

High School Football Players Use Their Helmets to Tackle Other Players Despite Knowing the Risks

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Abstract

There is greater attention to head-related injuries and concussions in American football. The helmet's structural safety and the way that football players use their helmets are important in preventing head injuries. Current strategies include penalizing players for high-risk behavior such as leading with their helmet or hitting an opposing player above the shoulder. Passive strategies include helmet modification to better protect the head of the players or to change the playing style of the players. Hawai'i high school varsity football players were surveyed to determine how they use their helmets and how a new helmet design would affect their style of play. One hundred seventy-seven surveys were completed; 79% said that they used their helmet to hit an opposing player during a tackle and 46% said they made this contact intentionally. When asked about modifying helmets with a soft material on the outside, 48% said they thought putting a soft cover over a regular helmet would protect their head better. However, many participants said that putting a soft cover over their regular helmet was a bad idea for various reasons. Most young football players use their helmets to block or tackle despite being taught they would be penalized or potentially injured if they did so. By gaining a better understanding of why and how players use their helmets and how they would respond to new helmet designs, steps can be taken to reduce head injuries for all levels of play.

Keywords

football, helmets, head injury, concussion, head injury prevention, concussion prevention, injury prevention

Introduction

American football is one of the most popular sports in the United States to watch and in which to participate.¹ Football players on all levels of play are getting bigger, stronger, and faster which makes the game more appealing to fans.² However, the increase in the size and speed of its players has resulted in more concern about head injuries and head safety.² Former National Football League (NFL) players have sued the NFL for improper protocol when dealing with player safety related to concussions.³ These retired players suffer from a variety of neurocognitive and neurodegenerative diseases, which are possible long-term consequences of concussions. The concern has now extended to youth and high school football players. Studies show greater risk for long term cognitive harm from injuries at younger ages.⁴ Pop Warner (a major youth football league in the United States) participation dropped 9.5% from 2010 to 2012, while flag football participation increased.⁵ The drop in participation could be a result of parents becoming better informed about injury prevention given the greater concern regarding concussion and neurocognitive harm.

Concussions in sports are common and its incidence is increasing.^{6,7} On the national level, football causes the most concussions among high school sports.^{6,7} Head Case (a sports concussion website) suggests that there were 3.8 million con-

cussions reported in 2012 (presumably in the United States), which is double that reported in 2002.⁶ From 2010 to 2012, Hawai'i public high schools reported 930 total concussions in all sports, and 425 of these were from football.⁸

Passive injury prevention strategies to address concussions and head safety involve creating a safe helmet worn by players to hopefully reduce the amount of impact to the head. In contrast, active injury prevention strategies in which the players must do something (behavior change) for the strategy to work, include teaching players about the risk of helmet to player contact, avoiding intentional helmet to player contact, and instituting a game penalty that results from such helmet to player contact. The effectiveness of these strategies can be measured by the number of occurrences of such penalties and the number of concussions diagnosed in players.

The purpose of our study was to survey high school football players' playing experience, their understanding of helmet contact risk, their opinions of potential helmet modifications, and how they use their helmets while playing. This data will help to determine the frequency of helmet to player contact in the current era of increasing awareness of helmet to player concussion risk and the imposition of helmet to player contact penalties (i.e., the active injury prevention strategies currently in place). This information will also help to guide the development of future prevention strategies.

Methods

We developed a 12 item survey (see Tables 1, 2, and 3) for high school players on how they used their helmets and how a new helmet design would affect their style of play. We limited our study to varsity team level high school football players aged 14 years or above.

This survey was developed by the study investigators based on reading the background literature. This survey is not based on previously existing survey instruments. We added questions about how players would react to modifying the exterior of the current helmet based on a previous study that we published demonstrating the reduction of head impact severity by applying foam to the exterior of the helmet.⁹ The survey had to be short and easily comprehended with clear replies to respect the time commitment required to complete the survey. We did not pilot test the survey on actual players, because we lacked easy access to high school football players, but the survey was reviewed and modified by the study investigators independently as well as by reviewers at the Hawai'i Pacific Health Research Institute, the Western IRB reviewers, and the University of Hawai'i Department of Public Health Sciences.

The surveys contained terminology that is well known to football players. “Spearing” or “leading with the helmet” refers to forcefully driving the instigating player’s helmet into the opposing player, usually at high speed. “Helmet slapping” refers to a celebratory gesture when a player strikes the helmet of a teammate with an open palm.

We had significant connections to many high school football teams. The study investigators, other faculty, and community physicians had close personal and professional relationships with many high school football teams in the State of Hawai‘i. Athletic directors and head coaches across the state were contacted via email, telephone, and personal conversation, to describe the study and ask for voluntary participation in the study. Approximately 16 schools were contacted via an athletic director, head coach, or assistant coach. Athletic directors and coaches were given copies of the survey for them to consider for participation. We informed them that the names of the participating schools would not be disclosed in the research publication. Only four teams agreed to participate (two public schools and two private schools). All surveys were completed in a team meeting session of approximately 30 minutes supervised by the study investigators. Players were informed that the survey was optional and anonymous. We were not able to determine the number of eligible participants, because we only had access to those who volunteered. The 12-item survey was distributed on paper to each of the participating players who came to the team meeting. Players completed the survey individually, and returned the completed survey form to the study investigators during the team meeting session. This study did not perform any preparation or teaching prior to, during, or following the surveys. To avoid any possibility of coercion, we informed the players that it was OK to turn in a blank survey and that we preferred a blank survey over a falsely completed survey (one in which the wrong or random responses were circled). A total of 177 high school varsity football players participated and completed the survey questionnaire. We did not receive any blank surveys submitted by the players. Surveys were administered before and during the 2013 and 2014 football seasons. An energy bar was given to each player after they completed their survey as a thank you snack for participating. Survey responses and percentages were calculated to summarize the results. This study was approved by Western IRB (WIRB, Olympia, WA) and parental consent was waived.

Results

The survey items and their responses are tabulated in Tables 1, 2, and 3. One hundred seventy-seven players completed the survey; 79% confirmed that they had used their football helmet to hit another player on the opposing team during a tackle in a game, practice, or drill (29%, more than 10 instances; 18%, 5-10 instances; 31%, 1-4 instances; 21%, never) (Table 1). Fifty-eight percent indicated that they did this during both games and practice, 10% in games only, and 11% in practice only.

In regard to leading or tackling with their helmet, 9% were told that this is a good way to tackle, 58% were told that this

	n (%)
Have you ever used your football helmet to hit another player on the other team during a tackle in a game or practice or drill?	
Yes	139 (79%)
Did you do this during a game, a practice (includes drills), or both?	
Never did this	36 (20%)
Game only	18 (10%)
Practice only	20 (11%)
Both game and practice	103 (58%)
About how many times have you done this in the last year in total (games and practice)?	
Never	38 (21%)
1-4 times	55 (31%)
5-10 times	32 (18%)
More than 10 times	52 (29%)
Even if you did this before, have you ever been taught (by coaches, parents, or anyone) that spearing and leading with your helmet is a bad idea?	
I was told it's a good way to tackle.	15 (9%)
I was told this is a poor way to tackle.	102 (58%)
I was told this would hurt the other player.	127 (72%)
I was told this would hurt me.	162 (92%)
I was told this would result in a penalty.	139 (79%)
I was told I would get kicked out of the game.	105 (59%)
I was told to NEVER block or tackle using my helmet.	124 (70%)
Have you ever made helmet-to-helmet contact with an opposing player during a tackle or block?	
Yes, it was an accident.	64 (36%)
Yes, I caused it on purpose.	27 (15%)
Yes, the other player caused it on purpose.	14 (8%)
Yes, I caused it one or more times and other players caused it one or more times.	55 (31%)
No, I have never had helmet to helmet contact.	15 (9%)
No Response	2

is a poor way to tackle, 72% were told that it would hurt the other player, 92% were told that it would hurt me (the player initiating the contact), 79% were told that this would result in a game penalty, 60% were told that this would result in being ejected from the game, and 70% were told never to block or tackle using their helmet (Table 1).

Nine percent of players never made helmet to helmet contact with an opposing player (Table 1). Thirty-six percent experienced accidental helmet to helmet contact, 15% confirmed that they caused deliberate helmet to helmet contact, 8% confirmed that the opposing player caused deliberate helmet to helmet contact, and 31% caused and received more than one episode of deliberate helmet to helmet contact.

Players were presented with a theoretical helmet redesign placing soft material over the outside of the current helmet. Half of respondents replied that it would hurt less, while only 9% replied that it would hurt more, and 41% replied that it would be the same (Table 2). Thirteen percent thought this helmet modification would be a good idea, 31% thought it would be a bad idea, and 56% were not sure. Among the various reasons reported, 30% replied that this is a bad idea because it takes away the hardest part of the player's gear, requiring them to switch to the shoulder pads or face guard to inflict pain on the opposing player.

	N (%)
If your opponent's football helmet was covered with a soft material (like foam rubber) on the outside, would it hurt less if you got hit by it during a tackle or block (compare getting hit by regular helmet and getting hit by a helmet covered with soft material)?	
Regular helmet is more sore	88 (50%)
Foam covered helmet is more sore	16 (9%)
Both helmets are the same	73 (41%)
Do you think that playing with a helmet that has a soft cover over your regular helmet would be a good idea?	
This is a good idea.	23 (13%)
This is a bad idea.	55 (31%)
I'm not sure.	99 (56%)
Do you think that putting a soft cover over your regular helmet would protect your head better?	
Yes.	85 (48%)
No.	87 (49%)
No Response	5
Why do you think that playing with a helmet that has a soft cover over your regular helmet would be a good idea or a bad idea?	
Bad idea, soft cover over my helmet would make my head look big	67 (38%)
Bad idea, soft cover over my helmet would make it harder (more difficult) to tackle/block other players.	72 (41%)
Bad idea, soft cover over my helmet takes away the hardest part of my gear. I will now have to use my shoulder pad or face guard to inflict some real pain on my opponent when tackling him.	52 (30%)
Bad idea, the sound of helmets colliding is part of the game of football. Putting a soft cover over our helmets would change the sound of the game.	51 (29%)
Good idea, soft cover over my regular helmet would protect my head better.	76 (43%)
Good idea, soft cover over my regular helmet would prevent me from wanting to spear or lead with my helmet during tackling and blocking.	40 (23%)
If your helmet was covered with a soft material on the outside, would you ever use it to hit another player on the other team during a tackle?	
Yes-because hitting other players with my helmet helps me tackle better	63 (36%)
Yes-because I think it could still hurt the other player	37 (21%)
Yes-for another reason	26 (15%)
No-because it wouldn't hurt the other player	25 (14%)
No-because I never hit other players with my helmet	53 (30%)
No-for another reason	30 (17%)

When asked about celebratory helmet slapping (Table 3), 66% had their helmet slapped resulting in no head pain, but 43% sustained helmet slapping that resulted in slight pain to the head or neck and 11% sustained helmet slapping that resulted in more than slight pain to the head or neck. Neck pain sustained from helmet slapping was less than head pain.

	N (%)
Did you ever get your helmet slapped by your team mates in celebration when you did something really good?	
No, I never had my helmet slapped.	15 (8%)
I had my helmet slapped, but no pain resulted.	116 (66%)
I had my helmet slapped and it hurt my HEAD slightly.	55 (31%)
I had my helmet slapped and it hurt my HEAD more than slightly (a headache or bad headache).	14 (8%)
I had my helmet slapped and it hurt my NECK slightly.	22 (12%)
I had my helmet slapped and it hurt my NECK more than slightly (a neck ache or bad neck pain).	5 (3%)

Discussion

These results indicate that more than 90% of the players are aware of the head injury consequence and 79% of the players were aware of the penalty consequences of helmet to player contact, yet 91% of the players experienced helmet to player contact and 46% of players intentionally initiated this contact, despite knowing these consequences.

More information on the neurocognitive and neurodegenerative risks of concussions is available now than in the past. More research is needed to prevent and treat these injuries properly. Our survey indicates that the current active prevention strategies (that requires player behavior modification) of teaching players about their personal head injury harm and penalizing players for helmet to player contact are not working well since players continue to use their helmet for tackling despite knowing these consequences.

A more passive approach is to see how players use their helmets and if they are open to the idea of a new helmet model. When asked their opinion on a soft cover over their helmet, only 13% thought it was a good idea. This idea of helmet redesign is new and the results show that when asked more specifically about the benefits of this specific helmet redesign, 48% replied that it would protect their head better.

Although the pain consequences of celebratory helmet slapping were small in this survey, some responses suggest that the consequence was more than minor. Head injury concussion consequences are known to be additive and any additional head trauma could add to the potential for neurocognitive harm.¹⁰ High school players are generally not as large or as strong as college or professional players,¹¹ so this might be a bigger issue at the upper levels of play and should be further explored. A larger, heavier, and faster hand increases all the parameters that lead to force and momentum, potentially resulting in a

disproportionately greater consequence on the recipient of the helmet slap. Helmet slapping is unnecessary and it would be preferable to celebrate with maneuvers that did not involve additional head trauma.

Most of the research on football related head injuries has focused on concussions, helmet designs, and risk factors. Our survey is unique in its probe into what players have been taught, and what they actually do on the playing field. Our results indicate that active injury prevention strategies may not be as effective as we would like them to be, therefore a passive injury prevention strategy may be needed. These factors point to the need for a modified helmet design.

While we assume the current hard helmet is safer than the leatherhead helmet of a previous football era, this might be paradoxically incorrect. One study comparing the protective safety parameters of helmets concluded that most of the current helmet designs were no more protective than the leatherhead helmet.¹² Additionally, if the hard helmet promotes and encourages helmet-to-player contact, while the leather helmet discourages this, the hard helmet might actually be detrimental. This is supported by the finding that youth rugby players were motivated to wear headgear because this enabled them to tackle harder suggesting that a belief in its protective capabilities may promote more aggressive tackling behavior,¹³ despite evidence that protective headgear does not reduce the rate of head injury or concussion.¹⁴ In rugby, illegal play is associated with a higher injury risk indicating that rules don't necessarily prevent injuries.¹⁵ Note that high level rugby players do not use a helmet and while there is substantial player contact in rugby, its concussion risk is not noticeably higher than in American football.¹⁵⁻²² If head protection gear promotes a more injurious style of play coupled with no true additional protection afforded by a hard helmet over a leatherhead, it is expected that this could paradoxically increase the frequency of concussions.

A passive injury prevention measure of applying a soft exterior to the helmet may also be considered. One study demonstrated that a foam exterior applied over a standard hard helmet reduced the impact severity as measured by accelerometers within the helmet.⁹ This suggests a two-fold benefit: (1) Overall impact reduction, and (2) By removing the incentive for intentional helmet-to-player contact, an overall reduction in helmet to player injuries.

This study has some key limitations that should be addressed. The sample size is small. Since the coaches and athletic directors were shown the survey prior to the team surveys, they could have taught their players the proper technique of tackling and blocking prior to the survey and/or they could have counseled them on how to answer these questions to make their school look good (or not as bad). Also, coaches potentially knew how their players would reply and this perhaps affected their decision on whether to participate in the survey. Our survey relied on player recall and reporting which could be biased. The survey indicated that 70% were taught to never tackle in this helmet leading manner. Players could have responded a certain way because they didn't want to contradict their coaching or

indicate that their playing performance violated the rules of the game. All of these factors would underestimate the severity of the areas of concern. In other words, the true picture might be worse than what our survey results indicate.

Some players might not have had the opportunity to inflict pain using their helmets, or experience such pain inflicted upon them, because of their playing position, their spot in the depth chart (whether they are a starting player who plays frequently and more likely to have sustained an injury, or a substitute player who plays infrequently and is less likely to have sustained an injury), and their previous playing experience level.

In retrospect, we could have obtained more information by collecting information about player position and previous concussion symptoms. Players who have sustained previous concussions might have different attitudes about helmet to player contact and a safer helmet design. The player's position could also potentially affect how they use their helmets since a previous study has demonstrated that the different positions have different concussion risks.^{23,24} However, collecting more information about the overall health status of a minor subject would have required written parental consent, making the survey much more difficult.

When describing the helmet redesign, it was only a worded description and players could have interpreted it differently. For example, they might not have been concerned about the visual appearance of the helmet until the survey pointed out to them that it might make their head look big.

Further research is needed to understand the true long-term and short-term effects of football concussions. Getting a closer look at players' intent while playing and exploring potentially safer helmet designs is an area that needs to be focused on for future studies.

Conclusion

This research adds to the current literature on football and helmet safety and can contribute to reducing head injuries caused by the sport. Coaches and parents can adjust how their players and children are approaching the sport of football and can take steps to help reduce the amount of head injuries. Players, regardless of what they are told, will use their helmets to tackle and block so other steps must be taken. Since players know the injury and penalty risks of using their helmets and still use them, making the rules stricter (eg, ejecting from game immediately) or modifying the helmet design would be more effective strategies for reducing head injuries.

Conflict of Interest

None of the authors identify any conflict of interest.

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