

**REACT: TESTING THE EFFECTS OF A POSTER EDUCATION PROGRAM
ON SPORT-RELATED CONCUSSION KNOWLEDGE AND ATTITUDES
IN HIGH SCHOOL FOOTBALL PLAYERS**

by

Molly Lee Johnson

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment
of the requirements for the degree of Master of Science in Biomechanics and
Movement Science

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ABSTRACT

Background: Sport-related concussions (SRCs) have recently become a large concern in sports of all types and levels. This study aimed to test the effectiveness of a poster concussion intervention program at influencing high school football players in a way that will guide them towards taking the necessary actions when faced with a potential SRC. **Methods:** The REACT posters were hung in six high schools during a competitive football season, while an additional six non-poster schools served as controls. Effectiveness of the poster campaign was assessed using two variables derived from the RoCKAS-ST survey including the Concussion Knowledge Index (CKI) and the Concussion Attitudes Index (CAI). **Results:** Both the CKI and CAI scores were higher in the control (non-poster) group. Additionally, the poster group encountered a slight drop in CKI and CAI scores from pre to post-season. **Conclusions:** Contrary to what we hypothesized, our REACT poster campaign was ineffective in changing SRC-related knowledge and attitudes. We contend that the disconnect between our poster theme and the RoCKAS-ST survey instrument used to measure outcomes, as well as an ineffective poster design were most likely the cause of our findings.

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Chapter 1

INTRODUCTION

Over the past decade, sport-related concussions (SRCs) have become a large concern in sports of all types and levels. McCrory et al. defined a concussion as a complex physiological process affecting the brain, induced by biomechanical forces.¹ A concussion can be caused by a direct or indirect blow to the head, neck, face, or elsewhere on the body, and may result in neuropathological changes. It is estimated that as many as 3.8 million concussions occur annually in the United States during competitive sports and recreational activities, and as many as 50% of concussions may go unreported.² This underreporting is due to lack of knowledge in the sport and medical communities, and/or intrinsic factors of the athletes themselves (such as attitude and perception).³

It is becoming clear that not only is the diagnosis and treatment of concussions a complex issue, but that concussive injuries are cumulative and can cause long-term cerebral damage impairing cognitive function.² Thus, research has shifted from purely assessment and treatment to prevention; with a key component of prevention being education. The majority of published research on concussion education focuses on coaches and medical professionals,³⁻¹⁶ while little has been directed towards the athletes themselves.¹⁷⁻¹⁹ The athlete populations studied in these few articles, focused on concussion education research, have spanned from elementary school students to collegiate-level athletes.¹⁷⁻¹⁹ The need for additional insight across all levels is clear. At the core of injury prevention education is behavioral change.^{20,21} These behavior

modifications on the part of the athletes themselves require alterations in attitude as well as many of the cultural aspects of sport, especially those of football. The violent nature of the sport of football has created a culture where it is assumed that winning at all costs means playing through the pain, and injuries are often dismissed as trivial. However, with sport-related concussions, dismissing them as trivial can be harmful and delay the healing process.^{7,14,22-32} Recently, several influential governing bodies including the National Football League (NFL), National Collegiate Athletic Association (NCAA), and National Federation of State High School Associations (NFSHSA), have adopted new rules and regulations in attempt to keep play safe and decrease the potential for SRCs in football. Some of these include removing a player from the game for at least one play if their helmet falls off, and enforcing penalties for helmet-to-helmet contact or contact directed above the shoulder area.³³ The Pop Warner youth football organization also instituted similar concussion-prevention rules³⁴ however, that league only regulates select teams. Despite these regulations, concussion education and behavioral change still must be emphasized for these young athletes.

A contemporary approach to concussion education involves the Sports Legacy Institute Community Educators (SLICE) Program focused on the youth athlete population.¹⁷ The program consists of a single presentation lasting 40-60 minutes, using pre and post-presentation quizzes to assess effectiveness and impact.¹⁷ Bagley et al. established the SLICE program to be a highly effective model for educating student-athletes ranging from age 9-18 across several different sports, about concussions.¹⁷ Potential limitations of this educational program include the time-consuming nature of the presentation, the need for training, and the single exposure

design of the program. Getting “*buy-in*” from athletic department administrators and more importantly, coaches, for a lengthy educational session has its drawbacks. The health promotions literature argues that in order to bring about a substantial change in consumer behavior, messages need to be novel, fun, and exposed to the population of interest over time.^{20,21} Miyashita et al. developed a 20-minute computerized presentation that targeted collegiate male and female basketball and soccer players during their pre-season meeting in an attempt to improve their level of concussion knowledge.¹⁹ The athletes were surveyed before the presentation and again post-season. The improved post-season scores suggest that the educational intervention given had a positive impact on their knowledge regarding sport-related concussions. Perhaps the brief nature of this presentation was advantageous in changing awareness however, they did not examine youth and football athletes. The CDC’s “Head’s Up: Concussion in Youth Sports” initiative³⁵ contains many resources for coaches, but limited resources for parents and athletes – the website provides only a short quiz, a few fact sheets, a poster geared toward coaches, and an online training course for coaches only. Covassin et al. concluded that the “Head’s Up” materials demonstrated that youth sports coaches were able to appropriately prevent, recognize, and respond to SRCs after reviewing the materials.⁵ Until a similar CDC program is adopted for athletes, it is unknown whether or not the same level of effectiveness could be seen in this population.

When the goal is to simply, yet effectively impact the adolescent population with a health-related message, research has shown that posters are one of the most efficient methods.³⁶⁻⁴³ An examination by Hong et al. on the effectiveness of an anti-tobacco poster intervention revealed that when posters are placed in high schools at

“life path” points, almost half (45.2%) of the exposed students reported that the message prevented them from smoking.³⁹ “Life path” points are locations that students pass by frequently, and include locations such as the primary entrance hall, entrances to the cafeteria and gymnasium, along with student commons areas.³⁹ A similar study involving tobacco usage by Schmidt et al. demonstrated that more than 50% of the participants remembered the slogan and liked the campaign when posters were aimed at changing social norms and contained relatable messages.⁴² A 2011 report by Hatfield et al. used a poster intervention program to spread a message on preventing rip-current related beach drowning.³⁸ A survey of random beachgoers was performed to examine the effectiveness and they reported that two-thirds of respondents acknowledged seeing the posters, and one-third remembered the message from the posters.³⁸ Additionally, they reported significant behavioral improvements at a 9-month follow-up time point as a result of the poster campaign, especially with regard to the correct identification of rip currents and what to do if caught in a rip current.³⁸ The repeated nature of exposure to poster campaigns without the need for structured meeting times make this type of intervention attractive, especially in an active high school setting.

There has been no published research to date on the effectiveness of a poster intervention aimed at helping high school student-athletes learn how to appropriately apply their concussion knowledge and take action when they or a teammate suffers a potential concussion. This study aims to apply the success of poster interventions from other health-related intervention programs to concussion education and prevention; to improve athletes’ knowledge about and attitudes toward SRCs, and fill the void between education and action for athletes. The simplicity of this poster intervention

contrasts the formal education programs studied previously.^{5,17,18,44,45} Many researchers have called for a simplistic education program developed specifically for athletes.^{1,15,22,23,46-54} Therefore, the purpose of this study was to test the effectiveness of an educational poster program at influencing the knowledge about and attitudes toward SRCs in a cohort of high school football players. We hypothesized that we would see a positive change in concussion knowledge and attitudes from pre to post season in athletes exposed to a concussion education poster program.

Chapter 2

METHODS

2.1 Participants

A total of 636 high school football players from twelve area high schools participated. After eliminating the surveys of athletes without the proper consent forms, the final number of participants was 394. The participants ranged in age from 13-18 years (mean age 15.9 ± 1.2 yr.). Six of the high schools were classified as Division I (182 participants) and the other six were classified as Division II (212 participants). These classifications are determined by the number of students enrolled at each respective school. Age, year in school, position and level-of-play (freshman, junior varsity, varsity) data were compiled for each participant. Each of the participants signed a university approved consent or child assent form along with an appropriate parental consent form (if necessary) before the study began (UDIRB #439895-1). Additional participant information is included in Table 1.

2.2 Instrumentation

2.2.1 The RoCKAS-ST

The Rosenbaum Concussion Knowledge and Attitudes Survey – Student Version (RoCKAS-ST) was introduced in 2010.⁵⁵ Psychometric analysis of the instrument determined that it could be used as a valid and reliable measure of concussion knowledge and attitudes in high-school students.⁵⁵ The RoCKAS-ST

contains five sections – sections 1, 2, and 5 combine to form the Concussion Knowledge Index (CKI) and sections 3 and 4 combine to form the Concussion Attitudes Index (CAI). (Figure 1)

Sections 1 and 2 examine knowledge and causes of the sequelae of concussion using 18 true/false items, whereas Section 5 contains a checklist of eight commonly reported concussion symptoms, and eight distractor symptoms. For sections 1, 2, and 5, correct answers are awarded 1 point, and incorrect answers receive a 0 for a total of 25 possible points; with higher scores indicating higher levels of knowledge.

Sections 3 and 4 contain a total of 15 items, each with a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.” Each answer receives 1-5 points based on the safety of the response. In other words, a response such as “strongly agree” to the statement “I feel that coaches need to be extremely cautious when determining whether an athlete should return to play” is the “safest” response versus the response “strongly disagree” would be considered least safe.

In this study, the CKI and CAI scores were used to measure the effectiveness of the concussion education poster intervention program. The RoCKAS-ST was administered to poster (intervention) subjects pre and post-season, and to the control subjects post-season.

2.2.2 The REACT Posters

The acronym “REACT” and each letter’s meaning were designed and placed on a total of six poster designs. (Figure 2) One poster design was dedicated to the full “REACT” acronym. Additionally, five other posters were produced with each of the letters in the REACT acronym. The “R” was used to convey the message to Recognize the signs and symptoms of a SRC. The letter “E” was meant to Encourage the player

along with their teammates to be smart with regard to SRCs. The letter “A” conveyed the message to Apply a concussion game plan. The letter “C” guided the athletes to Communicate with their coaches, athletic trainers, school nurses, teammates, and parents if they suspected a SRC. Lastly, the letter “T” inspired the football players to Think about the future free from worry about the unintended consequences of an untreated SRC. The posters were printed on 3’ x 5’ vinyl sheeting with rivets on each top corner for hanging. The posters were designed to be colorful and attractive with a simple message that student-athletes could remember from walking by these posters a few times each day.

2.3 Procedure

2.3.1 Recruitment

Recruitment letters were sent via email to administrators from 12 area high schools (six Division I and six Division II) in May 2013. Upon agreeing to participate, three Division I and three Division II schools were selected at random to serve as “poster” schools while the remaining schools would serve as control groups. Our purpose for selecting schools from different divisions was to accurately reflect the population of interscholastic football players at differing levels of competition in our area.

2.3.2 Pre-Season Testing

Baseline testing was completed during the two weeks of pre-season football practices in August 2013. Consent forms were sent out via email to the athletic trainers and coaches of all poster schools to be distributed to the football players in advance. Using a quiet classroom setting, the football players completed the

RoCKAS-ST survey prior to beginning practice. The survey required about 15 minutes to complete.

Once the baseline testing was complete, we hung the REACT posters around the school at life-path point locations including the locker room, cafeteria, athletic training room, hallways, and team meeting room. A total of seven posters were placed in each of these schools; two contained the entire REACT message while the other five posters were the individual REACT letter designs. (Table 2) The posters remained in the intervention schools throughout the fall 2013 football season.

2.3.3 Post-Season Testing

Post-season testing occurred at the conclusion of the competitive football season. Consent forms were sent to the athletic trainers and coaches of the six control schools who did not take part in the baseline testing.

The RoCKAS-ST survey was completed by the football players of both the control and poster schools in a quiet classroom setting, and in a manner similar to that previously described. Participants from the poster schools had an additional page of questions attached to their survey asking them to recall information from the REACT posters and to express their like or dislike towards the posters. Once the surveys were complete, the REACT posters were removed with the exception of one full-acronym poster that remained in the athletic training room.

2.4 Data Analysis

The dependent variables in this study were CAI and CKI scores derived from the RoCKAS-ST survey; the independent variable was group status (poster vs. control). All data were analyzed using SPSS Statistical Software version 21 (IBM,

Armonk, NY). Dependent samples t-tests were computed to compare the pre and post-season CKI and CAI scores within the poster group. Independent samples t-tests were used to compare the post-season CKI and CAI scores between the groups.

Chapter 3

RESULTS

3.1 CKI Pre- to Post-Season in Poster Group

CKI scores ranged from 6 to 24 overall; keeping in mind that higher scores indicate a greater knowledge of concussions, with the highest possible score being 25. Surprisingly, there were no significant differences in CKI scores pre to post-season in the poster group ($t = 1.138$, $df[214]$, $p = .256$). (Figure 3) Table 3 presents means and standard deviations for the dependent variable of CKI scores and it does so separately for each measurement (pre and post-season).

3.2 CKI Between Groups Post-Season

CKI scores ranged from 6 to 24 in both groups post-season. Unexpectedly, there were no significant differences in CKI scores between the two groups post-season ($t = .991$, $df[392]$, $p = .322$). (Figure 4) Table 4 presents means and standard deviations for the dependent variable of CKI scores and it does so separately for the two groups.

3.3 CAI Pre- to Post-Season in Poster Group

CAI scores ranged from 8 to 75 overall, with the highest possible score being 75. There was a significant difference in the CAI scores pre to post-season in the poster group ($t = 4.096$, $df[214]$, $p = .000$). (Figure 5) Table 5 presents means and

standard deviations for the dependent variable of CAI scores and it does so separately for each measurement (pre and post-season). We were intrigued to find that the post-season scores were lower than the pre-season scores; resulting in a lowering of their attitude toward sport-related concussions. Our *post-hoc* calculation resulted in a moderate ($d = .301$) effect size.⁵⁶

3.4 CAI Between Groups Post Season

CAI scores ranged from 17 to 75 in both groups post-season. There was a significant difference in the CAI scores between the two groups post-season ($t = 2.083$, $df[392]$, $p = .038$). (Figure 6) Table 6 presents means and standard deviations for the dependent variable of CAI scores and it does so separately for the two groups. Interestingly, the control group CAI scores were higher than those of the poster group; reflecting lower attitudes towards SRCs in the poster group. Our *post-hoc* calculation resulted in a small ($d = 0.21$) effect size.⁵⁶

3.5 Responses to REACT Poster Questions (Poster Group Only)

Six of the eight survey questions asked of the poster group participants were related to their feelings about the posters. Responses to these six questions are listed below.

Did you notice the REACT posters hanging around your school this season?
Yes: 173 (80%) No: 42 (20%)

Did the REACT posters help you understand more about concussions?
Yes: 143 (67%) No: 72 (33%)

Did the REACT posters encourage you to pay more attention to any concussion-like symptoms during the season?
Yes: 137 (64%) No: 78 (36%)

Would you like to see the REACT posters stay in your school for future student-athletes to see and learn from?

Yes: 186 (87%) No: 29 (13%)

Do you think you were more likely to tell someone you thought you had a concussion this season?

Yes: 152 (71%) No: 63 (29%)

Do you think you were more likely to tell a teammate you thought they might have had a concussion this season?

Yes: 169 (79%) No: 46 (21%)

The remaining two questions asked poster group participants to recall specific information about the message from the posters that were hung throughout their schools. In a multiple choice format, the following two questions were asked: (1) in the REACT acronym did they remember what the letter A stood for and (2) did they remember what the letter T stood for. Responses to these questions are listed below.

What did the “A” letter stand for?

Correct Choice: 94 (44%) Incorrect Choice: 121 (56%)

What did the “T” letter stand for?

Correct Choice: 168 (78%) Incorrect Choice: 47 (22%)

Chapter 4

DISCUSSION

The recent NATA Position Statement on Management of Sport Concussion recommends that athletic trainers work with appropriate administrators to ensure that parents, coaches, and athletes are educated on various aspects of concussion including prevention, recognition, and return-to-play guidelines.²⁶ Furthermore, the most recent international consensus statement on the management of concussion in sport recognized the need to develop guidelines, educational resources, and other health promotion approaches for the prevention of concussion and its adverse outcomes across all sports.¹ With this in mind, we set out to test the effectiveness of an educational poster program at influencing knowledge about and attitudes toward SRCs in a cohort of high school football players; acknowledging the fact that our sample was taken from a limited geographical within one state, so the subjects may not have been a completely representative sample of the larger population in question (sampling error).⁵⁸ Using a previously validated survey (RoCKAS-ST), we were interested to see if a highly visible and easy to understand educational poster awareness initiative would influence survey outcomes in this population. Contrary to what we had hypothesized, the results of this study are in direct contrast to others who have reported favorable outcomes following concussion education programs.^{5,17,19} The CKI from pre to post-season in the poster group participants indicated no change in knowledge despite exposure to the REACT posters over a period spanning three and a half months. In fact, the lack of differences between the poster and control group CKI

scores is further evidence that the posters were ineffective at changing the knowledge about SRCs in these football players. Perhaps more alarming is the lowering of the CAI scores from pre to post-season in the poster group and the higher scores in the control group when compared to the poster group post-season. This lowering of attitudes towards SRCs was an unexpected and disturbing finding given the fact that the poster group athletes were exposed on an almost daily basis to the REACT posters.

The most suitable explanation for why this poster education program was not successful lies within the design of the REACT posters. The World Health Organization (WHO) states that a key component of posters promoting safety is that they should appeal to the personal responsibility of the targeted population, to physical self-preservation, and to comradeship.⁵⁷ For example, central to their posters is an image portraying the adverse consequences of not applying the safety message.⁵⁷ In our REACT poster campaign, the central focus of the posters was more on each letter of the REACT acronym, with our intention of getting the football players to remember the REACT message. Perhaps the focus more on the letters or in remembering the acronym was a road block to the central theme of concussion awareness. The WHO also recommends that effective safety posters must make people stop and absorb the message, displaying a forceful image accompanied by ‘hard-hitting’ words.⁵⁷ In contrast, the REACT posters had background images of football players, coaches, and equipment with the individual letter designed to be the center of focus. For the high school athlete, seeing such a poster with many words and letters likely did not render the ‘hard-hitting,’ ‘catchy’ slogan that the WHO recommends. Quite possibly the posters would have been more effective if they contained images of Junior Seau; an NFL player who committed suicide, presumably due to the adverse effects of repeated

concussions over his career, or if they contained pictures of autopsied brains showing the damage untreated concussions can cause. We contend that the athletes at the poster schools simply became bored by the message, which in turn produced the unfavorable follow-up survey results. Using powerful images as the central focus of the REACT posters instead of letters may have made the athletes more likely to stop and think about the posters' message, more effectively etching the meaning of the campaign into their minds.

Validated surveys pertaining to the assessment of concussion knowledge are limited. In fact, prior to pilot testing we actually experimented with using our own survey to best illustrate our intended outcome. However, we settled on using the RoCKAS-ST survey instrument, swayed by the fact that it had been validated and carefully scrutinized, especially since it was developed for high-school athletes. After carefully examining our survey results, it became evident that the RoCKAS-ST may not have been the best at helping us determine changes in attitude and awareness of SRCs. Central to our poster message was *reacting* to SRCs on the part of the player and included a simple step-by-step plan of action. Upon reviewing each poster's individual message, we think that the REACT message did not have enough overlap with the survey to elicit an increase in CAI and CKI scores. In other words, our intended behavioral change constructs were in conflict with those that the RoCKAS-ST intended to measure. The only poster design that contained direct information from the RoCKAS-ST was the letter "R" poster: recognize the signs and symptoms. The symptoms listed on this poster were the same as the symptoms listed in section 5 of the survey. The meanings of the other letters were concurrent with that of the REACT message; promoting the necessary steps to initiate SRC management, and

consequently, a safe return to activity. However, the construct of action on the part of the student-athlete is not explicitly tested in the RoCKAS-ST. Perhaps if some of the themes central to the role-play scenarios contained within the survey had been included on the posters, the CAI and CKI scores would have increased. As previously mentioned, at the post-season testing of the poster schools an additional eight follow-up questions were included in the survey. It was interesting to note that the athletes' responses revealed that they did indeed notice the REACT posters and retained the campaign message. This is evidence that questions specific to our REACT poster message were responded to favorably, and had all of the poster designs covered the attitude and knowledge constructs examined by the RoCKAS-ST, the responses would have been different.

In recent years, concussion education and awareness has shared the spotlight with diagnosis and treatment. Contrary to what we hypothesized, our REACT poster campaign was ineffective in changing SRC-related knowledge and attitudes. We contend that the disconnect between our poster theme and the RoCKAS-ST survey instrument used to measure outcomes, as well as an ineffective poster design were most likely the cause of our findings. Although our approach was unsuccessful, we highly recommend that future research continue in order to gain a better understanding of the effectiveness of SRC education/awareness programs.

Chapter 5

TABLES AND FIGURES

Table 1: Participant Information

| Group | Division | | Team | | | Grade | | | | | Total |
|---------|----------|-----|---------|----|----------|-----------------|-----------------|------------------|------------------|------------------|-------|
| | I | II | Varsity | JV | Freshman | 8 th | 9 th | 10 th | 11 th | 12 th | |
| Poster | 98 | 117 | 153 | 59 | 3 | 0 | 58 | 55 | 57 | 45 | 215 |
| Control | 84 | 95 | 137 | 24 | 18 | 2 | 32 | 44 | 44 | 57 | 179 |
| Total | 182 | 212 | 290 | 83 | 21 | 2 | 90 | 99 | 101 | 102 | |

Table 2: Location of the REACT posters in the six poster schools.

| Poster School Number | REACT 1 | REACT 2 | R | E | A | C | T |
|----------------------|------------------------|-------------------------------|----------------|-------------|--------------------------------|------------------------------------------|-----------------------------------------------------|
| 1 | Nurse's office | Boy's locker room | Cafeteria A | Cafeteria D | Cafeteria A | Cafeteria D | Athletic Training room |
| 2 | Athletic Training room | Boy's locker room | Nurse's office | Weight room | Hallway near coach's classroom | Head coach's classroom/team meeting room | Hallway – just outside Athletic Trainer's classroom |
| 3 | Athletic Training room | Football locker room | Nurse's office | Weight room | Hallway outside gymnasium | Athletic hallway | Football locker room |
| 4 | Athletic Training room | Athletic hallway | Nurse's office | Weight room | Boy's locker room | Health education classroom | Cafeteria |
| 5 | Athletic Training room | Entrance to athletic building | Nurse's office | Weight room | Boy's locker room | Cafeteria | Athletic Hallway |
| 6 | Athletic Training room | Team meeting room | Nurse's office | Weight room | Boys' locker room | Cafeteria | Athletic Hallway |

Table 3: Means, Standard Deviations and Distributional Statistics for CKI Scores
Within the Poster Group

| Statistic | Measurement | |
|--------------------|-------------|-------------|
| | Pre-Season | Post-Season |
| Mean | 18.69 | 18.39 |
| Standard Deviation | 2.977 | 3.489 |

Table 4: Means, Standard Deviations, and Distributional Statistics for Post-Season CKI Scores

| Statistic | Condition | |
|--------------------|-----------|---------|
| | Poster | Control |
| Mean | 18.39 | 18.73 |
| Standard Deviation | 3.489 | 3.275 |

Table 5: Means, Standard Deviations, and Distributional Statistics for CAI Scores
Within the Poster Group

| Statistic | Measurement | |
|--------------------|-------------|-------------|
| | Pre-Season | Post-Season |
| Mean | 55.04 | 52.52 |
| Standard Deviation | 8.278 | 8.430 |

Table 6: Means, Standard Deviations, and Distributional Statistics for Post-Season CAI Scores

| Statistic | Condition | |
|--------------------|-----------|---------|
| | Poster | Control |
| Mean | 52.52 | 54.21 |
| Standard Deviation | 8.430 | 7.449 |

Figure 1: The RoCKAS-ST

RoCKAS-ST

NOTE: The phrase "Return to play/competition" refers to being cleared to play in both practice and games.

Section 1

DIRECTIONS: Please read the following statements and circle TRUE or FALSE for each question.

1 There is a possible risk of death if a second concussion occurs before the first one has healed.

TRUE

FALSE

2 Running everyday does little to improve cardiovascular health.

TRUE

FALSE

3 People who have had one concussion are more likely to have another concussion.

TRUE

FALSE

4 Cleats help athletes' feet grip the playing surface.

TRUE

FALSE

5 In order to be diagnosed with a concussion, you have to be knocked out.

TRUE

FALSE

6 A concussion can only occur if there is a direct hit to the head.

TRUE

FALSE

7 Being knocked unconscious always causes permanent damage to the brain.

TRUE

FALSE

8 Symptoms of a concussion can last for several weeks.

TRUE

FALSE

9 Sometimes a second concussion can help a person remember things that were forgotten after the first concussion.

TRUE

FALSE

10 Weightlifting helps to tone and/or build muscle.

TRUE

FALSE

11 After a concussion occurs, brain imaging (e.g., CAT Scan, MRI, X-Ray, etc.) typically shows visible physical damage (e.g., bruise, blood clot) to the brain.

TRUE

FALSE

12 If you receive one concussion and you have never had a concussion before, you will become less intelligent.

TRUE

FALSE

Section 1

(Continued)

13 After 10 days, symptoms of a concussion are usually completely gone.

TRUE

FALSE

14 After a concussion, people can forget who they are and not recognize others but be perfect in every other way.

TRUE

FALSE

15 High-school freshmen and college freshmen tend to be the same age.

TRUE

FALSE

16 Concussions can sometimes lead to emotional disruptions.

TRUE

FALSE

17 An athlete who gets knocked out after getting a concussion is experiencing a coma.

TRUE

FALSE

18 There is rarely a risk to long-term health and well-being from multiple concussions.

TRUE

FALSE

Section 2

DIRECTIONS: Please read each of the following scenarios and circle TRUE or FALSE for each question that follows the scenarios.

Scenario 1:
While playing in a game, Player Q and Player X collide with each other and each suffers a concussion. Player Q has never had a concussion in the past. Player X has had 4 concussions in the past.
1 It is likely that Player Q's concussion will affect his long-term health and well-being.

TRUE

FALSE

2 It is likely that Player X's concussion will affect his long-term health and well-being.

TRUE

FALSE

Scenario 2:
Player F suffered a concussion in a game. She continued to play in the same game despite the fact that she continued to feel the effects of the concussion.
3 Even though Player F is still experiencing the effects of the concussion, her performance will be the same as it would be had she not suffered a concussion.

TRUE

FALSE

Section 3

DIRECTIONS: For each question circle the number that best describes how you feel about each statement.

Strongly

Disagree

Disagree

Neutral

Agree

Strongly

Agree

1 I would continue playing a sport while also having a headache that resulted from a minor concussion.

1

2

3

4

5

2 I feel that coaches need to be extremely cautious when determining whether an athlete should return to play.

1

2

3

4

5

3 I feel that mouthguards protect teeth from being damaged or knocked out.

1

2

3

4

5

4 I feel that professional athletes are more skilled at their sport than high-school athletes.

1

2

3

4

5

5 I feel that concussions are less important than other injuries.

1

2

3

4

5

6 I feel that an athlete has a responsibility to return to a game even if it means playing while still experiencing symptoms of a concussion.

1

2

3

4

5

7 I feel that an athlete who is knocked unconscious should be taken to the emergency room.

1

2

3

4

5

8 I feel that most high-school athletes will play professional sports in the future.

1

2

3

4

5

Section 4

DIRECTIONS: For each question read the scenarios and circle the number that best describes your view. (For the questions that ask you what most athletes feel, base your answers on how you think MOST athletes would feel.)

Strongly

Disagree

Disagree

Neutral

Agree

Strongly

Agree

Scenario 1:
Player R suffers a concussion during a game. Coach A decides to keep Player R out of the game. Player R's team loses the game.
1 I feel that Coach A made the right decision to keep Player R out of the game.

1

2

3

4

5

Scenario 2:
Athlete M suffered a concussion during the first game of the season. Athlete O suffered a concussion of the same severity during the semifinal playoff game. Both athletes had persisting symptoms.

1

2

3

4

5

Section 4

(Continued)

Strongly

Disagree

Disagree

Neutral

Agree

Strongly

Agree

3 I feel that Athlete M should have returned to play during the first game of the season.

1

2

3

4

5

4 Most athletes would feel that Athlete M should have returned to play during the first game of the season.

1

2

3

4

5

5 I feel that Athlete O should have returned to play during the semifinal playoff game.

1

2

3

4

5

6 Most athletes feel that Athlete O should have returned to play during the semifinal playoff game.

1

2

3

4

5

Scenario 3:
Athlete R suffered a concussion. Athlete R's team has an athletic trainer on the staff.
7 I feel that the athletic trainer, rather than Athlete R, should make the decision about returning Athlete R to play.

1

2

3

4

5

Scenario 4:
Athlete H suffered a concussion and he has a game in two hours. He is still experiencing symptoms of concussion. However, Athlete H knows that if he tells his coach about the symptoms, his coach will keep him out of the game.

1

2

3

4

5

9 I feel that Athlete H should tell his coach about the symptoms.

1

2

3

4

5

10 Most athletes would feel that Athlete H should tell his coach about the symptoms.

1

2

3

4

5

Section 5

DIRECTIONS: Think about someone who has had a concussion. Check off the following signs and symptoms that you believe someone may be likely to experience AFTER a concussion.

✓

✓

Hives

Feeling in a "Fog"

Headache

Weight Gain

Difficulty Speaking

Feeling Slowed Down

Arthritis

Reduced Breathing Rate

Sensitivity to Light

Excessive Studying

Difficulty Remembering

Difficulty Concentrating

Panic Attacks

Dizziness

Drowsiness

Hair Loss

24

Figure 2: REACT Poster Designs

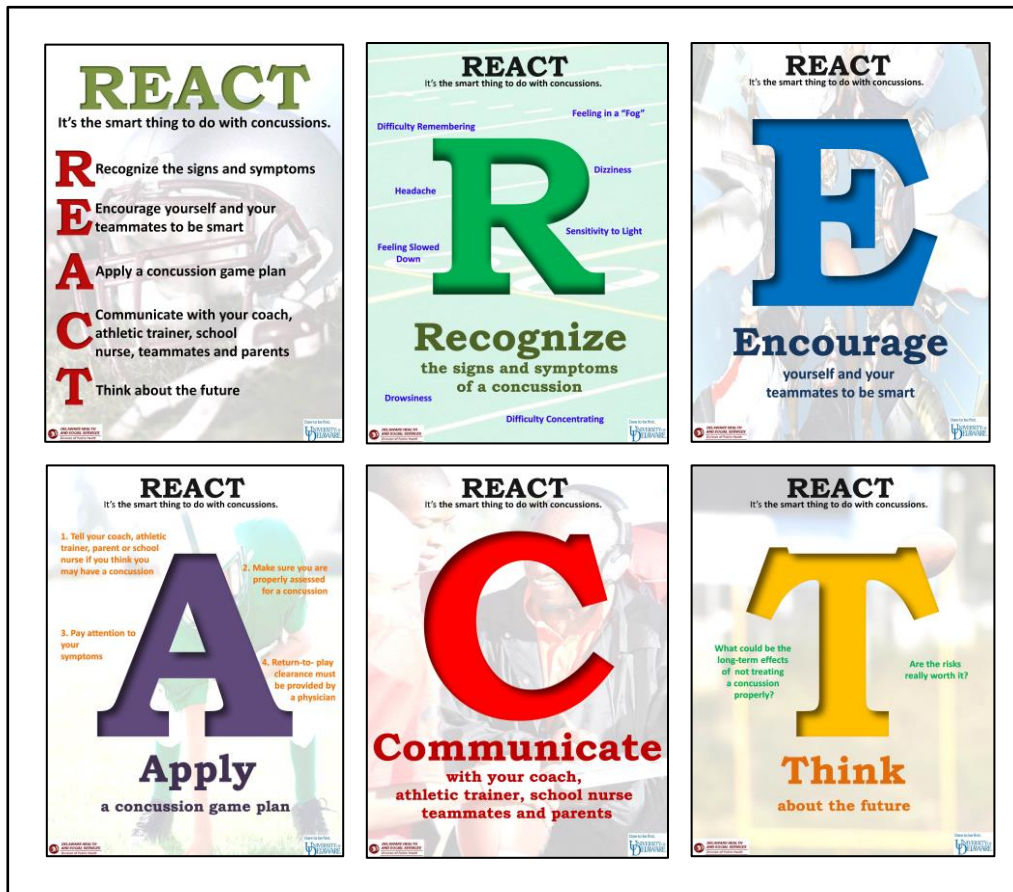


Figure 3: Poster Group CKI Scores

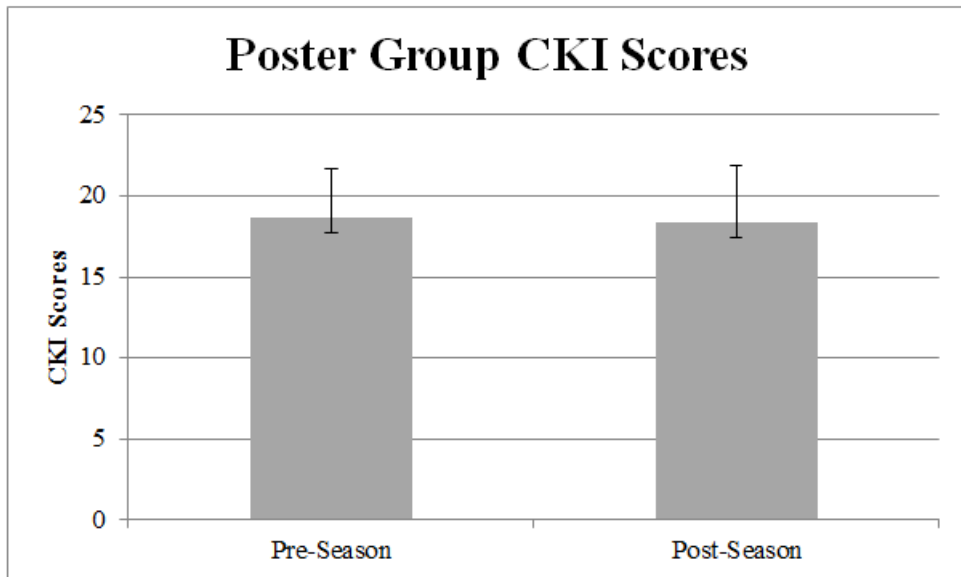


Figure 4: Post-Season CKI Scores

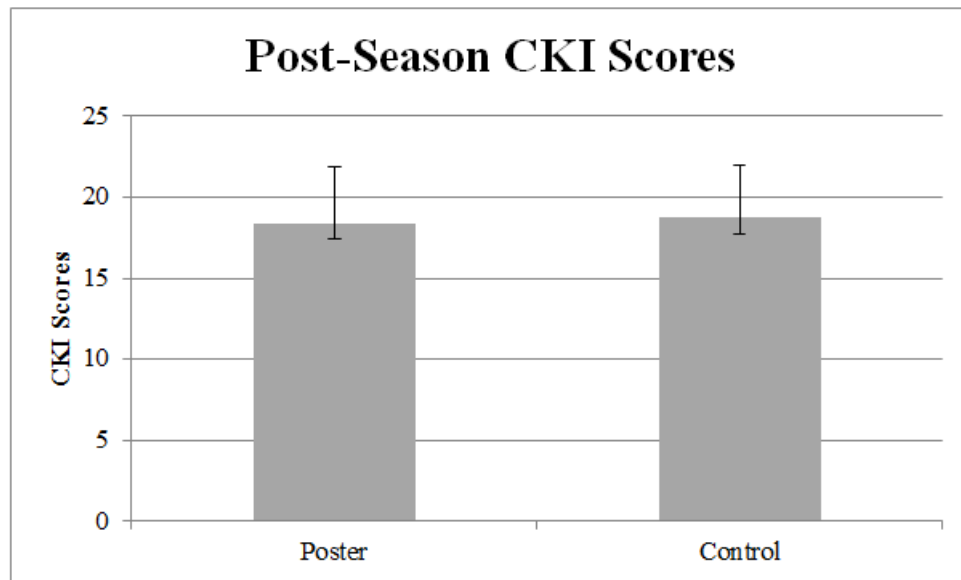


Figure 5: Poster Group CAI Scores

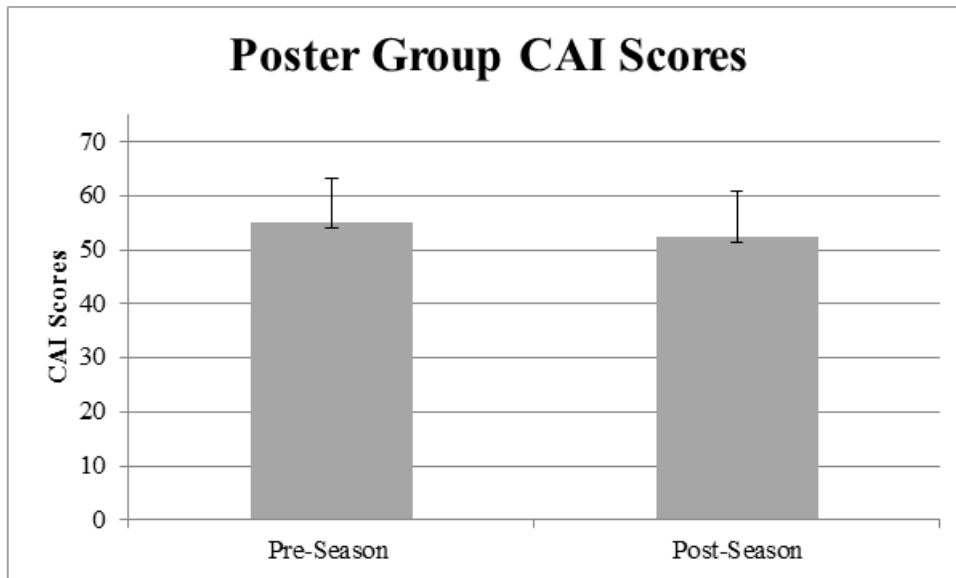
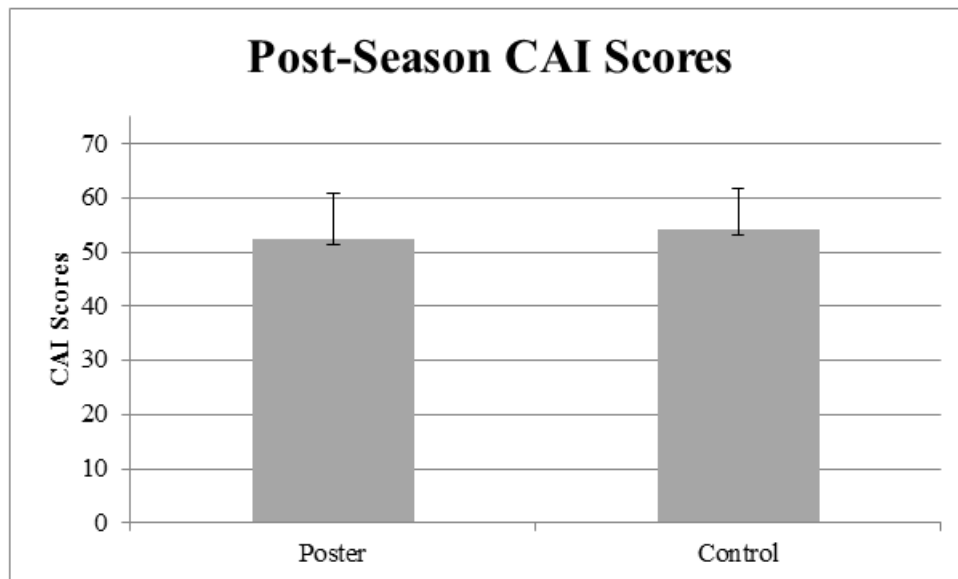


Figure 6: Post-Season CAI Scores



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Appendix A

PRE SEASON SURVEY



Pilot Survey

The following survey was developed for research about high school athletes and their attitudes towards concussion in sport. Please answer all questions honestly and to the best of your ability about your most recent football season. Circle the option that best describes how you reacted to the situation in question. If you feel uncomfortable answering a question, it is okay to skip it and move on to the next one. There is no right or wrong answer, and your responses will remain anonymous.

Introductory Questions

1. How old are you? _____
2. What year in high school are you? _____
3. What position do you play? _____
4. Do you think the recent attention to sport-related concussions is important? YES NO I'm Not Sure
5. Are you concerned about getting a concussion while playing football? YES NO I'm Not Sure

Questions about Last Season

6. During a practice or game, did you take a hit or fall that made you feel confused? YES NO I'm Not Sure
 - Did you tell anyone you felt confused? YES NO I'm Not Sure
 - Who did you tell? Teammate Coach Athletic Trainer Parent I'm Not Sure
(Circle all that apply)
7. Did you ever have a headache after a practice or game and thought it was normal, so you didn't tell anyone? YES NO I'm Not Sure
 - Did this headache happen more than once during the season? YES NO I'm Not Sure
8. Did you ever have a headache for a few days following a game? YES NO I'm Not Sure
 - Did you tell anyone about it? YES NO I'm Not Sure
 - If you told someone, who did you tell? Teammate Coach Athletic Trainer Parent I'm Not Sure
(Circle all that apply)
9. During a practice or game, did it take you longer than normal to get up after a hit because you felt woozy or disoriented? YES NO I'm Not Sure
 - If so, did you keep playing? YES NO I'm Not Sure
 - Did you tell anyone about it? YES NO I'm Not Sure
 - If you told someone, who did you tell? Teammate Coach Athletic Trainer Parent I'm Not Sure
(Circle all that apply)
10. Did one of your teammates ever seem dizzy or confused after taking a big hit during a practice or game last season? YES NO I'm Not Sure
 - Did you tell them to get checked out by the athletic trainer? YES NO I'm Not Sure

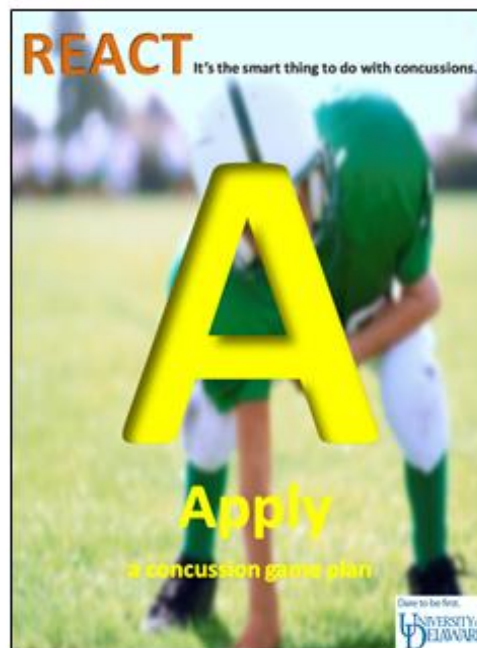
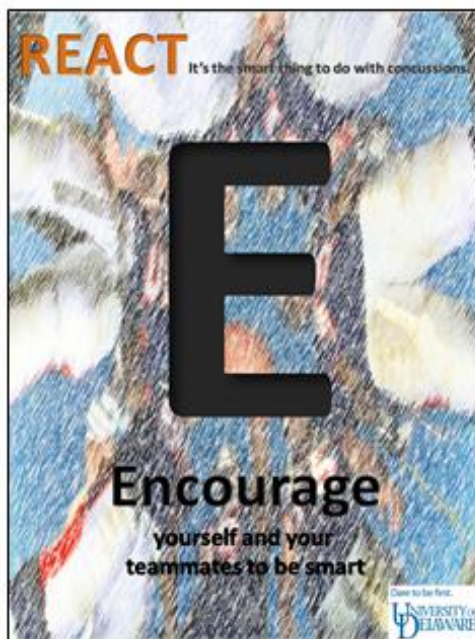
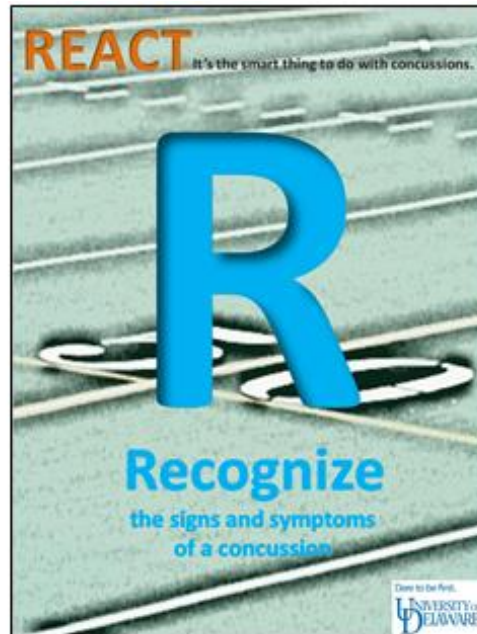
11. Did you ever “black out” or lose your vision after taking a hit or falling during a practice or game? YES NO I’m Not Sure
 ➤ Did you tell anyone? YES NO I’m Not Sure
 ➤ If you told someone, who did you tell? Teammate Coach Athletic Trainer I’m Not Sure
 (Circle all that apply)
12. During practice last season, did you participate in hitting or tackle drills? YES NO I’m Not Sure
 ➤ If so, did you ever get a headache afterwards? YES NO I’m Not Sure
 ➤ Did you tell anyone about this headache? YES NO I’m Not Sure
 ➤ Who did you tell? Parent Coach Teammate Athletic Trainer I’m Not Sure
 (Circle all that apply)
13. Did you ever have a headache or did not feel right after a practice, and *did not* tell your coach about it because you had a big game coming up? YES NO I’m Not Sure
14. Did your parents or teammates ever tell you that you didn’t seem like yourself after a game where you took more than one bit hit? YES NO I’m Not Sure
15. Do you think the new rules and warnings about concussions are silly or unimportant? YES NO I’m Not Sure
16. Last season, did you ever think you might have a concussion? YES NO I’m Not Sure
 ➤ Did you tell anyone? YES NO I’m Not Sure
 ➤ If you told someone, Parent Teammate Coach School Nurse Athletic Trainer I’m Not Sure
 who did you tell?
 (Circle all that apply)
17. Did you notice a teammate acting confused or in a daze, and thought they were having an “off” day, and were still okay to practice or play? YES NO I’m Not Sure
18. Have you ever been diagnosed with a concussion? YES NO I’m Not Sure
 ➤ If so, how many? _____

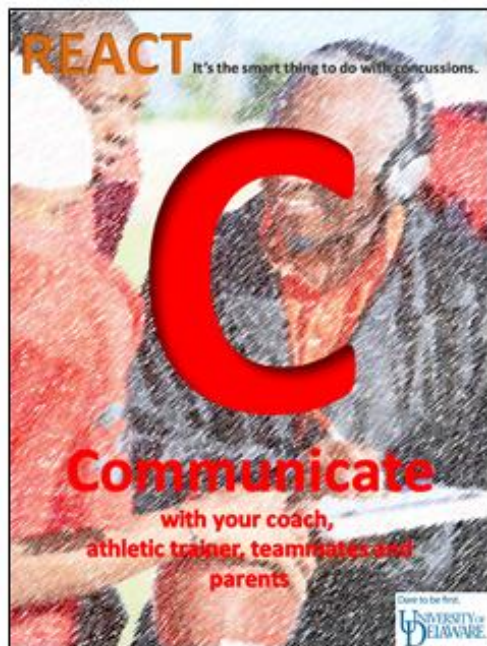
Primary Investigator:
 Molly L. Johnson, BS
 (302) 690-6648
 mljohnso@udel.edu

Faculty Advisor:
 Thomas W. Kaminski, PhD, ATC, FNATA, FACSM
 (302) 831-6402
 kaminski@udel.edu

Appendix B

REACT POSTERS





Appendix C

RECRUITMENT LETTER



*Department of Kinesiology & Applied Physiology
Athletic Training Research Laboratory
Room 159 Fred Rust Ice Arena
541 South College Avenue
Newark, DE 19716
302-831-6402*

May 10, 2013

Mr. Charles Baldwin
President
Charter School of Wilmington
100 N. DuPont Rd
Wilmington, DE 19807

Dear Mr. Baldwin:

The Athletic Training Research Laboratory at the University of Delaware is interested in involving The Charter School of Wilmington in a landmark concussion education program involving high school football student-athletes. This study has been reviewed by the DIAA Board of Directors and Sports Medicine Advocate Committee (SMAC) and both entities feel this is a worthwhile educational project.

This letter will serve as a formal invitation to your school, and we hope that you will consider participating. The following is an overview of your school's commitment to this project:

- Assurances from six DIAA Division II high schools will be confirmed by June 7th, 2013
- Parental consent forms will be sent electronically to football coaches (July 2013)
- Three of the six schools will be randomly assigned to the educational program while the remaining three will serve as control schools
 - o If your school is selected to serve as a "control school" be assured that if the results of this study are positive, it is our hope that the concussion awareness poster program will be initiated in all Delaware high schools in the near future!
- Football student-athletes at the three educational program schools will be required to complete a preseason survey (10 minutes) prior to beginning the fall 2013 season (August 2013)
- For the three schools assigned to the educational program group --- educational posters (7, Vinyl, 3' x 4') will be hung at specific "Lifepath Points" throughout the school (August 2013)
- Football student-athletes from all six schools will be asked to complete a postseason survey at the conclusion of the 2013 football season (10 minutes, December 2013)

If you accept our invitation to participate in this worthwhile educational endeavor, please reply via email to Molly Johnson (mljohnso@udel.edu) no later than Friday June 7th, 2013.

Sincerely,

A handwritten signature in cursive script, appearing to read "Molly Johnson".

Molly Johnson, BS
Athletic Training Research Laboratory

A handwritten signature in cursive script, appearing to read "Thomas W. Kaminski".

Dr. Thomas W. Kaminski, PhD, ATC
Athletic Training Research Laboratory

Appendix D

IRB DOCUMENTS

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| HUMAN SUBJECTS PROTOCOL University of Delaware | |
| Protocol Title: | REACT: Testing the effectiveness of an educational awareness program for sport-related concussions in high school football players |
| Principal Investigator | |
| Name: Molly L. Johnson, BS | |
| Department/Center: Kinesiology and Applied Physiology (KAAP) | |
| Contact Phone Number: (302) 690-6648 | |
| Email Address: mjohnso@udel.edu | |
| Advisor (if student PI): | |
| Name: Thomas Kaminski, PhD, ATC | |
| Contact Phone Number: (302) 831-6402 | |
| Email Address: kaminski@udel.edu | |
| Other Investigators: | NONE |
| Investigator Assurance: | |
| By submitting this protocol, I acknowledge that this project will be conducted in strict accordance with the procedures described. I will not make any modifications to this protocol without prior approval by the IRB. Should any unanticipated problems involving risk to subjects occur during this project, including breaches of guaranteed confidentiality or departures from any procedures specified in approved study documents, I will report such events to the Chair, Institutional Review Board immediately. | |
| 1. Is this project externally funded? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | |
| If so, please list the funding source: | |
| 2. Research Site(s) | |
| <input checked="" type="checkbox"/> University of Delaware | |
| <input type="checkbox"/> Other (please list external study sites) | |
| Is UD the study lead? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (If no, list the institution that is serving as the study lead) | |

3. Project Staff

Please list all personnel, including students, who will be working with human subjects on this protocol (insert additional rows as needed):

| NAME | ROLE | HS TRAINING COMPLETE? |
|------------------|---------|-----------------------|
| Molly L. Johnson | PI | Yes |
| Thomas Kaminski | Advisor | Yes |
| | | |
| | | |
| | | |
| | | |
| | | |

4. Special Populations

Does this project involve any of the following:

Research on Children? YES

Research with Prisoners? NO

If yes, complete the Prisoners in Research Form and upload to IRBNet as supporting documentation

Research with Pregnant Women? NO

Research with any other vulnerable population (e.g. cognitively impaired, economically disadvantaged, etc.)? please describe

5. RESEARCH ABSTRACT Please provide a brief description in LAY language (understandable to an 8th grade student) of the aims of this project.

Talk of sport-related concussions (SRC) in the United States and abroad has been saturated by the media. Today, athletes of all ages – especially football players – encounter many concussion facts, rules, testimonials, and stories of tragedies throughout their careers. There appears to be a gap between concussion education and behaviors applied by athletes in dealing with this concussion information. Closing this gap will bring in to the picture the most important person in these situations; the student-athlete. As much as awareness and appropriate management schemes have been adopted by sports health care professionals, coaches, and administrators, the most important player in the process, the student-athletes themselves, have yet to be included in this movement. The REACT poster intervention program is designed to help athletes remember the most important actions to take when they or a teammate has suffered a possible concussion: Recognize the signs and symptoms, Encourage yourself and your teammates to act smart, Apply a concussion game plan, Communicate with your coach, athletic trainer, teammates and parents, and Think about the future. The main objective of this study is to test the effectiveness of a concussion intervention program (REACT) involving posters, at influencing high school football players in a way that will guide them towards taking the necessary precautionary actions when faced with a potential sport-related concussion.

6. **PROCEDURES** Describe all procedures involving human subjects for this protocol. Include copies of all surveys and research measures.

Instrumentation

Pre- and post-season surveys were developed to explore student-athletes' behaviors with regards to SRC. The surveys are designed to assess athletes' self-reported behaviors when they or a teammate suffers a potential concussion. The 18-question pre-season survey will be validated on a small sample population of male high school student athletes, and then given to all subjects prior to the start of the fall football season. An educational poster campaign will be initiated at half of the participating schools, followed by a post-season survey that will be given to assess whether or not there was a change in reported behaviors. The posters were developed by the PI and will be displayed at half of the participating schools during their football season (Figure 1).



(Figure 1)

Testing Procedures

Pilot Project

Our intended survey instrument will be validated using a group of male sophomore college students at the University of Delaware who played football in high school. We intend to distribute the survey instrument later in the spring of 2013. Only the pre-season survey will be distributed to this group of pilot subjects.

The survey will be distributed to the student athletes in a quiet classroom setting. It is expected that the survey will take approximately 10-15 minutes to complete.

The data from this pilot project will be used to validate the survey instrument for the formal project.

Pre-Season Testing

A total of 12 Delaware high school football programs will be identified and asked to participate in this project. Cooperation from administrators, football coaches, and athletic trainers at each school will be important to the completion of this study. All student-athletes ages 17 and under will be asked to obtain parental consent prior to completing any surveys. The pre-season survey instrument will be distributed to all participants prior to the start of the fall 2013 football season. We envision testing the

entire group of athletes in a quiet classroom setting with the time required to complete the survey of no more than 15 minutes.

REACT Poster Intervention Program

Of the 12 high schools selected to participate, six will be chosen at random as the "intervention" schools. After conferring with the appropriate administrators, strategic locations throughout the high school facility will be designated and the REACT posters will be displayed at those locations, and will remain up throughout the fall football season. Strategic locations are designated as "life path" points that student-athletes frequent. At the conclusion of the fall football season, these posters will be taken down.

Post-Season Testing

One week following the conclusion of the fall football season, in early December 2013, the athletes will be asked to return to complete the post-season survey. The context for the post-season survey is that all questions are in response to the just completed fall 2013 football season. Subjects in the intervention group will have an additional set of questions related to the REACT posters. The total time to complete the post-season survey is estimated to be 15 minutes.

7. STUDY POPULATION AND RECRUITMENT

Describe who and how many subjects will be invited to participate. Include age, gender and other pertinent information.

Attach all recruitment fliers, letters, or other recruitment materials to be used. If verbal recruitment will be used, please attach a script.

Student-athletes from 12 high school football programs in the State of Delaware will be recruited to participate in this study. To ensure fairness and an appropriate representation, six Division I (larger) and six Division II (smaller) schools will be asked to take part. Student-athletes (male and female) will range in age from 14-18 years (freshman to senior).

Describe what exclusionary criteria, if any will be applied.

NONE

Describe what (if any) conditions will result in PI termination of subject participation.

NONE

8. RISKS AND BENEFITS

List all potential physical, psychological, social, financial or legal risks to subjects (risks listed here should be included on the consent form).

There are no risks associated with participation in this study.

In your opinion, are risks listed above minimal* or more than minimal? If more than minimal, please justify why risks are reasonable in relation to anticipated direct or future benefits.

Risks are not above minimal.

*(*Minimal risk means the probability and magnitude of harm or discomfort anticipated in the research are not greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests)*

What steps will be taken to minimize risks?

N/A

Describe any potential direct benefits to participants.

The education of athletes on how to react to a potential concussion has numerous benefits to them and their teammates. Early detection of a concussion can result in proper treatment and return-to-play decisions, preventing further or life-threatening brain damage.

Describe any potential future benefits to this class of participants, others, or society.

As stated above, being educated on how to react to a sport-related concussion could have life-saving effects. Educating athletes early in their careers is crucial to ensuring the development of good habits to be implemented throughout their athletic endeavors.

If there is a Data Monitoring Committee (DMC) in place for this project, please describe when and how often it meets.

No DMC in place for this project.

9. COMPENSATION

Will participants be compensated for participation?

NO

If so, please include details.

10. DATA

Will subjects be anonymous to the researcher?

NO

If subjects are identifiable, will their identities be kept confidential? (If yes, please specify how)

Yes – all subjects will have a code number.

How will data be stored and kept secure (specify data storage plans for both paper and electronic files. For guidance see <http://www.udel.edu/research/preparing/datastorage.html>)

Surveys and consent forms will be kept in a locked file to which only the PI and advisor will have access.

How long will data be stored?

The data will be kept for a minimum of three years in case results are needed for future analysis. Consent forms will be kept for three years and then destroyed.

Will data be destroyed? ☒ YES ☐ NO (if yes, please specify how the data will be destroyed)

The data will be destroyed using a paper shredder.

Will the data be shared with anyone outside of the research team? ☐ YES ☒ NO (if yes, please list the person(s), organization(s) and/or institution(s) and specify plans for secure data transfer)

How will data be analyzed and reported?

Data will be analyzed using SPSS. A repeated measures ANOVA will be performed on the data to look for any change in reported behaviors from pre- to post-season.

11. CONFIDENTIALITY

Will participants be audiotaped, photographed or videotaped during this study?

NO

How will subject identity be protected?

Consent forms will be kept in a locked file. Each participating student-athlete will be assigned a code number to match their consent forms with surveys only for the purpose of ensuring that only participants with consent are participating. The PI will keep a list of each subject's name and code number but will not have any other identifiable information on that subject. This list will be kept in a locked file. Surveys will not have any identifiable information on them outside of the subject number, and will also be kept in a locked file.

Is there a Certificate of Confidentiality in place for this project? (If so, please provide a copy).

NO

12. CONFLICT OF INTEREST

(For information on disclosure reporting see: <http://www.udel.edu/research/preparing/conflict.html>)

Do you have a current conflict of interest disclosure form on file through UD Web forms?

NO

Does this project involve a potential conflict of interest*?

NO

* As defined in the [University of Delaware's Policies and Procedures](#), a potential conflict of interest (COI) occurs when there is a divergence between an individual's private interests and his or her professional obligations, such that an independent observer might reasonably question whether the individual's professional judgment, commitment,

actions, or decisions could be influenced by considerations of personal gain, financial or otherwise.

If yes, please describe the nature of the interest:

13. CONSENT and ASSENT

☒ Consent forms will be used and are attached for review (see Consent Template under Forms and Templates in IRBNet)

☒ Additionally, child assent forms will be used and are attached.

☐ Waiver of Documentation of Consent (attach a consent script/information sheet with the signature block removed).

☐ Waiver of Consent (Justify request for waiver)

14. Other IRB Approval

Has this protocol been submitted to any other IRBs?

NO

If so, please list along with protocol title, number, and expiration date.

15. Supporting Documentation

Please list all additional documents uploaded to IRBNet in support of this application.

Parental Consent Form
Child Assent Form
Consent Form
Athlete Survey

Rev. 10/2012

**University of Delaware Human Subjects
Informed Consent Form**

RESEARCH STUDY:

REACT: Testing the effectiveness of an educational awareness program for sport-related concussions in high school football players.

INVESTIGATORS:

Molly L. Johnson (Principal Investigator) and Thomas W. Kaminski, PhD (Advisor) - Department of Kinesiology and Applied Physiology (KAAP)

INTRODUCTION: Exposure to a great deal of information concerning sport-related concussions is evident in today's world.

PURPOSE: The purpose of this study is to survey your attitudes towards sport-related concussions.

PROCEDURES: You are being asked to complete a survey on your behaviors when you or a teammate deals with sport-related concussions. The survey consists of various questions related to how athletes react to concussions. It will take you 5-10 minutes to complete the survey questions. At the conclusion of your football season, you will be asked to complete a similar survey.

CONDITIONS OF SUBJECT PARTICIPATION: The information obtained by this study will be publicly reported, however all personal information that links you to your results will remain confidential and will only be seen by investigators.

POTENTIAL RISKS AND BENEFITS:

There are no potential risks with this study.

FINANCIAL CONSIDERATIONS: There will be no financial compensation for this study. There will be no cost to you for participating in the study.

CONTACTS:

Any questions that you may have that are associated with this research study may be directed toward the following individuals:

Molly L. Johnson, BS
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (302) 690-6648
mjohnso@udel.edu

Thomas W. Kaminski, PhD, ATC (Thesis Advisor)
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-6402
kaminski@udel.edu

Your questions concerning your rights in relation to this research study may be directed towards:

Human Subjects Review Board
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-2137

ASSURANCE:

By signing this consent form you indicate that you have read and agreed to all procedures; understand the conditions, the risks and benefits associated with participation as well as the financial considerations. You were also informed that your participation in this research study is considered voluntary and that you may exercise your right to refuse or cease participation at any point. Your discontinuation in this study does not result in penalty or the loss of the previously discussed benefits. All of your personal information will remain confidential. You also understand that a copy of this consent form will be given to you.

CONSENT SIGNATURES

Participant's Name: _____

Participant's Signature: _____ Date: _____

I, the investigator, certify that I have explained the procedures, conditions of participation, risks and benefits associated with participation as well as the financial considerations. I also informed the participant that their involvement in this research study is considered voluntary and that he/she may exercise their right to refuse or cease participation at any point. I have answered all questions that the participant asked and have witnessed the above signature.

Investigator's Name: _____

Investigator's Signature: _____ Date: _____

Signed consent forms will be retained by the researcher for three years after completion of the research.

University of Delaware
Parental Permission for Participating in a Research Study

RESEARCH STUDY:

REACT: Testing the effectiveness of an educational awareness program for sport-related concussions in high school football players.

INVESTIGATORS:

Molly L. Johnson (Principal Investigator) and Thomas W. Kaminski, PhD (Advisor) - Department of Biomechanics and Movement Science

INTRODUCTION: Exposure to a great deal of information concerning sport-related concussions is evident in today's world.

PURPOSE: The purpose of this study is to survey your child's attitudes towards sport-related concussions.

PROCEDURES: Your child is being asked to complete a survey on their behaviors when they or a teammate deals with sport-related concussions. The survey consists of various questions related to how athletes react to concussions. It will take your child 5-10 minutes to complete the survey questions. At the conclusion of your child's football season, they will be asked to complete a similar survey.

CONDITIONS OF SUBJECT PARTICIPATION: The information obtained by this study will be publicly reported, however all personal information that links your child to their results will remain confidential and will only be seen by investigators.

POTENTIAL RISKS AND BENEFITS:

There are no potential risks to your child for participating with this study.

FINANCIAL CONSIDERATIONS: There will be no financial compensation for this study. There will be no cost to you or your child for participating in the study.

CONTACTS:

Any questions that you may have that are associated with this research study may be directed toward the following individuals:

Molly L. Johnson, BS
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (302) 690-6648
mljohnso@udel.edu

Thomas W. Kaminski, Ph.D. (Thesis Advisor)
Human Performance Lab
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-6402
kaminski@udel.edu

Your questions concerning your rights in relation to this research study may be directed towards:

Human Subjects Review Board
University of Delaware
Newark, Delaware 19716
Phone: (302) 831-2137

ASSURANCE:

By signing this consent form you indicate that you have read and agreed to all procedures; understand the conditions, the risks and benefits associated with participation as well as the financial considerations. You were also informed that your child's participation in this research study is considered voluntary and that you or your child may exercise your right to refuse or cease participation at any point. Discontinuation of your child's participation in this study does not result in penalty or the loss of the previously discussed benefits. Your child's personal information will remain confidential. You also understand that a copy of this parental consent form will be given to you.

CONSENT SIGNATURES

Parent/Guardian's Name: _____

Child's Name : _____

Parent/Guardian's Signature: _____ Date: _____

I, the investigator, certify that I have explained the procedures, conditions of participation, risks and benefits associated with participation as well as the financial considerations. I also informed the parent/guardian that their child's involvement in this research study is considered voluntary and that they may exercise their right to refuse or cease participation at any point. Prior to completing the survey, I will answer all questions that the child may have.

Investigator's Name: _____

Investigator's Signature: _____ Date: _____

Signed consent forms will be retained by the researcher for three years after completion of the research.

**University of Delaware
Adolescent Assent form for Youth Ages 12-17**

You are being asked to participate in this study. First, we want to explain what you will do in this study. If you do not understand, please ask questions. Your parents have given you permission to be in this study, but you can choose to be in the study, not be in the study or take more time to decide.

What is the name of the study?

REACT: Testing the effectiveness of an educational awareness program for sport-related concussions in high school football players.

Who is in charge of the study?

The people in charge of the study are Molly Johnson and Dr. Thomas Kaminski from the University of Delaware Department of Kinesiology and Applied Physiology (KAAP).

What is the study about?

This study will survey your attitudes towards sport-related concussions.

Why are you asking me to be in this study?

You are being asked to be in the study because you are a high school football player in the State of Delaware.

What will happen to me in the study?

You will be asked complete a survey on your behaviors when you or a teammate deals with sport-related concussions. The survey consists of various questions related to how athletes react to concussions. It will take you 5-10 minutes to complete the survey questions. At the conclusion of your football season, you will be asked to complete a similar survey.

Will I be paid to be in this study?

You will NOT be paid for being in this study. There are no other incentives for participating.

What are possible risks of being in this study?

There are no risks associated with completing the surveys.

What are possible benefits of being in this study?

You will not benefit directly from taking part in this research.

How will confidentiality be maintained?

Data will be kept confidential and your information will be assigned a code number. The list connecting your name to this number will be kept in a locked file. When the study is completed and the data have been analyzed, the list will be destroyed. Data will be kept securely in electronic storage formats and saved indefinitely. Your name will not be used in any report. We will make every effort to keep all research records that identify you confidential to the extent permitted by law. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared. Your research records may be viewed by the University of Delaware Institutional Review Board, but the confidentiality of your records will be protected to the extent permitted by law.

Do I have to be in the study?

You do not have to participate this study if you do not want to. If you are in the study, you can stop at any time. Nobody will be upset with you if you do not want to be in the study or if you want to stop. If you have any questions or do not like what is happening, please tell the person in charge of this study immediately.

You have had the study explained to you. You have been given a chance to ask questions. By writing your name below, you are saying that you want to be in the study.

Adolescent's Signature

Date

Name of Person Obtaining Assent

Signature of Person Obtaining Assent

Date



RESEARCH OFFICE

210 Halliham Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: March 8, 2013

TO: Molly Johnson, BS
FROM: University of Delaware IRB

STUDY TITLE: [439895-1] REACT: Testing the effectiveness of an educational awareness program for sport-related concussions in high school football players.

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: March 8, 2013

EXPIRATION DATE: March 7, 2014

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Jody-Lynn Berg at (302) 831-1119 or jlberg@udel.edu. Please include your study title and reference number in all correspondence with this office.

Appendix E

ORIGINAL THESIS PROPOSAL FROM MAY 2013

SPECIFIC AIMS

Today, athletes of all ages – especially football players – encounter many concussion facts, rules, testimonials, and tragedies throughout their careers. The messages that concussions are a risk associated with contact sports, that they are serious injuries, and that they increase the risk of a life-threatening injury with premature return to activity are now common knowledge to athletes, coaches, and athletic trainers thanks to the development and use of concussion education programs.^{2,3,5} However, due to an interventional gap between concussion education and behavioral practice, athletes are dealing with concussion information in extreme ways. There seems to be a behavioral continuum among athletes when dealing with concussion information: they either ignore the significance, thinking that it won't happen to them/that a championship or scholarship is worth more than a minor headache, or they become terrified of suffering a life-altering concussion and quit their sport altogether like former Yale football player Chris Coyne, former NFL player Jacob Bell, and former NFL free-agent Chad Diehl.³⁷ Leaving athletes on their own with so many facts and rules seems unfair to them – it is our responsibility as researchers and clinicians to help guide them through the process of not only acquiring this information, but also dealing with it in a practical sense. We need to help them use their new knowledge to adapt their on- and off-the field behaviors appropriately and become smarter when experiencing or witnessing a potential concussion, so that the incidence of life-threatening head injuries can be decreased along with any fears athletes may have about suffering a serious head injury.

Research on the effectiveness of concussion education for coaches is abundant.^{10,13,31,51} Most studies found that these programs, most commonly the materials from the CDC's "Head's Up" initiative, are very effective in increasing coaches' knowledge of sport-related concussions and how to treat them.^{10,14,51} It has also been found that coaches are using some of these materials to educate their athletes and parents about sport-related concussions.^{10,31,51} Some of the most popular materials from the "Head's Up" initiative among coaches are posters⁴ to help remind their athletes to keep their heads up when playing the game in order to avoid a concussion. What has not been readily made available however, are posters on how to react to a potential concussion – what constitutes symptoms, what those symptoms look and feel like, when they should remove themselves from activity, who to tell, and why it is important to be over-precautious – for the *athletes* to use.

The **REACT** poster intervention program is designed to help athletes remember the most important actions to take when they or a teammate have suffered a possible concussion: **R**ecognize the signs and symptoms, **E**ncourage yourself and your teammates to act smart, **A**pply a concussion game plan, **C**ommunicate with your coach, athletic trainer, teammates and parents, and **T**hink about the future.

This poster intervention program is based on previous research on the effectiveness of such intervention programs for educating and encouraging high-school aged youth about the dangers of smoking, changing social norms, and other issues among the teenage population.^{4,6,16,18,19,33,42,48} This research has shown that when posters are placed in “life path points” around a high school, and include messages that the students can relate to, the message will reach the majority of the targeted population and has a favorable impact on their behaviors.¹⁸

The main objective of this study is to test the effectiveness of a poster concussion intervention program at influencing high school football student-athletes in a way that will guide them towards taking the necessary precautionary actions when faced with a potential sport-related concussion.

Expected Outcome: The REACT posters will provide a unique informational message to encourage high school student-athletes to act when they or a teammate suffers a potential sport-related concussion. The posters will encourage them to take the appropriate precautionary measures to ensure a proper diagnosis and safe return to play.

Aim 1: Survey a group of Delaware high school football players on their behaviors when confronted with a possible concussion during their previous playing season.

Hypothesis 1: Athletes will have sound knowledge of the dangers of sport-related concussions (SRC) and the consequences of returning to play too soon after suffering an SRC. However, they will not report taking the necessary actions after receiving a possible concussion to assure that they are diagnosed properly and returned to play after healing.

Aim 2: Place the REACT posters in half of the participating high schools through the season and survey the athletes on their behaviors post-season to see whether or not they were effective at promoting any SRC-related behavioral changes in the athletes.

Hypothesis 2: The posters will be effective at drawing the attention of the high school football players, and will help them to understand how to safely view and react to concussions in an educated manner. When given a hypothetical situation post-season, the athletes will know what symptoms to look for and the appropriate actions to take.

SIGNIFICANCE

Over the past decade, sport-related concussions (SRCs) have become a large concern in sports of all types and levels. Football has especially taken the limelight in

the media due to its popularity, violent nature, and the fact that its rate of SRCs is one of the highest among sports – accounting for around 63% of the 62,000 concussions that occur annually in high school sports¹⁴. For football players, the fact that concussions are a serious injury is a well-known fact. However, with published research exemplifying the long-term consequences of repeated concussions⁷, on top of the possibility of life-threatening brain damage from returning to play too soon post-concussion⁸, these athletes are left with an overwhelming amount of information that they must sift through, interpret, and cope with on their own. Stories are now emerging from areas all over the country highlighting just how overwhelming this information can be; some football players are quitting their sport in fear of suffering a head injury that could change their lives forever³⁷, while others simply brush it aside thinking that it won't happen to them, or a championship game is worth a small headache.^{10,14,31,51}

Now that we know concussion education programs are effective in increasing knowledge about the signs and symptoms of a concussion in coaches,¹⁴ it's time to close the gap in this behavioral continuum regarding how *athletes* are dealing with the information by facilitating the transition from education to behavioral change. The research on the effectiveness of concussion education programs for coaches is abundant, and shows a trend of these coaches taking concussions more seriously and using more conservative approaches when an athlete has a suspected concussion.^{10,31,51} The CDC's "Head's Up: Concussion in Youth Sports" initiative⁹ contains many resources for coaches, but limited resources for parents and athletes – the website provides only a short quiz, a few fact sheets, a poster geared toward coaches (**Figure 1**) and an online training course for coaches only. During practice and game situations, coaches *are* responsible for taking care of their players. However, we cannot expect them to take full responsibility for concussion detection; athletes have to also be aware of what to look for and how to handle the situation when they or a fellow player suffers a potential concussion.

Most high school football programs are required to have a Certified Athletic Trainer (ATC) present at every game, however very few schools have access to one at every practice¹⁴. This lack of a sports-medicine resource increases the risk of a concussion going undetected or a player returning to practice too soon after a potential head injury, which further exemplifies the importance of educating athletes just as heavily as coaches so that they can look out for one another and decrease the risk for complications from a potential head injury. When ATCs are present during game situations (and some practices), they are the on-site clinicians responsible for testing for concussions and making return-to-play (RTP) decisions. Therefore, they are also a target group for which concussion education and behavioral changes need to be monitored and emphasized as much as it has been for coaches. The National Athletic Trainer's Association (NATA) has a Concussion/Brain Injury Resources page on their website³², and research has shown that ATCs are using multi-dimensional approaches to diagnose and treat SRCs.^{11,13,34}

Recently, the National Football League (NFL) and National Collegiate Athletic Association (NCAA) have adopted new rules and regulations in attempt to keep play safe and decrease the potential for SRCs. Some of these include removing a player from the game for at least one play if their helmet falls off, and enforcing penalties for helmet-to-helmet contact or contact directed above the shoulder area.²⁴ These

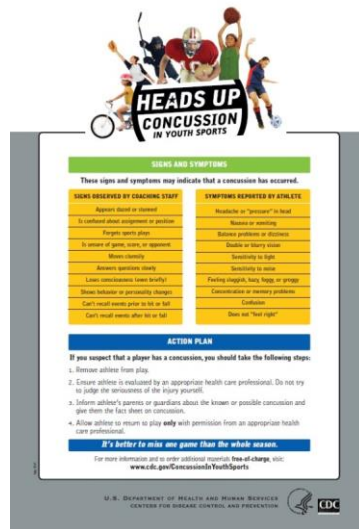


Figure 1: CDC's "Head's Up" Concussion in Youth Sports Informational Poster
www.cdc.gov/concussion/HeadsUp/youth.html

regulations, along with the availability of ATCs at every practice/game and a designated team physician, create an advantage over youth and high-school football leagues, especially in regards to concussions. One youth football league, Pop Warner, instituted similar concussion-prevention rules³⁶ however, that league only regulates select teams in youth sports and high school teams are not among those included. Since these sports medicine professionals are not as readily available for youth and high-school student-athletes as they are for those in the NCAA, education and behavioral changes must be emphasized for these athletes so that they can become smarter players while also paying attention to their fellow teammates. Creating an intervention program that focuses on resources accessible to all athletes nationwide will further facilitate these changes. Developing a generation of smarter athletes at a younger age will not only create a safer playing environment now, but also has the potential to benefit their careers,

and lives in the future.

When the goal is to simply, yet effectively impact the adolescent population with a health-related message, research has shown that posters are one of the most popular methods of choice.^{4,6,16,18,19,33,42,48} One study on the effectiveness of an anti-tobacco poster intervention revealed that when posters are placed in high schools at "life path" points, almost half (45.2%) of the exposed students reported that the posters prevented them from smoking.¹⁸ "Life path" points were locations that the students passed by frequently, such as the primary entrance hall, entrances to the cafeteria and gym and student common areas. A similar study demonstrated that when posters are aimed at changing social norms and have relatable messages, over half of the participants remembered the slogan and liked the campaign.⁴² The REACT study's design is similar to that of the 2011 research by Hatfield et al., which used a poster intervention to prevent rip-current related beach drowning and pre/post intervention surveys to test the posters' effectiveness. It was found that about two-thirds of respondents reported seeing the posters, and about one-third remembered the lesson from the posters. Hatfield et al. also viewed several statistically significant behavior improvements post-intervention, such as correctly identifying a possible rip and reporting correct behavior if caught in a rip,¹⁶ further demonstrating the simple effectiveness of a poster intervention for changing health-related safety behaviors.

It is clear that concussion education programs have the ability to increase coaches' knowledge of sport-related concussions, resulting in coaches taking a more conservative approach when dealing with a potentially concussed athlete.^{10,14,31,51} Research has also shown that ATCs are using multi-dimensional diagnosis and treatment practices for SRCs – continually adapting them to current research findings and beliefs.^{11,13,34} However, the athletes themselves also need to be included in the emphasis on education and behavioral change – especially in high school and youth programs, so that the athletes can become smarter players, and can work in conjunction with the ATC(s) and coaches to detect and treat head injuries and concussions. This study will test the effectiveness of the REACT poster intervention at making an impact on high school student-athletes by instilling the importance of reacting appropriately to a potential concussion.

IMPACT AND INNOVATION

There has been no published research to date on the effectiveness of a poster intervention aimed at helping high school student-athletes learn how to appropriately apply their concussion knowledge and take action when they or a teammate suffers a potential concussion. This study aims to apply the success of poster interventions for other health-related intervention programs to concussion education and prevention, and fill the void between education and action for athletes. The REACT message is designed to appeal to the ever-busy world of teenagers and high school athletes today, catching their attention and making an impact on their concussion decision-making. The simplicity of this poster intervention contrasts the formal education programs studied previously.^{3,5,10,25,47} Though effective, these formal programs are time-consuming and often costly, while posters are relatively cheap, easy to apply, do not require a formal meeting. Posters also have the potential to save schools money in the future by decreasing the incidence of serious head injuries (if proven effective). Many researchers have called for a simplistic education program developed specifically for athletes,^{1,2,15,20,22,26,27,28,30,41,51-53} and this research aims to answer that call to action and propel the concussion movement in a positive direction by determining whether a poster campaign can meet the current educational needs.

If this study is successful, high-school football programs of all demographics will be able to use these simple posters to help their athletes react to concussion, decreasing premature return-to-play decisions and worsening of a head injury. These posters, if successful, can also be adapted for athletes of all ages – from pee-wee, through middle school and up to the collegiate and professional levels. Helping an athlete become educated on what to do to protect themselves and their teammates from playing with a concussion is the first step in decreasing their risk of life-threatening head injuries and Second-Impact Syndrome.

APPROACH

Subjects

Subjects participating in this study will be high school football players in the State of Delaware. A letter will be sent via email to the principals of 12 public, private, and charter high schools in the state with football teams, explaining the background, significance, and aims of the proposed study. After permission of the principal, athletic director, head coach and athletic trainer from each school has been obtained, three types of consent forms will be distributed to the teams. One informed consent form for athletes over the age of 18, and a parental consent form as well as an adolescent consent form for athletes under the age of 18. All consent forms have been approved by the University of Delaware Institutional Review Board (IRB). See Appendix D for IRB documents.

Ideally, all 48 high school football programs in the state of Delaware would participate in the study. A priori power-analyses for required sample sizes were performed for both Dependent and Independent *t*-Tests. These determined that at least 26 athletes will need to be in each group of this study for statistical significance between groups (**Table 1**), and at least 12 athletes will need to be in the poster group for statistical significance within that group (**Table 2**). In order to have not only a statistically significant sample size, but a representative sample of high school football student-athletes as well, the goal for this study is to have a total of 12 high schools participate; six division I and six division II, with three poster and non-poster schools in each division, and each divisional group including a variety of schools (public, private, and charter). If all football student-athletes in all 12 high schools participate, this would amount to around 600 athletes.

With the use of surveys comes the possibility of the subjects reporting false behaviors and making up answers, which has the potential to contaminate or skew the results, and due to the subjective nature of surveys, there will be an unavoidable number of athletes who will not be honest when answering the questions they are given.

Table 1: Values used in Power Analysis for Subject Sample Size (Independent Samples *t*-Test)

| <i>Input Parameters</i> | | <i>Output Parameters</i> | |
|-----------------------------|------|----------------------------------|--------|
| Tail(s) | Two | Noncentrality parameter δ | 2.8844 |
| Effect size d | 0.8 | Critical t | 2.0086 |
| A err prob | 0.05 | Df | 50 |
| Power (1- β err prob) | 0.80 | Sample size group 1 | 26 |
| Allocation ratio N2/N1 | 1 | Sample size group 2 | 26 |
| | | Total sample size | 52 |
| | | Actual power | 0.8075 |

Table 2: Values used in Power Analysis for Subject Sample Size (Dependent Samples *t*-Test)

| <i>Input Parameters</i> | | <i>Output Parameters</i> | |
|-----------------------------|------|----------------------------------|--------|
| Tail(s) | Two | Noncentrality parameter δ | 3.0984 |
| Effect size dz | 0.8 | Critical t | 2.1448 |
| A err prob | 0.05 | Df | 14 |
| Power (1- β err prob) | 0.80 | Total sample size | 12 |
| | | Actual power | 0.8213 |

Surveys

Of the high schools that agree to participate, two study groups will be formed via a random selection process: intervention (poster) and non-intervention (control). Only the poster schools will participate in a pre-season behavioral survey asking the athletes to report their behaviors during their most recent season when confronted with a possible concussion situation. All schools will participate in a post-season survey asking the athletes to report their behaviors during the 2013 season when confronted with a possible concussion situation.

Questions will be formatted asking the athlete how they responded when confronted with a possible concussion symptom or situation, such as: “Did you ever ‘black out’ or lose your vision after taking a hit or falling during a practice or game?” with answer options being “Yes,” “No,” or “I’m not sure.” If the athlete answers “Yes,” they will then be asked if they told anyone and to circle who they told. There will be two types of behavioral questions: those asking whether the athlete took the appropriate precautionary measures (**Figure 2.1**), and those asking whether the athlete either ignored a concussion sign/symptom or did not take the proper precautionary measures (**Figure 2.2**). Each question has an “I’m Not Sure” option for the athletes to circle if they did not experience the situation in question or if they wish to not answer that question. The primary investigator will have a survey key designating which questions are of which type and how to code each question for data analysis purposes.

During pre-season training, posters will be placed in specific “life path” locations throughout those schools in the intervention group, with the most emphasis being in the athletic hallway, locker room(s), weight room, and gym(s). Adjustments will be made as needed, based on each individual school’s design. Both groups will play their normal seasons, and will take the same survey post-season, with the wording of the questions changed to reference the 2013 season. There will also be a few questions asking the athletes about their reactions to the posters and testing their recall of the information on the posters at the end of the post-season survey for the poster intervention groups (**Figure 2.3**).

The pre-season survey (to be taken by the poster group only) will consist of 18 questions and will take no longer than 5-10 minutes to complete. The post-season survey for the poster group will have 25 questions and will take 10-15 minutes to complete. The post-season survey for the control group will have 18 questions and will take no longer than 5-10 minutes to complete. Surveys will be distributed, filled out, and collected within one sitting at which the primary investigator will be present.

The pre-season surveys will be administered during the two weeks of preseason practice before the school year begins (beginning August 15th, 2013), and the post-season surveys will be administered one week after the Delaware State Championship Game (second weekend in December). Since most published concussion surveys are knowledge-focused, the survey questions for this study were developed and adapted from the format of the behavior-focused questions used by Hong et al. (2008). The survey used by Hong et al. (2008) was adapted from previously published measures to evaluate student exposure to an in-school media campaign related to tobacco prevention and was pilot-tested prior to use. See Appendix A for the full pre-season survey to be used in this study.

| | | | |
|------------------------------------------------------------------------------------|----------|-------|------------------|
| During a practice or game, did you take a hit or fall that made you feel confused? | YES | NO | I'm Not Sure |
| ➤ Did you tell anyone you felt confused? | YES | NO | I'm Not Sure |
| ➤ Who did you tell? (Circle all that apply) | Teammate | Coach | Athletic Trainer |
| | | | I'm Not Sure |

Figure 2.1: Example survey question for proper precautionary actions

| | | | |
|-------------------------------------------------------------------------------------------------------------|-----|----|--------------|
| Did you ever have a headache after a practice or game and thought it was normal, so you didn't tell anyone? | YES | NO | I'm Not Sure |
| ➤ Did this headache happen more than once during the season? | YES | NO | I'm Not Sure |

Figure 2.2: Example survey question for improper precautionary actions

| | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----|----|--------------|
| Do you think the REACT posters encouraged you to tell someone during a game or practice if you felt you had any symptoms of a concussion? | YES | NO | I'm Not Sure |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----|----|--------------|

Figure 2.3: Example survey questions on the athletes' reactions to the REACT posters

Survey Pilot Testing

The pre-season survey was pilot tested on a group of University of Delaware freshman enrolled in two different Kinesiology and Applied Physiology (KAAP) classes (n = 41) in March 2013. One of the pilot subjects was a current senior high school football student-athlete. The surveys were distributed during the first few minutes of class time and were handed back to the primary investigator once completed. Only students who participated in a contact sport in high school were asked to participate, and their answers were prompted to be in regards to their most recent contact sport season.

Some findings from the pilot data further support Hypothesis 1 and the need for an education program specific to student-athletes. When asked if the recent attention to sport-related concussions is important, the majority of the students answered "yes" (n = 39, 95%). However, of those who reported getting a headache after participating in hitting or tackle drills (n = 8), only one reported telling someone about it. The majority of the students also answered "no" when asked if they thought

the new rules and warnings about concussions are silly or unimportant (n = 37, 90%), but when asked if they noticed a teammate acting confused or in a daze, but thought they were having an “off” day and were still okay to play, the students were divided: 18 replied “yes,” 19 replied “no,” and 4 replied “I’m Not Sure.” One more notable finding was of the 41 students who took the pilot survey, eight reported playing football in high school and the majority of those students reported being concerned about getting a concussion while playing football (n = 6, 75%).

REACT Posters

The REACT posters are designed to be simple yet effective, and relatable to all high school student-athletes regardless of experience, age, position and demographics. The design of the posters is intended to catch the attention of student-athletes, and give them an easy way to remember how to react to concussions using a catchy acronym: REACT. Each letter of the acronym stands for an action each athlete should take when they or a fellow athlete or teammate suffers a possible concussion – no matter the situation.

Posters will be vinyl, 3’ x 4’, and printed at a location to be determined based on funding. They will be hung where allowed by the school in the stated areas at eye-level (about 5’ off the ground) using Command™ Strips and Hooks to ensure a hold without damaging any walls or surfaces in the schools.

There are six poster designs, and each poster will include the REACT logo with the slogan “It’s the smart thing to do with concussions” at the top. One design will showcase the full acronym, and what each letter stands for (**Figure 3.1**). The other five poster designs will each feature one letter from the acronym with a full description of the components for that action below (**Figure 3.2**).

Seven posters, (two general acronym posters and one each of each letter poster), will be hung in each of the schools where the football players will be most likely to give them attention, and where they will be repeatedly exposed to them (at least twice daily). Locations that posters will be placed in will be the athletic hallway, locker room(s), weight room, and gym(s). If a school has extra facilities which the football team uses often, posters will be placed there as well and that will be taken into account during the post-season analysis of the posters’ efficacy.

Since the participating schools will likely play each other throughout the season, the posters will not be placed in the visiting team locker rooms at the high schools. However, sight of posters in other locations by non-intervention school athletes will be unavoidable and poses a potential contamination of intervention methods between groups. This effect should not be significant post-season, however, because repeated daily exposure to the posters is a key factor in the intervention – which a visiting athlete will not receive during the relatively short time they spend in the locker room on game day.

Each REACT poster will also have the University of Delaware logo on the bottom right corner, and may include the logos of local sports medicine-related

practices/companies that make a contribution to this project. See Appendix B for all six REACT poster designs.



Figure 3.1: REACT general acronym poster

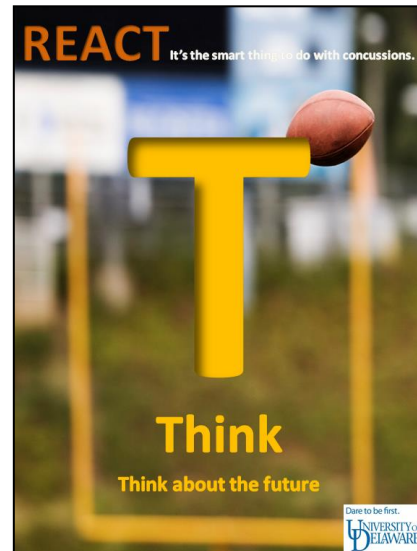


Figure 3.2: Example of a REACT single letter poster

Statistical Analysis

All statistical analyses will be done using SPSS Statistical Software version 19.0 (IBM: Somers, NY). A Paired (Dependent Samples) *t*-Test will be used to assess behavioral changes (via responses to survey questions) within the poster group from pre-season to post-season. An Unpaired (Independent Samples) *t*-Test will be performed on the survey question responses for both groups post-season to look for differences in behaviors based on exposure to the REACT posters. The values used for the *t*-Tests will be the number of subjects who answered a particular response to the question being analyzed.

As stated in hypothesis 2, the effectiveness of the posters at helping the athletes react in a safe manner will be tested using pre-season surveys on the intervention (poster) group and post-season surveys on both intervention (poster) and non-intervention groups. For these posters to be deemed “effective,” there should be a significant increase in reported precautionary behavior of the intervention group athletes from pre- to post-season survey, and more athletes reporting safer behavior post-season in the intervention group over the control group. For example, one variable that will be tested is the number of athletes who told someone that they felt woozy or dizzy after a big hit during a game or practice – this number will be compared within the poster group (pre- to post-season), and between the two groups post-season. We will be looking for a significant increase in this number from pre- to post-season in the poster group, and for a significant difference in the number of athletes who responded yes to this question in the poster group (higher) over the control group (lower). The *p*-value for significance will be set at $p < 0.05$.

Timeline

Exact dates are subject to change based on school schedules. Pre-season practices for fall high school sports begin on August 15th, 2013. See Appendix C for the recruitment letter sent to the schools.

| | |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| May 14 th | - Send out initial recruitment letters via email to high school principals, athletic directors, athletic trainers, and head football coaches |
| May 20 th | - Send follow-up emails to principals, athletic directors, athletic trainers, and head football coaches |
| June 7 th | - Deadline for schools to commit or decline participation in the study |
| June 10 th | - Contact head football coaches to schedule pre-season survey dates and times |
| July 5 th -12 th | - Finalize poster designs, order posters to be printed |
| August 5 th - August 9 th | - Randomly assign poster schools - Confirm pre-season survey dates and times with coaches - Distribute consent and assent forms via email |
| August 13 th | - Send reminder email to coaches about consent and assent forms |
| August 15 th - 23 rd | - Pre-season survey testing and poster hanging (to be done on same day) |
| November 1 st | - Contact coaches and arrange a time for post-season survey testing |
| December 2 nd - 6 th | - Remove REACT posters from poster schools |
| December 9 th - 20 th | - Post-season survey testing |