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PROTECTING PLAYERS WHILE PROTECTING THE INTEGRITY OF THE GAME IN
YOUTH SOCCER

By

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Undergraduate Professional Paper
presented in partial fulfillment of the requirements
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Protecting Players While Protecting the Integrity of the Game in Youth Soccer

Thomas Rau

Youth sports have been under severe scrutiny lately for the neurological damage coming to light after years of repeated head impact players endure. US Soccer has created somewhat controversial concussion regulations and protocols in the last couple of years to combat this criticism- such as not allowing players under the age of eleven to head the ball. Many coaches, however, believe these regulations could impair the game of soccer and the abilities of the players themselves. As a human biological sciences major as well as having played soccer for the last seventeen years, my project is centered around coalescing current research on the dangers of heading in youth soccer with various coaches' opinions of how certain regulations can endanger the integrity of a game 2.65 billion people take part in worldwide. I have created an editorial piece that examines the coaches' perspectives on how to better maintain the beauty of the game while creating a safe playing environment. To carry out this project I interviewed coaches of all playing levels ranging from coaching players five years of age to the professional level. I then asked scholars with diverse medical backgrounds their opinions on the new Return to Play Protocol. Using these sources as well as the most current research I hope to discover how to best combat the neurological impact soccer can have on current and future players. I have created an article that is easy to understand for people of all educational backgrounds to educate parents, coaches and players while also stimulating dialogue on the issue and possible solutions. This research can be used for further insight into how to integrate science into the beautiful game of soccer and create a safe, educated, and fun playing environment for all to enjoy.

Protecting Players while Protecting the Integrity of the Game in Youth Soccer

Introduction

The most popular sport in the world, soccer or futbol, has been thriving in the United States for the past three decades. Over three million youth registered in the past year to compete in clubs sanctioned by US Soccer¹. In the year 1999, I was one of the children registered. I have played soccer for the past seventeen years- the last four of which I spent playing at the University of Montana for the Division I women's soccer team. During my time at Montana, I have worked toward Bachelor of Science in Human Biological Sciences. To perform my research project, I wanted to combine my knowledge of science and physiology with my passion for soccer. I have witnessed a multitude of injuries over the years including many concussions- a hot topic of today. One of my teammates hit her head on the ground with such velocity that she had a seizure on the field. When I began researching what US Soccer is doing to prevent neurological damage in younger players to keep the game safe, I was shocked at the controversy I found. In 2015, US Soccer created regulations stating: *“Players in U-11 programs and younger shall not engage in heading, either in practices or in games. Limited heading in practice for players in U-12 and U-13 programs. More specifically, these players shall be limited to a maximum of 30 minutes of heading training per week, with no more than 15-20 headers per player, per week. When a player deliberately heads the ball in a game, an indirect free kick (IFK) should be awarded to the opposing team from the spot of the offense. If the deliberate header occurs within the goal area, the indirect free kick should be taken on the goal area line parallel to the goal line at the point nearest to where the infringement occurred. Any player suspected of suffering a head injury may be substituted for evaluation without the substitution counting against the team's total number of allowed substitutions during the game.”*² While these rules may seem to be beneficial, coaches and current players are nervous these changes to the game- specifically the change of no child under eleven being allowed to head the ball- might alter the game in a negative fashion and endanger players. I decided to interview coaches and trainers to determine why they were uncomfortable with the new regulations as well as coalesce the most current research to see if it either supports US Soccer's decision to eliminate heading from the youth game or not. I then wrote an editorial article for the soccer community to educate parents, coaches, and directors of clubs on the basis for the newest regulations and other

research-supported advice for clubs to decrease the concussion level we are seeing today in youth soccer. The overarching theme of my project was: Will not heading a ball until the age of twelve make an impact on the neurological damage we witness in the sport of soccer or will the safety benefit be too small to overcome the negative effect on the game itself?

Methods

In order to perform my project, I began by researching the newest US Soccer protocols as seen above. I found that US Soccer had a lawsuit filed against them by previous parents and players for negligence in treating and monitoring head injuries in August of 2014³ which prompted the youth concussion initiative and development of the newest protocols released in December of 2015. I then interviewed coaches from the youth level all the way to the professional level from across the nation. Six coaches were analyzed with a total of over one hundred years of coaching and playing experience. The questions I asked are attached on page 9. I also then interviewed an NCAA Division I trainer as well as a high school athletic trainer to seek their medical opinions on the new regulations and how concussions are diagnosed as well as treated in soccer. I followed this up by looking into the most current research on if proper heading techniques performed in competition led to concussions. Combining my results, I then wrote my editorial article that is attached.

Results

A) Coach Results

Using the questions as seen on page 9, I found that almost all of the coaches believed that not heading a ball until the age of eleven could increase danger due to improper technique at an older age, decrease aerial abilities at all levels, and make games at the lower age groups less skillful. Some coaches not as knowledgeable about the game may attempt to use this new rule to their advantage as one coach I interviewed stated, “one coach kept yelling at his players to keep kicking the ball in the air and at their heads...since the other team cannot head the ball (and if they do it’s an indirect free kick against them)”. On the other hand, all of the coaches I interviewed also supported an increase in mandatory education for coaches as well as parents on concussion diagnosis, symptoms and treatment. They also believe that heading should not be performed by children until the proper technique is taught and the player is at an ability that will

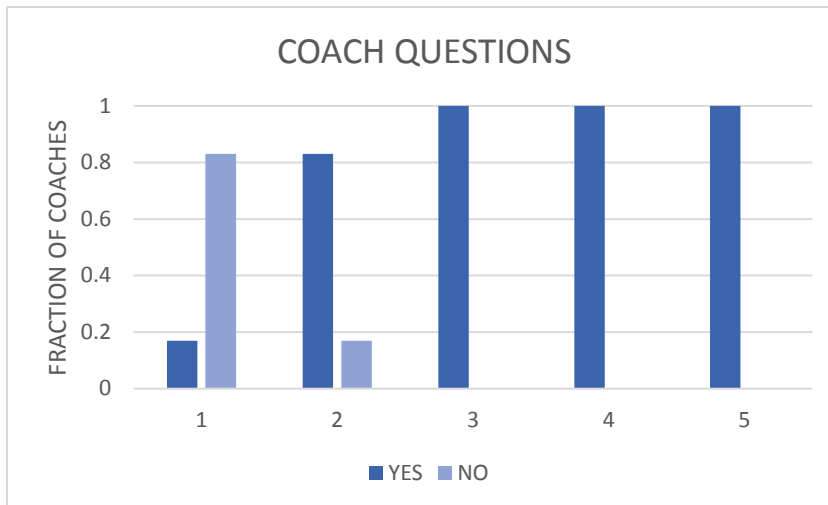


Figure 1

1. Will soccer be safer without heading the ball until a child is 11?
2. Do you feel that improper heading technique could lead to more concussions?
3. Should there be more parent and coach education required regarding concussion symptoms and long term effects they may cause?
4. Should the number and type of headers be regulated during practice while teaching proper technique?
5. Do you see more concussions from other factors such as player to player contact or player to surface contact more than from heading a ball properly?

pose as small of a risk as possible while heading. A major concern I found from their answers included the lack of medical personnel at youth level games. Until high-school there are no medical personnel present at games or tournaments. The youth age group relies on coaches that are CPR certified as well as their parents to initially take care of any injury until they call or find someone trained in medicine. Each coach had seen dozens

of their players suffer concussions over the years, and they were unanimous in having seen more concussions occur due to player to player contact, player to ground contact as opposed to player to ball contact. Quantifying their results led me to produce Figure 1.

B) Trainer Results

To determine if the trade-off of the impact to the game might be outweighed by the safety of the players with the new regulations, I asked trainers from the high school level as well as the collegiate level their thoughts (page 10). Analyzing their responses led to the results that more trainers or other medical providers should be present at youth level games since usually there is minimal, if any, medically trained providers at games at the youth age group. They also believed that coaches should be further educated about concussion protocol and the ramifications neurological damage can occur. When asked if they thought heading was a problem with the game, I received mixed results. The high school trainer believed no research had been shown to correlate proper heading with concussions. The collegiate trainer believed that heading was a dangerous part of the game if at a great velocity with increased repetitions especially while the

youth brain was developing, however they were not sure how to diminish heading from the game since it is a major part of the excitement of the game. They both believed that decreasing head acceleration and limiting player to player contact could better player safety, but also acknowledged this could have a negative impact on the game and the players' abilities.

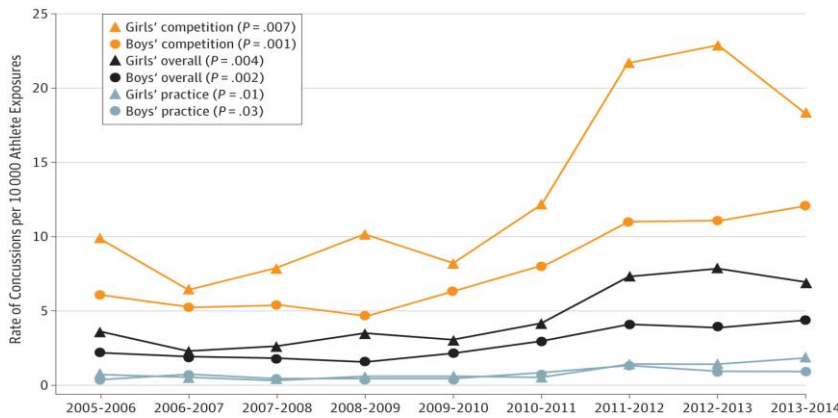


Figure 2: Concussion Rates Over Time in Boys' and Girls' Soccer, National High School Sports-Related Injury Surveillance Study, Original Sample, 2005-2006 Through 2013-2014

neurological damage. The American Academy of Pediatrics found, "The best technique [for heading properly] is to contract the neck muscles to hold the head rigidly fixed to the trunk, allowing the ball to contact the hairline of forehead" as well as stating that "data [has] been insufficient to link repetitive heading with permanent cognitive impairment"⁴. One study conducted by Dawn Comstock et al considered the injury mechanism of concussions for high

C) Research Results

To examine all of the results I had compiled from coaches and trainers, I did a critical analysis of the most current research of brain damage in youth soccer with heading. The result: no primary literature supports that proper heading technique will result in acute or long term

school boys and girls. They began by looking at the rate of concussions per 1000 athlete exposures for boys and girls in practice, in competition and overall for the past ten years. They found an increase in both genders during both games and practices, however a significant

Table 1. Overall Concussions and Heading-Related Concussions in Boys' and Girls' Soccer by Injury Mechanism, National High School Sports-Related Injury Surveillance Study, Original Sample, 2005-2006 Through 2013-2014

Variable	Boys' Soccer		Girls' Soccer	
	Frequency ^a	National Estimate, No. (%) ^b	Frequency ^a	National Estimate, No. (%) ^b
Injury Mechanism for All Concussions				
Contact with another player	296	165 791 (68.8)	326	181 855 (51.3)
Contact with playing surface	62	32 153 (13.3)	109	68 087 (19.2)
Contact with playing apparatus, including ball	72	40 999 (17.0)	182	102 766 (29.0)
Total ^c	432	240 998 (100)	623	354 249 (100)
Injury Mechanism for Heading-Related Concussions				
Contact with another player	107	58 235 (78.1)	100	53 764 (61.9)
Contact with playing surface	13	4606 (6.2)	8	5119 (5.9)
Contact with playing apparatus, including ball	16	11 404 (15.3)	49	28 049 (32.3)
Total ^c	137	74 610 (100)	157	86 932 (100)

^a Frequencies do not add up to totals due to censure of a small number of injury reports in which the mechanism was described as "other."

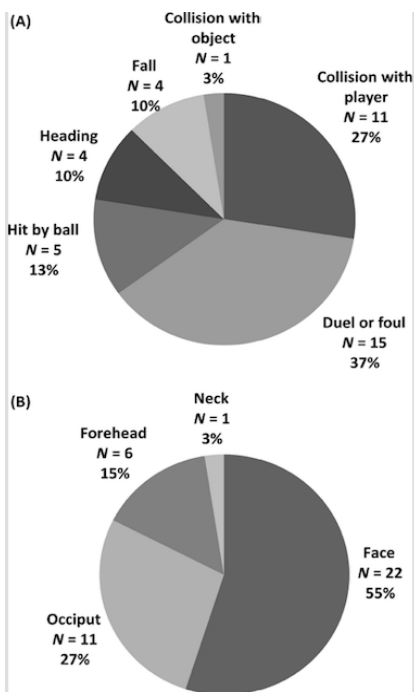
censure of the "other" category and to rounding.

^b Percentages calculated from national estimates do not add up to 100% due to censure of the "other" category and to rounding.

^c Data are missing for 10 boys' and 4 girls' soccer concussions due to missing injury mechanism information.

increase in girls' competition (Figure 2). I believe this could be due to the increased aggression and competition in the women's game in the last decade. Table 1 shows the injury mechanism

found for all concussions to have a national estimate of 17 and 29 percent for boys and girls respectively. They then further analyzed how the heading related concussions occurred and found that only 15.3 and 32.3 percent of them occurred due to contact with the ball. Contact with another player posed the greatest risk for concussion. From their analysis, Comstock et al stated “...we postulate that banning heading from soccer will have limited effectiveness as a primary prevention mechanism (ie, in preventing concussion injuries) unless such a ban is combined with concurrent efforts to reduce athlete-athlete contact throughout the game”⁵. While the percentages for concussions occurring due to the ball are not insignificant enough to discount, there was no way to determine if the ball contact utilized proper heading technique or not. I also was more curious about the youth side of the sport and the developing brain.



Faude and Rossler et al analyzed head and neck injuries in youth players from Europe ages seven to twelve years old. Figure 3 demonstrates their findings. Ten percent of children were found to have injuries due to heading. Figure 3b results show the area of head that suffered the blow. The forehead, the place of impact of a properly performed header, was seen to only have fifteen percent of concussions occur. The face and occiput- or back of the head- resulted in the most injuries. The incidence of head injuries in the youth game was also seen to be relatively small in this study. They concluded that there was a very low risk to children when heading the ball but parents and coaches should still be educated about the ramifications of concussions as well as how to diagnose them and

treat them properly both on and off the field.

After analysis of dozens of more articles, there has been no evidence of correlation between acute and long term neurological deficits and proper heading of the ball at a young age. Mouth guards as well as head gear has been found in some studies to decrease head acceleration which improves chances of not suffering a concussion. Strengthening jaw and neck muscles has also been found to decrease head acceleration.

Conclusions:

By not teaching proper technique at a young age, more instances of face and occiput impact could occur due to the decreased ability to time balls out of the air. An increase in the velocity of the ball as one gets older means that starting to learn proper technique at an older age could increase the risk of a higher velocity ball impacting the incorrect portion of the head leading to a greater risk for injury. US Soccer might have good intentions by preventing youth to head the ball, however research and coaches alike do not support that this protocol will increase player safety. If they instead implement different regulations for youth coaches such as mandatory education on teaching proper heading technique, begin to regulate how to strengthen jaw and neck muscles at such a young age, and have medical personnel come to games of youth players the game can remain safe and the same beautiful game so many around the world enjoy. More research into whether or not concussion/head injuries have decreased in youth soccer since 2015 would conclusively tell us if these regulations are benefiting players.

My editorial article is attached and has been distributed to various club coaches across the nation. I hope I can begin a dialogue to enhance player safety as well as protect this game that has taught me so much. Concussions are a very serious injury, and we should do something to protect youth athletes of all sports. However, I hope the risk of injury does not prevent parents and children to take part in youth athletics. The reward is so much more than the risk might be.

Questions for Coaches

- 1) Has US Soccer, NCAA, or any other governing soccer body implemented new rules, regulations, or protocols relating to injuries of the head for the age that you coach? If so, what are they?

- 2) Do you feel as though these rules will make the game safer for your players?

- 3) If you suspect your player has had a concussion, what are you supposed to do?

- 4) Is there medical personnel required to be at every practice or game? If yes, what is their level of training ie doctor, nurse, trainer?

- 5) If a player has suffered a head injury during practice or a game, do you have any way to test if it is a concussion immediately or do you rely on symptoms such as a headache and nausea?

- 6) Following one of your players being diagnosed with a concussion, what is your role in letting them return to play? Do the parents have a say or are you required to have medical clearance before allowing them to participate in practices or games?

- 7) With new rules such as not heading the ball until a certain age- what impact do you think these rules will have on the game itself and your players' abilities?

- 8) In your experience, approximately how many concussions have you seen occur from heading a soccer ball? How many have you seen from player to player contact such as head to head, elbow to head etc? How many have you seen occur from a player's head hitting the ground or goalpost?

- 9) Do you think there should be more/different regulations to protect player safety? If so- what?

- 10) Do you think there is a way to maintain player safety while also maintaining the integrity of the game?

Questions for Trainers

- 1) How do you evaluate immediately if a player has a concussion?
- 2) Have you been given new protocols in the last few years for returning to participation if a soccer athlete suffers a concussion?
- 3) Do you think heading the soccer ball poses a high risk for neurological damage?
- 4) Do you feel as if not heading a soccer ball before the age of 12 will cause you to see less injuries for the players you work with?
- 5) How do you feel the game of soccer should be changed in order to be the safest it can be?
- 6) Do you think most of the coaches you have worked with or are currently working with have a good knowledge about concussions and their ramifications?

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Protecting Players While Protecting the Integrity of the Game in Youth Soccer
An editorial article by Aspen Peifer

I have played soccer for the last seventeen years and finally concluded my career as a Division I athlete at the University of Montana. I will also graduate this May with a Bachelors of Science in Human Biological Sciences. I have witnessed a multitude of injuries over the years including many concussions- a hot topic of today. When I began looking into what US Soccer is doing to prevent neurological damage in younger players to keep the game safe, I was shocked at the controversy I found. In 2015, US Soccer created regulations stating: “ 1) *Players in U-11 programs and younger shall not engage in heading, either in practices or in games.* 2) *Limited heading in practice for players in U-12 and U-13 programs. More specifically, these players shall be limited to a maximum of 30 minutes of heading training per week, with no more than 15-20 headers per player, per week.* 3) *When a player deliberately heads the ball in a game, an indirect free kick (IFK) should be awarded to the opposing team from the spot of the offense. If the deliberate header occurs within the goal area, the indirect free kick should be taken on the goal area line parallel to the goal line at the point nearest to where the infringement occurred.* 4) *Any player suspected of suffering a head injury may be substituted for evaluation without the substitution counting against the team’s total number of allowed substitutions during the game.*” While these rules may seem to have a beneficial impact for players, coaches and current players are nervous these changes to the game- specifically the change of no child under eleven being allowed to head the ball- might alter the game in a negative fashion. I sought out to combine my passion for the game with my love of science to determine if the newest protocols are the safest and most effective to maintain integrity of this game we all love.

I decided to conduct a research project that compiled the most current concussion research and medical opinions with various coaches’ opinions to evaluate and suggest ways to improve the newest regulations to create a fun and safe playing environment for all. Each coach I interviewed from the youth level to the professional level seemed to feel the same of the newest regulations: not heading a ball until the age of eleven could increase danger due to improper technique at an older age, decreased aerial abilities, and make games at the lower age groups less skillful. Some coaches not as knowledgeable about the game may attempt to use this new rule to their advantage as one coach I interviewed stated, “one coach kept yelling at his players to keep kicking the ball in the air and at their heads...since the other team cannot head the ball (and if they do it’s an indirect free kick against them)”. The coaches need their voices heard: they feel as though regulations like this could hurt the most popular game in the world that is enjoyed by millions of people. On the other hand, each coach felt as though concussions are an issue with the game and proper technique should be taught in a controlled setting before performing a header in a game. They also support an increase in mandatory education for coaches as well as parents on concussion symptoms and effects.

To determine if the trade-off of the impact to the game might be outweighed by the safety of the players with the new regulations, I asked trainers from the high school level as well as the collegiate level their thoughts. Analyzing their responses led to the results that more trainers or other medical providers should be present at youth level games since usually there is minimal, if any, medically trained providers at games at the youth age group. They also believed that

coaches should be further educated about concussion protocol and the ramifications of concussions in a child. When asked if they thought heading was a problem with the game, I received mixed results. Many believed no research had been shown to correlate proper heading with concussions. Others believed that heading was a dangerous part of the game, however they were not sure how to diminish heading from the game since it is a major part of the game.

To examine these results, I did a critical analysis of the most current research of brain damage in youth soccer with heading. Concussions have been shown to be increasing in both boys and girls high school soccer in the last ten years as seen in Figure 1 from a study performed by Comstock et al. They also analyzed the injury mechanisms for all concussions and found the national estimate for concussions due to the ball to be 17 and 29 percent for boys and girls. They then further analyzed how the heading related concussions occurred and found that only 15.3 and 32.3 percent of them occurred due to contact with the ball. Contact with another player posed the greatest risk for concussion. From their analysis, Comstock et al stated "...we postulate that banning heading from soccer will have limited effectiveness as a primary prevention mechanism (ie, in preventing concussion injuries) unless such a ban is combined with concurrent efforts to reduce athlete-athlete contact throughout the game". I wanted to know if this held true for the younger age group as well as if the players had proper technique when they did receive a concussion from heading the ball. The American Academy of Pediatrics found, "The best technique [for heading properly] is to contract the neck muscles to hold the head rigidly fixed to the trunk, allowing the ball to contact the hairline of forehead" as well as stating that "data [has] been insufficient to link repetitive heading with permanent cognitive impairment"⁴.

To further justify these results, I considered a study performed in Europe analyzing almost eight hundred head and neck injuries in soccer players ages seven to twelve. Ten percent were found to have obtained these injuries due to heading. Further analysis showed the placement of the ball on the head when the concussion occurred. The forehead, the place of impact of a properly performed header, was seen to only have fifteen percent of concussions occur. The face and occiput- or back of the head- resulted in the most injuries. The incidence of head injuries in the youth game was also seen to be relatively small in this study. They concluded that there was a very low risk to children when heading the ball but believe that parents and coaches should still be educated about the ramifications of concussions as well as how to diagnose them and treat them properly both on and off the field.

Other articles also discuss the benefits of head gear and mouth guards. Each are capable of decreasing head acceleration which in turn lowers the risk of having a concussion occur, however there is some data that supports the loss of cautiousness when one wears a mouth guard or head gear. Another great way to decrease head acceleration is to strengthen a player's neck and jaw muscles. The American Academy of Pediatrics found, "The best technique [for heading properly] is to contract the neck muscles to hold the head rigidly fixed to the trunk, allowing the ball to contact the hairline of forehead" as well as stating that "data [has] been insufficient to link repetitive heading with permanent cognitive impairment".

After extensive research into the impact purposeful and well executed heading can have neurologically I have found no primary literature supports that proper heading technique will result in acute or long term neurological damage. US Soccer should however consider altering

their new regulations to include mandatory education of coaches on how to properly coach heading technique, mandate a medically trained professional be at all youth level games for immediate diagnosis and treatment of all injuries, and instruct coaches on how to strengthen the neck and jaw muscles of their players. Taking away heading from the younger age groups will not make the game safer. The velocity of the ball will increase as a player gets older, and if they are not taught proper technique and allowed to practice their form at a slower pace such as at the youth level, they could risk getting seriously injured when trying to learn later in life when the ball is flying at them at a great speed. As serious as concussions are, the risk of injury is far less than the reward of playing this great sport. I have had a wonderful soccer career; I have learned so much from the sport and also made lifelong friendships. We need to focus on player safety as well as protecting this beautiful game.