

BIG FIVE PERSONALITY TRAITS AND EXPERIENTIAL VARIABLES AS
PREDICTORS OF ATHLETE ATTITUDE TOWARD CONCUSSION

by

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	vi
ABSTRACT.....	vii
CHAPTER	
I. INTRODUCTION.....	1
II. LITERATURE REVIEW.....	4
III. METHOD.....	19
IV. RESULTS.....	22
V. DISCUSSION.....	24
VI. REFERENCES.....	27

LIST OF TABLES

Table	Page
1. Big Five Personality Traits and descriptions.....	13
2. Descriptive Statistics of Big Five Personality Traits and Experience with Sport/Head Injury.....	23
3. Simultaneous Multiple Regression Coefficients of Full Model Effects on Attitude toward Concussion.....	23

ABSTRACT

This study examines the "Big 5" personality traits, and experiences with head injury and football among university athletes. 44 football players completed a survey assessing "higher" or "lower" attitudes toward concussions reflecting self-preservation or rushing return to play, respectively. Though not significant, a trend between high levels of conscientiousness combined with low levels of neuroticism relating to a "rushing to return to play" attitude toward concussion was revealed.

I. INTRODUCTION

This study focuses on the personality traits of collegiate football players as well as their experience with the sport contributing to their attitudes toward concussions.

When examining the issue of concussion as it relates to the sport of professional football, two distinct players come to mind as their career paths differed drastically due to head injury. Luke Kuechly was a standout player at Boston College where he was drafted ninth overall by the Carolina Panthers in 2012 (Reed, 2020). Kuechly, who had a prior history of concussions in high school and college, played eight seasons in the NFL where he suffered three significant concussions ultimately ending his career (Reed, 2020). Chris Borland is much less known than Kuechly but was also a standout in college while playing at the University of Wisconsin earning the Big Ten Conference's Defensive Player of the Year Award in 2013 (Fairnau-Wada & Fairnau, 2015). Borland became a fourth-round pick of the San Francisco 49ers the following year where he tallied 98 tackles in half a season after replacing Patrick Willis, a former All-Pro, his rookie year. Having had a prior history of concussions in college and high school, Borland decided to retire during training camp before his second season. During an interview Borland noted that he experienced a bell-ringer in practice that gave him concussion like symptoms but managed to finish the practice. Not long after, Borland notified the 49ers of his retirement citing his "health" and that there are "too many unknowns" as it relates to the long-term effects of head injuries as reasons for his retirement (Fairnau-Wada & Fairnau, 2015).

Concussions as well as related head trauma injuries have been linked to brain disease later in life such as Chronic Traumatic Encephalopathy (CTE). The CDC reports that CTE is caused by repeated traumatic brain injuries (Center for Disease Control,

2019). These injuries are commonly seen in contact sports such as American football, boxing and ice hockey. CTE has been associated with severe mood swings, poor decision making (impulsivity), impaired memory consolidation, and believing things that are not based in reality (EBSCO Medical Review Board, 2020). In addition to these symptoms of CTE, memory loss, headaches, inability to focus, dizziness/nausea, sensitivity to light and fatigue can occur after the event of a concussion (EBSCO Medical Review Board, 2020). The CDC cites that CTE can only be diagnosed after death as an autopsy of one's brain must be conducted which is why diagnosis is difficult in former football players. In the famous case of Junior Seau, a former star linebacker for the San Diego Chargers and All-Pro player committed suicide in May 2012 which was then determined to be caused by CTE following his autopsy (Farmer, 2013). In response, NFL spokesperson Greg Aiello mentioned the recognized need for additional research to accelerate a full understanding of CTE following the Seau event (Farmer, 2013). The case of Seau more than highlights the level of severity for head injuries.

Despite all known information regarding concussions and traumatic brain injuries it is still unknown why some players choose to play regardless of the risks while others do not. Psychological data needs to be incorporated into the analysis of attitude toward concussion as the dynamic of playing through head injury and lack of reporting has yet to be explained. Although it may be difficult to predict player attitude toward concussion, this could possibly be explained by Big Five personality traits as underlying contributors. As in the case of Kuechly and Borland, each player had similar careers prior to reaching the professional level, but only Kuechly decided to continue his career after experiencing head injury. Kuechly who suffered multiple concussions in the NFL chose to keep

playing after his first two which ultimately caused his retirement following a third concussion after only eight seasons for the brilliant young player. Borland, on the other hand, decided enough was enough after one incident of head trauma prior to his second season. There has been limited information in current literature with studies testing specifically for personality as it relates to attitude toward concussion which is one of the reasons for the current study design. The following literature review will depict related research on athlete attitude toward concussion with varying contributors.

II. LITERATURE REVIEW

Attitude Toward Concussion among Athletes

Each athlete participating in a contact sport knows that head injuries are a possible outcome of competition. It is important to note that these researchers along with the current research team will refer to attitudes of concussion with “higher” and “lower” labels. These labels refer to self-preservation as “higher attitudes” would constitute an athlete being more likely to remove his or herself from competition as compared to “lower attitudes” which show an athlete who is more likely to return to competition despite risking further injury. One study examined attitude toward concussion and predictors of continuing play among high school athletes (Wallace et al. 2020). This research team amassed a sample of over 500 high school athletes spanning multiple sports and gender. Participants were asked questions such as rate on a scale of 1-7 how serious you think it is when you experience a headache and dizziness following a blow to the head or body (Wallace et al. 2020). Although this study tested for differences in attitude based on demographic and ethnicity information it still gives great evidence for attitudes of young athletes in which some will move into collegiate athletics. Results showed that African American football players had a significantly lower attitude toward concussion compared with players of other demographics (Wallace et al. 2020). This information could be very important as a large portion of the intended sample for the current study is African American. Although ethnicity is not controlled in the current study, general trends could be noted based on player response. In a 2020 study, researchers examined middle and high school student-athletes around the Columbia, SC area on concussion knowledge, attitude, self-report feelings and intentions. After the

analysis was completed, the researchers found that general knowledge of concussions was higher in urban than rural areas (Chandran et al. 2020). On the other hand, knowledge was lower in students from a lower socioeconomic status background (Chandran et al. 2020). Furthermore, odds of self-reporting and seriousness were lower for males than females (Chandran et al. 2020).

Self-reporting and concussion history were also examined during a 2017 study where researchers amassed a sample population of 167 high school athletes. With sports ranging from football to lacrosse, 26% of the sample reported having sustained at least one concussion (Register-Mihalik et al. 2017). Furthermore, 32% of the sample indicated that he or she participated in a game while experiencing the signs and symptoms of a concussion (Register-Mihalik et al. 2017). Arguably the most notable piece of evidence from this study is that a greater number of recalled concussions was associated with reduced probability of disclosure (Register-Mihalik et al. 2017). Some of the rationale mentioned for non-disclosure is the lack of knowledge of the potential short-term and long-term consequences of the injury along with concerns about possibly disappointing social referents like teammates or coaches (Register-Mihalik et al. 2017).

Although football is a disproportionately male sport, it is not closed to female participation. With this in mind, it is important to consider gender differences with transparency of head injury. In a 2017 study, male and female Division 1 athletes were gathered across various sports to assess norms when playing while possibly symptomatic and reporting intention among other measures (Kroshus et al. 2017). Compared to women, men on average have stronger feelings of winning and risk taking (Kroshus et al. 2017). On the other hand, men are less likely to seek help and have lower concussion

knowledge (Kroshus et al. 2017). Since football is a predominantly male sport, the athletes in the current study may not be likely to disclose information with head injuries and other symptoms.

Gender was also considered during a 2018 study where 435 high school athletes from Gaelic football, hurling and camogie teams in Ireland made up the sample population. These athletes were assessed using Rosenbaum and Arnett's Concussion Attitude Index (Rosenbaum & Arnett, 2010) as well as a knowledge assessment from Rosenbaum and Arnett (Sullivan & Molcho, 2021). Athletes at this age group show a lack of knowledge when it comes to sport-related concussion (SRC) as 41% of participants incorrectly indicated that concussions can only occur from direct hits to the head (Sullivan & Molcho, 2021). As far as attitude, males were less likely than females to believe they would be better off in the long run if they reported a SRC. Male and female athletes reported that they were most likely to report vomiting or nausea along with dizziness after experiencing head trauma in a game (Sullivan & Molcho, 2021). These same athletes also reported they were less likely to report headaches, sleepiness, or dazed feelings after receiving a blow to the head during competition (Sullivan & Molcho, 2021). Overall, the consistent pattern of unhealthy responses toward concussion and low reporting intention exhibited by males needs to be remedied as these youth athletes must recognize the potential lasting effects of head injury.

Rugby players were surveyed on knowledge and attitude toward concussion using the Rosenbaum Concussion Knowledge and Attitude Survey (RoCKAS) which is one of the most widely used surveys to date (Kraak et al. 2018). Despite their sample including collegiate rugby players and not football players, rugby is one of the most similar sports

to American football because of the physical contact involved in the sport. A total of 180 athletes responded to questions such as true/false, “there is possible risk of death if a second concussion occurs before the first has healed” were asked in the knowledge section (Kraak et al. 2018). Attitude questions were answered on a scale in which players responded to the extent with which they agreed with statements such as “I would continue playing a sport while also having a headache that results from a concussion” (Kraak et al. 2018). Researchers found a positive correlation in responses as more knowledge contributed to higher attitudes toward concussion (Kraak et al. 2018). This research team found only a couple players who had low attitudes showing that there is a chance for some to play in a seemingly reckless manner (Kraak et al. 2018). The results of this study bolster the model of the current study as athletes with greater knowledge of concussion should have higher attitudes toward concussion.

Another study incorporating rugby players assessed concussion knowledge and attitude in youth aged athletes. This research team found that 65 of the 77 total concussions reported were suffered by forward players (Kearney & See, 2017). Results also showed a high level of attitude as 97% of participants reported they would inform a coach after striking their head (Kearney & See, 2017). On the other hand, concussion knowledge was poorer, as only one participant correctly identified the three symptoms of a worsening concussion (Kearney & See, 2017). In New Zealand, home to many rugby teams, 416 players participated in a 2020 study looking to gauge knowledge and disclosure behavior regarding concussion. Participants were surveyed on playing experience, concussion history, guidelines, signs and symptoms, knowledge, and attitude, along with recovery among other expansive categories (Salmon et al. 2020). Results on

concussion knowledge were exceptional as almost 90% of participants correctly identified a symptom of concussion with the most common being headaches, dizziness, and nausea (Salmon et al. 2020). Very high attitudes were found among players as 99% indicated that sustaining a second concussion before the first is healed would result in a more serious injury (Salmon et al. 2020). Furthermore, athletes at better funded schools were significantly more likely to report a concussion compared to lower funded schools (Salmon et al. 2020).

Student-athlete knowledge and reporting behavior was surveyed among a few Michigan counties in which some schools employed a full-time athletic trainer while others had no full-time athletic trainer (Wallace et al. 2017). Each student was presented with standardized knowledge prior to the assessment. Sport participation varied across football, volleyball, basketball, wrestling, gymnastics, soccer, and cheerleading (Wallace et al. 2017). Results pertaining to knowledge showed that athletes with access to an athletic trainer scored higher than those without access to an athletic trainer (Wallace et al. 2017). One prominent piece of evidence is that 16% more athletes without access to an athletic trainer believed continued play was permissible if they thought they had a concussion (Wallace et al. 2017). Furthermore, approximately, 12% more athletes in the no access group thought it was permissible to continue play while experiencing a concussion symptom (Wallace et al. 2017). Researchers calculated a total of 55% of the population underreporting concussion (Wallace et al. 2017).

Ice hockey incurs some of the hardest collisions outside of American football which is why researchers in the U.K. assessed knowledge and attitude toward concussion in 61 hockey players in 2019. The researchers used the RoCKAS, a concussion

misconceptions measure, and player demographics to assess concussion knowledge, attitude, and effect of sport concussion history (Hutchinson et al. 2019). Results showed that a positive significant relationship exists between playing experience, knowledge, and attitude (Hutchinson et al. 2019). However, level of competition and concussion history were non-significant in reference to concussion knowledge and attitude (Hutchinson et al. 2019). Playing experience was related to overall safer attitudes toward concussion (Hutchinson et al. 2019) which could easily translate to the current study as junior and senior class athletes should exhibit higher attitudes toward concussion.

The RoCKAS was used by researchers in the summer of 2012 on the first day of football camp for high school players in the Cincinnati area. These researchers accumulated a sample of 120 high school football players ranging from ninth through twelfth grade. Upon completion of the RoCKAS along with a survey provided by the area children's hospital, results showed that these student-athletes had excellent knowledge of head injuries (Anderson et al. 2016). Specifically, over 90% of respondents exhibited knowledge that experiencing a second concussion can lead to serious injury or death before the first is completely healed (Anderson et al. 2016). In terms of attitude, just over 50% of respondents agreed that they would always or sometimes report symptoms of a concussion to their coach (Anderson et al. 2016). Although these student-athletes show great knowledge of the severity of head injuries, there is still a large portion that may be at risk for not reporting symptoms which is a main reason for determining whether personality impacts self-report intentions.

Competitiveness was at the forefront of a Canadian study incorporating athletes across American football, rugby, and hockey. Researchers compiled a sample of 161

athletes across a wide age range to incorporate those who may have varying levels of access to resources pertaining to SRC (Doucette et al. 2021). Athletes were surveyed using the RoCKAS as well as the Sports Orientation Questionnaire (SOQ). The SOQ contained 25-items which used a 5-point Likert scale to gauge level of agreement with statements pertaining to competitiveness with personal goals and thriving on competition (Doucette et al. 2021). Results showed that significant differences existed in levels of competitiveness between sexes as males scored significantly higher than females (Doucette et al. 2021). A significant positive correlation existed between age and competitiveness as older participants showed higher levels of competitiveness (Doucette et al. 2021). Researchers found that 44% of the athletes surveyed had continued to participate in a game after experiencing what was thought to be a concussion without disclosing the information to coaches or medical staff. (Doucette et al. 2021). Furthermore, researchers found a significant effect of competitiveness on nondisclosure such that higher levels of competitiveness leads to greater intentions of nondisclosure (Doucette et al. 2021). Results such as these continue to raise concern for researchers as self-reporting continues to be an issue among some athletes.

Another study incorporating the RoCKAS is a pilot study by Austin Westland at South Dakota State University. First, Westland selected approximately 80 middle and high school student athletes from a rural school district spanning across gender and sport (Westland, 2018). During his analysis, he tested for demographic differences among knowledge and attitude toward concussion as well as safe participation (Westland, 2018). This sample consisted of one of the lowest mean participant ages in existing literature at 15 years in which a positive trend existed between knowledge, attitude, and likelihood to

report (Westland, 2018). These results are consistent with previous experiments as knowledge seems to be a likely predictor of attitude. One reason the current study will not be including knowledge of concussion is the sample consists of only college football players who will have the same level of education as presented by the athletic trainers and medical staff.

Next in the existing literature on athlete attitude toward concussion is a survey conducted on collegiate athletes spanning across 21 sports teams at a NCAA Division III institution (Chapman et al. 2017). A total of 433 participants completed the RoCKAS along with a brief demographic measure (Chapman et al. 2017). While not finding any significant differences among demographics, researchers noted that internal consistency ratings were found to be good-to-excellent on the Concussion Attitude Index (CAI) (Chapman et al. 2017). Ratings of internal consistency for the Concussion Knowledge Index (CKI) were found to be slightly lower than that of the CAI (Chapman et al. 2017). This research team suggests that more attitude questions should be developed as their efficacy is only rising due to increased focus on athlete attitude toward concussion and not just knowledge (Chapman et al. 2017).

The RoCKAS was incorporated into a study involving professional English soccer players where an additional semi-structured was conducted. Although soccer does not seem to have large collisions such as American football or ice hockey, almost a quarter of all injuries sustained in soccer are concussions making the risk very substantial (Williams et al. 2015). Since this study incorporated an interview process, 26 participants averaging over 16 years of playing experience made up the study's population but had no formal concussion education prior to the onset of the study (Williams et al. 2015). Results

showed misconceptions about concussion knowledge where players believed that the risk for a repeated concussion was not likely after sustaining a first concussion (Williams et al. 2015). In addition, a major misconception produced from this study is that long-term health risks do not exist from sustaining multiple concussions (Williams et al. 2015). Results from player interviews showed that an overwhelming majority believed a player should be removed from a game with immediate reporting to medical staff. Something that was not generally agreed upon is who is responsible for removing a player from competition after exhibiting symptoms of a concussion. Some players believed the medical staff alone should make the decisions while others felt as if the player or manager should play a role in this decision (Williams et al. 2015). A small portion of the respondents indicated that they would not report a suspected concussion to medical staff while others believed it mostly depended on circumstance (Williams et al. 2015).

Big 5 Personality Traits

Big Five Personality Traits refers to a person's tendencies to think and feel in a consistent way (Shiner & Caspi, 2003). When applied to football players, personality traits should present evidence as to why each player reacts to an injury [concussion] that can occur during any given situation during a game or practice. Since Big Five Personality Traits can explain differences in personality, the current research team believes that these traits can be applicable in the search for predictors of attitude toward concussion. Each Big Five Personality Trait represents a spectrum to which an individual can have high or low levels. The Big Five personality traits themselves are conscientiousness, agreeableness, neuroticism, openness, and extraversion. Conscientiousness measures relative levels of discipline, care, organization, and

achievement-orientation (Barbaranelli et al. 2016). Next, agreeableness refers to willingness to help, cooperation, and sympathy toward others (Barbaranelli et al. 2016). Neuroticism is exemplified by emotional instability, anxiety, depression, and anger (Barbaranelli et al. 2016). Openness is shown through intellectual or insightful ideas, cultural interests, fantasy and creativity (Barbaranelli et al. 2016). Lastly, extraversion is described by sociability, assertiveness, confidence, and talkativeness. (Shiner & Caspi, 2003). Big Five traits have the potential to change over time but are generally stable throughout the life of an individual.

Two schools of thought exist concerning the rank-order stability of personality traits (Shiner & Caspi, 2003). The classical trait perspective argues that personality traits in adulthood are biologically based temperaments that are not susceptible to environmental influence or change over time (Shiner & Caspi, 2003). On the other hand, the contextual perspective bolsters the significance of life changes along with role transitions in the development of personality ultimately suggesting personality is fluid and subject to change (Shiner & Caspi, 2003). Table 1 illustrates each Big Five trait with characteristics pertaining to higher or lower levels.

Table 1. *Big Five Personality Traits and descriptions*

Personality Trait	High Levels	Low Levels
Conscientiousness	Organization, discipline, and care. Allows them to complete tasks (Barbaranelli et al. 2016) while delaying gratification (Shiner & Caspi, 2003)	Struggle with impulse control and organization having difficulty completing tasks (Barbaranelli et al. 2016)

Agreeableness	Trusting, altruistic and compliant. Sympathetic, helpful, and cooperative. (Barbaranelli et al. 2016)	Antagonistic, manipulative, uncooperative (Barbaranelli et al. 2016)
Extraversion	Attention seeking, sociable, assertive, talkative, and self-confident (Barbaranelli et al. 2016)	Reserved, withdrawn, introverted (Shiner & Caspi, 2003)
Openness	Creative, intellectual, curious, desire new experience or knowledge (Barbaranelli et al. 2016)	Prefer routine and practicality (Barbaranelli et al. 2016)
Neuroticism	Anxious, insecure, and self-pitying. Emotionally unstable (Barbaranelli et al. 2016)	Calm, secure and self-satisfied. Emotionally stable (Barbaranelli et al. 2016)

In a large survey of collegiate student athletes, 1,398 responses were recorded where participant ages ranged from 18 to 24 years (Beidler et al. 2017). Participants spanned across gender and sport in which they were asked to complete a survey encompassing demographic information, self-reported concussion history, and personality traits. These researchers used a 44-item Big Five Inventory (BFI) while testing for an effect of gender in which they found extraversion, neuroticism, and openness all having statistically significant ratings (Beidler et al. 2017). Each of these three traits were found to be higher in females (Beidler et al. 2017).

A couple years prior, one study evaluated the relationship between personality and symptom reporting in collegiate athletes (Merritt et al. 2015). They amassed a sample of 759 participants who were involved in an ongoing concussion management program then were surveyed on a Post-Concussion Symptom Scale (PCSS) as well as a 60-item

Big Five personality inventory (Merritt et al. 2015). The researchers found that all five personality traits significantly predicted all aspects of PCSS score which reflect physical, cognitive, affective, and sleep symptoms following a concussion (Merritt et al. 2015). In addition, the neuroticism scale was shown to be a significant predictor of PCSS total score and all four symptom clusters where higher neuroticism scores show higher symptom scores (Merritt et al. 2015). The agreeableness scale was also a significant predictor of PCSS total score and the physical symptom cluster where higher scores of agreeableness show lower symptom scores (Merritt et al. 2015). This study ultimately suggests that Big Five personality factors can be used to predict symptom reporting.

In a similar study, researchers compiled a sample of 797 participants who were all former NCAA Division I athletes (Zachary et al. 2016). Participants were surveyed on self-identified sport related concussions as well as motivations for nondisclosure (Zachary et al. 2016). One result to note is that 68.3% former football players were likely to not disclose a SRC for those who experienced at least one SRC while competing (Zachary et al. 2016). The most common reported motivations for nondisclosure of a SRC among all athletes surveyed were not wanting to leave game/practice, not wanting to let the team down, did not know it was a concussion, and did not think it was serious enough (Zachary et al. 2016). Each of these motivations were cited with a 70% response rate or higher (Zachary et al. 2016) which current researchers believe can tie into Big Five personality traits such as agreeableness, openness, and extraversion. Athletes containing such motivations could relate to low levels of each of the previously listed characteristics ultimately contributing to their motivation for nondisclosure of a serious head injury. Dr. Zachary's self-identified concussion measure compares well to the

experience measure of the current study which will serve as a solid base determining the level of experience a player has with football as well as head injury.

Crossover and Implementation

Lastly, in recent literature examining athlete attitude toward concussion as well as personality comes a study from Justin Rigby, a former graduate psychology student at Texas State University in 2010. The first part of his study examined possible neurocognitive differences in high school athletes versus college athletes after experiencing a concussion (Rigby, 2013). Results showed that within 72 hours post-concussion, high school and college athletes show similar neurocognitive deficits (Rigby, 2013). Although deficits were similar among these two groups of athletes, Rigby notes there is a greater risk for negative effects in adolescents versus adults (Rigby, 2013). Rigby found an effect of age in that high school athletes showed worse performance on neurocognitive output than college athletes (Rigby, 2013). This finding suggests that high school athletes need a greater period of rest after experiencing a sport-related concussion when compared to college athletes (Rigby, 2013).

This finding leads into the second part of Rigby's study which addresses athletic trainers' beliefs toward a broad-spectrum management approach after sport-related concussion (Rigby, 2013). In assessing these beliefs, Rigby had a low response rate showing a small usage of multifaceted management approaches. However, his measure was determined to be valid and reliable which suggests its efficacy for future testing in an attempt to gauge athletic trainers' beliefs toward a multifaceted management program among other health professionals (Rigby, 2013). Rigby noted that more behavior questions need to be implemented for future studies. This ultimately suggests to current

researchers that Big Five personality traits could be examined in athletic trainers and medical professionals to assess their likelihood of implementing multifaceted management approaches related to concussion recovery.

Another study looking to implement an education program for high school athletes incorporated four interactive presentations and the RoCKAS (Caron et al. 2018). During this study, thirty-five student-athletes participating mainly in basketball and ice-hockey were informed on the signs, symptoms, and long-term implications of concussions. In addition, psychological aspects of athletic injuries as well as creating a safe and healthy sporting environment played a role during interactive presentations (Caron et al. 2018). Results showed that participants gained concussion knowledge specifically with protective equipment and symptoms along with increased attitudes regarding implementation of preventative behaviors (Caron et al. 2018). Additional results indicated that concussion knowledge was retained for two months following intervention showing that an interventional education program is effective for high school athletes (Caron et al. 2018). A concussion education programs was tested in Irish high school students-athletes across Gaelic football, hurling, and camogie teams in 2018 (Sullivan et al. 2018). Researchers implemented a theory-based intervention where students were educated on the nature of a concussion, the signs and symptoms, and management guidelines among other related topics (Sullivan et al. 2018). Upon completion of the program, the intervention group showed increased perceived behavior control over concussion symptom recognition and disclosure when compared to the baseline scores (Sullivan et al. 2018). Intervention athletes also showed higher reporting intention compared to baseline responses (Sullivan et al. 2018). With significant

improvements across almost all facets of the study, research has showed that education-based intervention programs have been effective in raising knowledge, awareness, and overall attitude toward concussion (Sullivan et al. 2018).

In summary, Big Five Personality traits when combined with athlete experience with head injury should elicit evidence in determining the overall attitude athletes have toward concussion. Multifaceted intervention and education programs have showed positive results but require many more resources than average studies inquiring athlete knowledge and attitude toward concussion. When applied to collegiate football players, lower levels of neuroticism and higher levels of conscientiousness should give evidence to a high attitude toward concussion. Although each athlete will react differently to the injury, current researchers predict the previous mentioned traits will elicit the most positive or highest attitude toward concussion. For example, an athlete who is low on neuroticism might find recovery easier than a highly neurotic athlete as they will have a much calmer and collected approach toward recovery. In addition, an athlete who is more conscientious might be more likely to delay the gratification of play in order to fully recover from a head injury.

III. METHOD

Participants

Participants for this study range in ages from 18-26 years. Forty-four student-athletes completed all components of the survey. All participants were male collegiate football players at Texas State University as there are currently no female players on the roster. Player's knowledge of concussion was standardized due to education from athletic trainers and medical staff.

Measures

Student-athletes completed a survey consisting of a Big Five Personality Trait index, an experience with football and head injury measure, and the attitude portion of the Rosenbaum Concussion Knowledge and Attitude Survey.

Big Five Personality Traits

Participants completed a 50-item questionnaire aimed at pinpointing each player's personality traits or the relative levels thereof. This personality trait questionnaire used statements such as, "Don't like to draw attention to myself" to which participants responded on a Likert scale of "very inaccurate" to "very accurate" when referring to their own personality (Goldberg, 1992).

Experience with Football and Head Injury

This self-produced measure is aimed at gauging participant experience with the sport of American football as well as incidence of associated head injury. Participants answered free-response questions such as, "what is the total number of years you have played tackle football?" In addition, participants answered questions asking if they are

“currently a starter or reserve” on the team as well as questions identifying their position i.e., “special teams, skill, line.”

Attitude Toward Concussion

Participants were asked to complete the Attitude portion of the Rosenbaum Concussion Knowledge and Attitude survey as participant knowledge has been standardized from required briefings by the athletic trainers and medical staff. Participants will be asked to respond to questions such as, “I feel that coaches need to be extremely cautious when determining whether an athlete should return to play” (Rosenbaum, 2007). A Likert scale ranging from “strongly disagree” to “strongly agree” will be used to identify each student athlete’s response (Rosenbaum, 2007).

Procedure

After approval from the university’s institutional review board was attained, an electronic recruitment letter was sent to each student-athlete participant through the principal investigator’s personal network. After viewing the recruitment letter, participants will view the online survey from the inserted link in the letter where they will first view an informed consent page. Players who wish to participate will indicate this at the bottom of the page then continue with the survey. Players who do not wish to participate will select the corresponding answer choice on the consent page then asked to close their browser.

Data Analysis

The present study incorporated a cross-sectional design aiming to determine whether personality and experience are possible predictors of attitude toward concussion. A simultaneous multiple regression analysis was conducted using SPSS Statistics where

personality and experience with head injury/football serve as the predictor variables with attitude toward concussion as the outcome variable. Data was grouped into categories based on the Big Five trait each question pretrained to form proper experimental variables. For example, the first, sixth, and eleventh questions referenced extraversion for a total of ten questions for each personality trait (Extraversion_whole). Each subsequent trait was recoded into a new variable to encompass each survey question used (Agreeableness_whole). All data points pretraining to experience were recoded into a single variable (EXP_whole). Data points referencing attitude toward concussion were recoded into a single variable prior to analysis (Att_whole,). Experience scores were calculated by totaling participant responses with skill and line players being coded higher than specialists due to the nature of the position. For example, a junior skill player who has played for eight years, is currently a starter, was a starter in high school, and has one diagnosed concussion with two bellringers would score a total of 28 on experience.

IV. RESULTS

Predictors of Athlete Attitude toward Concussion

After obtaining a total of 44 survey submissions, 6 were discarded due to incomplete or incorrect responses leaving a total sample of 38 from which data was extracted ($N = 38$). Incorrect or incomplete responses reflected improper answers with words such as “a few” or “a lot” to free response sections requiring a numerical value. Descriptive statistics can be found in Table 2. The personality subscale consisted of 50 items ($\alpha = .55$), and the experience subscale consisted of 9 items ($\alpha = .21$). To examine athlete attitude toward concussion, participants completed a personality index to determine whether a specific trait could predict an athlete’s willingness to self-preserve or play reckless following injury. The difference in mindsets regarding head injury reflects a “higher” or “lower” attitude toward concussion, respectively. Analysis was completed using a simultaneous multiple regression in which personality and experience with head injury/football serve as predictors for attitude toward concussion. Results indicated the model explained 14.0% of the variance, but was not a significant predictor of attitude toward concussion $F(6, 31) = .844, p = .546$. In addition, no significant results were found for personality, however, conscientiousness was found to be the strongest predictor ($\beta = .200, SE = .114, p = .285$) while neuroticism was found to be the weakest predictor ($\beta = .025, SE = .082, p = .886$). Experience with sport and head injury was not a meaningful predictor when compared to the Big Five traits ($\beta = .114, SE = .187, p = .553$). Table 3 contains regression coefficients for each of the Big Five personality traits.

Table 2*Descriptive Statistics of Big Five Personality Traits and Experience with Sport/Head Injury*

Variable	Mean	Standard Deviation	N
Attitude (whole)	25.105	2.287	38
Extraversion	33.105	2.893	38
Agreeableness	32.105	2.911	38
Conscientiousness	33.053	3.667	38
Neuroticism	29.026	4.874	38
Openness	33.579	3.072	38
Experience	19.579	2.321	38

*Note. All athletes had experience with tackle football prior to the collegiate level.***Table 3***Simultaneous Multiple Regression Coefficients of Full Model Effects on Attitude toward Concussion*

Variable	B	β	SE	p	95% CI	sr ²
Extraversion	-.135	-.171	.161	.407	[-.463, .192]	-.149
Agreeableness	.145	.184	.146	.328	[-.152, .441]	.176
Conscientious	.124	.200	.114	.285	[-.109, .358]	.192
Neuroticism	.012	.025	.082	.886	[-.155, .178]	.026
Openness	-.064	-.086	.166	.703	[-.403, .275]	-.069
EXP	.112	.114	.187	.553	[-.270, .494]	.107

V. DISCUSSION

The purpose of the current study was to examine whether personality and experience with football/head injury serve as possible underlying predictors of athlete attitude toward concussion. Results showed that none of the predictor variables were significant predictors of attitude toward concussion. In previous research, Big Five personality traits were found to be significant predictors of post-concussion symptoms mainly for female athletes although male scores were still significant in this study (Merritt et al. 2015) Despite the lack of significance for the current study, it is noteworthy to mention that the results trend toward support of the experimental hypothesis which describes lower levels of neuroticism and higher levels of conscientiousness predicting the “highest” attitude toward concussion in collegiate football players. Players with this attitude are more likely to self-preserve than rush return to play. In addition, players are more likely to be disciplined with recovery. The experimental hypothesis cannot be accepted due to lack of significance despite results providing marginal support.

A limitation of this study that is essential to mention is the overall small sample size accumulated from the Texas State University Football team. Researchers expected to amass over 100 responses across the various positions on the football team although only 38 of 44 total responses were included into data analysis. A convenience sampling technique was used during this experiment, but it is likely that future research will need to move away from this technique. An additional limitation that was not expected to be a drawback was the free-response portions of experience questions. In these indicated sections, participants were asked to present a numerical response (most accurately representing participant experience) if the participant had exceeded the provided answer

choices with incidence of “bell-ringers/blackouts” as well as diagnosed concussions. Free-response answers showed no pattern of wording making standardization attempts futile resulting in discarded responses from a small number of participants.

Future research should be aimed to include demographic characters of participants to account for a diverse team along with personality as previous research has shown significance with the inclusion of demographics. Specifically, African American high school athletes showed the “lowest” overall attitude toward concussion when compared to other demographics (Wallace et al. 2020). Future research should be pointed toward the inclusion of coaches in the aspects of coaching philosophy/ideology, experience, personality, and success. By including coach responses, researchers can determine the impact a coach has on the overall mindset of a player regarding the individual’s career. Coaching philosophies can greatly evolve over time which is another pertinent component for coach participation in research. From previous experience, a player may not want to provide information on an injury out of fear the player’s role on the team will be lost or change substantially. Another addition to future research is including a scale to incorporate overall competitiveness into a player’s disposition toward the sport. The SOQ would be a great measure to add as player competitiveness plays a role in the mindset behind sport participation. Players like Luke Kuechly would likely score high on this survey which could ultimately let coaches know which players are potentially at risk for head injury due to the need for continued play.

Tackle football is one of the most popular American sports in which athletes across various ages may participate. In terms of advancing the game in safety as well as longevity it is important that the athlete feels comfort when disclosing information

regarding injury whether to coaches, athletic training staff, or teammates. Athletes must also understand the danger and long-term impact of head injuries prior to participation. Athletes who are not presented with this important information are at risk for potential brain disease which can lead to life-threatening outcomes. Although personalities concerning head injuries may be different player safety must remain at the forefront of those involved so that a positive life after participation in football is possible.

VI. REFERENCES

- Anderson, B. L., Gittelman, M. A., Mann, J. K., Cyriac, R. L., & Pomerantz, W. J. (2016). High school football players' knowledge and attitudes about concussions. *Clinical Journal of Sport Medicine*, 26(3), 206–209.
- Barbaranelli, C., Caprara, G. V., Rabasca, A., Pastorelli, C., & Goldner, L. (2016). Prote'ge's' Personality Traits, Expectations, the Quality of the Mentoring Relationship and Adjustment: A Big Five Analysis. *Child & Youth Care Forum*, 45, 85–105.
- Beidler, E., Donnellan, M. B., Covassin, T., Phelps, A. L., & Kontos, A. P. (2017). The association between personality traits and sport-related concussion history in collegiate student-athletes. *Sports, Exercise & Performance Psychology*, 6(3), 252–261.
- Center for Disease Control. (2019). Chronic Traumatic Encephalopathy. *CDC Heads Up Initiative*. Accessed on November 24, 2020.
- Chandran, A., Nedimyer, A. K., Kerr, Z. Y., O'Neal, C., Mensch, J., & Yeargin, S. W. (2020). Concussion knowledge, attitudes, and self-reporting intentions in youth athletes. *Journal of Athletic Training*, 55(10), 1027–1034.
- Chapman, E., Nasypany, A., May, J., Henry, T., Hummel, C., Hyung, J. (2018). Investigation of the Rosenbaum Concussion Knowledge and Attitudes Survey in Collegiate Athletes. *Clinical Journal of Sport Medicine*, 28, 117-124.
- Doucette, M. M., Du Plessis, S., Webber, A. M., Whalen, C., & Garcia-Barrera, M. A. (2021). In it to win it: Competitiveness, concussion knowledge and nondisclosure in athletes. *The Physician and Sportsmedicine*, 49(2), 194–202.

- EBSCO Medical Review Board (Ed.). (2020). Chronic Traumatic Encephalopathy. Health Library: Evidence-Based Information. Accessed on November 24, 2020.
- Fainaru, M. & Fainaru-Wada, S. (2015). SF's Borland quits over safety issues. *ESPN*. Epub 2015 March 16. Accessed on November 24, 2020.
- Farmer, S. (2013) Junior Seau had brain disease when he committed suicide. *Los Angeles Times*, Epub 2013 January 10. Accessed on November 24, 2020.
- Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, 4, 26-42.
- Hutchinson, S., Ellison, P., Levy, A., & Marchant, D. (2019). Knowledge and attitudes towards concussion in UK-based male ice hockey players: A need for attitude change? *International Journal of Sports Science & Coaching*, 14(2), 153–161.
- Kearney, P. E., & See, J. (2017). Misunderstandings of concussion within a youth rugby population. *Journal of Science and Medicine in Sport*, 20(11), 981.
- Kraak, W. J., Bernardo, B. A., Gouws, H. A., Loubser, A., Vuuren, J. O., & Coetzee, M. C. (2018). Concussion knowledge and attitudes amongst Stellenbosch University hostel rugby players. *South African Journal of Sports Medicine*, 30(1), 1–5.
- Kroshus, E., Baugh, C. M., Stein, C. J., Austin, S. B., & Calzo, J. P. (2017). Concussion reporting, sex, and conformity to traditional gender norms in young adults. *Journal of Adolescence*, 54, 110–119.
- Merritt, V. C., Arnett, P. A., & Rabinowitz, A. R. (2015). Personality factors and symptom reporting at baseline in collegiate athletes. *Developmental Neuropsychology*, 40(1), 45–50.

- Reed, S. (2020). Panthers LB Kuechly retiring after 8 seasons in NFL. *Boston.com*.
Accessed on November 24, 2020.
- Register-Mihalik, J. K., Valovich McLeod, T. C., Linnan, L. A., Guskiewicz, K. M., & Marshall, S. W. (2017). Relationship Between Concussion History and Concussion Knowledge, Attitudes, and Disclosure Behavior in High School Athletes. *Clinical Journal of Sport Medicine*, 27(3), 321–324.
- Rigby, J. H. (2013). Understanding Athletic Trainers' Beliefs Toward Implementing a Multifaceted Management Approach After a Sport-Related Concussion: Validity and Reliability Measurements of an Application of the Theory of Planned Behavior. *Journal of Athletic Training*, 48(5), 40-60.
- Rosenbaum, A. (2007). An Examination of the Knowledge About and Attitudes Toward Concussion in High School Athletes, Coaches, and Athletic Trainers. *Journal of Clinical and Experimental Neuropsychology*, 32(1), 220-222.
- Rosenbaum, A. & Arnett, P. (2010). The development of a survey to examine knowledge about and attitudes toward concussion in high-school students, *Journal of Clinical and Experimental Neuropsychology*, 32(1), 44-55.
- Salmon, D. M., McGowan, J., Sullivan, S. J., Murphy, I., Walters, S., Whatman, C., Keung, S., Clacy, A., & Romanchuk, J. (2020). What they know and who they are telling: Concussion knowledge and disclosure behaviour in New Zealand adolescent rugby union players. *Journal of Sports Sciences*, 38(14), 1585–1594.
- Shiner, R., & Caspi, A. (2003). Personality differences in childhood and adolescence: measurement, development, and consequences. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 44(1), 2–32.

- Sullivan, L. & Molcho, M. (2021). Gender differences in concussion-related knowledge, attitudes and reporting-behaviours among high school student-athletes. *International Journal of Adolescent Medicine and Health*, 33(1).
- Sullivan, L., Pursell, L., & Molcho, M. (2018). Evaluation of a theory-based concussion education program for secondary school student-athletes in Ireland. *Health Education Research*, 33(6), 492–504.
- Wallace, J., Covassin, T., Nogle, S., Gould, D., & Kovan, J. (2017). Knowledge of Concussion and Reporting Behaviors in High School Athletes With or Without Access to an Athletic Trainer. *Journal of Athletic Training (Allen Press)*, 52(3), 228–235.
- Wallace, J., Deitrick, J. M., Martin, T., & Moran, R. N. (2020). Investigating Disparities in High School Athletes' Attitude Toward Concussion and Predictors of Continuing Play. *Journal of Health Disparities Research & Practice*, 13(2), 11–25.
- Westland, A. (2018). Pilot Study: Knowledge and Attitudes Regarding Sport-Related Concussion in a Rural Interscholastic Sport Sample. *Electronic Theses and Dissertations*. 2448.
- Williams, J. M., Langdon, J. L., McMillan, J. L., & Buckley, T. A. (2016). English professional football players concussion knowledge and attitude. *Journal of Sport and Health Science*, 5(2), 197–204.

Zachary Y., K., Johna K., R.-M., Emily, K., Christine M., B., & Stephen W., M. (2016).
Motivations Associated with Nondisclosure of Self-Reported Concussions in
Former Collegiate Athletes. *American Journal of Sports Medicine*, 44(1), 220–
225.