve in multiple different ways. In recent years, about 1.6 to 3.8 million athletes sustained a head injury, a majority of them diagnosed to be a concussion. Among those athletes the majority occur annually throughout high school athletics.[3] A concussion as defined by The 4th International Conference on Concussion in Sport is defined as a "complex pathophysiological process affecting the brain, induced by biomechanical forces."[5] Concussions can be caused by many factors but the following is the most common mechanism of injury: direct blow to the head, face, or neck, causing an "impulsive" force transferred to the head.[2-5] Many concussions will resolve between seven to ten days although recovery times differ for every athlete.[2,5] Current concussion evaluations are designed for adult athletes, therefore it is important for practitioners to be able to properly diagnose and treat concussed athletes. Over the past years there has been an increase in concussion awareness among coaches, parents, athletes, and medical professionals.[3] It is important that any person who is diagnosing, treating, and/or making the return to play protocol be aware of reliability of concussion testing.

The purpose of this literature review is to focus on a review of concussion assessments that are available to coaches. As well as the need for concussion awareness and long term effects to be implemented among athletics.

Background of a Concussion

Epidemiology

The sports-related concussion rate occurring annually in the United States is estimated between 1.6-3.8 million concussions per year.[6,7,9-11] Concussions have been acknowledged and were of concern since Hippocrates. Hippocrates once stated that a concussed patient consisted of "falling down immediately, loses speech, cannot see or hear."[8] Throughout history a concussion has been defined differently and some proposed definitions were even refuted. Within this data pediatric patients (ages 5-18) reported for 65% of sports-related traumatic brain injuries.[9] Activities that were accounted for with most visits to the ED for traumatic brain injury included bicycling, football, basketball, playground activities, and soccer.[9]

Concussions in high school athletics are becoming more common with contact sports.[2,8,9] One football study suggests

that about 1 in 20 high school football players will have a documented concussion per season. This also shows that the incidence rate may be higher due to athletes not reporting concussion like symptoms to their athletic trainer.[9] Many times athletes do not recognize the symptoms of the concussion. Also other times the athletes do not want to miss playing time from their sport. Concussions that have been reported seem to be more biased toward female athletes. Studies have not clearly shown why this is the case. But some studies show that male athletes will have stronger neck musculature than females, which helps alleviate some of the force.[9] The decrease allows for less force to be transmitted to the brain, which in return would have caused the concussion like symptoms.

Biomechanics of Impact

Over time the study of concussion biomechanics has advanced from examining monkey skulls to observing brain motion to real time human impact.[12] The most common concussion injuries are a result of rapid acceleration and/or deceleration. This is where energy is quickly transferred to the brain. To produce a concussion the hit must be discretely absorbed by the head and brain to rigger the various intracranial stressors. Cantu found that when

football players anticipated the hit they contracted their neck muscles and the likelihood of receiving a concussion was decreased. An athlete who receives a linear blow to the head is considered a coup injury that occurs at the trauma site. There is a delayed response known as contrecoup which is due to reverse movement of the brain hitting the opposite side of the skull. When there is rotational trauma the brain is able to contact numerous locations of the skull in a short period of time. This type of trauma does not normally contribute to coup or contrecoup lesion but it can lead to more diffuse axonal injury.[8] According to Brolgio et al the simplest terms to describe concussion biomechanics is through the Newtonian Laws of Motion. "The magnitude of the impulse applied during the impact times its duration."[12] This concept has been sought to develop injury risk curves from post-impact head velocity and acceleration.[6,12]

Pathophysiology

In order for researchers to fully understand the pathophysiology of brain injuries, animal models have been developed in an effort to replicate human physiological changes. The model most applicable to concussion is the lateral fluid percussion (LFP) brain injury model which has

recently emerged. The LFP model produces injury to the brain utilizing a device to drive fluid against the intact dura of the brain surface. This mechanism produces a brain contusion which may mimic a moderate brain injury. This allows of secondary metabolic effects to be produced.[9] The cellular process of a concussive injury is described by a complex cascade of ionic, metabolic, and pathophysiological occurrences that are accompanied by microscopic axonal injury.'[8,10] With the change in intracellular sodium and potassium which alter the pH of the cell leading to an influx of calcium.[10] Further disruption of these cells before they have completely healed can worsen the cellular metabolic changes and create more substantial cognitive deficits. This cell injury is an explanation as to why concussive symptoms can worsen over the first 24 hours after the original injury.[3,9,13] Evidence has been suggesting that further damage before full recovery can cause the brain to have prolonged dysfunction. Many of the concussive injuries are more prevalent in youth due to the brain not being fully mature causing them to be more susceptible to repeat concussions before full recovery. [13]

Signs and Symptoms

Signs and symptoms after a concussion may not be noticeable directly after a hit. The presentation of symptoms could occur directly after the hit or even up to several hours after the initial injury. There are a wide range of symptoms including the following: physical signs, cognitive impairment, neurobehavioral features, and sleep disturbance. Not only are the symptoms a major factor in determining a concussion and its severity but a detailed concussion history is necessary. This should be done during the pre-participation exam as well as post-injury. [5,9] Although loss of consciousness can be a key sign it is not a reliable factor for determining the presence or determining the severity of a concussion, as only 10% of concussion result in loss of consciousness.[9] In some cases symptoms are not recognized until the athlete's cognitive functions are stressed (i.e. school work). Every case of a diagnosed concussion could consist of one or more of the following: symptoms (somatic or cognitive), physical signs, behavioral changes, cognitive impairment (slowed reaction time), and sleep disturbances.[5,9] By utilizing computerized concussion testing it allows the practitioner to seek out symptoms that may not be otherwise detected or physically visible.

Safety in Youth Sports Act

The Safety in Youth Sports Act was enacted on July 1, 2012. According to the Youth Sports Act there are standards established for concussion management and traumatic brain injuries to student athletes.[1] This law sets standards for managing concussions and traumatic brain injuries in student athletes, provides educational tools about concussions, assigns proper people to remove an athlete from play, and allows for penalties to take place. If a coach does not take proper precautions for removing a student athlete from play penalties will take place.[1] Informational meetings can be held prior to an athletic season for student athletes, parents, coaches, and other school officials. It is very important for individuals to know the proper concussion management, how preseason baseline assessments can aid in the evaluation, and recovery process.[1] The law states that a student athlete who exhibits any concussion symptoms must be removed from play. Those individuals who can remove student athletes from play are a game official, coach from the student athlete's team, certified athletic trainer, licensed physician, licensed physical therapist, or other official designated by the student athlete's school. Each year every coach must take a

concussion management certification training course offered by the Centers for Disease Control and Prevention, the National Federation of State High School Associations or another provider approved by the Department of Health.[1]

Concussion Courses for Coaches

Heads Up Concussion in Youth Sport

Concussion symptoms are not always noticed by the person who has sustained the injury. Signs and symptoms often times can be hidden making it difficult to recognize an injury. With limited medical coverage at youth sporting events it is important that coaches and referees have proper education about concussions.[15,16] The CDC's National Center for Injury Prevention and Control developed the *Heads Up: Concussion in High School Sports* toolkit. The toolkit was developed to help coaches prevent, identify, and manage concussions among athletes. Sawyer et al. (2010) conducted a pilot study on April 15, 2005 to see if the toolkit was useful to the coaches. The toolkit included a letter from the CDC, a brochure for coaches, a pocket card for quick reference on the field of play, fact sheets for athletes and parents, two athletic training room posters,

video segment from PBS's *News Hour with Jim Lehrer*, and a CD-ROM with downloadable tool kit materials. There were five states selected with 1,000 coaches from each state randomly selected. Responses were recorded by utilizing the computer-assisted telephone interviewing (CATI) technology. Ninety-seven percent of coaches who responded said that they would recommend the *Heads Up* toolkit to other coaches. After concluding the research it was stated by Sawyer et al. that the toolkit was viewed as appealing and useful for athletic coaches across the nation. These toolkits may also help increase the prevention and management of concussion among athletes.[14] The Heads Up Concussion in Sports course meets the Youth Safety Act requirements on concussion education for coaches. Coaches can access the Heads up Concussion in Sports quiz by the following link: http://www.cdc.gov/concussion/headsup/online_training.html. Coaches will need to complete a quiz to be considered knowledgeable of the needs for concussion management and awareness.

National Federation of State High School Associations—Concussion in Sports

The National Federation of State High School Association (NFHS) and CDC have taken another step at

giving individuals the opportunity to further their education on concussions. "Concussion in Sports-What you need to know" was developed in May 2010 by both the NFHS and the CDC.[17] NFHS has provided many courses over the years for various subjects. This is a free online course for coaches, parents, and athletes through the NFHS Coach Education Program. The NFHS-Concussion in Sports course meets the Youth Safety Act requirements on concussion education for coaches. Those individuals who decide to take the course have access to a parent's guide to concussion in sports, a coach's guide, an athlete fact sheet, and material to implement a concussion treatment protocol.[17,18] After the course has been completed individuals should be able to educate others about concussions, identify signs and symptoms, notice the problems associated with concussions, and identify responsibilities of coaches, parents and students.[18] This course is available every day and only takes twenty minutes to complete. Within the course there are four units: Concussion Overview, The Problem, Your Responsibility, and a Review.[17,18] Coaches can access the NFHS-Concussion in Sports quiz by the following link:
http://nfhslearn.com/electiveDetail.aspx?courseID=38000. Coaches will need to complete a quiz to be considered

knowledgeable of the needs for concussion management and awareness.

ConcussionWise™

Sport Safety International is an organization that helped introduce the ConcussionWise™ courses. These online concussion courses can be used by coaches, parents, athletic trainers, and other health care professionals. The ConcussionWise™ course meets the Youth Safety Act requirements on concussion education for coaches. This course is designed to provide concussion education, prevention, and management. There are various courses made for specific individuals. Courses for coaches will be designed differently than one would be for athletic trainers. There is limited information on the site that coaches can utilize The ConcussionWise™ program is available at any time by logging onto www.concussionwise.com/pennsylvania; upon completion the participant receives a certificate.[19] Coaches can access the ConcussionWise™ quiz by the following link: http://concussionwise.com/Pennsylvania. Coaches will need to complete a quiz to be considered knowledgeable of the needs for concussion management and awareness.

Departments of Health and Education Regional Concussion Course

The Brain Injury Association of Pennsylvania (BIAPA) and the Pennsylvania Athletic Trainers' Society offers a free concussion course that meets the Youth Safety Act requirements on concussion education for coaches.[20,21] The Approved Department of Health and Education Regional Concussion course is an alternative to the following online concussion courses: Centers for Disease Control and Prevention, the National Federation of State High School Associations, and the Pennsylvania Athletic Trainers' Society.[21] Information provided throughout the course will be geared toward coaches, athletes, parents, school administrators, sports officials, and many others interested in learning about concussions. The BIAPA provides all participants with a PowerPoint handout, Safety in Youth Sports Act, CDC concussion fact sheet, CDC concussion fact sheet for coaches, CDC concussion fact sheet for parents, and CDC concussion fact sheet for athletes.[21] The main focus of this course is to understand the severity, recognizing signs and symptoms, testing, treatment, return to play, and developing management and prevention policies.[20,21] After the course has been completed participants will receive a certificate of completion.[20]

Concussion Management

Pre-Participation Assessment

Identifying that not all athletes understand what a concussion is or cannot remember if they ever had one is the benefit of having a detailed concussion history. Before a season starts, if an athlete has previously suffered from a concussion, the clinician can properly identify if certain athletes fit into a high risk category or not. In either case, it allows the clinician to educate the athletes and their parents regarding the importance of reporting concussive like symptoms. Concussion history should include specific questions about length of recovery and symptoms. This will allow earlier recognition for those athletes. Athletes, parents, and coaches can be informed about proper fitting of equipment to help decrease the chance of a concussion.[5] Lately many clinicians are holding meetings for anyone involved in athletics in any way so they can understand what a concussion is, how to prevent it, and how to treat one. These meetings can include handouts for what to look for if you suspect an athlete has a concussion and what to do in that scenario.[5]

Post-Concussion Assessment

Barth et al. was the pioneer of the basic baseline and post-concussion assessment that has been developed for the neuropsychological assessment. This type of assessment has now been established with large groups of athletes from high school to professional athletics. Post-injury athletes go through a series of tests to determine deficits and clinical symptoms are no longer present. It is considered standard practice that an athlete return to baseline or better before beginning any type of athletic performance.[22] Obtaining baseline measurements to compare athletes post-concussion testing will help better evaluate athletes who are recovering from a concussion. Administering a symptom's checklist right after the athlete has sustained the concussion will also help with the evaluation as well as a method to track the symptoms over time.[2]

Neuropsychological Evaluation

Neuropsychologists tend to have a background knowledge and training to understand the brain's behavior relationships. They are also specialists who can identify and treat those with cognitive impairment. Neuropsychologist are also trained to choose, administer, and interpret neuropsychological test. In order for them to

select such tests they take a look into the individual's history and presentation. Specifically if an athlete has had a prior diagnosis of a learning, attentional, or developmental disorder, psychiatric condition (past or present), and/or other serious brain trauma.[22,23] Many states now require advanced training and even licensure to utilize neuropsychological testing. It is required that in order to oversee and supervise the clinical application of a neuropsychological test you must be a licensed psychologist, Board certified in clinical neuropsychology, or with clinical experience in the evaluation of sport-related concussion.[2,23]

Return to Play

When to Return-to-Play

Once an athlete is asymptomatic, has normal physical test results, and normal cognitive test results the athlete can start to discuss a return-to-play protocol. A return-to-play protocol should be discussed with the athlete, coach, and parent.[24] Many researchers are now suggesting that a stepwise program be initiated.[5] If a clinician is working with a younger athlete with a concussion it is recommended to be more conservative with their return-to-

play due to their continued brain developing.[5,24] McCrory et al. also advises that children under the age of 15 be treated more conservatively.[5]

How to Return-to-Play

A return-to-play protocol is a now recommended to be followed by a stepwise process. The stepwise program allows an athlete to progress to the next level if they are asymptomatic at the current level. It is suggested that each step should take 24 hours, which would leave the athlete to recover within a 7 day period. If any symptoms occur throughout the rehabilitation process the athlete should begin the previous stage until asymptomatic again.[5,24,25] According to the Consensus Statement on Concussion in Sport the athlete should follow this graduated return to play protocol: Stage One: No activity, Stage Two: Light aerobic exercise, Stage Three: Sport specific exercise, Stage Four: Non-contact training drills, Stage Five: Full contact practice, Stage Six: Return to play.[5]

Home Care

Signs and Symptoms

When an athlete has been diagnosed with a concussion, a comprehensive medical plan should be executed. If the symptoms continue, worsen, or the level of consciousness decreases then neuroimaging should be fulfilled. Many athletic trainers and hospital emergency rooms have created home instruction forms. With the previous information being known a concussion symptoms sheet should be given to the athlete and the adult responsible for the athlete. The concussion home instructions include information pertaining to when the concussion happened, when to report back to the doctors and/or athletic training room for a follow-up. If any of the symptoms worsen (i.e. nauseous, loss of consciousness, etc) it is recommended the athlete go to the emergency department. Some instructions that athletes and parents should know are that it is okay to do the following: Use ice pack on head and neck as needed, eat a light diet, return to school, sleep, and rest. It is NOT necessary for the athlete or parent to do the following: Check eyes with flashlight, wake up every hour, test reflexes, or stay bed ridden. Lastly it is suggested that athletes not drink alcohol or eat spicy foods due to those

increasing concussion like symptoms and delaying the healing process. Both alcohol and spicy foods can alter the athletes cognitive function[2,13]

Diet

There is limited research regarding the best type of diet when recovering from a concussion. With the changes in neurochemical, ionic, and metabolism occur it is hard to distinguish what is helpful and what is not. When compared to controls athletes who sustained a severe brain injury ate a larger meal and increased daily caloric intake. With the limited dietary information it is acceptable to instruct athletes to avoid alcohol, illicit drugs, and central nervous system medications that may interfere with their cognitive function. An athlete should be cautious of what food they consume especially staying away from spicy foods. A well balanced diet is suggested so athletes do not lose their needed nutrients to help with the recovery process.[2]

Medication

There is not enough evidence based pharmacologic evidence to treat athletes with a concussion. It has been suggested by Guskiewicz et al. that athletes with a

concussion avoid medications containing aspirin or non-steroidal anti-inflammatories.[2] These medications will decrease platelet function and potentially increase the amount of intracranial bleeding, which in the end will disguise the severity and duration of symptoms, which could lead to further injury. It is highly recommended that athletes stay away from any type of medication that will adversely affect the central nervous system which will decrease recovery time from a concussion.[2]

Rest

Physical and cognitive rest is often applied as an immediate treatment for sports concussion. Previously, instructions suggested that the concussed athlete be wakened every 3 to 4 hours during the night to evaluate changes; but with recent debate it is unnecessary.[26,27] It has been stated that the wake ups disturb the athlete's sleep cycle even more, which may increase symptoms due to a combination of injury and sleep deprivation. The concussed athlete should avoid activities that increase symptoms but should resume normal activities. If any of the activities of daily living worsen the symptoms, the athlete should decrease that activity until asymptomatic. If their symptoms keep decreasing they should be following the

exertion scale that was previously mentioned in return-to-play.[2]

Disqualifying an Athlete

Game or Practice

The decision to disqualify a student athlete from a game or practice is usually determined on the day of the concussive episode based on the sideline assessment, symptoms, and past history. The literature is clear that if any athlete sustains loss of consciousness they are not allowed to return to play regardless of how mild their symptoms are. Athletes who complain of any concussive symptoms are not allowed to return to play as well.[2] A student athlete may return to play after they have a written clearance from an appropriate medical professional. An appropriate medical professional includes a licensed physician and health care professional trained in the evaluation and management of concussions or a licensed psychologist neuropsychologically trained in the evaluation and management of concussions.[1]

Season

Both Cantu and the American Academy of Neurology suggest that season termination be in effect after the

athlete has sustained a third concussion within the same season. Even though many athletes participate in sports year round it can be hard to define at which point they can resume sport activity. There are a lot of questions about season disqualifications of athletes who have not been found unconscious or who have had numerous mild concussions throughout their entire career.[2]

Career

Disqualifying athletes for the rest of their career is even more difficult as this is not clear cut in literature. There have been highly publicized cases with athletes sustaining multiple concussions with post-concussion symptoms lasting for a lengthy period of time.[2]

Equipment Issues

Helmets, Headgear, and Mouth guards

There have been many studies done on equipment-based methods to prevent concussions, but literature argues that there is no such thing as preventative equipment. No protective equipment has been shown to have zero-risk of incidence for sport-related concussion. Mouth guards show limited effect in decreasing the risk of a concussion but

not eliminating the possibility.[28,29] Football helmets that are properly fitted may help decrease the chances of a concussion but will not prevent concussions. If a helmet is not properly fitted athletes will be more vulnerable to a concussion.[2,30] When an athlete receives a hit to the head or the head is caused to decelerate, the brain will still move within the skull due to the buoyancy created by cerebral spinal fluid. Once the head stops moving the brain within the skull will still continue to move forcing it to contact the inside of the skull.

Prevention

Managing the increase in concussions is one of the hottest debates among medical professionals. This being because there has been such an increase in research in the past years. There is still so much more to know about the brain and injuries that can happen. Standards for concussion management are constantly changing in response to new research. Over the past ten years, concussion management has become increasingly individualized. The new and upcoming diagnostic tools help clinicians diagnose concussions more carefully due to it being difficult to recognize cognitive reactions.[31] While many concussions

fully resolve within weeks of the injury some can have long term effects if not taken care of properly. Concussions that are not properly managed can result in having symptoms for months or even years. Previous concussions were considered to be benign, but there is evidence supporting that previous concussions can have long-term consequences. Understanding the risks associated with a concussion helps highlight the need for better diagnosis, treatment, and prevention.[32]

Summary

Due to recent research concussion awareness is becoming more accessible; however, there is still backlash that concussions should not be handled the way they are. Over the years there have been studies with different return to play protocols, today if an athlete has any signs or symptoms of a concussion they have to be pulled from activity. There is still research being conducted on what is the more efficient way to return an athlete to play after sustaining a concussion. As concussion research is expanding it is critical for coaches, athletes, and parents to be properly educated on concussion before an athlete sustains one. The Youth Sports Safety Act offers free

courses to student athlete's parents and coaches about the risks of concussion and traumatic brain injury. The existing guidelines and materials developed by the Centers for Disease Control and Prevention should be utilized. Every year both the parents and student athletes have to sign and return an acknowledgement of receipt that they have reviewed the designated concussion and traumatic brain injury information sheet to their school. The importance of proper concussion management should be discussed with all individuals in contact with the student athlete.

APPENDIX B

The Problem

STATEMENT OF THE PROBLEM

Mild traumatic brain injuries, more commonly known as concussions, are becoming increasingly prevalent in athletes of all abilities. Year after year more research has been published on how to detect and manage a concussion. The State of Pennsylvania Youth Safety Act, effective July 1st, 2012, states that "a student who determined by a…coach from the student's team…, exhibits signs or symptoms of a concussion or head injury while participating in athletic activity shall be removed by the coach from participation at the time."[1]

Once every academic year coaches need to complete a concussion management certification course. All concussion courses are intended to provide proper concussion management skills, how preseason baseline assessments can aid in the evaluation, management of a concussion, and the recovery process.[1] Since the inception of these courses and the Youth Sports Safety Act, there is limited evidence that supports the effectiveness of the courses. Therefore, this research sets out to bridge the gap between whether coaches have the correct knowledge to manage a concussion according to the Youth Sports Safety Act. Concussion courses are offered by the Centers for Disease Control and Prevention,

the National Federation of State High School Associations, ConcussionWise™ Pennsylvania, and Approved Departments of Health and Education Regional Concussion Courses. Not every state has implemented a concussion law for coaches to follow. This study is important because it will help determine if the concussion courses offered are effective in educating coaches. More specifically, this research sets out to determine if one of the approved concussion training courses is better at educating coaches in the recognition and management of concussion.

Definition of Terms

1) Student Athlete- A student who is enrolled in a public school district, charter school, cyber charter school or area vocational-technical school.[37]
2) Appropriate Medical Professional-A licensed physician and a licensed or certified health care professional trained in the evaluation and management of concussions. A licensed psychologist neuropsychologically trained in the evaluation and management of concussion or has postdoctoral training in neuropsychology and specific training in the evaluation and management of concussions.[1]

3) Athletic Activity- Interscholastic athletics and any athletic contest or competition that is sponsored by or associated with a school entity. Cheerleading, club-sponsored sports activities, and sports activities sponsored by school-affiliated organization. Noncompetitive cheerleading sponsored by or associated with a school entity, athletic practices, interschool practices, and scrimmages for all of activities previously stated.[1]

Basic Assumptions

The following are basic assumptions of this study:

1) All survey questions are answered honestly, correctly, and to the best of the ability of the high school coach.
2) The sample obtained for this research was a representation of a PIAA high school coach.
3) The survey will be properly distributed by the PIAA to high school athletic directors, who will then in turn email to their high school coaches.

Limitations of the Study

The following are possible limitations of the study:

1) Distribution of the survey link to all PIAA coaches is reliant on the Executive Board, Executive Director of the PIAA, and high school athletic directors.

Delimitations

The following are possible delimitations of the study:

1) High school coaches within the PIAA.

   The survey is based on the following programs: the Centers for Disease Control and Prevention, the National Federation of State High School Associations or another provider approved by the Department of Health.[7]

Significance of the Study

Recognizing and managing concussions correctly is important to those involved in the injury. Throughout the past few years concussion awareness has been a very popular topic. This has been seen often times in many contact sports such as football, hockey, and soccer. Often times the major differences can be seen within high schools due to lack of concussion education. There are many different

resources on concussion education but utilizing certain concussion courses may in turn create more consistency. This study will examine the implementation of concussion education tools among high school coaches. The study is significant because there are a variety of concussion education courses but there may be those select few that provide better information. Therefore, findings from this study can be used to determine which course is more effective in providing concussion knowledge for PIAA coaches along with defining other factors that may impact coaches' concussion knowledge. This study may also encourage other states to implement a concussion education course.

Appendix C

Additional Methods

APPENDIX C1

Institutional Review Board –

California University of Pennsylvania

Institutional Review Board

California University of Pennsylvania

Morgan Hall, Room 310

250 University Avenue

California, PA 15419

instreviewboard@calu.edu

Robert Skwarecki, Ph.D., CCC-SLP, Chair

Dear Ashley Nicole McNamara,

Please consider this email as official notification that your proposal titled "Are Coaches Properly Trained to Manage Concussion; A survey Driven Research based on the Youth Sports Safety Act" (Proposal #13-054) has been approved by the California University of Pennsylvania Institutional Review Board as submitted.

The effective date of the approval is 4-11-2014 and the expiration date is 4-10-2015. These dates must appear on the consent form.

Please note that Federal Policy requires that you notify the IRB promptly regarding any of the following:

(1) Any additions or changes in procedures you might wish for your study (additions or changes must be approved by the IRB before they are implemented)

(2) Any events that affect the safety or well-being of subjects

(3) Any modifications of your study or other responses that are necessitated by any events reported in (2).

(4) To continue your research beyond the approval expiration date of 4-10-2015 you must file additional information to be considered for continuing review. Please contact instreviewboard@calu.edu.

Please notify the Board when data collection is complete.

Regards,

Robert Skwarecki, Ph.D., CCC-SLP

APPENDIX C2

Cover Letter for Coaches

CALIFORNIA UNIVERSITY OF PA
ATHLETIC TRAINING

Date:

Dear Coaches:

My name is Ashley McNamara and I am currently a student in the Graduate Athletic Training Education Program at California University of Pennsylvania. I am performing a survey-based research study to evaluate if the Safety in Youth Sports Act is effectively educating coaches on concussions. The Safety in Youth Sports Act, effective in 2012, requires all coaches to take an annual concussion management certification training, which is offered by four different sources prior to each school year. I want to determine the knowledge level of coaches by having them complete a survey, which directly reflects the material from the concussion management certification training. Gathering this information is significant because it will help determine whether or not the concussion management certification trainings are doing what it intends to do and also determine the effectiveness of the Safety in Youth Sports Act.

You are being asked to participate because you are a high school coach within the PIAA. However, your participation is voluntary and you do have the right to decline participating in this survey. You also have the right to discontinue participating at any time during the survey completion process, at which time your data will be discarded. Your participation or non-participation will have no benefit or penalty. This study will be approved by the California University of Pennsylvania Institutional Review Board. This approval is effective 04/11/2014 and expires 4/10/2015.

All survey responses are anonymous and will be kept confidential; by completing this survey, you are providing informed consent to use the data collected upon return of the survey. Completed surveys will not have any information that identifies you or the associated school district. Electronic data will be stored in password-protected files

on California University of Pennsylvania's servers. Minimal risk is posed by participating as a subject in this study. I ask that you please take this survey at your earliest convenience as it will take approximately 15 minutes to complete. I also ask you consider the benefits of gathering this data as it will identify strengths and weaknesses of the recently passed legislation focused on protecting your athletes from head injury. If you have any questions regarding this project, please feel free to contact the primary researcher, Ashley McNamara, LAT, ATC at mcn6299@calu.edu. You may also contact the thesis chair supervising the research, Dr. Michael Meyer, LAT, ATC at meyer_m@calu.edu.

Thank you for taking the time to take part in this research. I greatly appreciate your time, thought, and effort you have put into completion of the survey.

To access the survey please click here or copy and paste the link provided (https://www.surveymonkey.com/s/HVZZLG3). This survey will be open 14 days following its distribution.

Sincerely,

Ashley A. McNamara

Ashley McNamara, LAT, ATC
Primary Researcher
California University of Pennsylvania
Graduate Athletic Training Education Program
250 University Ave
California, PA 15419
mcn6299@calu.edu

Appendix C3

Cover Letter for Athletic Directors

Date:

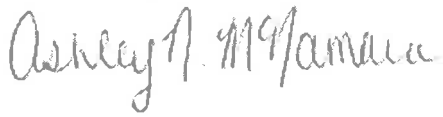
Dear Athletic Director:

My name is Ashley McNamara and I am currently a student in the Graduate Athletic Training Education Program at California University of Pennsylvania. I am performing a survey-based research study to evaluate if the Safety in Youth Sports Act is effectively educating coaches on concussions. The Safety in Youth Sports Act, effective in 2012, requires all coaches to take an annual concussion management certification training, which is offered by four different sources prior to each school year. I want to determine the knowledge level of coaches by having them complete a survey which directly reflects the material from the concussion management certification training. Gathering this information is significant because it will help determine whether or not the concussion management certification trainings are doing what it intends to do and also determine the effectiveness of the Safety in Youth Sports Act.

You are being asked to distribute this to ALL high school coaches because you are a high school athletic director within the PIAA via email. However, your participation is voluntary and you do have the right to decline participating in this survey. Your participation or non-participation will have no benefit or penalty. This study will be approved by the California University of Pennsylvania Institutional Review Board. This approval is effective 04/11/13 and expires 04/10/14. If you have any questions regarding this project, please feel free to contact the primary researcher, Ashley McNamara, LAT, ATC at mcn6299@calu.edu. You may also contact the thesis chair supervising the research, Dr. Michael Meyer, LAT, ATC at meyer_m@calu.edu.

Thank you for taking the time to take part in this research. I greatly appreciate your time, thought, and effort you have put into sending this survey.

Sincerely,



Ashley McNamara, LAT, ATC
Primary Researcher
California University of Pennsylvania
Graduate Athletic Training Education Program
250 University Ave
California, PA 15419
mcn6299@calu.edu

Appendix C4

Heads Up Concussion in Youth Sport Survey

Heads Up Concussion in Youth Sport

This survey will be accessed only by subjects who took part in the Heads Up Concussion in Youth Sport training program. Question 13 was taken from a survey that Guilmette, Malia, and McQuiggan utilized.[33] Questions 16-31 were taken directly from the Heads Up Concussion in Youth Sports concussion quiz.[34]

1. Are you 18 or older?
    a. Yes
    b. No
2. Select your age:
    a. <18
    b. 18-30
    c. 31-40
    d. 41-50
    e. 51-60
    f. >60
3. Select your gender:
    a. Male
    b. Female
    c. Prefer not to answer
4. Select the highest level of education you have completed:

a. Did not graduate high school

b. GED

c. HS

d. Secondary School

e. Graduate

f. Doctorate

g. Other (Fill in the Blank)

5. How many years have you been coaching at the high school level?

a. <1

b. 1-5

c. 5-10

d. 10-15

e. 15-20

f. 20-25

g. 25-30

h. >30

6. Select the class of the school that you currently coach for:

a. A

b. AA

c. AAA

d. AAAA

7. Select what PIAA district you are in:

a. 1

b. 2

c. 3

d. 4

e. 5

f. 6

g. 7

h. 8

i. 9

j. 10

k. 11

l. 12

8. What sport(s) do you coach (select all that apply):

a. Baseball

b. Basketball-Girls

c. Basketball-Boys

d. Bowling

e. Cross Country-Girls

f. Cross Country-Boys

g. Field Hockey

h. Football

i. Competitive Spirit- Girls

j. Golf

k. Gymnastics-Girls

l. Gymnastics-Boys

m. Indoor Track and Field

n. Lacrosse-Girls

o. Lacrosse-Boys

p. Rifle

q. Soccer-Girls

r. Soccer-Boys

s. Softball

t. Swimming and Diving

u. Tennis-Girls

v. Tennis-Boys

w. Track and Field

x. Volleyball

y. Water Polo-Girls

z. Water Polo-Boys

aa. Wrestling-Girls

bb. Wrestling-Boys

9. What level sport(s) do you coach?

a. Freshman

b. Junior Varsity

c. Varsity

d. Middle School

e. Other

10. Have you coached athletes who have been diagnosed by a physician with a concussion?
    a. Yes
    b. No
    c. I don't know
11. Have you ever been diagnosed with a concussion?
    a. Yes
    b. No
    c. I don't remember
12. Does your school have access to a Certified Athletic Trainer?
    a. 1-3 days per week
    b. 4-5 days per week
    c. Only Practices
    d. Only Games
    e. We do NOT have an Athletic Trainer
13. How long (total) have YOU coached in PIAA sanctioned/organized sports (Include all levels AND current high school level)?
    a. Years ____(Fill in the blank) Months ____
14. In your experience, what is the single most important indicator that a player has sustained a concussion?
    a. Fill in the blank.
15. Please select the concussion course that you used:

a. Heads Up Concussion in Youth Sports

b. National Federation of State High School Associations—Concussion in Sports

c. Sports Safety International--ConcussionWise™

d. The Approved Department of Health and Education Regional Concussion Course

16. A concussion is a:

a. Type of traumatic brain injury (or TBI) caused by a bump, blow, or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth.

b. brain bruise

c. loud sound heard from far away

17. When can concussions occur?

a. Only When playing full contact sports

b. Only when the individual who was hit or jolted loses consciousness

18. In any organized or unorganized recreational sport or activity and the most occur without loss of consciousness.How do you identify a concussion?

a. By looking at a CT or MRI scans of an individual's brain.

b. By watching for different types of signs or symptoms, such as a change in the athlete's behavior, thinking, or physical functioning.

c. Asking an athlete if they had their "bell rung" in the last hit.

19. Which of the following are signs of a concussion that you as a coach may identify?

a. The athlete appears stunned, is unsure of the game, score, or opponent, is confused about their assignment or position, and is answering questions slowly.

b. The athlete follows the rules for safety and the rules of the sport, practices good sportsmanship, and uses the proper equipment for the sport.

c. The athlete looks pale, their tongue is white, and after gently pinching the skin, it does not immediately snap back into place.

20. Which of the following are symptoms of a concussion that an athlete may describe?

a. The athlete complains of shoulder pain that radiates down the arm to a tingling feeling in the fingers.

b. The athlete feels weak, tired, and has stopped sweating.

c. The athlete states the lights hurt their eyes, they feel confused, "not right," and complains of an odd headache with "pressure" in their head.

21. If an athlete has had a previous concussion he or she:
    a. Is more likely to sustain another concussion, especially if the first concussion has not had time to heal.
    b. Will never have another concussion.
    c. Will not sustain another concussion from a similar blow or jolt.
22. What is the first thing you should do as a coach when one of your players has sustained a bump or blow to the head or body and isn't acting right?
    a. Immediately rush an athlete to the hospital-even if none of the Danger Signs are present.
    b. Allow the athlete to finish out the quarter/period/half, etc. and then take the athlete for a medical examination.
    c. Remove the athlete from play and look for signs or symptoms of a concussion-even those that may appear hours later.
23. Which of the following would be considered Danger Signs of a severe concussion and require rushing an athlete to the emergency department immediately:

a. The athlete seems slightly off balance, complains of a headache, did not lose consciousness, but just "isn't feeling right".

b. The athlete lost consciousness, has slightly slurred speech, and seems to become increasingly more confused and restless.

c. The athlete complains of a headache and appears slightly dazed or stunned.

24. When can an athlete return to play after a concussion?

a. As soon as they are feeling better.

b. After being evaluated by a health care professional.

c. After being cleared by a health care professional and after a five-step process in which the athlete's activity level is slowly increased over a period of days, weeks, or months depending on the athlete's response to the increasingly challenging activities.

25. When should you talk to the athlete's parents about the possible concussion he/she may have had?

a. The evening of the event or the following day.

b. Immediately following the game or practice-before allowing the child to go home. You should provide information to the parents regarding the signs and

symptoms of concussion, encourage them to see a health care professional, and follow up regarding the status of the athlete.

c. Before the next game/match/event so as to make sure the child is cleared for play.

26. How can you help prevent concussions?

a. By ensuring that all athletes wear properly fitted gear, play with good sportsmanship at all times, and obey the rules of safety.

b. By working with parents, athletes, school, and club administrators to spread awareness about concussions all year: pre-season, during the season, and post-season.

c. Both A and B.

27. Which of the following is true?

a. Most concussions occur w/o LOC.

b. Athletes who have ever had a concussion are at increased risk for another concussion.

c. Young children and teens are more likely to get a concussion than adults.

d. All of the above.

28. Why is it important to recognize and respond properly to a suspected concussion?

a. Not giving the brain enough recovery time after a concussion can be dangerous. A repeat concussion that occurs before the brain recovers from the first concussion can slow recovery or increase the chances for long-term problems.

b. You can't see a concussion like you can a broken bone, but it is a disruption of how the brain works and a serious issue.

c. While rare, permanent brain damage and death are two potential consequences of not identifying and responding to a concussion in a proper or timely manner.

d. All of the above.

29. After sustaining a concussion, you speak with a health care professional regarding your athlete's condition and it was determined he could return to play. What is the first step in this process?

a. Begin heavy, non-contact physical activity- including sprinting/running, high-intensity stationary biking, regular weightlifting routine, and non-contact sports-specific drills.

b. Start light aerobic exercise, but only to increase an athlete's heart rate-meaning 5-10 minutes on an exercise bike, walking, or light

jogging. No weight lifting, jumping, or hard running.

c. Begin activities that increase the athlete's heart rate and incorporate limited body or head movement-including moderate jogging, brief running, moderate-intensity stationary biking, and moderate-intensity weightlifting.

d. Put the athlete back into unrestricted play.

e. Reintegrate the athlete in practice sessions, even full contact in controlled practice if appropriate to the sport.

30. After sustaining a concussion, you speak with a health care professional regarding your athlete's condition and it was determined he could return to play. What is the second step in this process?

a. Begin heavy, non-contact physical activity-including sprinting/running, high-intensity stationary biking, regular weightlifting routine and non-contact sports-specific drills.

b. Start light aerobic exercise, but only to increase an athlete's heart rate-meaning 5-10 minutes on an exercise bike, walking, or light jogging. No weight lifting, jumping, or hard running.

c. Begin activities that increase the athlete's heart rate and incorporate limited body or head movement–including moderate jogging, brief running, moderate-intensity stationary biking, and moderate-intensity weightlifting.

d. Put the athlete back into unrestricted play.

e. Reintegrate the athlete in practice sessions, even full contact in controlled practice if appropriate to the sport.

31. Concussions affect people differently. While most athletes with a concussion recover quickly and fully, some will have symptoms that last for days, or even weeks. A more serious concussion can last for months or longer.

a. True

b. False

Appendix C5

National Federation of State High School Associations—

Concussion in Sports

National Federation of State High School Associations—Concussion in Sports

This survey is accessed only by coaches who took part in the National Federation of State High School Associations-Concussion in Sports training program. Question 14 were taken from a survey that Guilmette, Malia, and McQuiggan utilized.[33] Questions 16-27 were taken directly from the National Federation of State High School Associations—Concussion in Sports concussion quiz.[35]

1. Are you 18 or older?
    a. Yes
    b. No
2. Select your age:
    a. <18
    b. 18-30
    c. 31-40
    d. 41-50
    e. 51-60
    f. >60
3. Select your gender:
    a. Male
    b. Female
    c. Prefer not to answer

4. Select the highest level of education you have completed:
    a. Did not graduate high school
    b. GED
    c. HS
    d. Secondary School
    e. Graduate
    f. Doctorate
    g. Other (Fill in the Blank)
5. How many years have you been coaching at the high school level?
    a. <1
    b. 1-5
    c. 5-10
    d. 10-15
    e. 15-20
    f. 20-25
    g. 25-30
    h. >30
6. Select the class of the school that you currently coach for:
    a. A
    b. AA
    c. AAA

d. AAAA

7. Select what PIAA district you are in:

a. 1

b. 2

c. 3

d. 4

e. 5

f. 6

g. 7

h. 8

i. 9

j. 10

k. 11

l. 12

8. What sport(s) do you coach (select all that apply):

a. Baseball

b. Basketball-Girls

c. Basketball-Boys

d. Bowling

e. Cross Country-Girls

f. Cross Country-Boys

g. Field Hockey

h. Football

i. Competitive Spirit- Girls

j. Golf

k. Gymnastics-Girls

l. Gymnastics-Boys

m. Indoor Track and Field

n. Lacrosse-Girls

o. Lacrosse-Boys

p. Rifle

q. Soccer-Girls

r. Soccer-Boys

s. Softball

t. Swimming and Diving

u. Tennis-Girls

v. Tennis-Boys

w. Track and Field

x. Volleyball

y. Water Polo-Girls

z. Water Polo-Boys

aa. Wrestling-Girls

bb. Wrestling-Boys

9. What level sport(s) do you coach?

a. Freshman

b. Junior Varsity

c. Varsity

d. Middle School

e. Other

10. Have you coached athletes who have been diagnosed by a physician with a concussion?

    a. Yes

    b. No

    c. I don't know

11. Have you ever been diagnosed with a concussion?

    a. Yes

    b. No

    c. I don't remember

12. Does your school have access to a Certified Athletic Trainer?

    a. 1-3 days per week

    b. 4-5 days per week

    c. Only Practices

    d. Only Games

    e. We do NOT have an Athletic Trainer

13. How long (total) have YOU coached in PIAA sanctioned/organized sports (Include all levels AND current high school level)?

    a. Years ____(Fill in the blank) Months ____

14. In your experience, what is the single most important indicator that a player has sustained a concussion?

    a. Fill in the blank.

15. Please select the concussion course that you used:
    a. Heads Up Concussion in Youth Sports
    b. National Federation of State High School Associations—Concussion in Sports
    c. Sports Safety International--ConcussionWise™
    d. The Approved Department of Health and Education Regional Concussion Course
16. What is a concussion?
    a. Type of traumatic brain injury (TBI) caused by a bump, blow or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth
    b. A brain bruise.
    c. Loud sound heard from far away
17. When can a concussion occur?
    a. Only when playing a full contact sport
    b. Only when the individual who was hit or jolted loses consciousness
    c. In any organized or unorganized recreational sport or activity and most occur without loss of consciousness
18. Please select the concussion course that you used:
    a. Heads Up Concussion in Youth Sports

b. National Federation of State High School Associations—Concussion in Sports

c. Sports Safety International--ConcussionWise™

d. The Approved Department of Health and Education Regional Concussion Course

19. How do you identify a concussion?

a. By looking at a CT or MRI scan of an individual's brain.

b. By watching for different types of signs or symptoms such as a change in athletes behavior, thinking, or physical functioning

c. Asking an athlete if they had their "bell rung" in the last hit.

20. Which of the following are signs of a concussion that you as a coach may identify?

a. The athlete appears to be stunned, is unsure of the game, score, or opponent, is confused about their assignment or position, and is answering questions slowly.

b. The athlete follows the rules for safety and the rules of the sport, practices good sportsmanship, and uses the proper equipment for the sport.

c. The athlete looks pale, their tongue is white, and after gently pinching the skin, it does not immediately snap back into place.

21. Which of the following are symptoms of a concussion that an athlete may describe?

a. The athlete complains of shoulder pain that radiates down the arm to a tingling feeling in the fingers.

b. The athlete feels weak, tired, and has stopped sweating.

c. The athlete states the lights hurt their eyes, they feel confused, and complains of a headache.

22. If a player returns to activity before fully healing from the concussion they:

a. Are more likely to sustain another concussion

b. Will never have another concussion

c. Will not sustain another concussion from a similar blow or jolt

23. What is the first thing you should do as a coach when one of your players has sustained a bump or blow to the head or body and isn't acting right?

a. Immediately rush the athlete to the hospital—even if none of the Danger Signs are present.

b. Allow the athletes to finish out the quarter/period/half etc. and then take the athlete for a medical examination.

c. Remove athlete from play and look for signs or symptoms of a concussion—even those that may appear hours later.

24. Which of the following would indicate a medical emergency of a severe concussion and require rushing an athlete to the emergency department immediately?

a. The athlete seems slightly off balance, complains of a headache, did not lose consciousness, but just "isn't feeling right."

b. The athlete lost consciousness, persistently vomiting, and seems to become increasingly more confused and restless.

c. The athlete complains of a headache and appears slightly dazed or stunned.

25. The athlete shall be removed from play and the athlete's parents should be alerted about a possible concussion immediately following the game or practice - before allowing the child to go home. What other elements make up "Heads Up" 4-step Action Plan?

a. Ensure that the participant is evaluated by a health care professional

b. Keep the participant out of play the day of the injury and until an appropriate health care professional says the player is symptom-free and it's OK to return to play.

c. Both A and B are correct.

26. When can an athlete return to play after a concussion?

a. As soon as they are feeling better.

b. After being evaluated by a health care professional.

c. After being cleared by a health care professional and after a five step process in which the athlete's activity level is slowly increased over a period of days, weeks, or months depending on the athlete's response to the increasingly challenging activities.

27. How can you help prevent a concussion?

a. By ensuring that all athletes wear properly fitted protective equipment, practice good sportsmanship at all times, and follow the rules of play.

b. By working with parents, athletes, and school and club administrators to spread awareness about concussions all year: pre-season, during the season, and post season.

c. Both A and B are Correct

Appendix C6

Sports Safety International—Concussion Wise™

Sports Safety International—Concussion Wise™

Question 14 was taken from a survey that Guilmette, Malia, and McQuiggan utilized.[33] Questions 16-26 were taken directly from the Sports Safety International—Concussion Wise™.[36]

1. Are you 18 or older?
    a. Yes
    b. No
2. Select your age:
    a. <18
    b. 18-30
    c. 31-40
    d. 41-50
    e. 51-60
    f. >60
3. Select your gender:
    a. Male
    b. Female
    c. Prefer not to answer
4. Select the highest level of education you have completed:
    a. Did not graduate high school
    b. GED
    c. HS

d. Secondary School

e. Graduate

f. Doctorate

g. Other (Fill in the blank)

5. How many years have you been coaching at the high school level?

a. <1

b. 1-5

c. 5-10

d. 10-15

e. 15-20

f. 20-25

g. 25-30

h. >30

6. Select the class of the school that you currently coach for:

a. A

b. AA

c. AAA

d. AAAA

7. Select what PIAA district you are in:

a. 1

b. 2

c. 3

d. 4

e. 5

f. 6

g. 7

h. 8

i. 9

j. 10

k. 11

l. 12

8. What sport(s) do you coach (select all that apply):

a. Baseball

b. Basketball-Girls

c. Basketball-Boys

d. Bowling

e. Cross Country-Girls

f. Cross Country-Boys

g. Field Hockey

h. Football

i. Competitive Spirit- Girls

j. Golf

k. Gymnastics-Girls

l. Gymnastics-Boys

m. Indoor Track and Field

n. Lacrosse-Girls

o. Lacrosse-Boys

p. Rifle

q. Soccer-Girls

r. Soccer-Boys

s. Softball

t. Swimming and Diving

u. Tennis-Girls

v. Tennis-Boys

w. Track and Field

x. Volleyball

y. Water Polo-Girls

z. Water Polo-Boys

aa. Wrestling-Girls

bb. Wrestling-Boys

9. What level sport(s) do you coach?

a. Freshman

b. Junior Varsity

c. Varsity

d. Middle School

e. Other

10. Have you coached athletes who have been diagnosed by a physician with a concussion?

a. Yes

b. No

c. I don't know

11. Have you ever been diagnosed with a concussion?

    a. Yes

    b. No

    c. I don't remember

12. Does your school have access to a Certified Athletic Trainer?

    a. 1-3 days per week

    b. 4-5 days per week

    c. Only Practices

    d. Only Games

    e. We do NOT have an Athletic Trainer

13. How long (total) have YOU coached in PIAA sanctioned/organized sports (Include all levels AND current high school level)?

    a. Years ____(Fill in the blank) Months ____

14. In your experience, what is the single most important indicator that a player has sustained a concussion?

    a. Fill in the blank.

15. Please select the concussion course that you used:

    a. Heads Up Concussion in Youth Sports

    b. National Federation of State High School Associations—Concussion in Sports

    c. Sports Safety International--ConcussionWise™

d. The Approved Department of Health and Education Regional Concussion Course

16. Concussion grading scales are a useful tool in determining how severe a concussion is:
    a. True
    b. False
17. Second Impact Syndrome can occur when an athlete sustains a second blow to the head before their symptoms disappear:
    a. True
    b. False
18. Please select the concussion course that you used:
    a. Heads Up Concussion in Youth Sports
    b. National Federation of State High School Associations—Concussion in Sports
    c. Sports Safety International--ConcussionWise™
    d. The Approved Department of Health and Education Regional Concussion Course
19. Headache, dizziness, and nausea are all symptoms of a concussion:
    a. True
    b. False
20. Concussion in younger children typically heal quicker than in adults:

a. True

b. False

21. Most concussions involve a loss of consciousness:

a. True

b. False

22. A CAT scan or MRI can be used to diagnose concussions:

a. True

b. False

23. Return to play is based solely on an athlete's performance on neurocognitive exams:

a. True

b. False

24. Cognitive rest is just as important as physical rest when recovering from a concussion:

a. True

b. False

25. Continuing to play sports before the brain completely recovers can slow recovery or increase the likelihood of having long-term problems:

a. True

b. False

26. Athletes can return to play as soon as they tell you they are symptom free:

a. True

b. False

Appendix C7

The Approved Department of Health and Education Regional Concussion Course

The Approved Department of Health and Education Regional Concussion Course

Question 14 was taken from a survey that Guilmette, Malia, and McQuiggan utilized.[33] Questions 16-20, 29, and 30 were taken directly from the Heads Up Concussion in Youth Sports concussion quiz.[34] Questions 21-23 were taken directly from the National Federation of State High School Associations—Concussion in Sports concussion quiz.[35] Questions 24-28, 31, and 32 were taken directly from the Sports Safety International—Concussion Wise™.[36]

1. Are you 18 or older?
    a. Yes
    b. No
2. Select your age:
    a. <18
    b. 18-30
    c. 31-40
    d. 41-50
    e. 51-60
    f. >60
3. Select your gender:
    a. Male
    b. Female

c. Prefer not to answer

4. Select the highest level of education you have completed:

   a. Did not graduate high school

   b. GED

   c. HS

   d. Secondary School

   e. Graduate

   f. Doctorate

   g. Other (Fill in the Blank)

5. How many years have you been coaching at the high school level?

   a. <1

   b. 1-5

   c. 5-10

   d. 10-15

   e. 15-20

   f. 20-25

   g. 25-30

   h. >30

6. Select the class of the school that you currently coach for:

   a. A

   b. AA

c. AAA

d. AAAA

7. Select what PIAA district you are in:

a. 1

b. 2

c. 3

d. 4

e. 5

f. 6

g. 7

h. 8

i. 9

j. 10

k. 11

l. 12

8. What sport(s) do you coach (select all that apply):

a. Baseball

b. Basketball-Girls

c. Basketball-Boys

d. Bowling

e. Cross Country-Girls

f. Cross Country-Boys

g. Field Hockey

h. Football

i. Competitive Spirit- Girls

j. Golf

k. Gymnastics-Girls

l. Gymnastics-Boys

m. Indoor Track and Field

n. Lacrosse-Girls

o. Lacrosse-Boys

p. Rifle

q. Soccer-Girls

r. Soccer-Boys

s. Softball

t. Swimming and Diving

u. Tennis-Girls

v. Tennis-Boys

w. Track and Field

x. Volleyball

y. Water Polo-Girls

z. Water Polo-Boys

aa. Wrestling-Girls

bb. Wrestling-Boys

9. What level sport(s) do you coach?

a. Freshman

b. Junior Varsity

c. Varsity

d. Middle School

e. Other

10. Have you coached athletes who have been diagnosed by a physician with a concussion?

a. Yes

b. No

c. I don't know

11. Have you ever been diagnosed with a concussion?

a. Yes

b. No

c. I don't remember

12. Does your school have access to a Certified Athletic Trainer?

a. 1-3 days per week

b. 4-5 days per week

c. Only Practices

d. Only Games

e. We do NOT have an Athletic Trainer

13. How long (total) have YOU coached in PIAA sanctioned/organized sports (Include all levels AND current high school level)?

a. Years ____(Fill in the blank) Months ____

14. In your experience, what is the single most important indicator that a player has sustained a concussion?

a. Fill in the blank.

15. Please select the concussion course that you used:

a. Heads Up Concussion in Youth Sports

b. National Federation of State High School Associations—Concussion in Sports

c. Sports Safety International--ConcussionWise™

d. The Approved Department of Health and Education Regional Concussion Course

16. What is a concussion?[34]

a. Type of traumatic brain injury (TBI) caused by a bump, blow or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth

b. A brain bruise.

c. Loud sound heard from far away

17. When can concussions occur?[34]

a. Only When playing full contact sports

b. Only when the individual who was hit or jolted loses consciousness

c. In any organized or unorganized recreational sport or activity and the most occur without loss of consciousness.

18. Please select the concussion course that you used:

a. Heads Up Concussion in Youth Sports

b. National Federation of State High School Associations—Concussion in Sports

c. Sports Safety International--ConcussionWise™

d. The Approved Department of Health and Education Regional Concussion Course

19. How do you identify a concussion?[34]

a. By looking at a CT or MRI scans of an individual's brain

b. By watching for different types of signs or symptoms, such as a change in the athlete's behavior, thinking, or physical functioning.

c. Asking an athlete if they had their "bell rung" in the last hit

20. Which of the following are signs of a concussion that you as a coach may identify?[34]

a. The athlete appears stunned, is unsure of the game, score, or opponent, is confused about their assignment or position, and is answering questions slowly.

b. The athlete follows the rules for safety and the rules of the sport, practices good sportsmanship, and uses the proper equipment for the sport.

c. The athlete looks pale, their tongue is white, and after gently pinching the skin, it does not immediately snap back into place.

21. If a player returns to activity before fully healing from the concussion they:[35]
    a. Are more likely to sustain another concussion
    b. Will never have another concussion
    c. Will not sustain another concussion from a similar blow or jolt
22. What is the first thing you should do as a coach when one of your players has sustained a bump or blow to the head or body and isn't acting right?[35]
    a. Immediately rush the athlete to the hospital—even if none of the Danger Signs are present.
    b. Allow the athletes to finish out the quarter/period/half etc. and then take the athlete for a medical examination.
    c. Remove athlete from play and look for signs or symptoms of a concussion—even those that may appear hours later.
23. Which of the following would indicate a medical emergency of a severe concussion and require rushing an athlete to the emergency department immediately?[35]

a. The athlete seems slightly off balance, complains of a headache, did not lose consciousness, but just "isn't feeling right."

b. The athlete lost consciousness, persistently vomiting, and seems to become increasingly more confused and restless.

c. The athlete complains of a headache and appears slightly dazed or stunned.

24. Second Impact Syndrome can occur when an athlete sustains a second blow to the head before their symptoms disappear.[36]

a. True

b. False

25. Headache, dizziness, and nausea are all symptoms of a concussion.[36]

a. True

b. False

26. Concussion in younger children typically heal quicker than in adults.[36]

a. True

b. False

27. Most concussions involve a loss of consciousness.[36]

a. True

b. False

28. A CAT scan or MRI can be used to diagnose concussions.[36]

    a. True

    b. False

29. Which of the following is true?[34]

    a. Most concussions occur w/o LOC

    b. Athletes who have ever had a concussion are at increased risk for another concussion

    c. Young children and teens are more likely to get a concussion than adults

    d. All of the above.

30. Why is it important to recognize and respond properly to a suspected concussion?[34]

    a. Not giving the brain enough recovery time after a concussion can be dangerous. A repeat concussion that occurs before the brain recovers from the first concussion can slow recovery or increase the chances for long-term problems.

    b. You can't see a concussion like you can a broken bone, but it is a disruption of how the brain works and a serious issue.

    c. While rare, permanent brain damage and death are two potential consequences of not identifying and

responding to a concussion in a proper or timely manner.

d. All of the above.

31. Continuing to play sports before the brain completely recovers can slow recovery or increase the likelihood of having long-term problems.[36]

a. True

b. False

32. Athletes can return to play as soon as they tell you they are symptom free:[36]

a. True

b. False

Abstract C8

Abstract

Title:	ARE COACHES TRAINED TO MANAGE CONCUSSION? A SURVEY DRIVEN RESEARCH BASED ON THE PENNSYLVANIA YOUTH SPORTS SAFETY ACT
Researcher:	Ashley McNamara, LAT, ATC, PES
Advisor:	Michael Meyer, PhD, LAT, ATC
Date:	June 2014
Research Type:	Master's Thesis
Context:	This study evaluated concussion knowledge of high school coaches within the Western Pennsylvania Interscholastic Athletic League based on the concussion courses in the Pennsylvania Youth Sports Safety Act.
Objective:	The primary scope of this study was to examine if coaches are properly trained on concussion education. The study looked at if concussion education courses properly educated coaches.
Design:	Descriptive Study
Setting:	Population-Based Survey
Participants:	The participants for this study were high school coaches over 18 years of age and in the Western Pennsylvania Interscholastic Athletic League.
Interventions:	The dependent variable was the coach's knowledge of concussion management. The data was analyzed using SPSS.

Main Outcome Measures:

Coaches chose which concussion education course they utilized and were directed to a quiz testing their

knowledge. These variables were analyzed using frequency counts.

Results: Most respondents (94.74%) were male coaches and (63.16%) had a certified athletic trainer at every event. However, due to the limited responses it is unclear if one concussion course properly educates coaches more than another.

Conclusion: The result of this study suggests that concussion education courses effectively educate coaches on concussions, though these findings are limited due to the low number of respondents.

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