The Choice of Football Helmets: Relationships between College Football Athlete's Problem Solving and Preference for Helmet Safety

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Dedication

This research endeavor has been a labor of love, supported by the unwavering dedication and encouragement of those closest to me. To my family, whose endless sacrifices and boundless love have sustained me throughout this journey, I am eternally grateful. Your unwavering belief in me has been the cornerstone of my perseverance, and for that, I dedicate this work to you.

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Abstract

This study investigated the intricate interplay between football players' choice of helmets and their problem-solving styles. In light of the paramount importance of player safety in football, understanding the multifaceted factors influencing helmet selection is of utmost significance. The research specifically sought to uncover if there is a relationship between a player's preferred problem-solving style and helmet choices, which may offer valuable insights into the decision-making process of football players. The study endeavored to contribute to a nuanced understanding of the complex dynamics of helmet selection in football, ultimately aiming to inform better decisions and enhance both player safety and satisfaction on the field.

Introduction

Football helmets have, for many decades, played an indispensable role in safeguarding the well-being of players on the gridiron. In a sport as physically demanding and high-impact as football, head injuries have consistently posed a significant threat to athletes. Helmets, in this context, serve as the primary line of defense against concussions, skull fractures, and other severe traumas that could have endured and life-altering consequences for players (Smithsonian Magazine, 2011). These protective gears are meticulously engineered and constructed to absorb and dissipate the force of collisions, effectively reducing the risk of head injuries.

Beyond their immediate impact on the safety of individual players, football helmets set a crucial example for young athletes who aspire to participate in the sport. They underscore the fundamental importance of safety in sports and convey a message of commitment to player well-being. Football helmets are not merely pieces of equipment; they symbolize the sport's dedication to ensuring that participants can enjoy the physicality and camaraderie of football while simultaneously minimizing the inherent risks associated with the game.

The history of football helmets is a captivating journey that reflects the evolution of sports safety from rudimentary headgear to the sophisticated, technologically-driven designs of today. In the early 1900s, football players wore little more than leather caps that offered minimal protection. It wasn't until the 1940s that the first plastic helmet, known as the Riddell suspension helmet, was introduced, marking a significant advancement in the field (Smithsonian Magazine, 2011). However, these early helmets were still relatively basic when compared to today's standards.

The modern era has witnessed football helmets evolve into high-tech marvels. They now feature advanced materials like foam and air pockets specifically designed to absorb and

dissipate the energy from impacts more effectively. Additionally, advanced technologies such as computer modeling and 3D scanning have been incorporated into the helmet design process, allowing for a customized fit that optimizes both comfort and protection (Smithsonian Magazine, 2011). Some helmets even incorporate sensors that monitor impacts, providing valuable data for injury prevention and further advancements in helmet technology.

The trajectory of football helmets' development and their continual improvement in technology and safety standards underscore the sport's commitment to prioritizing the well-being of its athletes. Football helmets are a testament to the sport's determination to allow players to experience the physicality and camaraderie of football while minimizing the inherent risks associated with the game. This dedication to player safety serves not only as an inspiration to young athletes but also as a reminder of the sport's responsibility to protect its participants.

Collegiate football players are provided uniforms by the university they represent on the playing field, with safety standards meeting National Collegiate Athletic Association (NCAA) criteria. Football players have little choice in much of the uniform, however, they are able to personally choose a helmet to their liking. There are many factors that may go into a player choosing a helmet, such as similarities to the helmet had in high school, design, and popularity. However, is safety a concern for these collegiate football players when choosing a helmet? Further, is it possible that some players are more concerned about safety than others?

Statement of the Problem

According to McIntosh et al. (2011), college and high school-aged athletes are subjected to a substantial number of head impacts, with estimates suggesting as many as 1,400 during a single playing season. While many of these impacts are of relatively low magnitude, their

cumulative effect over time remains poorly understood. This lack of understanding raises concerns about the long-term consequences for the brain health of these athletes (McIntosh et al., 2011). Furthermore, while the short-term effects of repetitive head impacts may not always be immediately apparent through traditional measures such as cognitive testing or neuroimaging, emerging research suggests a potential link between these impacts and long-term cognitive decline. Studies on retired American football players have shown a significant increase in the incidence of early-onset dementia, pointing to a potential connection with repetitive head impacts sustained during their playing careers (McIntosh et al., 2011). Given the decades needed to research long-term effects of low impact during the play of football, it doesn't seem favorable to wait for these findings. Whatever can be done to mitigate impact to the brain of these student athletes should be researched without delay. Simply stated, more research is needed to better understand how to protect student athletes and help them make better informed decisions.

Current efforts in the field are aimed at various aspects of addressing the issue of helmet safety. These efforts include better monitoring of head impact exposure at different age levels, correlating head impact biomechanics with clinical outcomes surrounding concussion diagnosis, understanding the risk of brain injury due to rotational head motion following impact, and developing biofidelic test methods for replicating head impacts in laboratory settings (McIntosh et al., 2011). However, few studies have examined football players' choice of a safer helmet. If safety on the field is a problem to solve, how does a football player go about solving the problem? Does their preferred problem-solving style, which indicates if one is more adaptive or more innovative (as measured by Kirton's Adaption-Innovation Inventory; KAI), in how they perceive structure a variable to consider in the decision-making process? The latest technology in

football helmet design and support is not useful unless the student athlete feels compelled to choose the safer helmet.

In summary, this research aims to provide a better understanding of the multifaceted factors influencing the selection of football helmets, with a particular focus on how problem-solving styles play a role in this decision-making process. This study may shed light on the complex dynamics of helmet choices in the context of football, ultimately contributing to better-informed decisions and potentially enhancing both player safety and satisfaction on the field.

Significance of the Problem

The critical importance of college student athletes making optimal helmet decisions rests on several key factors. Firstly, extensive research underscores the long-term health risks associated with repetitive head impacts in sports, emphasizing the need for helmets that effectively mitigate such risks (McIntosh et al., 2011). Moreover, college athletes experience a significant number of head impacts during a single playing season, heightening the cumulative risk of neurological injury (McIntosh et al., 2011). The potential for career-altering injuries looms large, with traumatic head injuries in college football posing profound consequences that can jeopardize athletes' future participation in the sport and impact their overall well-being. Equally important is the educational imperative of equipping athletes with knowledge about the latest helmet technologies and the repercussions of inadequate protection, fostering informed decision-making. Lastly, colleges have an ethical obligation to prioritize the health and safety of student athletes by providing access to top-tier protective equipment and promoting a culture of safety in athletics. In summary, the gravity of helmet decision-making for college athletes is

evident, considering the long-term health risks, frequency of head impacts, potential for career-altering injuries, educational needs, and institutional duties.

In this context, the utilization of tools such as the Kirton Adaption-Innovation Inventory (KAI) could be invaluable for college football student athletes in making informed decisions regarding football helmets. By assessing individual problem-solving styles, which indicates one's preference towards adaption or innovation, along a continuum (Kirton, 2011), this may provide insights into how athletes approach decision-making with respect to safety with respect to helmet selection. Speculating based on A-I theory, athletes with a stronger preference for innovation may be less aware of safety measures, and more likely to take on risks for performing better on the field. On the other hand, more adaptive football players may be more aware of safety measures and may more quickly adopt the helmet in light of evolving research and technological advancements. By incorporating problem-solving style into the decision-making process, we may better understand how athletes may make choices regarding football helmets, ultimately enhancing their safety and well-being on the field.

Purpose of the Study and Research Questions

Purpose Statement

The primary purpose of this study is to investigate the relationship between football players' choice of helmets and their problem-solving styles. Through a comprehensive exploration of this relationship, the research aims to provide valuable insights into the decision-making process behind helmet selection in football, with potential implications for player safety, performance, and satisfaction on the field.

Research Questions

This study began with the research question: Is there a difference between the more adaptive and the more innovative football players, in their decision of selecting a helmet? By addressing this research question, this study aims to deepen our understanding of the intricate interplay between problem-solving styles and helmet choices in football. The findings may offer practical insights for players, coaches, and equipment manufacturers, ultimately contributing to enhanced player well-being and performance on the field.

Definition of Terms

Football Helmet: A football helmet is a protective headgear worn by players to reduce head injuries. It has a hard outer shell, cushioning inside, and a face mask for face protection.

TPU Cushioning: The cushioning material made from thermoplastic polyurethane (TPU). It's commonly used in sports equipment such as football helmets. TPU offers excellent impact absorption properties, helping to reduce the force of collisions and protect the wearer from head injuries.

Multi-directional Impact Protection System (MIPS): Technology used in helmets, especially in sports like cycling and skiing. MIPS helmets have a low-friction layer inside that allows the helmet to slide slightly on impact, reducing rotational forces transferred to the head and potentially decreasing the risk of brain injuries.

Virginia Tech STAR: An advanced football helmet designed by Virginia Tech's Helmet Lab. It incorporates innovative technology to enhance player safety and reduce the risk of head injuries during gameplay.

Kirton's Adaptive-Innovative Theory: A theory which explores how individuals approach problem-solving and innovation. It suggests people fall into two categories of problem-solving styles, which are positioned on an interval scale: adaptors, who prefer working within existing structures, and innovators, who challenge norms and seek different solutions. Understanding these preferences can enhance teamwork and innovation.

Cognitive Gap: refers to the difference or disparity in cognitive abilities or understanding between two individuals or two groups. It can manifest in various contexts, such as education, communication, or problem-solving.

Adaption-Innovation Continuum: a bipolar scale which distinguishes adaption (incremental improvements) and innovation (transformative breakthroughs). An individual's preferred problem-solving style places them on the continuum, indicating their preference for more adaption or more innovation.

Limitations of Study

While this study aimed to provide comprehensive insights into the relationship between football helmet selection and problem-solving styles, several limitations must be acknowledged. Firstly, the research was constrained by its focus on a specific team of football players, potentially limiting the generalizability of findings to broader populations or other sports contexts. Additionally, the study primarily relied on self-report measures to assess problem-solving styles and helmet preferences, which may be subject to biases or inaccuracies inherent in such methodologies.

Furthermore, the research design predominantly utilized a cross-sectional approach, which restricted the ability to establish causality or observe longitudinal trends in helmet

selection and problem-solving behaviors over time. Longitudinal studies could offer more nuanced insights into the dynamic nature of these relationships.

Another limitation lies in the complexity of factors influencing helmet choices beyond problem-solving styles, such as individual player preferences, team culture, coaching influences, and external pressures. While this study attempted to account for some of these factors, the multifaceted nature of helmet selection in football suggests that other variables may also play significant roles.

Additionally, the study's scope was limited to examining the relationship between helmet choices and problem-solving styles, omitting other potentially influential variables such as player performance, injury history, or socioeconomic background. Future research could benefit from incorporating a broader range of factors to provide a more holistic understanding of equipment selection in football.

Finally, due to practical constraints, this study did not assess the actual performance or effectiveness of different helmet models in mitigating head injuries. While helmet technology and safety standards were discussed, empirical evaluations of helmet efficacy were beyond the scope of this research. Overall, while this study contributes valuable insights into the complex dynamics of football helmet selection, these limitations underscore the need for future research to further elucidate the intricacies of this phenomenon and its implications for player safety and well-being.

Assumptions

This research study is underpinned by several fundamental assumptions that shape its methodology and interpretation. Firstly, it is assumed that the surveyed college student-athletes

possess a genuine interest in and awareness of helmet technology, recognizing its pivotal role in ensuring both safety and optimal performance during football activities. Additionally, the study assumes that participants have access to comprehensive information regarding a diverse range of helmets available from the football program, allowing for informed decision-making based on factors such as features, functionalities, and potential impacts on safety and performance, without budget restrictions.

Furthermore, the research assumes that the surveyed athletes possess a foundational understanding of technical terminologies commonly associated with helmet technology, such as impact absorption, ventilation systems, weight distribution, and ergonomic design. It is also presupposed that participants have access to a varied selection of helmets representing different levels of adaptability and innovation.

In terms of decision-making influences, the study assumes that safety is the primary concern for surveyed college student-athletes when selecting a helmet, with considerations such as comfort, aesthetics, and performance enhancements occupying secondary positions. The decision-making processes are anticipated to be influenced by a myriad of factors, including expert advice, peer preferences, brand reputation, personal comfort, team requirements, perceived innovative features, and participants' problem-solving styles as discerned through the KAI.

Lastly, the research assumes that a subset of participants may prioritize new helmet features aimed at augmenting performance metrics, such as advanced ventilation systems, lightweight materials, customizable fit options, and technological integrations, alongside safety-related attributes. These assumptions, integrated with the KAI test outcomes and provided

guidance, collectively establish a robust framework for understanding college student-athletes' perspectives on helmet choice, adaptability, and innovation within the context of football safety and performance.

Literature Review

The selection of appropriate protective gear, particularly football helmets, is a critical consideration for ensuring the safety of student-athletes in football programs. This literature review aims to explore various facets related to helmet safety, including the role of equipment personnel, helmet safety ratings, helmet efficacy in preventing head injuries, athlete problem-solving skills in choosing helmets, and attitudes toward protective headgear among athletes and coaches. By examining these factors, this review seeks to provide insights into the complex landscape of football helmet safety and inform strategies for optimizing player safety on the field.

Virginia Tech Helmet Lab Testing Review

The Virginia Tech Football Helmet Ratings, also known as the Virginia Tech Helmet Lab Ratings, are a highly influential system developed by researchers at the Virginia Tech Helmet Lab, which is part of the Virginia Tech College of Engineering (Virginia Tech Helmet Lab, n.d.). The primary objective of these ratings is to offer athletes, coaches, parents, and consumers valuable information about the protective capabilities of football helmets, ultimately improving safety in the sport.

These ratings stand out due to their comprehensive testing methodology, which goes beyond traditional industry standards. Advanced laboratory testing equipment and techniques are employed to assess a helmet's performance in reducing the risk of head injuries during various impact scenarios. Impact testing plays a central role, encompassing both linear impacts (direct

blows to the head) and rotational impacts (angular or twisting forces), mimicking real-world football-related impacts. Linear impacts are evaluated through a drop test, while rotational impacts are assessed using specialized test rigs that replicate the forces experienced during tackles and falls.

The proprietary Summation of Tests for the Analysis of Risk (STAR) rating system is at the core of this evaluation process. Helmets are assigned STAR values based on their performance in the impact tests, with lower STAR values signifying superior protection (Virginia Tech Helmet Lab, n.d.). The rankings of helmets are then determined based on their STAR ratings, with higher-rated helmets positioned at the top of the list, indicating their superior protective capabilities.

One of the critical aspects of the Virginia Tech Helmet Lab Ratings is their commitment to public accessibility. The ratings and rankings are readily available on their website, ensuring that consumers, athletes, parents, and coaches can easily access this vital information. The transparency provided empowers individuals to make informed decisions when selecting a football helmet, prioritizing safety.

The ratings are not influenced by any helmet manufacturer or industry group, maintaining their impartiality and credibility. They are regularly updated to account for the latest helmet models and innovations in technology, ensuring that the information remains current and relevant.

Furthermore, the criteria used for evaluation encompass several important factors. These include the helmet's performance in linear and rotational impacts, the fit and stability of the helmet on the athlete's head, helmet weight, the STAR rating, ranks and percentile scores, and

even the cost of the helmet. These factors collectively help individuals assess the value of protection relative to the price of the helmet, promoting well-informed decisions.

In summary, the Virginia Tech Football Helmet Ratings have been pivotal in advancing safety standards in football. Their rigorous testing methodology, STAR rating system, commitment to transparency, and independence from industry influence have made them a vital resource for those looking to enhance the safety of athletes by selecting football helmets that provide superior protection against head injuries.

Each of these helmet model (see Appendix A) has its own set of advantages and disadvantages, and the choice ultimately depends on a player's specific needs, preferences, and budget considerations. Player safety should always be a top priority when selecting a football helmet, and proper fit and maintenance are essential for optimal protection on the field.

While player safety should always be the paramount concern when choosing a football helmet, it's also true that factors like appearance, popularity among professionals, and helmet weight can influence players' decisions, including those at Virginia Tech.

Appearance plays a significant role in the choice of helmets for many players. Football is a sport where personal style and identity are often expressed through equipment choices, including helmets. Players may prefer helmets that look sleek, modern, or visually appealing on the field. This preference for a certain aesthetic can influence their decision, as they want to feel confident and comfortable in their gear.

Popularity among professional players can also sway collegiate athletes' decisions. Many college football players aspire to reach the professional level, so they may look to emulate the equipment choices of their favorite NFL players. Helmets worn by star athletes in the NFL may

gain popularity among college players who admire those professionals, leading them to choose similar models.

Additionally, the weight of the helmet is a practical consideration for players, as it can affect comfort and performance on the field. Lighter helmets may reduce fatigue over the course of a game and allow for greater agility and mobility. Players, especially those in skill positions like wide receivers or defensive backs, may prioritize helmets with lighter construction for these performance benefits.

However, it is crucial for players to balance these factors with safety considerations. While appearance, popularity, and weight are important, they should not take precedence over a helmet's protective features and ability to mitigate the risk of head injuries. Virginia Tech, like many other collegiate programs, likely emphasizes the importance of player safety in helmet selection, providing players with information about the safety ratings and performance of different helmet models through resources such as the Virginia Tech Helmet Lab.

Ultimately, players at Virginia Tech and other football programs must weigh all these factors when choosing a helmet, striving to find the right balance between style, performance, and safety to optimize their experience on the field.

Role of Equipment Personnel in Helmet Safety

Oja and Bass (2016) shed light on the pivotal role of equipment personnel in ensuring the safety of student-athletes, particularly in concussion management within football. Despite increased awareness of concussions, equipment personnel often face limitations in their decision-making power regarding protective gear. Empowering equipment personnel is crucial for enhancing safety standards and protecting athletes' well-being. Researchers observed equipment issue room personnel and athletic training staff on current communication helmet selection

procedures and were educated as to the communication that occurs within the program regarding helmet standards as well as the sharing of those standards with student-athletes (Sebastian, K., Nelson, R., & Edwards, L. (2022). While the observed Division I program is not mandated to choose only from the highest-rated helmets on the NFL performance list (NFL, 2020), the director of football equipment and the associated coaching staff use this NFL and NFLPA ratings list to aid in helmet selections made for the team. Each player has their own preference regarding helmet selection which generally aligns with position-dependent needs for that player. This highlights the importance of comprehensive communication and informed decision-making in equipment selection to enhance player safety effectively.

Helmet Safety Ratings and Player Autonomy

The introduction of a helmet safety-rating system aimed to mitigate concussions in football (Colello et al., 2018). However, the NFL's policy allowing players to choose their helmets raises concerns about the effectiveness of such measures. While player preferences may influence helmet choices, there is a clear correlation between safety ratings and concussion incidence, highlighting the need for education and policy changes to prioritize safety.

Helmet Efficacy and Development

Research emphasizes the efficacy of helmets in preventing head injuries, especially in reducing moderate to severe risks (McIntosh et al., 2011). Advances in helmet technology are necessary to address athletes' distinct needs and improve safety outcomes. Understanding athletes' problem-solving skills and preferences is vital for designing helmets that offer optimal protection and promote safer play.

Helmet Fit and Stability

The importance of achieving an optimal fit, stability, and position in helmets is crucial for effective protection (Thai et al., 2015). Insights from motorcycle helmet research underscore the significance of athlete problem-solving abilities in selecting helmets that offer the best possible protection during high-impact activities like football.

Helmet Design in Extreme Sports

McIntosh and Patton (2017) highlight the challenges in helmet design and safety across extreme sports, emphasizing the need for helmets to meet specific sport-related injury risk management objectives. Understanding athletes' preferences for helmet safety can inform design improvements and enhance effectiveness in mitigating head injuries.

Attitudes Toward Protective Headgear

A scoping review by Tjønndal and Austmo Wågan (2021) reveals a gap between positive attitudes toward protective headgear and actual usage among athletes and coaches. Bridging this gap requires targeted interventions informed by factors such as problem-solving skills, safety perceptions, and preferences in helmet features to promote consistent and proactive head injury prevention strategies.

In conclusion, optimizing football helmet safety requires a comprehensive approach that considers equipment personnel empowerment, helmet safety ratings, efficacy, fit, design advancements, and attitudes toward protective headgear. By addressing these factors, stakeholders can work towards creating safer sports environments and reducing the incidence of head injuries among student-athletes.

Theoretical Framework

Kirton's (2011) Adaptive-Innovative (A-I) Theory, developed by Dr. Michael J. Kirton, offers a comprehensive framework for understanding how individuals approach problem-solving and decision-making. At its core, this theory posits that people can be positioned along a continuum of problem-solving styles, ranging from strong adaptiveness to strong innovativeness. Adaptive individuals tend to work within existing structures, rules, and procedures, focusing on efficiency and incremental improvements. They seek solutions that fit within established norms and guidelines. On the other end of the continuum, innovative individuals question existing norms, are less aware of rules and structure, with less attention to detail. They challenge the status quo and are more inclined to think outside the box. The theory has significant implications for organizational settings, as individuals with an adaptive style may excel in roles requiring consistency and adherence to established processes, while individuals with an innovative style are better suited for tasks which require less structure, less detail, and more tolerance of risk.

One crucial concept in Kirton's (2011) A-I theory is the idea of the "cognitive gap," which refers to the difference in problem-solving style between two individuals. This cognitive gap can lead to conflicts and challenges within teams and organizations, as people with different styles may find it difficult to understand and work with each other effectively. However, it also highlights the importance of building diverse teams that balance adaptive and innovative thinkers, as both styles bring unique strengths to the table. Recognizing and valuing these cognitive differences can lead to more productive and innovative collaborative environments.

The A-I continuum, as proposed by Dr. Michael J. Kirton, is an interval scale that helps us understand how individuals approach problem-solving, decision-making, and creative thinking. This continuum suggests that people fall along a continuum, ranging from strongly

adaptive to strongly innovative problem-solving styles. At one end of the continuum, we find individuals with a strong adaptive style. These individuals are inclined to work within established structures, rules, and procedures. They prioritize efficiency, incremental improvements, and adhering to existing norms and guidelines. Adaptive thinkers tend to seek solutions that fit comfortably within the established boundaries of a problem. They are typically viewed as dependable, detail-oriented, and skilled at optimizing processes within the existing framework (Kirton, 2011).

On the other end of the continuum, individuals with a strong degree of innovativeness exhibit a different problem-solving style. They question existing norms, challenge the status quo, and focus on creative thinking. Innovative thinkers are more likely to explore unconventional and out-of-the-box solutions, often reframing problems and seeking novel perspectives. They are seen as having a fresh perspective, being transformative, and as risk-takers, willing to push the boundaries to drive change and introduce disruptive ideas (Kirton, 2011).

Kirton's (2011) theory utilizes this numerical continuum ranging from 32 to 160, with a standard deviation of approximately 18. This scoring system positions individuals on the A-I continuum based on their problem-solving styles, with scores to the left of 95 indicating a preference for adaptation and scores to the right of 95 indicating a preference for innovation. The standard deviation of 18 highlights the normal distribution within the population, showcasing a spectrum of problem-solving styles from high adaptors to high innovators.

In summary, the adaptation-innovation continuum provides a valuable framework for comprehending how people approach problems and make decisions. It underscores the importance of recognizing and appreciating both adaptive and innovative thinking styles, as they each have their unique contributions and strengths. By understanding and leveraging these

cognitive differences, leaders and organizations can create a balanced approach that blends stability and efficiency with fresh thinking and risk, contributing to overall success in various contexts.

In the context of college football players choosing their helmets, the A-I theory offers valuable insights into the decision-making process. It is speculated prior to data collection, that more adaptive players are more likely to prioritize safety and would typically opt for helmets recommended by coaches and experts, conforming to established safety standards. It is also likely that the more adaptive will be the first to adopt a newer technology if they are more invested in the latest advancements of a particular technology (Kirton, 2011). Innovative players, on the other hand, may be more open to exploring unconventional helmet options, with less attention to the details of specifications, which may lead them to deviate from traditional choices. They may also prioritize appearance, looking for helmets that not only offer safety, but also align with their personal style.

Methodology

This research can be categorized as a case study, as it aims to investigate and identify potential relationships or associations between various variables without attempting to establish a cause-and-effect relationship. Specifically, in this study, the focus is on examining the relationships between a football player's choice of helmet, their positional role on the field, their problem-solving style, and the decision to switch helmets during the season.

A case study does not seek to determine if one variable causes change in another but rather aims to better understand a complex social phenomenon, by uncovering patterns, trends, and connections between variables. In this context, the study is interested in whether certain

factors, such as positional roles, problem-solving styles, and helmet switching, are related to one another. The study does not aim to establish a causal link between these variables but rather to identify associations or patterns that may exist.

Participant Selection

This population of this study included members of a Southern Land Grant University football team, during the 2023-2024 playing season. The study was reviewed by the IRB (Internal Review Board; protocol #23-1227) at the university, as well as approved by the university's athletic department. Existing data was gathered from the athletic department on football helmet choices and if changes in helmet choice had been made by players. This data was utilized as a basis for determining who should complete the KAI for the purposes of addressing the research questions.

Instrumentation

Acquiring data on the Virginia Tech Football Helmet Inventory was gained by the author's workplace database along with having the Virginia Tech Helmet Lab, which is accessible to the public to gain knowledge on how the helmets test when it comes to impact levels and weight. When acquiring data from the university's athletic department, the researcher had access to the helmet inventory and what each player wears and their position, along with their fit helmet. Acquiring data from the VT Helmet Lab, the lab's website allows one to obtain data when it comes to the helmet testing and classification when it comes to the helmet's logistics and specs.

To address the administration of the KAI to 13 university football players in a systematic and organized manner, several key steps will be followed, with clearly defining the purpose of completing the KAI and obtaining informed consent from participants. Administration of the

KAI occurred through use of an accredited KAI practitioner who had emailed participants a code and link to complete the KAI online. Participants were reminded via email and text message to complete the KAI in a timely manner.

Timeline and Data Collection

The research gained approval from the IRB office to begin collecting data on November 30th, 2023. Analysis of existing data obtained from the university athletic department, began at the time with the identification of individuals who would complete the KAI. Unfortunately, participants were mostly unresponsive to completing the KAI towards the end of the semester, and with prospects of competing in after-season playoff games. The last KAI used in this study was completed on March 20, 2024.

Data Analysis

Data analysis began with inputting the data from the surveys into a digital format and conducting an analysis to identify problem-solving styles and relationships with helmet choices. Ensuring participant anonymity is maintained throughout this process, not linking individual responses to specific players. Themes were captured in the survey data by examining player responses submitted online, to five questions about choosing a helmet. Then these responses were separated by problem-solving style, thereby creating two groups of football players, one more adaptive and more innovative. By separating the responses between the more adaptive and more innovative football players, the data was allowed to be compared by problem-solving style. Differences between the more adaptive and the more innovative are presented in the findings.

Findings

To begin the study, the KAI was first administered to the 2023-2024 season football players (N = 109), with a total of 13 players responding by completion of the KAI. Once a player completed the KAI, they were administered the second online survey for questions on helmet choice.

KAI Results

The most adaptive player participating in the study scored a 77, and the most innovative player participating in the study scored a 110; with the average for the group being 92.31. The results are as follows in Table 1.

Table 1. KAI Results of Players and their Position

Football Player	Position	Problem-Solving Style	KAI Results
Player 1	Offensive Line	Adaptive	77
Player 2	Wide Receiver	Adaptive	81
Player 3	Defensive Line	Adaptive	83
Player 4	Tight End	Adaptive	85
Player 5	Tight End	Adaptive	86
Player 6	Long Snapper	Adaptive	88
Player 7	Offensive Line	Adaptive	88
Player 8	Defensive Line	Adaptive	89
Player 9	Offensive Line	Innovative	97
Player 10	Offensive Line	Innovative	103
Player 11	Linebacker	Innovative	106
Player 12	Wide Receiver	Innovative	107
Player 13	Offensive Line	Innovative	110

Player Survey Findings on Helmet Choice

A survey was sent to each of the football players to ask them about their helmet choice with respect to helmet safety ratings, helmet technology, recommendations from coaching staff, and helmet comfort. Responses to each of these questions are indicated below, in order of the question.

Question 1: How much did the helmet's safety rating, as evaluated by organizations like Virginia Tech's helmet ratings, factor into your decision?

Significant Influence: One respondent indicated that the helmet's safety rating was the biggest deciding factor in their decision-making process. This suggests a strong emphasis on safety ratings in guiding their choice.

Limited Influence: Two respondents stated that safety ratings did not significantly influence their decision. One of them relied on personal experience, while the other prioritized comfort over safety ratings.

Moderate Influence: Two respondents mentioned that safety ratings played a minor role in their decision-making process. They considered comfort as the primary factor but acknowledged the importance of safety ratings in hindsight.

Unawareness: Three respondents confessed to having no prior knowledge about helmet safety ratings, with one attributing it to their international background.

Potential Influence: One respondent expressed a willingness to consider safety ratings if they had known about them earlier, indicating a retrospective acknowledgment of its importance.

Positive Influence: One respondent, who transferred to Virginia Tech, noted the significance of safety ratings upon discovering Virginia Tech's helmet rating system.

Mixed Influence: One respondent mentioned that safety ratings would have influenced their decision to a good extent, suggesting a moderate impact.

These findings highlight the diverse perspectives regarding the influence of helmet safety ratings on consumers' decision-making processes. While some prioritize safety ratings as a critical factor, others may overlook them due to various reasons such as lack of awareness or reliance on other factors. Additionally, exposure to institutions conducting safety evaluations, like Virginia Tech, can significantly impact consumers' perception of safety ratings. Overall, there is potential for increased awareness and education to empower consumers to make informed decisions regarding helmet safety.

Question 2: Were there specific features or technologies that you prioritized in selecting your helmet, considering the resources available to you as a member of the Virginia Tech Football team?

Deformable Outer Shell: One respondent expressed a preference for helmets with a deformable outer shell, highlighting a specific technological feature they valued. This indicates a focus on advanced safety features that can potentially reduce the risk of head injuries.

Custom Fitting: Another respondent mentioned that they had their helmet custom-fitted, indicating a prioritization of individualized comfort and fit. This suggests a recognition of the importance of proper helmet fit in ensuring optimal protection during gameplay.

Comfort and Protection: Several respondents emphasized the importance of comfort and protection in their helmet selection process. They prioritized feeling comfortable and protected while playing, indicating a balance between comfort and safety features.

Consistency: Some respondents mentioned wearing the same helmet throughout their college career, highlighting the importance of familiarity and consistency in their equipment choices. This suggests a preference for reliability and trust in their chosen helmet model.

Injury Prevention: One respondent stated that they prioritized helmets that limit injuries, indicating a focus on safety features aimed at reducing the risk of football-related injuries. This aligns with the broader goal of ensuring player safety and well-being on the field.

Aesthetic Considerations: A couple of respondents mentioned considering the look of the helmet, indicating a balance between functionality and aesthetics. While comfort and protection were prioritized, the visual appeal of the helmet also played a role in their decision-making process.

Overall, these findings highlight a range of considerations and priorities among Virginia Tech Football team members when selecting helmets. While safety and comfort are paramount, preferences for specific features, customization options, and aesthetic considerations also influence helmet choices. This suggests a holistic approach to helmet selection, where players aim to balance safety, comfort, and personal preferences to optimize their performance and well-being on the field.

Question 3: Did you receive guidance or recommendations from coaching staff or equipment managers in choosing your helmet, and if so, how did that influence your decision?

Personal Preference: One respondent mentioned having a preferred helmet from high school and sought to continue using it at Virginia Tech. This indicates that personal experience and comfort with a specific helmet model influenced their decision, rather than guidance from coaching staff or equipment managers.

Feedback and Trial: Several respondents indicated receiving guidance or recommendations from coaching staff or equipment managers regarding helmet selection. They mentioned trying out different helmets and receiving feedback on their performance and suitability. This suggests that the input from knowledgeable staff members played a role in helping players make informed decisions about their helmet choices.

Equipment Staff Involvement: Some respondents specifically mentioned receiving guidance from the equipment staff. This indicates a proactive approach from the equipment management team in assisting players with their helmet selection process. The involvement of equipment staff suggests a collaborative effort to ensure players have access to helmets that meet their needs and preferences.

Transfer Knowledge: One respondent noted that the coaching staff or equipment managers were aware of the helmet they used prior to transferring to Virginia Tech. This suggests that the staff took into account the player's previous helmet preferences, potentially influencing their decision-making process at the new institution.

Overall, these findings suggest that while some players may rely on personal preferences or past experiences with specific helmet models, guidance and recommendations from coaching staff and equipment managers play a significant role in assisting players with their helmet selection process. The involvement of knowledgeable staff members ensures that players have access to helmets that not only meet safety standards but also align with their individual needs and preferences.

Question 4: How important was the comfort and fit of the helmet during your selection process, especially considering the rigorous demands of college-level football?

Balanced Priorities: One respondent indicated that while comfort and fit were considered during the selection process, safety remained the top priority. They expressed gratitude towards the Vicis helmet for providing both comfort and safety, suggesting that a balance between these factors was achieved with their chosen helmet.

Emphasis on Comfort: Several respondents highlighted the paramount importance of comfort in their helmet selection process. They emphasized the need to feel comfortable on the field to perform at their best, indicating that comfort directly impacts their ability to operate effectively during gameplay.

High Priority: A significant number of respondents emphasized the high priority placed on comfort and fit during their helmet selection process. They indicated that ensuring comfort and a proper fit was essential, reflecting the rigorous demands of college-level football and the importance of optimal performance.

Safety and Comfort: Some respondents mentioned prioritizing their comfort and feel while also considering safety concerns. They sought helmets that provided both comfort and safety, indicating a holistic approach to helmet selection that prioritizes player well-being on the field.

Familiarity and Longevity: One respondent highlighted the significance of familiarity and longevity in their helmet selection process. They emphasized the importance of being familiar with the helmet they wear, suggesting that comfort and fit over an extended period of use were key considerations.

Fit as the Biggest Factor: Another respondent emphasized the importance of fit as the primary factor in their helmet selection process. They prioritized finding a helmet that fit them well, indicating that a secure and proper fit was crucial for their safety and comfort on the field.

Safety Concerns: Some respondents explicitly mentioned the importance of not feeling unsafe while playing, indicating that comfort and fit play a significant role in ensuring their confidence and security during gameplay.

Personal Preference: One respondent expressed a desire to wear a helmet that fit them best and made them feel like themselves on the field, highlighting the importance of personal comfort and identity in the helmet selection process.

Overall, these findings highlight the multifaceted nature of considerations related to comfort and fit in the helmet selection process for college-level football players. While safety remains a top priority for many, comfort, familiarity, and personal preference also play significant roles in ensuring optimal performance, confidence, and well-being on the field.

Question 5: Have you noticed any performance benefits or drawbacks associated with your chosen helmet style/model since using it in practice or games?

Positive Experience: The majority of respondents reported positive experiences with their chosen helmet style/model, highlighting performance benefits and expressing satisfaction with their selection. They noted no drawbacks, and expressed love or satisfaction with their helmet, indicating that their chosen helmet has met their expectations and provided a favorable experience during practice and games.

Performance Improvement: Some respondents explicitly mentioned that their chosen helmet has helped them greatly or has contributed to their performance positively. This suggests

that they perceive their helmet as a factor contributing to their success or improvement on the field, reflecting positively on their overall experience with the chosen helmet style/model.

General Satisfaction: Other respondents expressed general satisfaction with their chosen helmet, stating that they feel good with it and enjoy playing the sport because they feel safe. This indicates that their helmet choice has provided them with a sense of security and confidence during gameplay, contributing to their overall enjoyment of the sport.

Overall, these findings suggest that college-level football players generally perceive their chosen helmet style/model positively, experiencing performance benefits and feeling satisfied with their selection. The absence of drawbacks and the presence of performance improvements or feelings of safety further reinforce the notion that players' chosen helmets effectively meet their needs and expectations during practice and games.

Responses Separated by Problem-Solving Style

These five questions were then separated by the football player's problem-solving style, creating a group of responses designated by four players who were more adaptive, and a group of responses designated by five players who were more innovative.

Analysis on Adaptive Responders

When examining the survey responses regarding the factors influencing football helmet selection, distinct trends emerge. Firstly, regarding the consideration of safety ratings, more adaptive participants indicated helmet safety ratings were important in their helmet selection. For example, Player 1 indicated "It was the biggest deciding factor," and Player 6 indicated "Big time, I transferred into VT and noticed this and thought that it would help." Individuals who are more adaptive, prefer to stay attuned to great detail, and have a lower tolerance for risk. It seems that these characteristics of the more adaptive transfer to safety standards of helmets.

When considering specific features or technologies to which more adaptive players were attracted to, players indicated comfort and appearance were priorities. For example, Player 2 indicated that “Comfort and Look” were priorities for him. Player 6 indicated, “Comfort and not looking stupid.” Both quotes indicate a desire for these players to have a well-fitting helmet and want to look professional on the field.

When participants were asked question number four, “How important was the comfort and fit of the helmet during your selection process, especially considering the rigorous demands of college-level football?” Football players were asked to compare and contrast the comfort and fit of the helmet with safety. The more adaptive football players tended to value safety in their helmet. For example, Player Two indicated: “It plays a big role in my helmet selection because I don’t want to feel unsafe playing.” While some players indicated comfort and fitness added to safety of the helmet, responses focused on safety of the helmet as paramount.

Analysis on Innovative Responders

The survey responses offer a comprehensive insight into the diverse considerations and nuanced perspectives that influence football helmet selection, showcasing an innovative approach informed by various factors. Firstly, participants' awareness of safety ratings differed significantly, with some initially lacking knowledge, influenced in part by their geographical backgrounds. However, upon gaining insight into safety ratings, a notable shift in perspective was observed, with individuals expressing newfound interest in considering this information for future decisions. For example, Player 13 stated, “I didn’t look too much into the helmet ratings but knowing now I would.” Also, Player 10 indicated, “I had no clue about it [the safety helmet ratings].” It seems that the more innovative, with less attention to detail, had mostly overlooked safety ratings, with some indicating that it could have been useful information.

Regarding the prioritization of features and technologies in helmet selection, respondents mostly indicated a preference towards injury prevention and comfort as crucial factors, while some prioritized comfort. For example, Player 10 indicated, “Comfortably, and making sure I was protected.” Also, Player 8 stated, “I wanted to make sure that injuries were kept to a limit and that I feel comfortable playing football.” It appears that even though details were missed about safety ratings of specific helmets, safety and prevention of injuries were top concerns. Similar to the adaptive football players, it seems there is a delicate balance between comfort and protection emerged as a pivotal consideration, with individuals highlighting the significance of feeling safe and comfortable while engaging in football activities, aligning their choices with both personal well-being and performance optimization.

Lastly, perceptions of performance benefits comparing and contrasting comfort and fit with the helmet along with safety concerns, these more innovative players tended to prioritize fit and comfort. For example, Player 12 indicated, “Comfort is everything for me, I need to feel comfortable to operate well.” Also, Player 9 saw comfort and fit as a part of safety, stating “I would say it’s big because I feel safe.” These innovative players valued comfort and fit of the helmet as an element of safety when playing on the field.

In summary, the survey responses epitomize an innovative and adaptive approach to football helmet selection, characterized by a nuanced understanding of safety considerations, personalized preferences for features and fit, reliance on expert guidance, and a holistic evaluation of performance outcomes. These multifaceted factors collectively contribute to an informed decision-making process that are different for more adaptive and more innovative individuals.

Conclusion and Discussion

To strike a balance between safety and appearance, teams should consider established safety standards and the latest technology in helmet design. Valuing both adaptive and innovative thinking in this decision-making process can lead to more informed choices that optimize player safety and satisfaction. By recognizing and respecting the diversity of perspectives within the team, a collaborative approach can be fostered, resulting in an effective and well-balanced strategy for helmet selection that benefits both the safety of the players and their personal preferences.

The evidence from this case study indicates that both the more adaptive and innovative football players value safety and see their helmet as a protection piece to prevent injury. While the more adaptive individuals played closer attention to the detail of safety ratings, the more innovative was less aware of this information, and thought it could have been useful in their decision-making process in selecting a suitable helmet. Further, while the more adaptive football players seemed to think of safety as an outcome of choosing a helmet, the more innovative football players valued comfort and fit, which they viewed as important aspects of safety in their helmets.

Collaboration between athletes, coaches, equipment managers, and medical professionals is crucial in developing comprehensive helmet selection protocols. This multidisciplinary approach ensures that all aspects, from performance to safety, are carefully considered and integrated into the decision-making process. Ultimately, by prioritizing a holistic approach that values both safety standards and athlete preferences, college teams can create a culture of safety that promotes long-term player well-being and success on the field.

Recommendations

Incorporating feedback from players regarding comfort and functionality can enhance the overall effectiveness of helmet selection strategies. Athletes' input can provide valuable insights into real-world helmet performance and user experience, bridging the gap between theoretical safety standards and practical application on the field. Additionally, ongoing education and training programs focused on concussion awareness and helmet technology updates can empower athletes to make proactive and informed decisions about their safety equipment. The more innovative players may be less aware of the details and specifications indicating helmet safety, opting for improved fit and comfort. More research is needed to determine how best to communicate safety specifications and helmet standards to those who are more innovative.

This case study sheds light on the nature of football helmet selection at a NCAA Division One college football program. More research is needed to look at larger data sets to enable statistical analysis and more generalizable findings.

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Appendixes

Appendix A:

Virginia Tech Football Helmet Options

The following helmets are available to football players at Virginia Tech:

Riddell SpeedFlex

Figure 1 Virginia Tech Helmet Lab

The Riddell SpeedFlex is a popular choice among football players due to its innovative features. One of its key advantages is the innovative flex system, designed to absorb impact effectively, enhancing player safety (Virginia Tech Helmet Lab, n.d.). This helmet also offers enhanced peripheral vision, allowing players to maintain better field awareness during the game. Furthermore, it is customizable with various facemask options, giving players the ability to tailor it to their preferences. However, the SpeedFlex comes at a higher cost compared to some other models, and its complexity may require more frequent maintenance, which can be seen as a potential drawback.

Riddell SpeedFlex TrueFit

Figure 2 [Virginia Tech Helmet Lab]

The Riddell SpeedFlex TrueFit stands out for its customized fit, reducing the risk of an improper fit and ensuring a secure and snug helmet that conforms to the player's head shape. This tailored fit enhances comfort during gameplay by minimizing pressure points and discomfort (Virginia Tech Helmet Lab, n.d.). However, achieving this custom fit may require a precise and time-consuming fitting process, which might be less convenient than selecting a standard-size helmet. Additionally, like other advanced helmets, the TrueFit may require more maintenance and adjustments over time to ensure continued proper fit and protection.

Riddell Axiom

Figure 3 [Virginia Tech Helmet Lab]

Riddell's Axiom helmet introduces advanced safety technology, such as MIPS, which reduces the risk of traumatic brain injuries by mitigating rotational motion during oblique

impacts. It offers enhanced protection against both linear and rotational impacts, making it ideal for football players facing a variety of impact scenarios (Virginia Tech Helmet Lab, n.d.). The improved impact response and a performance-focused design add to the benefits, potentially improving player safety and performance. However, these advancements come at a higher cost, potentially limiting accessibility for some players and teams. Maintenance can be a concern, and if the fit doesn't cater to all players comfortably, it might pose a disadvantage. Additionally, the helmet's weight and initial availability might be factors to consider.

Schutt F7

Figure 4 **Virginia Tech Helmet Lab**

The Schutt F7 helmet is well-regarded for its TPU cushioning, which provides superior impact absorption, enhancing player safety. It also offers good ventilation, contributing to player comfort. However, it is costlier than some other models, and its style may not suit everyone's preferences (Virginia Tech Helmet Lab, n.d.).

Schutt F7 2.0

Figure 5 [Virginia Tech Helmet Lab]

The Schutt F7 2.0 further enhances player safety with its excellent energy absorption capabilities and position-specific padding, catering to the specific needs of players in different positions on the field. Its lightweight construction reduces player fatigue and may improve on-field performance (Virginia Tech Helmet Lab, n.d.). Ventilation is improved with large ventilation holes, minimizing the risk of overheating and fatigue. However, like other high-quality helmets, the F7 2.0 comes at a relatively higher price point. Availability may vary by region, and it's essential to ensure a proper fit to maintain safety. Regular maintenance is also necessary, and compliance with safety standards is crucial.

Vicis Zero2 Trench

Figure 6 [Virginia Tech Helmet Lab]

The Vicis Zero2 Trench is designed for superior comfort and impact protection, making it a top choice for players concerned about safety. However, it is expected to be on the higher end in terms of price, potentially limiting its accessibility to players and teams with budget constraints (Virginia Tech Helmet Lab, n.d.).