

New technologies that are currently being implemented into helmets

(Technical Paper)

The history of football helmets and their improvements over time

(STS paper)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction:

As football continues to be played in and outside the United States, a part of the game that is continually changing is the helmet. Football helmets were once thin leather skull caps that provide minimal protection for the players wearing them. Now, they are sophisticated pieces of technology that combine materials like carbon fiber, polyurethane foams, and plastics that are put together to protect the players on the field. In addition to the changes that have been made to the helmets, there have been many changes to the rules of the game to improve player safety to reduce concussions and other types of injuries.

In 2016, the National Football League (NFL) stated they would spend 100 million to develop new technology and for medical research. (Dallas News, 2016). One of the main things driving this is concern for player safety not only in the short term, but the long-term effects that continuous impacts to the head can have. One of the biggest long-term effects is Chronic Traumatic Encephalopathy (CTE), a neurodegenerative disease associated with repeated head trauma. There is currently some conflicting data about the percentages of former NFL players that have CTE, but there is a consensus that almost all NFL players are at risk of CTE. In this paper I will discuss some of the early development of helmets and the motivations behind them, how the materials have changed over time, the cultural and economic impacts of this, and what the future could look like for helmets.

I will use the Actor-Network Theory (ANT) framework to guide this paper. This will allow for me to dive into the roles of everyone and everything including medical professionals, engineers designing the helmets, researchers, the players themselves in addition to the helmets themselves and governing bodies like the NFL and the NFLPA (NFL Players association). In my

technical portion I will talk about the some of the current engineering that is being put into helmets and the research around position specific helmets.

Technical Topic

The technical portion of my topic is exploring the different technologies that are currently being implemented into football helmets. What I want to do is discuss a few of the newest technologies and what it is about them that improves the helmet. The technology that is put in the helmets is the best physical embodiment of all the actors that play a role in preventing concussions as it is worn by every on the field and it protects the head of each individual that wears it.

The first technology is Guardian Caps. They were first seen in the 2023 NFL preseason and practices, but now they are being seen in regular season games. While this is relatively new, it has proved to be an effective way of mitigating concussions. “when players wore the caps during practice, the number of concussions decreased by 50%” (Schultz, 2024). Its design is a cover that fits overtop of the helmet itself and it has foam pads that are mean to reduce the impact force on the helmet. “Various studies purport a 10 to 20% reduction in the forces generated with collisions” (Schultz, 2024). The Guardian Cap is something that can be used by all players, but one thing that has been around for quite some time, but continues to improve are position specific helmets. “Position-specific helmets are the latest advancement in helmet technology, providing customized protection for position groups” (NFL, 2023). These have been providing better protection for players and continue to improve on previous years performances. The one thing about this that is interesting to me and is a personal observation is that this is something that I have been able to witness in my lifetime. I have seen the shapes and designs of the helmets,

change for all players on the field from a somewhat round and now antiquated looking helmet, to much more robust looking designs that obviously have some practical application.

Liquid shock absorbers are the next thing that I want to dive into. As opposed to the traditional foam shock absorbers that have been used for decades in helmets, liquid shock absorbers could reduce impact severity significantly. (Gillham, 2023). The helmet with liquid also outperformed all other helmets in the Helmet Performance Score, an annual test done by the NFL. In the research for this, it was also found that they did not compromise any other areas of helmet protection. This technology might also have other applications like the padding that players wear for their shoulders and legs which could help prevent injuries in other areas than the head. For the last technology that I will mention, is impact sensors and monitoring. This technology has been implemented for well over five years now but it goes to show the increased depth of data that can be gathered from a helmet.

STS topic

Concussions are a part of every contact sport that humans play, it is entirely unavoidable. “The Center for Disease Control estimates that 5-10% of athletes will experience a concussion in any given sports season.” (University of Michigan) Concussions can occur playing any sport, but the one that causes the most outside of combat sports, and that is American Football. By the very nature of the sport, concussions are bound to happen. Almost every play involves a player’s head making contact with a surface, whether it be the ground, another player’s body, or another player’s head. One thing to note is that concussions do not have a lot of data until recently, additionally the mentality towards concussions has changed over the years meaning players are more likely to be diagnosed now. I will apply Actor Network Theory to gain a better understanding of the overall history of football helmets, the reasoning behind why they have

changed over time, additional changes that have helped reduce the number of concussions, and the cultural and economic impact that this all has.

Football helmets started as leather caps that provided minimal protection, but also, the sport looked a little different. There was less head-to-head contact, but there were still head to ground contact which could have caused concussions. Eventually, there was a shift to plastic helmets in the 1940s which was in an effort to use more durable materials. This had an effect where the sport was thought to be safer which caused players to play more violently. Helmet to helmet hits started to become a part of the sport and with that came additional concussion risk for both the tackler and the person being tackled. Starting in the 1960s and 70s, helmets were fitted with padding on the inside to increase comfort, but also provide more protection. (Chester County Hospital, 2023). Some other things were added along the way such as the facemask and different materials. The motivation behind most of the early changes were for durability and to protect the players. Helmets used to be more of a “one size fits all” type of thing, but now they are fully customizable to each player to better protect them. This involves the players wearing them and the researchers doing studies to find out what works best to prevent concussions. Today, helmets have unbelievable amounts of technology in them, ranging from position specific helmets, to liquid shock absorber padding on the inside, and sensors to help detect hits that could’ve caused a concussion.

The reason all of this is important is because it can help prevent long term health deterioration of the players of the sport which has massive cultural importance especially in the United States. This research is important as it could potentially improve the efficiency and overall process of improving and making new helmets. Additionally, it can find which actors could play a bigger role and how the actors can improve their own individual jobs

Some of the actors included in the Actor Network are medical professionals, players, coaches, the NFL, helmet developers, the helmets themselves, and the game of football. Medical professionals play a massive role in all of this because they are the ones that discovered CTE in the first place and they are some of the biggest advocates for protecting the players. Coaches are the ones that teach players how to play by the rules, which are made to protect the other players as much as possible. The players of course are one of the biggest factors if not the biggest because they are the ones that wear the helmet and they are the ones that are often on both the giving and receiving end of a concussion. While these players (at least in the ones in the NFL) financially profit the most off playing the sport, they are also the ones that suffer the most brain damage from repeated hits to the head. The NFL is one of the biggest actors and it has both human and non-human actors. It is the governing body for the most popular organizations in the sports, not only does it make and change the rules of the game but it provides a massive amount of funding towards research for helmets. The helmet developers and the helmets themselves are of course actors as they are the product that this surrounds this thesis topic. Finally, the sport of football is of course an actor as the helmets would not exist without it.

Plan for the Thesis:

For the thesis, I plan to explore all the actors in the network of football helmets and what causes them to change. I will research what caused the changes in the past and if the actors have been the same or changed with time. I will research through research papers, online articles, and in person interviews. Ideally, I am able to get an interview with a person from all of the human actors to create a well-rounded discovery process.

Conclusion

As football continues to be played at every level, it is important that helmets are continually improved and updated in order to prevent both long- and short-term injuries for the players. It is additionally important that rules are changed to decrease the opportunities for concussion causing plays. While the risk is always present, there are ways to prevent and mitigate them and it is society's responsibility to undertake that task.

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