CONCUSSION KNOWLEDGE AMONG PARENTS AND COACHES OF YOUTH ATHLETES (AGES 8-12)

A THESIS

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by
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INTRODUCTION

Concussions are an inevitable aspect of athletic competition. A concussion is considered a mild traumatic brain injury that can affect how the brain normally functions.[1-9] Although initial symptoms of a concussion can seem mild, these symptoms can lead to severe problems in the future.[10-13] Mild traumatic brain injuries can affect a person's physical, cognitive, and psychological aspects of life.[14-18] This is an injury that must be taken seriously at all levels of competition.

There are many detrimental effects that can occur after sustaining a concussion. In retired athletes, serious cognitive issues can begin to surface such as memory loss, dementia, and depression.[19-21] Longer recovery times of verbal memory and reaction time are being seen in college athletes with a previous history of concussions.[22] Any athlete can be at risk for Second Impact Syndrome, which causes rapid swelling of the brain resulting in brain damage or death.[23-24] Second Impact Syndrome occurs when an individual sustains a second concussion before the first concussion has fully resolved. Youth athletes must be protected from these dangerous risks by improving prevention, recognition and management of concussions.

With medical professionals, such as physicians or athletic trainers, who are rarely present at youth sporting events, the responsibility falls on the parents and coaches to keep the youth athletes safe. To do this, parents and coaches of youth athletes must be properly educated on concussion prevention, recognition and management.

There are many mechanisms that can cause a concussion. Concussions can be caused by a direct hit to the head or an indirect hit to another area of the body that causes a shearing or a rotational force to the brain.[1,8,10,25] One of the reasons concussions are so difficult to recognize is each individual may present with different signs and symptoms. In addition, some symptoms present right away, while others can take days or weeks to develop.[26] Physical, cognitive, and behavioral symptoms can all result from sustaining a concussion.[27-28] Table 1 shows concussion signs and symptoms that can present in each of the three categories stated above. Educating parents and coaches of youth athletes of signs and symptoms can increase proper recognition and management of concussions.

Table 1. Concussion Signs & Symptoms

Physical	Cognitive	Behavioral
• Balance problems • Vision problems • Dizziness • Fatigue • Headache • Lightheaded • Nausea/Vomiting • Slurred Speech • Ringing in ears • Sensitivity to light	• Amnesia • Confusion • Easily distracted • Feeling in a fog • Poor concentration • Slow to answer questions • Disorientation	• Irritability • Personality change • Anxiety • Depressed mood • Easily frustrated

There are many short and long term effects that can occur following a concussion. Short term effects can last anywhere from a few days to a couple weeks.[27] These can include headache, photophobia, difficulty concentrating, short term memory issues, poor balance and insomnia. Research has shown that once an athlete has sustained a concussion, the athlete is at a higher risk of sustaining a second concussion.[29] Long term effects can include memory loss, early onset dementia/Alzheimer, emotional distress, depression, chronic traumatic encephalopathy and increased risk of suicide.[19-21] These long term effects are usually seen in athletes that have sustained multiple concussions or repetitive subconcussive hits to the head such as boxing, football, hockey or soccer players.

Awareness of concussions continues to increase among the athletic population. However, there is still room for improvement regarding concussion recognition and management knowledge among parents and coaches of youth athletes. In a study by O'Donoghue et al[12], youth sport coaches were found to have a moderate knowledge of sport-related concussions with a mean score of 84% on concussion knowledge. In a study by Coghlin, Myles and Howitt[4], 76.32% of parents incorrectly assumed that an athlete must lose consciousness to be considered a concussion. To help protect youth athletes, educational efforts must continue in order to increase concussion knowledge among parents and coaches.

Another area that must be looked into is the influence the media has on youth athletes. How the media portrays concussions among professional athletes influences the perception of risk by youth athletes, parents, and coaches. In a study by McLellan and McKinley[11], media portrayal of suspected concussions sustained by European professional rugby players were assessed. Sixty percent of the athletes suspected of sustaining a concussion were shown to continue or return to play during the game. If the media is showing concussions to be an injury that you can recover from so quickly, how are youth athletes, parents, coaches going to understand the damage concussions can cause?

Concussions can be difficult to prevent. There is no specific equipment that can prevent every concussion, but there are factors that can reduce the risk of sustaining a concussion. The first way to reduce the risk of concussions is for coaches to teach proper technique in dangerous maneuvers such as tackling in football. Mouth guards help disperse the force of a hit to the jaw or face, while a helmet helps disperse the force of a hit to the head.[18,30] By dispersing the force of a hit, it can reduce the disruptive forces placed on the brain. Another prevention strategy that is gaining attention is strengthening an individual's neck muscles to reduce jarring motions of the head after a hit.

Concussions are evaluated utilizing several different methods. These methods include subjective information from the athlete, balance testing, cognitive questions and neurocognitive testing.[31-32]

Although there has been a great amount of research with college and professional athletes, there is little research on specific management guidelines for youth athletes, specifically under the age of fourteen. The trouble with youth athletes is baseline cognition may be difficult to assess due to rapid cognitive development seen during childhood.[33-34] As with all post-concussion protocols,

youth athletes, should not return to play until all symptoms have resolved[35]. A seven day progressive return to play protocol is used by most medical professionals for youth athletes. This protocol starts with no physical or cognitive exertion and ends with full return to play.[18,31,36] Without proper rest, symptoms can be exacerbated after cognitive or physical activity.[34,37]

There is no single return to play guideline used for the entire athletic population. One component shared by all return to play guidelines is an athlete should not begin a progression until fully asymptomatic.[38] Most return to play guidelines follow that of the Zurich Concussion Consensus Statement. There are six steps that guide athletes back into full contact play.[30] Refer to Table 2 for each step of the return to play progression.[30]

Table 2. Gradual Return to Play Protocol

Return to Play Stages
1. No activity
2. Light aerobic exercise
3. Sport-specific exercise
4. Non-contact drills
5. Full contact practice
6. Full return to play

The research shows that concussions are a prevalent issue among athletes of all ages.[14,25,38-40] However, little research has been conducted on concussions specifically among youth athletes and the educational tools that are available to this population. Proper prevention, recognition and management of concussions must be implemented to protect youth athletes from short and long term effects. For youth athletes this can best be achieved by educating parents and coaches. Therefore, the purpose of this study is to assess concussion knowledge among parents and coaches of youth athletes between the ages of 8-12.

METHODS

The primary purpose of this study is to examine concussion knowledge among parents and coaches of youth athletes. This section will include the following subsections: research design, subjects, instruments, procedures, hypotheses, and data analysis.

Research Design

A descriptive design was used for this study. The dependent variable is concussion knowledge score obtained from the Concussion Knowledge Survey. The independent variables are youth sport parents, youth sport coaches, CPR certification, first aid certification, and attendance of a concussion awareness class. The survey went through validity and reliability testing. The survey was reviewed by a panel of experts consisting of ten certified athletic trainers. In addition, the survey was taken by ten parents/ coaches of youth athletes to assess reliability of the survey. Reliability testing was performed on the survey and received a Cronbach's α of 0.732.

Subjects

The survey was distributed to an unknown number of male and female parents and coaches of youth athletes. All subjects included in this study either coached a youth athletic team, or have a child that participated in youth sports or both a parent and coach of a youth athlete. Individuals coaching or parenting an adolescent under the age of 8 or over the age of 12 were excluded in order to target concussion knowledge of youth athletes. Participation in the study was on a voluntary basis upon completion of the Concussion Knowledge Survey. The study was approved by the Institutional Review Board at California University of Pennsylvania (Appendix C1). All participants' identities remained anonymous and did not appear in the study.

Preliminary Research

The Concussion Knowledge Survey (Appendix C2) was a previously used survey in a study by Gourley et al[5]. The purpose of the survey was to assess general knowledge of sport-related concussions and recognition of concussion-

related symptoms. Gourley et al[5] performed preliminary research to assess the clarity of the survey.

Instruments

The survey was created electronically using www.surveymonkey.com. Subjects were asked to complete a demographic information section. The first question determined if the participant was above 18 years of age. If the participant was under the age of 18, the participant was thanked and dismissed from the survey. An additional question was added to determine if the participant was a coach or a parent of a youth athlete. If the participant was neither a coach nor a parent of a youth athlete, the participant was thanked and dismissed from the survey. Demographic information questions were different based on population choice (parent vs. coach). The parents' demographic questions included: age, gender, state of residency, number of children, age of children participating in a sport, sports the children participate in, previous medical training, level of education, and personal concussion history. The coach demographic questions included: age, gender, state of residency, sports coached, years of coaching, levels coached, level of

education, previous medical training, personal concussion history, and coaching clinics attended. If the participant was both a parent and a coach of a youth athlete the subject answered the parent demographic questions.

Additional questions assessed the participant's knowledge of concussions, signs and symptoms, recognition, management, and return to play decisions. The entire survey took approximately ten minutes to complete. There was minimal risk for the participant to complete the survey.

Procedures

The researcher applied and obtained approval from the IRB at California University of Pennsylvania (Appendix C1) before any research was conducted. Participants for the study were contacted in two different ways. Some individuals were personal contacts of the researcher and were asked to participate in the survey on a voluntary basis. This was considered a convenience sample. Other participants were obtained through youth sports associations. Contacts for youth coaching organizations were found by searching youth sport leagues' web sites and emailing current coaches of youth athletes. The researcher contacted youth sports organization leaders, through

contact info found on the organizations' website, to explain the purpose of the study. Once permission was obtained from each youth sports organization leader, the researcher sent the survey via email to the youth sports organization leader. Then the youth sports organization leader distributed the survey to the organization's parents and coaches. The study was distributed by the youth coaching association through their mailing lists.

The survey was sent to youth sport coaches and parents with a cover letter explaining the purpose of the study and a link to the survey. Informed consent was stated and implied when the participant clicked on the link to take the survey.

A reminder e-mail was sent one week after the original e-mail to encourage survey completion. There was no obligation of the subject to participate in the study. All subjects remained anonymous with no way to trace answers back to one subject. There was minimal risk for the subject to participate in the survey.

Hypotheses

The following hypotheses are based on previous research and the researcher's review of the literature.

1. There will be no difference in concussion knowledge score between parents and coaches of youth athletes.
2. There will be no difference in concussion knowledge score between youth sport parents with CPR and first aid certification, and youth sport parents without CPR and first aid certification.
3. There will be no difference in concussion knowledge score between youth sport coaches with CPR and first aid certification, and youth sport coaches without CPR and first aid certification.
4. There will be no difference in concussion knowledge score between youth sport coaches who have attended a concussion awareness class or clinic, and youth sport coaches who have not attended a concussion awareness class or clinic.

Data Analysis

All data was analyzed by SPSS version 18.0 for windows at an α of 0.05. The first research hypothesis was analyzed using a one way ANOVA. The other three hypotheses were analyzed using an independent *t*-test.

RESULTS

The purpose of this study was to assess concussion knowledge among parents and coaches of youth athletes. The data was obtained using an electronic survey. This section contains the following subsections: Demographic Information, Hypothesis Testing and Additional Findings.

Demographic Information

The participants consisted of parents and coaches of youth athletes who obtained the survey through the researcher's personal contact or from a youth sports organization leader. A total of 85 surveys were returned with 70 fully completed (82.4%). The sample consisted of parents of youth athletes (n=38), coaches of youth athletes (n=14), and subjects who were both a parent and a coach of youth athletes (n=18). Table 3 represents the state of residency of the participants. The highest number of responses were received from Pennsylvania with 22 parents and coaches. There was only one respondent from California.

Table 3. State of Residency

Classification	Parents N (%)	Coaches N (%)	Both N (%)
California	0 (0)	1 (1.4)	0 (0)
Pennsylvania	7 (10)	7 (10)	8 (11.4)
Texas	13 (18.6)	0 (0)	4 (5.7)
Utah	2 (2.9)	0 (0)	0 (0)
Virginia	1 (1.4)	1 (1.4)	0 (0)
Washington	8 (11.4)	4 (5.7)	5 (7.1)
West Virginia	7 (10)	1 (1.4)	1 (1.4)

Table 4 represents personal concussion history of the participants. Only 22.8% (n=16) of parents and coaches of youth athletes had a personal history of being diagnosed with a concussion.

Table 4. Personal Concussion History

Classification	Previous History N (%)	No History N (%)
Parents	8 (11.4)	30 (42.9)
Coaches	6 (8.5)	8 (11.4)
Both	2 (2.9)	16 (22.9)

Table 5 represents the sports the parents' children participated in and the sports coached by the coaches. The subjects were allowed to choose more than one sport. Basketball had the highest number of responses from parents of youth athletes with a total of 41 (58.6%). While boxing, strength/conditioning and water polo had the lowest number of responses with 0 parents of youth athletes for each sport. Soccer had the highest number of responses with

seven coaches and basketball had the second highest response with five coaches.

Table 5. Frequency Table of Sports for Participants

Sport	Parents N (%)	Coaches N (%)
Baseball	38 (15.6)	2 (6.7)
Basketball	41 (16.8)	5 (16.7)
Boxing	0 (0.0)	0 (0.0)
Cheerleading	6 (2.5)	1 (3.3)
Field Hockey	4 (1.6)	1 (3.3)
Football	31 (12.7)	3 (10.0)
Golf	6 (2.5)	0 (0.0)
Gymnastic	5 (2.0)	0 (0.0)
Hockey	2 (0.8)	0 (0.0)
Lacrosse	4 (1.6)	2 (6.7)
Martial Arts	10 (4.1)	0 (0.0)
Rugby	2 (0.8)	0 (0.0)
Skiing	4 (1.6)	0 (0.0)
Soccer	33 (13.5)	7 (23.3)
Softball	12 (4.9)	2 (6.7)
Strength/Conditioning	0 (0.0)	2 (6.7)
Swimming	17 (7.0)	0 (0.0)
Tennis	5 (2.0)	0 (0.0)
Track & Field	11 (4.5)	2 (6.7)
Water Polo	0 (0.0)	0 (0.0)
Wrestling	4 (1.6)	0 (0.0)
Volleyball	9 (3.7)	3 (10.0)

Hypothesis Testing

All hypotheses were tested with a level of significance set at $\alpha \leq 0.05$.

Hypothesis 1: There will be no difference in concussion knowledge score between parents and coaches of youth athletes.

A one-way ANOVA was used to determine if there was a difference in the total scores on the Concussion Knowledge Survey between parents and coaches of youth athletes. The results of the analysis are presented below in Table 6.

Table 6. One-way ANOVA statistics: Hypothesis 1

Classification	N	Mean	SD
Parents	38	20.45	2.658
Coaches	14	21.29	2.525
Both	18	20.39	2.173

Conclusion: The pretest means of concussion knowledge scores between parents, coaches, and both (a parent and a coach) were compared using a one-way ANOVA. No significant difference was found ($F(2, 67) = 0.653$, $p > .05$). The concussion knowledge score from the three groups did not differ significantly from one another. Participants who were parents had a mean score of 20.45 (SD = 2.658) out of a possible 26 (78.7%). Participants who were coaches had a mean score of 21.29 (SD = 2.525) out of 26 (81.9%).

Participants who were both a parent and a coach had a mean score of 20.39 (*SD* = 2.173) out of 26 (78.4%).

Hypothesis 2: There will be no difference in concussion knowledge score between youth sport parents, with CPR and first aid certification, and youth sport parents without CPR and first aid certification.

An independent *t*-test was used to determine if there was a difference in concussion knowledge score of parents with CPR/first aid certification and parents without CPR/first aid certification. The results of the analysis are presented below in Table 7.

Table 7. Independent *t*-test: Hypothesis 2

Parents	**N**	**Mean**	**SD**
With CPR/First Aid	28	20.64	2.281
Without CPR/First Aid	27	20.26	2.754

Conclusion: An independent-samples *t*-test was calculated comparing the mean score of participants who identified themselves as a parent with CPR/first aid certification to the mean score of participants who identified themselves as a parent without CPR/first aid certification. No significant difference was found ($t(53) = .563$, $p > .05$). The concussion knowledge score was out of a possible 26. The mean of the parents with CPR/first aid certification ($M = 20.64$, $SD = 2.281$) was not

significantly different from the mean of parents without CPR/first aid certification (M = 20.26, SD = 2.754).

Hypothesis 3: There will be no difference in concussion knowledge score between youth sport coaches, with CPR and first aid certification, and youth sport coaches without CPR and first aid certification.

An independent t-test was used to determine if there was a difference in concussion knowledge score of coaches with CPR/first aid certification and coaches without CPR/first aid certification. The results of the analysis are presented below in Table 8.

Table 8. Independent t-test: Hypothesis 3

Coaches	N	Mean	SD
With CPR/First Aid	20	21.00	2.128
Without CPR/First Aid	12	20.42	2.712

Conclusion: An independent-samples t-test was calculated comparing the mean score of participants who identified themselves as a coach with CPR/first aid certification to the mean score of participants who identified themselves as a coach without CPR/first aid certification. No significant difference was found ($t(30)$ = .677, $p > .05$). The mean of the coaches with CPR/first aid certification (M = 21.00, SD = 2.128) was not significantly different from the mean of coaches without CPR/first aid certification (M = 20.42, SD = 2.712).

Hypothesis 4: There will be no difference in concussion knowledge score between youth sport coaches, who have attended a concussion awareness class or clinic, and youth sport coaches who have not attended a concussion awareness class or clinic.

An independent *t*-test was used to determine if there was a difference in concussion knowledge score of coaches who have attended a concussion class/clinic and coaches who have not attended a concussion class/clinic. The results of the analysis are presented below in Table 9.

Table 9. Independent *t*-test: Hypothesis 4

Coaches	**N**	**Mean**	**SD**
Attended Class	7	21.14	2.673
Not Attended Class	7	21.43	2.573

Conclusion: An independent *t*-test compared the mean scores of coaches who had attended a concussion class/clinic and coaches who had not attended a concussion class/clinic. The data showed no significant difference between the means of the two groups ($t(12) = -.204$, $p > .05$). The mean of coaches who had attended a concussion class/clinic was lower ($M = 21.14$, $SD = 2.673$) than coaches who had not attended a concussion class/clinic ($M = 21.43$, $SD = 2.573$).

Additional Findings

Using the demographic section and the total score of the Concussion Knowledge Survey, several tests were conducted in an attempt to determine additional findings.

An independent *t*-test was used to determine if there was a difference in total scores between participants who had a personal history of sustaining a concussion and those who have never sustained a concussion. The results of the test are represented in Table 10.

Table 10. Independent *t*-test: Personal Concussion History

Classification	N	Mean	SD
History of Concussion	16	21.53	1.821
No History of Concussion	54	20.30	2.611

Conclusion: An independent *t*-test compared the mean scores of participants who had a personal history of sustaining a concussion and those who had no history of sustaining a concussion. The data showed no significant difference between the means of the two groups ($t(68) = -1.899$, $p > .05$). The mean of the participants with a personal history of sustaining of a concussion ($M = 21.63$, $SD = 1.821$) was not significantly different from the mean of participants without a personal history of sustaining a concussion ($M = 20.30$, $SD = 2.611$).

A one-way ANOVA was used to determine if there was a difference in total scores between participants based on the subject's state of residency. The results of the test are represented in Table 11.

Table 11. One-way ANOVA statistics: State of Residency

Classification	N	Mean	SD
Pennsylvania	22	20.91	2.635
Washington	17	20.65	2.370
Texas	17	20.12	2.619

Conclusion: The pretest means of concussion knowledge scores based on the participant's state of residency (Washington, Pennsylvania, and Texas) were compared using a one-way ANOVA. No significant difference was found ($F(2, 53) = .467$, $p > .05$). The concussion knowledge score from the three groups did not differ significantly from one another. Participants who resided in the state of Pennsylvania had a mean score 20.91 ($SD = 2.635$). Participants who resided in the state of Washington had a mean score of 20.65 ($SD = 2.370$). Participants who resided in the state of Texas had a mean score of 20.12 ($SD = 2.619$).

Table 12 represents the symptom recognition section of the Concussion Knowledge Survey. The section is broken up by the participants status of either being a parent, coach, or both a parent and coach of a youth athlete.

Table 12. Correct Symptom Recognition Section of Subjects*

Symptom	Parents	Coaches	Both
Abnormal sense of smell	21(55.3%)	7(50.0%)	7(38.9%)
Abnormal sense of taste	22(57.9%)	6(42.9%)	9(50.0%)
Loss of memory	**36(94.7%)**	**14(100%)**	**18(100%)**
Blurred vision	**37(97.4%)**	**14(100%)**	**18(100%)**
Chest pain	30(78.9%)	12(85.7%)	17(94.4%)
Dizziness	**37(97.4%)**	**14(100%)**	**18(100%)**
Confusion	**37(97.4%)**	**14(100%)**	**18(100%)**
Headache	**37(97.4%)**	**14(100%)**	**18(100%)**
Nosebleed	14(36.8%)	8(57.1%)	7(38.9%)
Loss of consciousness	**37(97.4%)**	**14(100%)**	**17(94.4%)**
Sharp burning pain in neck	22(57.9%)	6(42.9%)	9(50%)
Nausea	**37(97.4%)**	**14(100%)**	**18(100%)**
Upper extremity numbness	16(42.1%)	7(50.0%)	5(27.8%)
Weakness in neck ROM	19(50.0%)	7(50.0%)	6(33.3%)
Sleep disturbances	**35(92.1%)**	**14(100%)**	**16(88.9%)**
Problem studying/focusing	**35(92.1%)**	**14(100%)**	**18(100%)**
Loss of appetite	7(18.4%)	3(21.4%)	3(16.7%)
Sensitivity to light	**34(89.5%)**	**14(100%)**	**17(94.4%)**
Change in mood/behavior	**35(92.1%)**	**14(100%)**	**17(94.4%)**

*Correct responses bolded

There were several concussion symptoms that more than 95% of the subjects answered correctly. These included: blurred vision, dizziness, confusion, headache, loss of consciousness, and nausea. In addition, there were several detractor symptoms that less than 60% of subjects answered correctly. These included: abnormal sense of smell, abnormal sense of taste, nosebleed, sharp burning pain in the neck, upper extremity numbness, weakness in neck ROM and loss of appetite. Only 41.4% of subjects correctly answered that a nosebleed is not a symptom of a concussion. In addition, only 40% of subjects correctly answered that upper extremity numbness/weakness is not a symptom of a

concussion. Although, the high success rate of correctly identifying concussion symptoms is impressive, the low level of correctly identifying the detractor symptoms is disheartening.

The survey used in this study was adapted from Gourley et al[1]. The three additional symptoms (loss of appetite, sensitivity to light, and change in mood/behavior) that were added to the current survey's sign/symptom section were removed to compare the results between Gourley et al[1] and the present study. Table 13 compares the correct symptom recognition section between the study by Gourley et al[1] and the current study.

Table 13. Comparison of Symptom Recognition Section*

Symptom	Gourley	Current Study
Abnormal sense of smell	32%	50.0%
Abnormal sense of taste	34%	52.9%
Loss of memory	**82%**	**97.1%**
Blurred vision	**86%**	**98.6%**
Chest pain	56%	84.3%
Dizziness	**88%**	**98.6%**
Confusion	**88%**	**98.6%**
Headache	**87%**	**98.6%**
Nosebleed	26%	41.4%
Loss of consciousness	**81%**	**97.1%**
Sharp burning pain in neck	21%	52.9%
Nausea	**82%**	**98.6%**
Upper extremity numbness	27%	40.0%
Weakness in neck ROM	20%	45.7%
Sleep disturbances	**56%**	**92.9%**
Problem studying/focusing	**57%**	**95.7%**

*Correct responses bolded

The mean symptom score for subjects who were parents in the current study was 12.33 of 16 (77.1%). The study by Gourley et al[1] showed the mean recognition of symptom score for parents was 9.23 of 16 (57.7%). In this study 92.9% of parents and coaches of youth athletes correctly identified sleep disturbances as a sign of a concussion. Studies conducted by Valovich et al[6] and Gourley et al found that 12.8% and 56%, respectively, identified sleep disturbances as a sign of a concussion. In addition, Gourley et al found that only 57% correctly identified problems with homework/studying as a sign of a concussion. The present study found that 95.7% of subjects correctly recognized problems with homework/studying as a concussion symptom. Over the three years between the current study and Gourley et al[1], concussion knowledge appears to have increased among parents and coaches of youth athletes.

DISCUSSION

This study has produced several findings related to the concussion knowledge among parents and coaches of youth athletes. The following section will discuss these findings and is divided into the following subsections: Discussion of Results, Conclusions, and Recommendations.

Discussion of Results

Everyone has heard the word concussion thrown around either on television or at the local sporting event, but some people still do not understand the detrimental effects a concussion can have on an athlete. A concussion is considered a mild traumatic brain injury that can affect a person's physical, cognitive, and psychological aspects of life[3]. While there is extensive research about concussions at the professional, collegiate and even the high school levels, there is a lack of literature at the youth level. In addition, licensed medical professionals who are trained in the prevention, recognition and management of concussions are not required to attend youth athletic events. For this reason the responsibility of safety among youth athletes falls onto the parents and coaches. The purpose of this study was to assess concussion knowledge among parents and coaches of youth athletes.

The researcher's first hypothesis was that there would be no significant difference between the concussion knowledge score of parents and coaches of youth athletes. Studies conducted by Stevens et al[26] and Gourley et al[1], examined concussion knowledge among parents of youth athletes through the use of surveys. Both surveys found a

moderate knowledge of concussions by parents and coaches. Gourley et al[1] stated that youth athletes and parents are moderately aware of the signs and symptoms of concussion and have little knowledge in proper concussion management. Table 6 in the results section shows the mean score of parents at 20.45 (78.7%), the mean score of coaches at 21.29 (81.9%) and the mean score of both a parent & a coach at 20.39 (78.4%) out of a possible 26. While the difference in scores between parents and coaches of youth athletes is not statistically significant, the overall score is still moderately low.

The second hypothesis inspected in this study stated that there would be no difference in concussion knowledge scores between youth sport parents with CPR and first aid certification, and youth sport parents without CPR and first aid certification. Gourley et al[1] found a significant difference in the number of symptoms correctly identified by parents with first aid certification or general medical training than those without. Table 7 in the results section shows the mean score of parents with CPR and first aid certification at 20.64 (79.4%) and the mean score of parents without CPR and first aid certification at 20.26 (77.9%) out of a possible 26. The results did support this hypothesis, as there were no significant differences

between concussion knowledge score of parents with CPR and first aid certification and those without CPR and first aid certification.

The third hypothesis examined in this study stated that there would be no difference in concussion knowledge score between youth sport coaches with CPR and first aid certification, and youth sport coaches without CPR and first aid certification. Valovich et al[6] found a significant difference between coaches with CPR or first aid certification than those without these credentials[6]. Table 8 in the results section shows the mean score of coaches with CPR and first aid certification at 21.00 (79.4%) and the mean score of coaches without CPR and first aid certification at 20.42 (77.9%) out of a possible 26. The results did support this hypothesis, as there were no significant differences between concussion knowledge score of coaches with CPR and first aid certification and those without CPR and first aid certification.

The fourth hypothesis inspected in this study stated that there would be no difference in concussion knowledge score between youth sport coaches who have attended a concussion awareness class or clinic, and youth sport coaches who have not attended a concussion awareness class or clinic. O'Donoghue et al[12] and Bramley et al[2] found a

statistical significance in the management of concussions among high school coaches who had attended a concussion workshop versus coaches who had never attended a concussion workshop. Table 9 in the results section shows the mean score of coaches who have attended a concussion class/clinic at 21.14 (81.3%) and the mean score of coaches who have not attended a concussion class/clinic at 21.43 (82.4%) out of a possible 26. The results did support this hypothesis, as there were no significant differences between the two groups.

In addition to examining the stated hypotheses, the researcher discovered additional findings by using supplementary demographic information and Concussion Knowledge Survey scores. The first additional finding used the concussion knowledge score to compare subject who had a history of sustaining a concussion and those without a history of sustaining a concussion. Although there was no statistical significance, the mean score for participants with a history of sustaining a concussion ($M = 21.53$) was slightly higher than those of participants who had never sustained a concussion ($M = 20.30$).

The second additional finding used the concussion knowledge score to compare subjects based on their state of residency. Only the three states with the highest number of

participants were utilized. Although there was no statistical significance, the mean score for subjects residing in Pennsylvania (20.91) was higher than the mean score of participants residing in Washington and Texas (20.65 and 20.12, respectively).

The third additional finding compared the current study's symptom recognition score to Gourley et al[1] symptom recognition score. Only subjects who were parents of youth athletes were used in the comparison, as Gourley et al[1] did not include coaches of youth athletes. In the three years between the previous study and the current study, symptom recognition score had increased from 9.23 (57.7%) to 12.33 (77.1%) out of a possible 16. Parents are improving their ability to recognize concussion symptoms among youth athletes. The ability to recognize concussion symptoms is important in protecting the youth athlete.

Conclusions

Similar to other studies[1,5,6,10,16], the researcher found no statistically significant differences of concussion knowledge score between parents and coaches of youth athletes. The moderate score on the Concussion Knowledge Survey shows that parents (*M* = 20.45, 78.7%) and coaches (*M*

= 21.29, 81.9%) of youth athletes could benefit from a continued increase in concussion education. The safety of youth athletes falls on the shoulders of parents and coaches; therefore this population needs to be well informed on concussion prevention, recognition, and management.

Many other studies have found a statistical significance between participants with CPR certification, first aid certification or attendance of a concussion education course and concussion knowledge[1,2,4,5]. This is contrary to the results found in this study. This study found no statistical significance of concussion knowledge between participants with or without CPR/first aid certification, or those who had or had not attended a concussion course. Although, the results of this study support the researcher's second, third and fourth hypotheses; this lack of statistical significance could be due to the low response rate of the study.

In the additional findings, the researcher examined the effect state residency had on the concussion knowledge score. Interestingly, participants from Pennsylvania, Washington and Texas had very similar mean scores despite various concussion laws. The mean concussion scores for Pennsylvania were 20.91 (80.4%), Washington 20.65 (79.4%),

and Texas 20.12 (77.4%). The Pennsylvania concussion law, entitled the *Safety In Youth Sports Act*, was enacted on July 1, 2012. The bill stated that once each school year, a coach shall complete a concussion management certification training course offered online[41]. The coach is not allowed to coach an athletic activity until the completion of the concussion training course. The Washington concussion law, entitled the Zackery Lystedt Law, was enacted in September 2009. The bill stated that each school district's board of directors will develop the guidelines for concussion management[42]. In addition, the board must create forms to educate coaches, athletes, and parents about the signs/symptoms of a concussion and return to play decisions. The Texas concussion law, entitled Natasha's Law, was enacted on September 1, 2012. The bill stated that each school district must appoint a concussion oversight team (COT) that will establish a return to play protocol[43]. The COT must include at least one physician. In addition, every two years coaches and licensed health care professionals either employed or volunteering for the school, must participate in at least two hours of concussion training. Even with such diverse laws, the states' mean concussion knowledge scores were very similar. Both Pennsylvania and Texas concussion laws are relatively

new, it would be interesting to see if concussion knowledge continues to increase in these states.

Based on the results of this study, it can be concluded that concussion education training should continue to be implemented at the youth level. If parents and coaches of youth athletes participate in concussion education it will provide a safer environment for all youth athletes.

Recommendations

This study has the potential to be improved with a few recommendations. The first recommendation is the sample size should be much larger. The researcher used a convenience sample of personal contacts and local youth sports associations to gain participants. A larger sample size would create a more accurate view of the current concussion knowledge among parents and coaches of youth athletes in the United States.

Another recommendation would be to try and maintain a similar number of participants in each group (parents vs. coaches vs. both). Since, there were many more parents (n = 38) compared to coaches (n = 18) and both a parent and a coaches (n =14) the results might not accurately represent

the difference in concussion knowledge between the three groups. This could be accomplished by distributing surveys to more youth sports associations.

A third recommendation would be to include subjects who are parents of children that do not participate in youth athletics. Children are still at risk of sustaining a concussion from a fall or blow to the head, even if they do not participate in athletics. This could determine if parents of youth athletes have a significantly higher knowledge of concussions compared to parents whose children do not participate in youth athletics.

The final recommendation would be to perform this same study in another three years. The original study by Gourley et al[1] was performed in 2010. By comparing the original study and the current study many improvements in concussion knowledge can be seen among parents and coaches of youth athletes. With the recent implementation of concussion laws across the country there could be an increases in concussion knowledge over the next few years. Performing this study every two to three years can show learning over time of the prevention, recognition and management of concussions.

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APPENDICES

APPENDIX A

Review of Literature

REVIEW OF LITERATURE

Concussions have become a hot button topic lately, not only at the professional level, but all levels of athletics. A concussion is considered a mild traumatic brain injury that can affect how the brain normally functions. Although initial symptoms of a concussion can seem mild these symptoms can lead to severe problems in the future. Mild traumatic brain injuries can affect a person's physical, cognitive, and psychological aspects of life. This is an injury that must be taken seriously at all levels of competition.

Many concussion studies are conducted at the professional, collegiate and high school level; however little research is available on concussions in youth sports. As the knowledge of concussions continues to grow more detrimental effects are being discovered in older athletes who have sustained multiple concussions over their athletic career. Researchers are starting to see an increasing number of older athletes who have cognitive issues such as memory loss, dementia, Alzheimer's, Chronic Traumatic Encephalopathy and depression[1]. Even at the college level, athletes with a previous history of a concussion take longer to recover verbal memory and

reaction time than athletes without a history of a concussion[2]. High school athletes can suffer terrifying affects as this population is at an increased risk of Second Impact Syndrome which can result in permanent brain damage or death[3]. For these reasons it is important to reduce the amount of concussions sustained by youth athletes by improving prevention, recognition and management of concussions.

Parents and coaches of youth athletes can play a key role in decreasing the prevalence of concussions by understanding proper prevention, recognition, and management strategies. Without the presence of medical professionals, such as physicians and licensed athletic trainers, parents and coaches of youth athletes must become advocates for the safety and health of all youth athletes. To begin protecting youth athletes from the dangers of concussions, with the help of parents and coaches, concussion knowledge must be assessed to create a baseline of understanding. Once knowledge is assessed, educational concussion efforts can be implemented to continue to improve knowledge and management of these conditions. Therefore, the purpose of this study is to examine the extent of concussion knowledge coaches and parents of youth

athletes possess, with focuses on concussion recognition and management.

Prevalence

Concussions are a common occurrence among youth athletes. In a five year study by Yang et al[4], 3,712 youth athletes from ages five to eighteen were hospitalized due to a suspected concussion. Mechanisms of injury ranged from sports-related, falls, and car accidents. The hospital charges from these incidents resulted in over 29 million dollars[4].

A study conducted by Yard and Comstock[5] determined whether high school athletes who had sustained a concussion complied with recommended return to play guidelines during the years 2005-2008. Concussions were reported by certified athletic trainers from 100 high schools across the country. Compliance was based on the American Academy of Neurology (AAN) or the Prague return to play guidelines. Over the course of the study 1,308 concussions were reported. Under the AAN guidelines, 40.5% of athletes were found to return to play prematurely. Under the Prague guidelines, 15% of athletes were found to return to play prematurely. Under the Prague guidelines, 21.9% of male athletes were non-compliant (not following the guidelines either by returning

too early or with symptoms still present) compared to 11.8% of females being non-compliant. Since there is not a golden standard return to play guideline, concussions are being managed in many different ways.

Mechanism of Injury

Many people assume that to sustain a concussion, the athlete must be hit in the head. In actuality, a concussion can be caused by either a direct hit to the head, an indirect shearing, or a rotational force[6]. Browne and Lam conducted a study that compared the characteristics of concussions in children as the result of sports or other physical activity[7]. Approximately 592 cases were recorded with children ranging in age from six to sixteen. The data showed 25.7% of concussions brought into the hospital were sports-related. Of the sports-related concussions, 54% resulted from a fall and 45% resulted from a collision.

In a study by Pickett et al[8], specifically on soccer players presenting to the emergency department, over 235 head injuries were observed over five years. Mechanisms of injury included: 65.1% contact with another player, 26.4% heading and 9.8% attempted heading. Due to the fact that concussions have many mechanism of injury it makes this injury even more difficult to diagnose.

Signs & Symptoms

There are many signs and symptoms that can occur from a concussion. Some can occur within seconds of injury or develop over several weeks later[9]. Signs and symptoms also vary from person to person. These variations are what make concussions so hard to recognize for non-health care professionals. Behavioral changes can include irritability, personality changes and depressed mood. Physical changes can include dizziness, blurred vision, poor coordination, and tinnitus. Cognitive changes can include amnesia, feeling in a fog, and poor concentration.

Headache, dizziness and confusion are the most well-known concussion symptoms[10]; however, there are many other symptoms that go unrecognized. In a survey conducted by Coghlin, Myles and Howitt[11], parents failed to recognize sleep problems, disorientation, and emotional irritability as signs of a concussion. Educating parents and coaches on the lesser known symptoms can increase concussion recognition among youth athletes.

In a study by Frommer et al[12], concussion symptoms were compared between male and female high school athletes. Data was collected from 100 high schools using the High School Reporting Information Online system. Over two years 812 sports-related concussions were recorded. No significant

gender difference was found in the number of symptoms reported. The difference was found in the types of symptoms reported. Male athletes reported more amnesia and confusion/disorientation than did female athletes. Female athletes reported more drowsiness and sensitivity to noise than did male athletes. Also, no significant gender differences were found between symptom resolution time and return to play timeline. Although concussion symptoms and resolution time can vary from individual to individual certain similarities can be found between males and females.

Short/Long Term Effects

Concussions can cause many short and long term effects. Not long ago having your "bell rung" was considered to be a harmless injury that an athlete could just shake off and return back to the game or practice. Research now has shown that severe consequences can occur from improper management of single or repeated concussions. Short term effects can include a few days of headache, avoidance of bright light and feeling in a fog. These symptoms can be very mild and resolve quickly. More severe effects include difficulty concentrating, poor balance, and insomnia that can last for a week or more.

Once an athlete has sustained a concussion, there is a greater risk of sustaining a second one with more severe symptoms[13]. Second Impact Syndrome is also a possibility which results in rapid swelling of the brain causing brain damage or death. Another effect that can proceed a concussion is Post-Concussion Syndrome (PCS). With Post-Concussion Syndrome, symptoms of a concussion can continue for weeks, months or even years without resolving. Post-Concussion Syndrome can occur whether it's the first concussion or a subsequent one.

Long term effects are starting to show in older athletes who have participated in sports for many years. Football players are showing the most detrimental negative effects from concussions. Multiple low intensity and/or subconcussive hits to the head can cause long term effects. These include: long term memory loss, early onset dementia, Alzheimer, emotional distress, depression, and suicide. For this reason concussions need to be handled with care and conservative treatment, especially with the youth athlete.

Chronic traumatic encephalopathy (CTE) is a neurodegeneration of the brain that is believed to be the result of repeated head injuries. These can include mild traumatic brain injuries as well as asymptomatic subconcussive hits to the head. This sort of trauma

triggers degeneration of the brain tissue and causes a build-up of an abnormal protein called tau[14]. The onset of CTE usually occurs in mid-life once the individual has retired from his/her sport. Signs and symptoms of CTE are usually recognized by family and friends. Cognitive difficulties include poor memory and information processing. Behavioral differences begin to emerge, such as irritability, anger, and apathy. This phenomenon was first seen in retired boxers, but more cases are being found in football, professional wrestlers, hockey, and soccer players. Although there is no concrete evidence that proves repeated concussions will result in CTE there is an increasing correlation between the two variables.

CONCUSSION KNOWLEDGE

Awareness of concussions has increased significantly over the past decade. However there is still a need for concussion education among parents, coaches and athletes that participate in youth and high school sports. Many youth sport coaches still believe that loss of consciousness is required to be considered a concussion[15]. Guilmette, Malia and McQuiggan found that high school coaches were significantly more knowledgeable about

concussions than a general public sample[10]. Due to the fact that medical professionals are rarely at youth sporting events it is extremely important that coaches and parents have accurate and current knowledge on concussions.

Coaches

Coaches of youth athletes need to become more aware of preventing, recognizing, and managing injuries that can be sustained by the young athlete. Information on concussions has been increasing over the years. However concussion recognition and management strategies have not trickled down to the youth arena as well as in the professional and collegiate leagues.

In a study by O'Donoghue et al[16], 126 high school coaches completed a survey measuring concussion knowledge. The participants displayed a moderate knowledge of sport-related concussions with a mean score of 84%. The greatest area of knowledge was seen in recognition with a mean score of 92%. The area with the least amount of knowledge was management with a mean score of 79%. Gender revealed a significant difference in recognition score. Male participants (7.59 ± 0.63) scored significantly higher than did female participants (7.02 ± 0.97) on the recognition section. Similarly, coaches with a personal history of a

concussion (7.61 ± 0.67) scored significant higher than those without a personal history of a concussion (7.30 ± 0.85) on the recognition section. Improvements in concussion education and management are still needed among coaches and must be addressed to help protect adolescent and youth athletes.

Valovich et al[15] conducted a study to assess youth sports coaches' basic knowledge of concussions. Over 250 coaches were recruited to participate in a survey containing a symptom checklist, a concussion scenario, and four true/false questions pertaining to concussion management. The mean number of correct responses for the symptom recognition was 9.78 ± 2.07 out of a possible 16. Participants were less likely to recognize vision problems, sleep disturbances, and nausea as symptoms of a concussion. In addition, 42% of subjects incorrectly thought that loss of consciousness was required for a concussion to occur. Surprisingly, 26% of participants would let an athlete return to play while still symptomatic. It is very important that coaches understand under no circumstance should an athlete be placed back in practice or competition if the athlete is suspected of having a concussion.

Broglio et al[17] conducted a study to evaluate the concussion knowledge and medical practice among athletes,

coaches and medical staff involved with club level soccer. The survey distributed exclusively to coaches aimed to determine how coaches perceive concussions, including recognition and management of concussions. The results indicated that 98.7% of coaches were able to correctly identify symptoms not associated with a concussion (hyperactivity, talking more than usual, elation). However, only 38.9% coaches accurately identified symptoms that are commonly associated with concussion (drowsiness, fatigue, sleeping more than usual, difficulty concentrating). In addition, 25.9% of coaches incorrectly guessed that prescription medication was the best way to recover from a concussion. Also, only 70.4% of participants agreed that an athlete should only return to play when they are symptom free. Awareness should be increased on cognitive and behavioral symptoms observed with concussions as many coaches are only looking for physical symptoms such as headache and dizziness.

Parents

Parents of youth athletes can be the greatest advocate in concussion recognition and management as they would be most likely to recognize unusual symptoms and behaviors in their children. It is the parents' responsibility to help

keep the youth athlete safe from undue injury. If medical personnel are not present to evaluate and care for the youth athletes the parents must learn to recognize and manage serious injuries, such as concussions.

In a study by Gourley, Valovich-McLeod, and Bay[18], youth athletes and parents were surveyed to measure awareness and recognition of concussions. Over 73 youth athletes and 100 parents responded to the survey. No difference was seen in recognition scores between youth athlete and parents. Parents with a previous history of first aid certification or general medical training scored significantly higher on symptom recognition than those without a medical background. About half of parents correctly identified sleep disturbances and difficulty concentrating (56% and 57% respectively) as concussion symptoms. Youth athletes and parents should receive specific education on concussion recognition as many still fail to recognize cognitive and behavioral symptoms.

Coghlin, Myles, and Howitt[11] conducted a study assessing the ability of hockey parents/guardians to recognize concussion symptoms in adolescent children. The survey consisted of true/false questions and a symptom checklist. The symptom checklist included eight false detractors symptoms. The data showed that 76.32% of parents

believe that an athlete must lose consciousness to be considered a concussion. It was determined that mothers scored significantly higher on recognizing the signs and symptoms associated with a concussion. Surprisingly, 47.4% of participants incorrectly guessed hearing voices and lowered pulse rate as signs/symptoms of a concussion. Although efforts from concussion awareness organizations have helped increase concussion knowledge among athletes, parents, and coaches, this population could still benefit from continuing concussion education.

It is clear that educating parents of youth athletes on concussion recognition and management is pivotal to youth safety in organized sports. By increasing awareness of concussion symptoms among parents of youth athletes the chance of chronic long term brain effects can be significantly reduced.

Media Influence

Recently the media, specifically in sports, has come under fire as how concussions are portrayed to the public. Many children idealize professional athletes and become determined to play like their heroes. Professional athletes are constantly shown playing through injuries that should require them to be taken out of the game or practice. A

study was conducted by McLellan and McKinley to establish the incidence rate of probable concussions among professional European rugby players in games that were broadcasted and how the injury was managed[19]. Twenty incidents were determined as an observable injury/impact to the head which were classified as probable concussions. Of the televised rugby games 30.8% showed a player visibly experiencing a probable concussion. Of the twenty incidents, 60% of the athletes were shown to continue or return to play during the game after being inspected by the medical staff. Based on the commentary provided by the media during the game, 66% of the athletes who continued or returned to play had experienced a probable concussion. It was observed that most injured players were shown to continue playing or return to play despite being visibly concussed.

In general, the media tends to celebrate players who play injured and question those who take the required time off[20]. Under reporting of concussions is a big concern among high school athletics. Perhaps the portrayal of professional athletes returning to play so quickly after being concussed is a contributing factor.

CONCUSSION PREVENTION

Preventing a concussion is a difficult charge to undertake. One of the first ways to help prevent an athlete from sustaining a concussion is proper technique in high risk sport specific skills. For example, in football, proper demonstration of tackling form is very important. Brain and neck injuries can occur from improper form, such as spearing and helmet to helmet contact. Excessive violence between athletes during athletic activities can increase the risk of concussion[21]. Coaches, parents and officials should foster a competitive, yet respectfully safe environment for athletes.

Protective equipment, such as mouth guards and helmets, have been suggested to reduce the risk of concussions. Mouth guards have been shown to prevent dental and orofacial injuries. In addition, mouth guards can help disperse the force of a hit to the jaw or face, thereby reducing the disruptive forces placed on the brain[22]. Although the main purpose of athletic helmets is to prevent skull fractures, it can be helpful in reducing the risk of sustaining a concussion. Biomechanical studies have shown a reduction in impact forces to the brain with the use of helmets[21]. Again, like the mouth guard, by dispersing the

force across the helmet it will decrease the negative impact on the brain.

A prevention strategy that has recently been researched is neck muscle strength in comparison to risk of concussion. The thought is by strengthening the neck muscles, the athlete can maintain the head in a fixed position during an impact, thus dispersing the force of the impact[9]. The problem with this theory is most impacts occur suddenly and without warning so the athlete may not have time to tense the neck muscles before impact.

It is quite difficult to fully prevent athletes from obtaining a concussion. However, there are several techniques that can be employed to help reduce the risk of concussions among athletes at any level.

CONCUSSION RECOGNITION

Parents and coaches are the first line of defense in recognizing concussion symptoms in youth athletes. Therefore, it is the coaches and parents that must protect the young athletes from long term effects of a concussion. Parents and coaches must be educated on the signs and symptoms that may present with a concussion and management strategies if a child had sustained a concussion.

Currently there are no neurocognitive assessment tools specifically designed for young children[23]. Since cognition is developing so quickly in children symptoms are much more difficult to assess versus symptoms that may be seen in an adolescent[24]. One symptom that often goes unrecognized in children is a change in mood or behavior[8]. Parents are more adept at noticing these kinds of changes in behavior and cognition. By increasing the awareness of lesser known concussion symptoms parents and coaches of youth athletes can better recognize concussions that may have gone unnoticed.

Neuroimaging techniques are occasionally used when an individual is suspected of sustaining a concussion. Due to the fact that concussions do not always cause structural damage to the brain, neuroimaging devices are used to rule out more critical injuries such as hemorrhages. Although, brain computed tomography (CT) cannot fully diagnosis a concussion it should be used whenever there is a suspicion of an intracerebral structural lesion[21]. Functional magnetic resonance imaging is becoming more popular is terms of concussion evaluation as it demonstrates activation patterns within the brain.

Neurocognitive Testing

Over the years the reliance on neurocognitive testing has increased as a tool for concussion assessment and management. The most widely used neurocognitive testing database is the Immediate Postconcussion Assessment and Cognitive Testing (ImPACT™) developed by the University of Pittsburgh Medical Center[25]. These types of test assess an individual's cognition ranging from verbal and visual memory to reaction time. In the past, concussion recognition and management were purely based on athletes self-reporting symptoms; however, this can be an unreliable technique as most often athletes would not want to be pulled out of competition. The purpose of neurocognitive testing is to add another tool to help assess concussion among individuals, not as a purely diagnostic tool.

Van Kampen et al[26] created a study to evaluate player symptom reporting sensitivity as judged by postconcussion symptoms and ImPACT™ testing among high school and collegiate athletes. Participants were examined two days after sustaining a concussion and post-injury ImPACT results and symptom scores were compared with baseline scores and with age and education matched non-injured athletes as a control group. The authors found that 64% of concussed athletes had a significant increase in symptoms

compared to baseline scores based on the postconcussion symptom score. In addition, 83% of concussed athletes had significantly decreased neurocognitive scores when compared to the individual's own baseline scores. By including the ImPACT™ scores, there was an increased sensitivity of 19%. Relying purely on athletes' self-reporting is not an effective way to assess and manage concussions. Neurocognitive testing can increase diagnostic accuracy when used along with self-reported symptoms.

Neurocognitive testing is also being used to help find patterns in concussion severity and recovery time when compared with age, gender, history of concussions, etc. In a study by Covassin et al[27], age and sex differences were observed among concussed individuals based on symptoms, ImPACT™ scores and postural stability, such as, the Balance Error Scoring System (BESS). A total of 296 high school and collegiate athletes were used for the study. Participants were examined at two, seven and fourteen days post-concussion. Results revealed that female athletes performed significantly worse than male athletes on visual memory (65.1% and 70.1%, respectively) and number of reported symptoms (14.4 and 10.1, respectively). It was also found that high school athletes performed worse than college athletes on verbal (78.8% and 82.7%) and visual memory

(65.8% and 69.4%). In addition, high school males scored worse on the BESS test than college males (18.8 and 13.0). Simiarily, high school females scored worse on the BESS test than college females (21.1 and 16.9). Neurocognitive testing helps provide an objective measurement for concussion management.

CONCUSSION MANAGEMENT

There is little research on definite management guidelines for youth athletes, specifically under the age of fourteen. The trouble with youth athletes is baseline cognition may be different due to rapid cognitive development seen during childhood[9]. In addition, children take longer to recover from neurocognitive symptoms. Children are more at risk for sustaining concussions due to lower mylienation, greater head to body ratio and thinner cranial bones[28]. Youth athletes should not return to play until all symptoms have resolved. A seven day progressive return to play protocol is used by most medical professionals for youth athletes. This protocol starts with no physical or cognitive exertion and ends with full return to play.

An athlete must be symptom free for 24 hours before proceeding to the next protocol level. After the initial injury the athlete should not be left alone and should be monitored for several hours incase signs of deterioration appear[21]. During the acute recovery period (1-7 days post-concussion) there is increased vulnerability of additional injury to the brain[23]. If an athlete receives a second concussion before the first concussion fully resolves there is a high risk of Second Impact Syndrome.

Cognitive rest is an often neglected aspect of concussion management. Cognitive activity causes an increase in neurometabolic demand on the brain. Research has shown that concussed subjects have exacerbated symptoms following cognitive activity, known as the cognitive exertion effect[29]. The goal is to avoid excessive mental challenges during the initial stage post-concussion. This is a difficult treatment to follow as most athletes are students. The best way to manage this aspect of the concussion is for parents, coaches, teachers and school administrators to work together.

Accommodations may be needed to help the athlete continue to succeed in class while waiting for concussive symptoms to resolve. Accommodations can include: excused absences from class, rest periods during the school day,

extension of assignment deadlines, postponement of test, extended testing time, use of a reader for school work, use of a scribe or a temporary tutor[30]. It may be difficult to convince academic faculty that a concussion warrants the need for cognitive rest and/or academic assistance. This challenge can be reduced by educating the staff on concussions so the athlete can receive the proper care needed to heal as quickly and safely as possible.

Return to Play Guidelines

At the moment there is no single return to play guideline that is used throughout the athletic population. Although there are several return to play guidelines used throughout the country and each have very similar components. The most important factor in a return to play decisions is the athlete should be completely asymptomatic before beginning any progression. If the athlete is experiencing any concussive symptom(s), they should refrain from participating in any physical or cognitive activity.

During the 2009, 3rd International Conference on Concussion in Sport, held in Zurich, a consensus statement was drafted on concussions in sport which included a graduated return to play protocol[21]. It compromised six steps that should be followed by the concussed athlete. The

first step is no activity; complete physical and cognitive rest. The second step is light aerobic activity. This could include walking, swimming or stationary cycling; however the athlete's heart rate should not exceed 70% of maximum heart rate. The athlete should not participate in any resistance training as well. The third step is sport-specific exercise. This could include shooting baskets, dribbling a soccer ball, participating in walk-through, skating drills, etc.

The second half of the return to play protocol begins with the fourth step which is non-contact training drills. This is a progression to more complex drills such as passing routes in football, running through plays, etc. The athlete may also begin participating in resistance training. The fifth step is full contact practice. The athlete is free to participate fully in all drills during practice. This may only occur after obtaining medical clearance. The final step is full return to game play. It must be stressed that for an athlete to proceed to the next step in the progression they must be symptom free for 24 hours. For example, if an athlete is in step two and is instructed to walk for 20 minutes. Later that night the athlete develops a headache and sensitivity to light. Now, the athlete must return to step one until all symptoms have

resolved for 24 hours. A progressive return to play guideline is needed to ensure proper safety for all athletes.

RESOURCES FOR COACHES & PARENTS

There are many resources available to coaches and parents to increase awareness of concussions. One example is the Centers for Disease Control and Prevention's "Heads Up" website. The website provides an online training course specifically designed for youth sports[31]. It also includes fact sheets and posters for parents and athletes. Concussion information is being relayed through all types of media. In a study by Goodman et al[32] a video game was developed that present information on concussions while the game was played. After playing the game the subjects had an increase awareness of concussion symptoms and proper management. Physicians and athletic trainers are always an excellent resource for parents and coaches to utilize.

Recently in Pennsylvania House Bill No. 2728 was passed that required all coaches of school entities to take an online or face-to-face concussion education course. The purpose of this bill was to establish a standard of care for managing concussions and head injuries among student

athletes. The bill applies to all school entities within Pennsylvania. Every year, as stated by the bill, parents must review a concussion fact sheet and sign an acknowledgment before the student may participate in any athletic activity. In addition, every two years coaches must complete a concussion training course offered by the Center for Disease Control and Prevention. It is then the coach's responsibility to remove an athlete from play if a concussion is suspected. Failure to follow this duty will result in suspension from coaching for the remainder of the season. The bill also gives authority to licensed/certified health care practioners and game officials to remove an athlete from play if a concussion is suspected. There are several resources available on the Pennsylvania Department of Health's website.

By educating parents and coaches of youth athletes they will be more likely to take action if they understand the severity of concussions and the long term effects this injury can cause[33]. In the end, the best way to protect youth athletes from concussions is to educate parents and coaches to recognize concussion symptoms, proper management and safe return to play guidelines.

SUMMARY

The research shows that concussions are a prevalent issue among athletes of many ages. However, little research has been conducted on concussion specifically among youth athletes and the educational tools that are available to this population. Proper prevention, recognition and management of concussions must be implemented to protect youth athletes from both short and long term effects. For youth athletes, this can best be achieved by educating parents and coaches. Due to the debilitating long term effects that are being seen in retired athletes, it is important to decrease the amount of concussions sustained by athletes at all levels. To do this the best place to start is at the beginning. By explaining the detrimental effects concussions can cause when children first start athletics, it can be stressed how proper prevention, recognition, and management can help protect youth athletes. Educational efforts have increased at the professional, collegiate and high school levels. Now it is time to increase awareness at the youth level.

APPENDIX B

The Problem

STATEMENT OF THE PROBLEM

The purpose of the study is to assess concussion knowledge among parents and coaches of youth athletes. It is important to assess this relationship because without medical professionals at youth sporting events parents and coaches must assume responsibility of medical care for youth athletes. By examining the amount of concussion knowledge it can be determined how competent parents and coaches can prevent, recognize and manage a concussion sustained by a youth athlete. Additionally it would be beneficial to see how concussion education can best be implemented for parents and coaches of youth athletes.

Definition of Terms

The following definitions of terms will be defined for this study:

1) Concussion – a complex pathophysiological process affecting the brain induced by traumatic biomechanical forces.
2) Mild Traumatic Brain Injury – an individual who has suffered a traumatically induced physiological disruption of brain function.

3) Return to Play – the term used when an athlete has been cleared by a medical professional to engage in physical activity without any limitations.
4) Medical Professional – a licensed physician or certified athletic trainer.
5) Youth Athlete – an individual who participates in a coach sponsored athletic activity and is between the ages of 8-12.
6) Neurocognitive Testing – a computerized or written test evaluating an individual's cognition including both short and long term verbal and visual memory, attention, reaction time, and processing speed.

Basic Assumptions

The following are basic assumptions of this study:

1) The subjects will be honest when they complete the demographic sheets.
2) The subjects will answer to the best of their ability on the survey.
3) The subjects will have access to a computer and internet in order to complete the online survey.
4) The sample obtained will be representative of the population.

Limitations of the Study

The following are possible limitations of the study:

1) The survey is a convenience survey and is not completely random.
2) The survey was completed online and without any supervision by investigators.
3) There may be trouble distributing the surveys to parents and coaches of youth athletes.
4) The survey was sent to youth sport associations and school districts to be forwarded to the appropriate target audience.

Significance of the Study

The significance of the study will be to reveal the concussion knowledge of parents and coaches of youth athletes. Concussions are a prevalent problem among athletes, it is important to properly recognize and manage concussions sustained by youth athletes. The responsibility of youth athletes is largely placed on parents and coaches. Therefore, this population must be educated on proper concussion prevention, recognition and management strategies. This study will help assess the level of knowledge parents and coaches of youth athletes already possess and if educational programs are still needed.

APPENDIX C

Additional Methods

APPENDIX C1

Institutional Review Board Approval-

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 Ms. Hjortedal:

Please consider this email as official notification that your proposal titled "Concussion Knowledge Among Parents and Coaches of Youth Athletes" (Proposal #12-035) has been approved by the California University of Pennsylvania Institutional Review Board as submitted.

The effective date of the approval is 2/18/2013 and the expiration date is 2/17/2014. 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 2/17/2014 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
Chair, Institutional Review Board

APPENDIX C2

Concussion Knowledge Survey

Concussion Knowledge Survey:

Parents Version

Dear Youth Parent or Youth Coach:

My name is Stephanie Hjortedal, and I am currently a graduate student pursing a Master of Science degree in Athletic Training at California University of Pennsylvania. This study is part of a research thesis required in the graduate study curriculum. I am conducting a survey to assess concussion knowledge among parents and coaches of youth sports. While the media has shown the long-term detrimental effects of sports-related concussions, the purpose of this survey is to identify the level of concussion recognition and management among parents and coaches of youth athletes. My goal is to continue building concussion awareness at the ground level, and to optimize the care and safety of youth athletes.

Coaches and parents of youth athletes are being asked to participate in this research; however, your participation is voluntary and you do have the right to choose not to participate. If you are neither a parent nor coach of a youth athlete you will be directed to the end of the survey and thanked for your time. You also have the right to discontinue participation at any time during the survey, at which time your data will be discarded. If you have received this survey via a sports organization and choose not to participate in the survey, it will have no bearing on your, or the athlete's, activity level with that organization. This survey is not under the auspices of the organization itself. You must be 18 or older to participate in the survey. The California University of Pennsylvania Institutional Review Board has reviewed and approved this project. The approval is effective 02/18/2013 and expires 02/17/2014.

All survey responses are anonymous and will be kept confidential. Informed consent to use the data collected will be assumed upon completion of the survey. Data collected electronically will be stored on California University of Pennsylvania servers with the individual files password protected. Any hard copy data collected, such as informed consent forms, etc., will be stored in the Health Sciences Department in the graduate athletic training education program director's office, Room 115. 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 only take approximately 10 minutes to complete. If you have any questions regarding this project, please feel free to contact the primary researcher, Stephanie Hjortedal at HJO0057@calu.edu. You can also contact the faculty advisor for this research (Dr. Jamie Weary, ATC, weary@calu.edu or 724-938-5708).

Thank you for taking your time to take part in my thesis research. I greatly appreciate your time and effort put into this task.

Sincerely,

Stephanie Hjortedal, LAT, ATC, PES
Primary Researcher
California University of Pennsylvania
250 University Ave
California, PA 15419
HJO0057@calu.edu

Demographic Informatin

1. How old are you?

- ◯ 17 or younger
- ◯ 18-25
- ◯ 26-30
- ◯ 31-35
- ◯ 36-40
- ◯ 41-45
- ◯ 46-50
- ◯ 51-55
- ◯ 56-60
- ◯ 60+

2. Are you?

- ◯ Male
- ◯ Female

3. In which state do you reside?

4. What is highest level of education you have completed?

- ◯ High School
- ◯ Two Year College (A.A. or A.S.)
- ◯ Four Year College (B.A. or B.S.)
- ◯ Masters or Professional degree
- ◯ Advanced graduate work or Ph.D

5. Are you currently certified in CPR?

- ◯ Yes
- ◯ No

6. Are you currently certified in First Aid?

- ◯ Yes
- ◯ No

7. Have you ever been diagnosed with a concussion?

- ◯ Yes
- ◯ No
- ◯ Not sure

Copy of page:

8. Are you?

- [ ] A parent of a youth athlete
- [ ] A coach of youth athletes
- [ ] Both
- [ ] Neither

9. Do you currently have any sons that are between the ages of 8-12? If so what are their ages?

- ◯ Yes
- ◯ No

Age(s):

10. Do you currently have any daughters that are between the ages of 8-12? If so what are their ages?

- ◯ Yes
- ◯ No

Age(s):

11. How many of your sons, between the age of 8-12, are/have played organized sports?

12. How many of your daughters, between the age of 8-12, are/have played organized sports?

13. What organized sports did/do your children participate? Check all that apply.

- [ ] Baseball
- [ ] Basketball
- [ ] Boxing
- [ ] Cheerleading
- [ ] Field Hockey
- [ ] Football
- [ ] Golf
- [ ] Hockey
- [ ] Lacrosse
- [ ] Martial Arts
- [ ] Rugby
- [ ] Soccer
- [ ] Softball
- [ ] Swimming
- [ ] Tennis
- [ ] Track & Field
- [ ] Water Polo
- [ ] Wrestling
- [ ] Volleyball

Other (please specify)

Signs and Symptoms

21. For each of the following signs and symptoms, please check yes if you think it is a sign or symptom of a concussion. Check no if you think it is not a sign or symptom of a concussion.

	Yes	No
Abnormal sense of smell	◯	◯
Abnormal sense of taste	◯	◯
Loss of memory	◯	◯
Blurred vision	◯	◯
Chest pain	◯	◯
Dizziness	◯	◯
Confusion	◯	◯
Headache	◯	◯
Nosebleed	◯	◯
Loss of consciousness	◯	◯
Sharp burning pain in the neck	◯	◯
Nausea	◯	◯
Numbness/tingling in upper extremity	◯	◯
Weakness of neck range of motion	◯	◯
Sleep disturbances	◯	◯
Problems studying or doing class work	◯	◯
Loss of appetite	◯	◯
Sensitivity to light	◯	◯
Change in mood or behavior	◯	◯

True/False Questions

22. A youth athlete who reports having a headache after a concussion will likely show other symptoms?

- ◯ True
- ◯ False

23. A concussion only occurs when the youth athlete blacks out:

- ◯ True
- ◯ False

24. Any youth athlete who sustains a concussion should be immediately removed from the game or practice:

- ◯ True
- ◯ False

25. Any youth athlete who shows any sign or symptom of a concussion should not be allowed to return to play:

- ◯ True
- ◯ False

26. Once a youth athlete who sustains a concussion is symptom free, they are to follow a slow profressive return to play program as long as they remain symptom free:

- ◯ True
- ◯ False

Scenarios

27. A youth football player receives a direct blow to the side of his head from another player and falls to the ground. As he gets up, he experiences mild dizziness and has a headache. But he continues to play and does not report his symptoms to the coach or athletic trainer. In your opinion, should the player have continued to play football in this situation?

- ◯ Yes
- ◯ No

28. A youth football player receives a hit to the head during a scrimmage game. As the player is examined on the sideline, it is found that he is conscious, has no loss of memory and feels fine at rest. When the athlete is asked to jog around the track he/she has only a mild headache. In your opinion, should the player return to play?

- ◯ Yes
- ◯ No

Thank you for your participation in the Concussion Knowledge Survey.

Below is a list of websites where you can find more information on concussion prevention, recognition, and management:

California University of Pennsylvania
http://www.calu.edu

National Athletic Trainers Association
http://www.nata.org/health-issues/concussion

Centers for Disease Control and Prevention
http://www.cdc.gov/concussion/index.html

National Collegiate Athletic Association
http://ncaa.org/wps/wcm/connect/public/NCAA/Health+and+Safety/Concussion+homepage/

Pennsylvania Department of Health
http://www.portal.state.pa.us/portal/server.pt?open=514&objID=666239&mode=2

Washington Interscholastic Activities Association
http://www.wiaa.com/subcontent.aspx?SecID=623

California
University
of Pennsylvania

Concussion Knowledge Survey:
Coaches Version

Dear Youth Parent or Youth Coach:

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Thank you for taking your time to take part in my thesis research. I greatly appreciate your time and effort put into this task.

Sincerely,

Stephanie Hjortedal, LAT, ATC, PES
Primary Researcher
California University of Pennsylvania
250 University Ave
California, PA 15419
HJO0057@calu.edu

Demographic Informatin

1. How old are you?

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- ◯ 18-25
- ◯ 26-30
- ◯ 31-35
- ◯ 36-40
- ◯ 41-45
- ◯ 46-50
- ◯ 51-55
- ◯ 56-60
- ◯ 60+

2. Are you?

- ◯ Male
- ◯ Female

3. In which state do you reside?

4. What is highest level of education you have completed?

- ◯ High School
- ◯ Two Year College (A.A. or A.S.)
- ◯ Four Year College (B.A. or B.S.)
- ◯ Masters or Professional degree
- ◯ Advanced graduate work or Ph.D

5. Are you currently certified in CPR?

- ◯ Yes
- ◯ No

6. Are you currently certified in First Aid?

- ◯ Yes
- ◯ No

7. Have you ever been diagnosed with a concussion?

- ◯ Yes
- ◯ No
- ◯ Not sure

Copy of page:

8. Are you?

- [ ] A parent of a youth athlete
- [ ] A coach of youth athletes
- [ ] Both
- [ ] Neither

14. Are you currently coaching?

- ◯ Yes
- ◯ No

15. What age level(s) are you currently coaching? Check all that apply.

- ☐ 5-7 years old
- ☐ 8-10 years old
- ☐ 11-12 years old
- ☐ 13-14 years old
- ☐ 15-18 years old
- ☐ College
- ☐ Professional

Other (please specify)

16. At what age level(s) have you coached? Check all that apply.

- ☐ 5-7 years old
- ☐ 8-10 years old
- ☐ 11-12 years old
- ☐ 13-14 years old
- ☐ 15-18 years old
- ☐ College
- ☐ Professional

Other (please specify)

17. What affiliations have you coached? Check all that apply.

- ☐ Interscholastic (Middle school, high school, college, etc)
- ☐ Club (YMCA, AAU, Intramurals, etc.)
- ☐ Professional

Other (please specify)

18. How many years have you coached youth sports?

19. What sport(s) do you coach? Check all that apply.

- [ ] Baseball
- [ ] Basketball
- [ ] Boxing
- [ ] Cheerleading
- [ ] Field Hockey
- [ ] Football
- [ ] Hockey
- [ ] Lacrosse
- [ ] Martial Arts
- [ ] Rugby
- [ ] Soccer
- [ ] Softball
- [ ] Swimming
- [ ] Tennis
- [ ] Track & Field
- [ ] Water Polo
- [ ] Wrestling
- [ ] Volleyball

Other (please specify)

20. Have you ever attended a concussion awareness class or clinic?

- ◯ Yes
- ◯ No

Signs and Symptoms

21. For each of the following signs and symptoms, please check yes if you think it is a sign or symptom of a concussion. Check no if you think it is not a sign or symptom of a concussion.

	Yes	No
Abnormal sense of smell	◯	◯
Abnormal sense of taste	◯	◯
Loss of memory	◯	◯
Blurred vision	◯	◯
Chest pain	◯	◯
Dizziness	◯	◯
Confusion	◯	◯
Headache	◯	◯
Nosebleed	◯	◯
Loss of consciousness	◯	◯
Sharp burning pain in the neck	◯	◯
Nausea	◯	◯
Numbness/tingling in upper extremity	◯	◯
Weakness of neck range of motion	◯	◯
Sleep disturbances	◯	◯
Problems studying or doing class work	◯	◯
Loss of appetite	◯	◯
Sensitivity to light	◯	◯
Change in mood or behavior	◯	◯

True/False Questions

22. A youth athlete who reports having a headache after a concussion will likely show other symptoms?

- ◯ True
- ◯ False

23. A concussion only occurs when the youth athlete blacks out:

- ◯ True
- ◯ False

24. Any youth athlete who sustains a concussion should be immediately removed from the game or practice:

- ◯ True
- ◯ False

25. Any youth athlete who shows any sign or symptom of a concussion should not be allowed to return to play:

- ◯ True
- ◯ False

26. Once a youth athlete who sustains a concussion is symptom free, they are to follow a slow profressive return to play program as long as they remain symptom free:

- ◯ True
- ◯ False

Scenarios

27. A youth football player receives a direct blow to the side of his head from another player and falls to the ground. As he gets up, he experiences mild dizziness and has a headache. But he continues to play and does not report his symptoms to the coach or athletic trainer. In your opinion, should the player have continued to play football in this situation?

- ◯ Yes
- ◯ No

28. A youth football player receives a hit to the head during a scrimmage game. As the player is examined on the sideline, it is found that he is conscious, has no loss of memory and feels fine at rest. When the athlete is asked to jog around the track he/she has only a mild headache. In your opinion, should the player return to play?

- ◯ Yes
- ◯ No

Thank you for your participation in the Concussion Knowledge Survey.

Below is a list of websites where you can find more information on concussion prevention, recognition, and management:

California University of Pennsylvania
http://www.calu.edu

National Athletic Trainers Association
http://www.nata.org/health-issues/concussion

Centers for Disease Control and Prevention
http://www.cdc.gov/concussion/index.html

National Collegiate Athletic Association
http://ncaa.org/wps/wcm/connect/public/NCAA/Health+and+Safety/Concussion+homepage/

Pennsylvania Department of Health
http://www.portal.state.pa.us/portal/server.pt?open=514&objID=666239&mode=2

Washington Interscholastic Activities Association
http://www.wiaa.com/subcontent.aspx?SecID=623

California
University
of Pennsylvania

Appendix C3

Survey Cover Letter

California University of Pennsylvania

Dear Youth Parent or Youth Coach:

My name is Stephanie Hjortedal, and I am currently a graduate student pursing a Master of Science degree in Athletic Training at California University of Pennsylvania. This study is part of a research thesis required in the graduate study curriculum. I am conducting a survey to assess concussion knowledge among parents and coaches of youth sports. While the media has shown the long-term detrimental effects of sports-related concussions, the purpose of this survey is to identify the level of concussion recognition and management among parents and coaches of youth athletes. My goal is to continue building concussion awareness at the ground level, and to optimize the care and safety of youth athletes.

Coaches and parents of youth athletes are being asked to participate in this research; however, your participation is voluntary and you do have the right to choose not to participate. If you are neither a parent nor coach of a youth athlete you will be directed to the end of the survey and thanked for your time. You also have the right to discontinue participation at any time during the survey, at which time your data will be discarded. If you have received this survey via a sports organization and choose not to participate in the survey, it will have no bearing on your, or the athlete's, activity level with that organization. This survey is not under the auspices of the organization itself. You must be 18 or older to participate in the survey. The California University of Pennsylvania Institutional Review Board has reviewed and approved this project. The approval is effective nn/nn/nn and expires mm/mm/mm.

All survey responses are anonymous and will be kept confidential. Informed consent to use the data collected will be assumed upon completion of the survey. Data collected electronically will be stored on California University of Pennsylvania servers with the individual files password protected. Any hard copy data collected, such as informed consent forms, etc., will be stored in the Health Sciences Department in the graduate athletic training education program director's office, Room 115.

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 only take approximately 10 minutes to complete. If you have any questions regarding this project, please feel free to contact the primary researcher, Stephanie Hjortedal at HJO0057@calu.edu. You can also contact the faculty advisor for this research (Dr. Jamie Weary, ATC, weary@calu.edu or 724-938-5708).

Please click the following link to access the survey https://www.surveymonkey.com/s/MNR378L

Thank you for taking your time to take part in my thesis research. I greatly appreciate your time and effort put into this task.

Sincerely,

Stephanie Hjortedal, LAT, ATC, PES
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California University of Pennsylvania
250 University Ave
California, PA 15419
HJO0057@calu.edu

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ABSTRACT

TITLE: CONCUSSION KNOWLEDGE AMONG PARENTS AND COACHES OF YOUTH ATHLETES (AGES 8-12)

RESEARCHER: Stephanie Hjortedal, LAT, ATC, PES

ADVISOR: Dr. Jamie Weary, LAT, ATC

DATE: May 2012

PURPOSE: The purpose of this study was to assess concussion knowledge among parents and coaches of youth athletes between the ages of 8-12.

Design: Descriptive Survey

Settings: Population-Based Survey

Participants: 38 parents, 14 coaches, and 18 subjects who were both a parent and a coach voluntarily participated in the Concussion Knowledge Survey.

INTERVENTIONS: The independent variables were being a parent or coach of a youth athlete, CPR certification, first aid certification, and attendance of a concussion class or clinic. The dependent variable was the score on the Concussion Knowledge Survey.

RESULTS: There was no significant difference in concussion knowledge score between parents and coaches of youth athletes. In addition, there was no significant difference in concussion knowledge score between parents or coaches with CPR/first aid certification and parents or coaches without CPR/first aid certification. Also, no significant difference was found in concussion knowledge score between coaches who had attended a concussion class and coaches who have never attended a concussion class.

CONCLUSIONS: Without the presence of health care professional at youth athletic events the

responsibility of the youth athlete falls upon the shoulders of the parents and coaches. Although no significance difference of concussion knowledge was seen between parents and coaches of youth athletes, subjects demonstrated a moderate knowledge of concussion prevention, recognition and management. Based on the results of this study, it can be concluded that concussion education training should continue to be implemented at the youth level.