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Perceptions, Attitudes, Self-Efficacy, and Behaviors of Mouthguard Use Among
Collegiate Athletes

By

Heather Prosser

A Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

In

Community Health Education

Minnesota State University, Mankato

Mankato, Minnesota

May 2020

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This thesis has been examined and approved by the following members of the student's
committee.

Dr. Emily Forsyth

Dr. Joseph Visker

Brigette Cooper

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Abstract

With the high risk of dental trauma in contact sports, it is important that all athletes have a strong foundation of how to prevent such injuries. Properly fitted mouthguards are the best available protective equipment to prevent orofacial trauma; however, previous research has found them underutilized, with the need for evidence-based interventions to promote mouthguard use among athletes. This study used a descriptive, cross-sectional, correlational research design, focusing on studying collegiate athletes at one large, Midwestern university, to determine their current attitudes, perceptions, self-efficacy, and behaviors of mouthguard use during participation in a contact sport. A convenience sampling technique was used to select the sample of athletes. A 12-item survey was used to assess their perceptions and behaviors of mouthguard use, using the Health Belief Model and adjusted questions from two instruments from previous studies. Most participants reported that they do not have a mouthguard, and a small percentage of those who did have one do not always wear them. A higher level of perceived risks, perceived benefits, and self-efficacy was found, despite the lack of behaviors. The most common reason given for not wearing a mouthguard was that they are not required, and the majority of participants responded that no one has influenced them to wear a mouthguard. Further studies regarding what athletes understand about the importance of mouthguards will help create more effective interventions to promote them.

Chapter 1: Statement of the Problem

Background

In the growing culture of competitive sports, injuries of all kinds are a common risk during participation, and dental injuries are no exception. Each year, sports-related injuries at all levels, including youth, adolescent, college, and professional, result in approximately five million teeth avulsed, or completely removed from the socket (Kracher & Knowlton, 2017). Orofacial injuries are commonly linked to sports participation, contributing to 13-39% of all dental trauma (Kracher & Knowlton, 2017). Common orofacial injuries can include soft tissue lacerations, dental fractures (of the roots, crowns, or bone), tooth intrusion, tooth extrusion, avulsion, and temporomandibular joint injury (Sathyaprasad, Philip, Vijaynath, Neethu & Rekha, 2018). With the high risk of dental trauma in contact sports, it is important that all athletes have a strong foundation of how to prevent such injuries.

The American Dental Association Council on Scientific Affairs and the Council on Advocacy for Access and Prevention, state that the best available protective device for reducing incidences and severity of sports-related dental injuries are properly fitted mouthguards (American Dental Association [ADA], 2019). The Academy for Sports Dentistry has gone further in mouthguard recommendations to change the word “mouthguard” to “properly fitted custom mouthguard”, setting guidelines that they need to fit accurately, stay in position during impact, and redistribute the impact’s energy (Academy for Sports Dentistry [ASD], 2019). Previous research has shown a significant

decrease in orofacial injuries with the use of mouthguards during physical activities (ADA, 2019). According to the ADA (2019), studies have found that dental-related trauma in those who used mouthguards was 7.5-7.75%, while dental-related trauma in non-users was 48.31%- 59.98%.

Sports-related dental and oral trauma at young ages may have a long-lasting effect on ones' life outside of sports (Young, Macias, & Stephens, 2015). Orofacial trauma can have an impact on the function and esthetics of teeth, which can affect physical, psychological, and social aspects in life (Tuna & Ozel, 2014). There is also a long-term financial impact with dental trauma (Collins, McKenzie, Roberts, Fields & Comstock, 2015). To treat an avulsed tooth can cost between \$5000-\$20,000 over the lifetime of the athlete (Young et al., 2015). The cost of replacing teeth due to sports-related trauma has resulted in almost \$500 million each year (Kracher & Knowlton, 2017). In addition to the research showing how effective mouthguards are, they are also easy to use, inexpensive, and readily available (Collins et al., 2015). However, unless required by organizations, the ADA has found that mouthguard use is low, despite research showing benefits of reducing injury (2019).

Examples given by the ADA for reasons for lack of mouthguard use include cost, not required, or lack of awareness for potential benefits (2019). Previous studies noted other reasons for lack of use, including a concern that mouthguards will inhibit performance, discomfort, belief of having a low risk for injury, and belief that the mouthguards are ineffective in protection (Collins et al., 2015). Some athletes complain

that athletic mouthguards make it difficult to breath during performance (Kracher & Knowlton, 2017).

Although mouthguards can benefit all athletes involved in contact sports, only some sports have required the use of them. The National Collegiate Athletic Association [NCAA] only requires mouthguard use for football, lacrosse, and field and ice hockey (ADA, 2019). Even with the mouthguard requirement, it has been found that only two-thirds of adolescent football athletes are compliant in wearing mouthguards (Kracher & Knowlton, 2017). In sports that do not require mouthguard use, like soccer, baseball and softball, only 7% of athletes wear mouthguards (Kracher & Knowlton, 2017). Basketball has the highest dental injury rate due to the close contact of athletes and the speed of the game; however, there is no mouthguard requirement (Kracher & Knowlton, 2017).

Statement of the Problem

Studies on this topic over the years have found that the impact of mouthguard use has an effect on all ages, genders, skill levels, contact, and even limited and noncontact sports participants (ADA, 2019). With participation in competitive sports growing at all levels, and over 500,000 participating collegiate athletes, there will also be an increase in injury exposure (Gould et al., 2016). Kracher & Knowlton (2017), discuss the need for more regulations of mouthguard use and an increase in educating the sports communities. Inadequate interventions focused on awareness and promoting mouthguard use in the past have led to an absence of mouthguard behaviors in athletes (Collins et al., 2015). Targeted interventions that are evidence-based on what athletes understand about mouthguards and the risks of not using them could increase overall mouthguard

prevalence (Collins et al., 2015). A systematic review found that community-based interventions encouraging mouthguard behaviors need to be in the form of educational approaches, supplying equipment at no or little cost through promotional activities, and/or environmental or policy approaches to be effective in increasing mouthguard use (The Community Guide, 2013).

Significance of the Problem

Collins et al. (2015), revealed in a study that even with research showing the high benefits of mouthguard use, they are underutilized, and past interventions promoting them have failed. This leaves questions on whether more information about collegiate athlete attitudes towards mouthguard use, perceptions of orofacial trauma, barriers hindering mouthguard use, and behavioral influences is needed for interventions to make a greater impact.

College athletes come from a variety of backgrounds, which impacts the amount of information they have been given on injury protection in their earlier years of being athletes. This study can be beneficial in showing the range of risk perceptions from not wearing mouthguards and the importance of preventing orofacial injuries among collegiate athletes. Previous studies have had a focus on mouthguard use for youth and adolescent athletes (Galic et al., 2018; Collins et al., 2015). Parents have the important role of attaining mouthguards and encouraging use for young athletes (American Academy of Pediatric Dentistry, 2020). Parent responsibility may not be the same for collegiate athletes. This study will help fill gaps in the literature on the perceptions and attitudes collegiate athletes have towards mouthguard use. By studying mouthguard use

and factors that influence or inhibit mouthguard use, this study could help determine areas of need and help create future targeted health education interventions that are evidenced-based, which could lead to an increase in mouthguard use and a decrease in orofacial injuries. These factors found in this research, could also have the potential to impact mouthguard use in athletes of other ages and involved in other levels of contact sports.

Purpose Statement

The purpose of this study is to determine the attitudes, perceptions, self-efficacy, and behaviors of mouthguard use among collegiate athletes at a large Midwestern university.

Theoretical Framework

The Health Belief Model is an individual health behavior model that focuses on health motivation (Rimer & Glanz, 2005). This model looks at how individuals are influenced to act in behaviors based on their susceptibility of disease and their perceptions of the benefits (Rimer & Glanz, 2005). Six constructs make up the Health Belief Model to determine what influences the behaviors of people to act in prevention (Rimer & Glanz, 2005). These constructs include *perceived susceptibility*, *perceived severity*, *perceived benefits*, *perceived barriers*, *cues to action*, and *self-efficacy* (Rimer & Glanz, 2005). The Health Belief Model can be appropriate in explaining the behaviors of mouthguard use in collegiate athletes by understanding their perceptions of mouthguards.

Research Questions

1. How often are collegiate athletes at a large Midwestern university wearing mouthguards?
2. What are the perceived risks of orofacial trauma among collegiate athletes at a large Midwestern university?
3. What are the perceived benefits of mouthguard use among collegiate athletes at a large Midwestern university?
4. Who influences collegiate athlete mouthguard use at a large Midwestern university?
5. What are the perceived barriers of mouthguard use among collegiate athletes at a large Midwestern university?
6. What is the level of self-efficacy among collegiate athletes regarding mouthguard use?

Limitations

The following limitations should be considered for this study.

1. Timing of the study. Some of the sports will not be in competition season when the survey is delivered. Although still in training, not being in their competitive season can alter the way they answer the questions. Their answers may reflect behaviors they want or need to change versus their current behaviors.
2. The sample size of the individuals surveyed will be small compared to the total number of collegiate athletes participating in sports today. This makes it difficult to state that the results are generalizable to the total population of collegiate athletes.

Delimitations

1. Male and female athletes ages 18 through 24, participating basketball, football, hockey, volleyball, wrestling, soccer, softball, and baseball will be surveyed at one Midwestern university. These are the sports of interest because they are classified as a level of contact sport.
2. The sample of individuals will come from one large Midwestern university. Even though this institution follows rules and guidelines of the NCAA, the data will be limited to the influences of the athletic administration and coaches specific to this school, which can influence student athlete behaviors.

Assumptions

For the purpose of this study, it was assumed that participants will answer truthfully and to the best of their knowledge without pressure or judgement and can withdraw from the study at any time.

Definitions of Terms

- Collision sports: A sport where athletes hit or collide with each other or objects with great force on purpose (Segen's Medical Dictionary, 2012a). Example- football and ice hockey
- Contact sports: A sport in which the participants necessarily come into bodily contact with one another (Lexico, 2019a). Example- wrestling. Can be referred as collision, contact, or limited contact.

- Limited contact sports: “A sport in which the rules are designed to prevent intention or unintentional contact between players” (Segen’s Medical Dictionary, 2012b, para. 1). Examples- soccer, volleyball, baseball, softball, basketball
- Mandibular arch: lower jaw (American Dental Association, 2020b)
- Maxillary arch: upper jaw (American Dental Association, 2020b)
- Mouthguards: mouth protectors that help cushion a blow to the face during contact or collision (Mouth Healthy, 2019)
- Orofacial: relating to the mouth and face; located on or directed at the mouth and that part of the face adjacent to it (Lexico, 2019b)
- Properly fitted mouthguard: mouthguards that “fit accurately, stay in position during impact, and redistribute the impact’s energy” and is fitted under a dentist’s supervision (Academy for Sports Dentistry, 2019, para. 1)
- Temporomandibular joint: “acts like a sliding hinge, connecting your jawbone to your skull” (Mayo Clinic, 2019, para. 1)
- Tooth avulsion: “entire tooth is knocked out” (Kracher & Knowlton, 2017, p. 3)
- Tooth extrusion: “the tooth is displaced partially out of the socket by the trauma” (Kracher & Knowlton, 2017, p. 5)
- Tooth intrusion: tooth is driven into the jawbone (Kracher & Knowlton, 2017)

Chapter II: Review of the Literature

Introduction

This chapter will review the purpose and functions of athletic mouthguards in relation to contact sports, going into detail about the different types of mouthguards, as well as the frequency of use. Different types of orofacial trauma related to contact sport injuries will be reviewed to better understand the benefits of mouthguard use during training and competition. This chapter will also review factors that impact the use of mouthguards, including barriers and influences. The Health Belief Model will be reviewed to help determine the perceptions college athletes have on mouthguard use.

Sports-Related Orofacial Trauma

Orofacial trauma is a broad term relating to a variety of injuries including tooth fractures, tooth avulsion (displacement), laceration of the soft tissue, facial bone fractures, and injuries to the temporomandibular joint (Bergman, Ortolan, Žarković, Viskiđ, & Mehulić, 2017). In previous studies, it has been found that 31% of orofacial trauma has been the result of sports participation, and 50% of those were oral and dental injuries (Bergman et al., 2017). Dental trauma can include crown fracture, root fracture, tooth extrusion, tooth intrusion, tooth avulsion, loss of one or several teeth, fracture of the alveolar process, and temporomandibular joint injuries (Sathyaprasad, Philip, Vijaynath, Neethu & Rekha, 2018). The most commonly reported tooth injuries are coronal (crown of tooth) fractures and tooth avulsions (removal from socket) (American Dental Association [ADA], 2019). It has been noted in previous studies that 50-90% of tooth

trauma is in the upper front teeth (Tuna & Ozel, 2014). Along with the pain experienced during injuries, oral and dental trauma can also cause esthetic, functional, psychological, and economic problems (Dursun, Ilarslan, Ozgul, & Donmez, 2015). It has been suggested that the injury of an avulsed tooth as a teenager can have \$20,000 in costs in the lifetime of the athlete (Council of Clinical Affairs, 2018). Deformations, including “abnormality of primary teeth exfoliation, failure of eruption of the permanent teeth, hypoplasia or other color changes in teeth, painful abscesses that result in tooth loss, dental crowding, and gaps in the mouth” are all widespread consequences that can have a lasting effect on physical, psychological, and social aspects (Sathyaprasad et al., 2018, p. 126). The results of these injuries can create problems with function, esthetics, and psychological well-being throughout the life of the athlete (Tuna & Ozel, 2014).

Oral and dental injuries have been most commonly linked to sports participation, according to the Surgeon General (Collins, McKenzie, Roberts, Fields, & Comstock, 2015). Previous research has found that 31% of dental injuries in adults and children is related to sports participation (Tuna & Ozel, 2014). There is a high risk of dental injuries in full-contact sports such as boxing, football, hockey, rugby, and lacrosse; however, there are also risks of dental injuries in sports that are not considered full-contact such as basketball, baseball, and softball (Collins et al., 2015). Previous studies have found that basketball and baseball have the highest dental injury rates (Collins et al., 2015). Soccer is not considered a collision or full contact sport; however, these athletes have a high risk for orofacial injuries due to the use of their head, head to head contact, and elbow to face contact (Dursun et al., 2015).

Dental injuries related to sports can be caused from falls, collisions or contact from other players, hard surfaces, or sports equipment (Gould et al., 2016). The speed of the sport also influences the risk of dental trauma (Dursun et al., 2015). Several factors can affect the type of trauma that can occur, including the “direction of force, the force of impact, and the resilience of the impacting object” (Tuna & Ozel, 2014, p. 778). The types of sports being played, the degree of contact, age, gender, and geographical location of the athlete all have a different effect on the prevalence of orofacial injuries (Sathyaprasad et al., 2018).

Mouthguards

Although mouthguards cannot eliminate all orofacial trauma, they can have a significant role in reducing the incidences (Gould et al., 2016). In previous studies, there was found to be an 82%-93% less chance of orofacial trauma when mouthguards were used (ADA, 2019). According to the Academy for Sports Dentistry (2019), an athletic mouthguard can be defined as “a resilient device or appliance placed inside the mouth to reduce injuries particularly to the teeth and surrounding structures” (para. 3). In 2010, the Academy for Sports Dentistry changed the term ‘mouthguard’ to ‘properly fitted custom mouthguard’ (Gould et al., 2016). Properly fitted custom mouthguards are fabricated and fitted by a dentist and “fit accurately, stay in position during impact, and redistribute the impact’s energy” (ASD, 2019, para. 3).

Purpose and function of mouthguards. Mouthguards are appliances that typically cover the upper teeth during sports activities to cushion contact to the face and to help protect the teeth and jaw from injuries, as well as soft tissue trauma to the lips,

tongue, and face (Mouth Healthy, 2019). Mouthguards can also be beneficial in supporting structures around areas where teeth are missing (Young, Marcias & Stephens, 2015).

Direct force on the oral structures can be prevented by mouthguards acting as an impact-absorption device (Tuna & Ozel, 2014). Mouthguards can be beneficial in reducing orofacial trauma using several mechanisms. Fractures and dislocation of teeth can be prevented by the mouthguard separating the mandibular and maxillary arches, which also absorbs and redistributes the shock caused from powerful impact (Goswami, Kumar, & Bhushan, 2017). Mandibular bone fractures can be prevented by the mouthguard absorbing and redistributing shock and stabilizing the mandible during forceful jaw closure (Goswami et al., 2017). Mouthguards can also act as a cushion to distribute forceful impacts, by separating teeth from soft tissue, which can help reduce soft tissue laceration and bruising (Goswami et al., 2017). No matter how the impact occurs, energy is created upon impact which is absorbed in the opposing structures and leads to greater damage (Aaronson, 2017). Mouthguards act as a cushion to redistribute and reduce these forces transmitted to the teeth (Aaronson, 2017).

Mechanical properties of mouthguards are not well defined (Lloyd et al., 2017). There are several basic requirements recognized by the American College of Prosthodontist that will make mouthguards more protective and effective when worn by athletes (American College of Prosthodontist [ACP], 2015). These requirements include enclosure of all maxillary teeth, comfort, retentive and proper fit, and use of a material that has been approved by the US Food and Drug Administration to reduce the force of

impact to orofacial structures (ACP, 2015). These requirements are similar to the ADA Council of Scientific Affairs and the Council on Advocacy for Access and Prevention, which also states that the material should be resilient, easy to clean, and should have “high-impact energy absorption and reduce transmitted forces upon impact” (ADA, 2019, para. 7). Properly fitted mouthguards with a thickness of at least three millimeters are effective in reducing impactive force to teeth (Lloyd et al., 2017). Properly fitted mouthguards should be fitted by a dentist (ASD, 2019). Other noted requirements include balanced occlusion on both right and left sides of the mouth and the mouthguard should extend to the back portion of the permanent molars (Lloyd et al., 2017). Mouthguards are considered nontoxic, have minimal moisture absorption and elastic property, and are easy to manufacture, making it a highly recommended protective appliance during sports activities (Sathyaprasad et al., 2018).

Types of mouthguards. Mouthguards can be classified into three types: custom fit, mouth-formed, and stock (Mouth Healthy, 2019). Stock mouthguards are prefabricated, are sold over the counter, and are the least expensive, which makes them the most common mouthguards used (ADA, 2019). Stock mouthguards are typically made from polyurethane, a copolymer of vinyl acetate, or ethylene (ACP, 2015). The disadvantages of these mouthguards are that they are available in a limited amount of sizes, which makes them bulky, have low retention, and are difficult to speak and breathe when worn (Mouth Healthy, 2019). Because of the inability to get a perfect fit, stock mouthguards can shift during contact, and forces cannot be evenly distributed across the teeth and soft tissues (Aaronson, 2017). These characteristics make stock mouthguards

uncomfortable to wear, leading to athletes not wearing them (Kracher & Knowlton, 2017). Previous research has advised that these are the least effective in preventing orofacial trauma (ADA, 2019).

Mouth-formed mouthguards, often called ‘boil and bite’, are self-adjusted by the athletes by putting it in hot water to soften the material and forming it around the teeth using the athlete’s fingers and tongue (ADA, 2019). Even though these are a closer fit than stock mouthguards, they cannot be considered properly fitted (Gould et al., 2016). These mouthguards are also available to purchase over the counter and are typically made of ethylene-vinyl acetate (ACP, 2015). They are also inexpensive; however, they do not keep their shape over time and can still feel bulky (ACP, 2015). The thickness of the material in mouth-formed mouthguards is not evenly dispersed across the teeth, which creates variations of protection, support, and force distribution (Aaronson, 2017). Previous studies have found that boil and bite mouthguards are not the best choice while participating in sports because of the risk of them being dislodged and airway blockage during play (Lloyd et al., 2017).

Custom fit mouthguards are made from impressions of the athlete’s mouth in a professional dental setting (ADA, 2019). Vacuum-forming or heat pressure lamination techniques are used on dental models of the athlete’s mouth to create the custom fit mouthguards (Tuna & Ozel, 2014). Because they are fabricated individually, this type of mouthguard is more expensive (Mouth Healthy, 2019). Custom fit mouthguards can range in price ranges from \$60 to \$285 (American Academy of Pediatric Dentistry, 2020). Regarding the cost barrier, a position statement by the American Academy of

Pediatric Dentistry (2019) has encouraged to continue with research to develop more cost effective mouthguards, encourage support from third party payors to improve access to mouthguard services, and to educate dental students in the fabrication of custom fit mouthguards. Athletes tend to be more compliant in wearing these mouthguards due to comfort, the ability to better communicate, and the ability able to breathe easier while wearing them (Kracher & Knowlton, 2017). These mouthguards are more durable than over-the-counter types (Altschuler, 2014).

Frequency of mouthguard use. Previous research of a variety of ages and sports showed that a significant percentage of athletes are aware of the importance of wearing mouthguards to help prevent orofacial trauma, but there is a low percentage of athletes who wear them (Chen, Buggy, & Kelly, 2019). Even though the prevalence of orofacial trauma is still high in limited or non-contact sports, the use of mouthguards is low unless mandated by organizations (ADA, 2019).

In one study, even though most of the athletes surveyed were aware that mouthguard use is beneficial in decreasing the risk of sports-related dental injuries, only 41% used them (Galic et al., 2018). Galic et al. found that only 7.7% of youth water polo and 5.7% of handball players indicated mouthguard use during these activities (2018). In a study looking at basketball players, 95% of the athletes reported that mouthguards were protective, but only 6.3% used them (Tiryaki et al., 2017). Bergman et al. (2017), found in a study on professional handball players that 67% of athletes were aware that mouthguards prevented dental trauma; however, only 28% wear them regularly. In another study by Goswami, Kumar, and Bhushan (2017), many youth and adolescents

participating in a variety of different sports, including football, basketball, and volleyball, were surveyed about their knowledge of mouthguards, finding that 71.3% were aware that mouthguards prevented dental trauma. However, 48.6% of the participants did not wear mouthguards, with the excuse that their coach did not recommend that they should wear one.

Collins et al. (2015), completed a study on mouthguard use among high school athletes participating in basketball, softball, and baseball. Results of this study indicated that only 12.3% of those athletes surveyed reported the use of mouthguards sometimes or every time during practice or competition (Collins et al., 2015). Dursen et al. (2015), focused on amateur soccer players, finding that 78.3% did not know about the benefits of mouthguard use, and 97.1% of these athletes had never used a mouthguard.

Factors Impacting Use of Mouthguards

Recommendations and requirements of mouthguard use. The ADA has created a list of activities where the use of mouthguards is recommended, which includes acrobatics, handball, sky diving, basketball, ice hockey, soccer, bicycling, inline skating, softball, boxing, lacrosse, squash, equestrian events, martial arts, surfing, extreme sports, racquetball, volleyball, field events, rugby, water polo, field hockey, shot-putting, weight lifting, football, skateboarding, wrestling, gymnastics, and skiing (Kracher & Knowlton, 2017). The American Academy of Pediatric Dentistry recommends that all youth who participate in organized sports should wear mouthguards (Kracher & Knowlton, 2017). The use of properly fitted custom mouthguards is recommended by the Academy for Sports Dentistry for those who participate in collision and contact sports (ASD, 2019).

The ASD also encourages and supports mandatory custom mouthguard use by the governing bodies of all collision and contact sports, to protect athletes from orofacial injuries (ASD, 2019). Although only some sports are mandated to wear athletic mouthguards, some states have successfully added additional sports, such as soccer, wrestling, and basketball, to the mandated mouthguard use list, including Maine, Massachusetts, Minnesota, and New Hampshire (Council on Clinical Affairs, 2018).

The National Collegiate Athletic Association's (NCAA) latest Sports Medicine handbook states that collegiate athletes should be educated on the best properly fitted mouthguard for them and should be regularly overseen by medical staff personnel (NCAA, 2014). The NCAA Sports Medicine Handbook also states, "the coach, student-athlete and medical staff need to be educated about the protective functions of a mouthguard, and the game rules regarding mouthguard use must be enforced" (NCAA, 2014, p. 112). Although there is significant research on the benefits of mouthguards in the prevention of orofacial trauma, the NCAA only requires use for field hockey, football, ice hockey, and lacrosse (NCAA, 2014). The mandates require the mouthguards to cover all the upper teeth and are required during regular season competition and NCAA championships (NCAA, 2014). Football also has the requirement that the mouthguard cannot be transparent or white, and needs to be a visible color (NCAA, 2014).

The university of interest for this study follows the policies and guidelines of the NCAA stating that "all athletic department personnel have a responsibility to become knowledgeable of applicable NCAA rules and regulations" (Minnesota State University

Department of Athletics, 2015, p. 8). It is also noted that coaches are then responsible for sharing rules and regulations to their student athletes (Minnesota State University Department of Athletics, 2015)

The National Federation of State High School Associations [NFHS] (2018) mandates that mouthguards be utilized for football, field hockey, ice hockey, lacrosse and wrestling (when wearing braces), also recommending that the mouthguards should be properly fitted. Even though some sports have mandated requirements for mouthguard use, studies show there is still a low prevalence of use (Kracher & Knowlton, 2017). For example, only two-thirds of athletes who play football wear mouthguards during participation, even though they are required to (Kracher & Knowlton, 2017). However, these numbers are higher than the 7% of soccer, baseball, and softball athletes who indicate mouthguard use when it is not required of them (Kracher & Knowlton, 2017).

Barriers for mouthguard use. In previous studies, when custom fit mouthguards were compared to boil and bite, there was not much of a difference with orofacial injury prevention, which might be because they are made from a similar material (Gould et al., 2016). However, the difference is in the comfort level; athletes find that properly fitted mouthguards are more comfortable to wear, which also increases compliance in wearing them during activities (Gould et al., 2016).

Bulkiness, stability, hardness, breathing difficulty, speaking difficulty, oral dryness, and nausea are some of the reasons that athletes are not compliant in wearing mouthguards (Gould et al., 2016). In the study by Collins et al. (2015), the most common reasons for adolescents to not wear mouthguards while participating in sports include not

being required to, difficulty talking or breathing while use, coaches do not tell them to wear mouthguards, and no one else on the team wears one. This same study made the connection that adolescents tend to make decisions inconsistent to their “long-term best interests, including risk taking and failing to adopt preventative measure to promote long-term health” (Collins et al., 2015, p. 7).

Past studies have found that the use of custom fit mouthguards decreases problems with breathing and improves durability of the device (Tanaka et al., 2015). In a study involving rugby players by Tanaka, et al. (2015), they found a significant decrease in orofacial injuries when mouthguards were used in training. This study also made a correlation between mouthguards and breathing problems, finding that rugby players who wore custom fit mouthguards did not have problems with breathing while wearing them (Tanaka et al., 2015).

In a study by Galic et al. (2018), it was found that 44% of athletes participating in youth water polo, karate, taekwondo and handball felt that mouthguards were unnecessary. This specific group of athletes, however, had never experienced dental trauma (Galic et al., 2018). This number was significantly higher than those who had a history of dental trauma, finding that only 4.4% of those athletes felt that mouthguards were unnecessary (Galic et al., 2018). In this same study, 97.3% of youth participants indicated that they were aware that mouthguards prevent dental trauma, and 93.9% considered it effective in preventing dental trauma (Galic et al., 2018). Another study by Collins et al. (2015), found that 22.6% of the high schoolers involved in basketball,

softball, and baseball that they surveyed were unaware of the need to wear a mouthguard to prevent dental injuries.

Custom fit mouthguards are the preferred choice of mouthguards when it comes to most protective and effective; however, the cost can be a barrier for many athletes (Council of Clinical Affairs, 2018). Custom fit mouthguards can range from \$60 to just under \$300 (Council of Clinical Affairs, 2018). This can be a limiting factor for parents with young athletes and for college athletes with limited resources. Interventions may need to focus on promotional activities to increase access to properly fit mouthguards for these young athletes (The Community Guide, 2013).

Influences on mouthguard use. It has been discussed in previous studies that dental professionals and individual practitioners should play a prominent role in promoting mouthguard use during activities, as well as advocating policy development in promoting mouthguard use in school sports and athletic organizations (Tanaka et al., 2015). In a study by Tuna and Ozel (2014), they discussed that the increase in athletic activities in youth, adolescents, and beyond gives reason for the importance of coaches, sports administrators, and other sports personnel to be involved in mouthguard compliance. This study also went further in explaining how promotion of mouthguard use for children and adolescents to decrease sports-related orofacial injuries can be a collaboration of several individuals, including athletes, coaches, dentists, pediatricians, and other professionals (Tuna & Ozel, 2014). Sathyaprasad et al. (2018), stated that it should be the combined duty of several professionals to encourage mouthguard use. The National Athletic Trainers Association recommends that athletes should be encouraged

by athletic trainers, coaches, and parents to wear properly fitted mouthguards during sports activities (Gould et al., 2016).

Although athletes are greatly influenced by the attitudes and recommendations of mouthguard use by their coaches, parents also feel like they have an equal role in influencing their child (Council of Clinical Affairs, 2018). Previous studies, however, have found that parents do not feel confident in their knowledge on the benefits of mouthguard use, and have only shown moderate support for this type of protective gear (Council of Clinical Affairs, 2018). Regarding coaches, studies have found conflicting results with their awareness about mouthguard benefits and their support for use. Tiryaki et al. (2017) studied mouthguard awareness of basketball athletes and their coaches, finding that 98% of coaches believed mouthguards prevented orofacial trauma, but only 47% recommended the use of them to their players. In a study looking at the attitude and awareness of physical trainers regarding mouthguards by Sathyaprasad et al. (2018), it was found that 58% of the physical trainers were aware of mouthguards, but that 64% of them felt mouthguards have a negative influence on athletic performance.

The promotion of mouthguard use needs to be a collaboration of many individuals, including coaches, dentists, physicians, and other professionals, to encourage athletes (Tuna & Ozel, 2014). Some studies have stressed that coaches and players need education on the high risk of oral injuries during contact sports to help increase the importance of preventing orofacial trauma (Tanaka et al., 2015). Dentists can also play a role in ensuring compliance over the long-term participation, providing proper education

to the athletes, and adjusting mouthguards when users report difficulty breathing (Tanaka et al., 2015).

Health Belief Model

The Health Belief Model is a behavioral change model that suggests “a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior” (LaMorte, 2019, para.1). Health motivation is the focus of the Health Belief Model (Rimer & Glanz, 2005). The constructs of this model are *perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy* (Rimer & Glanz, 2005). Studying individuals using key constructs from the Health Belief Model will help determine the perceptions college athletes have on athletic mouthguard use.

Perceived susceptibility can be used to determine the perceptions on the risk of not wearing mouthguards, including oral and dental injuries. Perceiving how serious these risks of orofacial injuries is an example of *perceived severity*. The attitudes and understanding of why it is important to wear mouthguards to prevent orofacial injuries represent *perceived benefits*. *Perceived barriers* take a closer look at the barriers that keep individuals from participating in the behavior of wearing mouthguards. Those people or things that influence the healthy behavior of mouthguard use is an example of *cues to action*. And *self-efficacy* represents how confident an individual is making the decision to wear mouthguards and properly using them during sports activities.

Understanding the individual's perceptions on mouthguards and orofacial trauma

can determine how confident they are in participating in this preventative behavior and will assist in seeing how vulnerable they are to the potential risks of not using mouthguards.

Summary

Properly fitted mouthguards are the best available protective appliance that can help reduce the incidence and severity of orofacial trauma related to sports participation (ADA, 2019). Sports related dental trauma can have a lasting effect on athletes throughout their lives, including esthetic, functional, psychological, and economic problems (Dursun et al., 2015). Even though there is significant evidence of the benefits in protecting athletes, mouthguards are underutilized and not consistently supported by key influencers, including coaches, parents, and dentists. Previous interventions in promoting mouthguard use seem to be failing (Collins et al., 2015). This study will focus on the perceptions and attitudes of orofacial trauma and mouthguard use among collegiate athletes, as well as barriers and influencers that are impacting use. The Health Belief Model will be implemented by identifying how some of its' constructs can be used to determine the intentions of collegiate athletes utilizing mouthguards during training and competition. The information found in this study can help in developing more effective interventions in promoting mouthguard use.

Chapter III: Methodology

Introduction

The purpose of this study is to determine the attitudes, perceptions, self-efficacy and behaviors of athletic mouthguard use among athletes participating in collegiate sports. This study is aimed to answer the following questions:

1. How often are collegiate athletes at a large Midwestern university wearing mouthguards?
2. What are the perceived risks of orofacial trauma among collegiate athletes at a large Midwestern university?
3. What are the perceived benefits of mouthguard use among collegiate athletes at a large Midwestern university?
4. Who influences collegiate athlete mouthguard use at a large Midwestern university?
5. What are the perceived barriers of mouthguard use among collegiate athletes at a large Midwestern university?
6. What is the level of self-efficacy among collegiate athletes regarding mouthguard use?

This chapter will go into detail about the research design that will be used to answer the above research questions. The population and sample techniques will be explained for the distribution of the survey. This chapter will then focus on instrumentation techniques, data collection strategies, and data analysis that will be used.

Research Design

This study used a descriptive, cross-sectional, correlational design, focusing on studying collegiate athletes at one specific point in time, to determine their current attitudes, perceptions, self-efficacy, and behaviors of mouthguard use during collegiate sports participation. This study was considered non-experimental research, meaning the researcher will “not manipulate any variables” (Statistics Solution, 2019, para. 2). Using this type of research helped to test and describe the relationship between collegiate athletes’ perceptions of mouthguards and behaviors of mouthguard use during practices and competitions.

Participants

The population for this survey was a sample of men and women collegiate athletes participating in basketball, football, hockey, volleyball, soccer, wrestling, softball, and baseball at one large Midwestern university. The study targeted collegiate athletes to collect data on their attitudes, perceptions, and behaviors of mouthguard use during practice and competition. Upon IRB approval, the athletes invited to take part in the study were asked because of their participation in a level of contact sport (Appendix B). The sports included were considered collision (football, ice hockey), contact (basketball, soccer, wrestling) or semi-contact (volleyball, baseball, softball). However, not all these sports contributed to the study due to lack of athlete contact. Both male and female students were surveyed. Participants were in the age range from 18 through 24+. Participants were categorized by their year of athletic eligibility as freshmen, red shirt freshmen, sophomore, junior, or senior year. Demographic questions were asked to

describe the students taking the survey. Because of the variety of student ages in college, those not in this age group or beyond senior class rank, but who are still participating in collegiate sports, were not dismissed from the study.

The sampling technique that was used in this study was convenience sampling, which can be defined as “a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in the study” (Research Methodology, 2019, para. 1). Convenience sampling was appropriate for this study because it allows for a large amount of data to be collected in a short amount of time. This study was specifically focused on collegiate athletes at one university, making it acceptable to select these athletes when they are available, either during practices or team meetings. There are approximately 270 student athletes involved in the contact sports of interest for this study at this large Midwestern university. Krejcie and Morgan developed a formula to determine an adequate sample size to represent the target population of a study (Krejcie & Morgan, 1970). Based on Krejcie and Morgan’s table for determining sample size, for a total population of 270 athletes involved in contact sports, 159 collegiate athletes was the goal in order to be an appropriate sample size for the study (Krejcie & Morgan, 1970).

Instrumentation

The instrument used in this study was a 4-page survey, measuring quantitative measures based on self-report from participants. There were 12 total questions and were formed using the Health Belief Model framework. There are several previous studies that have focused on the topic of mouthguard awareness, attitudes, and behaviors; however,

there are not any previous studies found that have used the Health Belief Model framework on this topic, with the focus on perceptions. The question responses included both Likert type items and multiple-choice options.

The survey was designed primarily from two previous studies by Galic et al. (2018) and Collins et al. (2015). Permission was received to use these instruments to design the survey for this study (Appendix A). Some questions were adjusted by the researcher. The portions of these instruments used to design the survey for this study did not state reliability or validity.

The study “Knowledge and attitudes about sports- related dental injuries and mouthguard use in young athletes in four different contact sports—water polo, karate, taekwondo and handball” by Galic et al. (2018) aimed their study on occurrences of dental trauma in young athletes participating in water polo, karate, taekwondo, and handball, as well as assessing their attitudes and habits of mouthguard use. Statements from question #8 were adjusted from the Galic et al. (2018) study, and used the constructs *perceived susceptibility*, *perceived benefits*, and *self-efficacy* from the Health Belief Model to design this question.

The study “Mouthguard BITES (Behavior, Impulsivity, Theory Evaluation Study): What Drives Mouthguard Use Among High School Basketball and Baseball/Softball Athletes” by Collins et al. (2015) focused on the knowledge, attitudes, beliefs, and behaviors regarding mouthguard use in high school basketball, baseball, and softball players. Questions # 1-7 were adjusted from the Collins et al. (2015) study and

used the Health Belief Model constructs *perceived barriers* and *cues to action* to design these questions, as well as behaviors of mouthguard use.

Two additional questions were asked regarding the type of mouthguard participants have and awareness of ‘properly fitted mouthguards’. The final four questions were structured items measuring demographic variables. These questions included age, gender, year of athletic eligibility, and the sport that the athlete currently played at the collegiate level.

Data Collection

Data was collected through a paper survey at one large Midwestern university during athletic meetings or practices. Coaches staffs were contacted through email and asked permission to take some time out of their meetings, practices, or workouts for the athletes to take the survey, which took less than 15 minutes. Access was not granted to survey athletes participating in wrestling, men’s hockey, and volleyball during the time of survey distribution. It was explained to the athletes that the purpose of the survey was to determine their attitudes, perceptions, self-efficacy, and behaviors of mouthguard use. It was explained to the athletes that survey participation was voluntary and at any time they could stop taking the survey. Also, it was explained that the survey results would not affect the relationship with the university and that there were no incentives by volunteering to participate in the study. Participation in the survey was anonymous and responses are kept confidential. Informed consent was presented at the beginning of the survey in written form and was verbally read by the researcher prior to study participation.

Data Analysis

Statistical Package for the Social Sciences (SPSS), Version 26.0 was used to analyze the data (IBM Corp, 2019).

1. *How often are collegiate athletes at a large Midwestern university wearing mouthguards?*

Answered using survey questions 2-3, ordinal data, analyzed using descriptive statistics including frequencies and percentages.

2. *What are the perceived risks of orofacial trauma among collegiate athletes at a large Midwestern university?*

Answered using survey questions 8B and 8C, ordinal data, analyzed using descriptive statistics including frequencies and percentages.

3. *What are the perceived benefits of mouthguard use among collegiate athletes at a large Midwestern university?*

Answered using survey questions 8D and 8E, ordinal data, analyzed using descriptive statistics including frequencies and percentages.

4. *Who influences collegiate athlete mouthguard use at a large Midwestern university?*

Answered using survey questions 6-7, nominal data, analyzed using descriptive statistics including frequencies and percentages.

5. *What are the perceived barriers of mouthguard use among collegiate athletes at a large Midwestern university?*

Answered using survey questions 4-5, nominal data, analyzed using descriptive statistics including frequencies and percentages.

6. *What is the level of self-efficacy among collegiate athletes regarding mouthguard use?*

Answered using survey question 8G, ordinal data, analyzed using descriptive statistics including frequencies and percentages.

Table 1

Table of Specifications

RESEARCH QUESTION (RQ)	SURVEY ITEMS	LEVEL OF DATA ORDINAL, NOMINAL, RATIO/INTERVAL	ANALYSIS NEEDED TO ASSESS RQ
HOW OFTEN ARE COLLEGIATE ATHLETES AT A LARGE MIDWESTERN UNIVERSITY WEARING MOUTHGUARDS?	Survey questions 2-3	Ordinal	Descriptive statistics, frequencies and percentages
WHAT ARE THE PERCEIVED RISKS OF OROFACIAL TRAUMA AMONG COLLEGIATE ATHLETES AT A LARGE MIDWESTERN UNIVERSITY?	Survey questions 8B- 8C	Ordinal	Descriptive statistics, frequencies and percentages
WHAT ARE THE PERCEIVED BENEFITS OF MOUTHGUARD USE AMONG COLLEGIATE ATHLETES AT A	Survey questions 8D- 8E	Ordinal	Descriptive statistics, frequencies and percentages

LARGE MIDWESTERN UNIVERSITY?			
WHO INFLUENCES COLLEGIATE ATHLETE MOUTHGUARD USE AT A LARGE MIDWESTERN UNIVERSITY?	Survey questions 6-7	Nominal	Descriptive statistics, frequencies and percentages
WHAT ARE THE PERCEIVED BARRIERS OF MOUTHGUARD USE AMONG COLLEGIATE ATHLETES AT A LARGE MIDWESTERN UNIVERSITY?	Survey questions 4-5	Nominal	Descriptive statistics, frequencies and percentages
WHAT IS THE LEVEL OF SELF-EFFICACY AMONG COLLEGIATE ATHLETES REGARDING MOUTHGUARD USE?	Survey question 8G	Ordinal	Descriptive statistics, frequencies and percentages

Summary

In this cross-sectional study, athletes participating in collegiate sports were surveyed to determine their attitudes, perceptions, and behaviors of mouthguard use, using the Health Belief Model framework, at one large Midwestern university. The sample of students were selected through convenience sampling during practices and meetings.

Chapter IV: Findings of the Study

Introduction

The purpose of this study is to determine the attitudes, perceptions, self-efficacy, and behaviors of mouthguard use among collegiate athletes at a large Midwestern university. The study attempted to answer the following research questions:

1. How often are collegiate athletes at a large Midwestern university wearing mouthguards?
2. What are the perceived risks of orofacial trauma among collegiate athletes at a large Midwestern university?
3. What are the perceived benefits of mouthguard use among collegiate athletes at a large Midwestern university?
4. Who influences collegiate athlete mouthguard use at a large Midwestern university?
5. What are the perceived barriers of mouthguard use among collegiate athletes at a large Midwestern university?
6. What is the level of self-efficacy among collegiate athletes regarding mouthguard use?

Participants

The participants in this study includes athletes involved in contact sports at one large Midwestern university. The contact sports of interest included basketball, football, soccer, hockey, softball, baseball, wrestling, and volleyball. A total of 181 collegiate

athletes were surveyed from the sports of basketball, football, soccer, softball, baseball, and women's hockey. A total of 176 surveys were used for analysis. Five surveys were not included in analysis due to the number of missing responses on the survey. The participants ranged in ages from 18-24+, with 46.6% (n= 82) being between 20-21 years of age. Participants included both male and female athletes, with majority being males at 62.5% (n= 110). The year of athletic eligibility for the participants was evenly distributed and included freshmen, redshirt freshmen, sophomore, junior, and senior. The collegiate sports involved in the study consisted of football (n= 61, 34.7%), baseball (n= 35, 19.9%), basketball (n= 30, 17.0%), soccer (n= 26, 14.8%), softball (n= 13, 7.4%) and hockey (n= 9, 5.1%).

When asked if participants had a mouthguard, almost 60% responded they did not (n = 105). Participants who responded they did have a mouthguard specified the mouthguard type as 'off the shelf, bite and boil', 'custom-fitted', or 'unsure of type'. Of those who did have a mouthguard, majority responded they have an 'off the shelf, bite and boil' type (n= 48, 27.3%). An understanding of what 'properly-fitted mouthguards' are, and the belief of mouthguard requirements were assessed using a Likert-type format. The demographic characteristics represented from the sample are provided in Table 2.

Table 2

Demographic Information and Additional Questions

Characteristic	n	%
Gender		
<i>Male</i>	110	62.5

Characteristic	n	%
<i>Female</i>	66	37.5
Age		
<i>18-19</i>	65	36.9
<i>20-21</i>	82	46.6
<i>22-23</i>	28	15.9
<i>24+</i>	1	0.6
Year of athletic eligibility		
<i>Freshman</i>	44	25.0
<i>Redshirt Freshman</i>	26	14.8
<i>Sophomore</i>	39	22.2
<i>Junior</i>	33	18.8
<i>Senior</i>	34	19.3
Collegiate sport		
<i>Basketball</i>	30	17.0
<i>Hockey</i>	9	5.1
<i>Football</i>	61	34.7
<i>Soccer</i>	26	14.8
<i>Softball</i>	13	7.4
<i>Baseball</i>	35	19.9
Do you have a mouthguard		
<i>Yes, off-the-shelf, boil and bite mouthguard</i>	48	27.3

Characteristic	n	%
<i>Yes, custom-fitted mouthguard</i>	15	8.5
<i>Yes, unsure on type</i>	8	4.5
<i>No</i>	105	59.7
I understand what a “properly fitted mouthguard” is.		
<i>Agree</i>	119	67.6
<i>Somewhat agree</i>	41	23.3
<i>Unsure or neutral</i>	7	4.0
<i>Somewhat disagree</i>	3	1.7
<i>Disagree</i>	6	3.4
I believe mouthguards should be required for the prevention of dental/mouth trauma in my sport(s)		
<i>Agree</i>	56	31.8
<i>Somewhat agree</i>	24	13.6
<i>Unsure or neutral</i>	34	19.3
<i>Somewhat disagree</i>	27	15.3
<i>Disagree</i>	35	19.9

Research Question One: How often are collegiate athletes at a large Midwestern wearing mouthguards?

The behaviors of mouthguard use among collegiate athletes was determined using two survey items with a 5-point scale. These questions were used to assess mouthguard behaviors during practice and competition. Majority of the participants responded that they *Never* wear a mouthguard during practice (n= 119, 67.6%) or competition (n= 112, 63.6%). And more participants *Always* wear mouthguards during competition (n= 46, 26.1%) versus practice (n= 17, 9.7%). Table 3 illustrates the responses from the mouthguard behavior survey items.

Table 3

Mouthguard Behaviors

Survey questions	n	%
How often do you wear a mouthguard during practice?		
<i>Always</i>	17	9.7
<i>Often</i>	24	13.6
<i>Sometimes</i>	5	2.8
<i>Rarely</i>	11	6.3
<i>Never</i>	119	67.6
How often do you wear a mouthguard during competition?		
<i>Always</i>	46	26.1
<i>Often</i>	12	6.8
<i>Sometimes</i>	3	1.7
<i>Rarely</i>	1	0.6

Survey questions	n	%
<i>Never</i>	112	63.6

Research Question Two: What are the perceived risks of orofacial trauma among collegiate athletes at a large Midwestern university?

The *perceived risks* collegiate athletes have about orofacial trauma during participation in contact sports was determined by responses from two statements in a Likert-type format. Majority of the participants *Agree* that an orofacial injury can occur in their sport (n=160, 90.9%) and that they are at risk of an orofacial injury in their sport (n= 124, 70.5%). See Table 4.

Table 4

Perceived risks of orofacial trauma

Survey questions	n	%
A dental/mouth injury can occur in my sport(s).		
<i>Agree</i>	160	90.9
<i>Somewhat agree</i>	12	6.8
<i>Unsure or neutral</i>	2	1.1
<i>Somewhat disagree</i>	2	1.1
<i>Disagree</i>	0	0
I am at risk of a dental/mouth injury in my sport(s).		

Survey questions	n	%
<i>Agree</i>	124	70.5
<i>Somewhat agree</i>	37	21.0
<i>Unsure or neutral</i>	6	3.4
<i>Somewhat disagree</i>	7	4.0
<i>Disagree</i>	2	1.1

Research Question Three: What are the perceived benefits of mouthguard use among collegiate athletes at a large Midwestern university?

Two statements, in a Likert-type format, were used to determine the *perceived benefits* collegiate athletes have on mouthguard use. Majority of the participants *Agree* that mouthguards can be beneficial in the prevention of orofacial injuries (n= 152, 86.4%), and that they can benefit from wearing mouthguards to prevent orofacial trauma (n= 118, 67%). Table 5 illustrates the responses from these two statements.

Table 5

Perceived benefits

Survey questions	n	%
Wearing a mouthguard can be beneficial in preventing dental/mouth injuries.		
<i>Agree</i>	152	86.4
<i>Somewhat agree</i>	17	9.7
<i>Unsure or neutral</i>	6	3.4

Survey questions	n	%
<i>Somewhat disagree</i>	1	0.6
<i>Disagree</i>	0	0
<hr/>		
I can benefit from wearing a mouthguard in my sport(s), to prevent dental/mouth injuries.		
<i>Agree</i>	118	67.0
<i>Somewhat agree</i>	36	20.5
<i>Unsure or neutral</i>	15	8.5
<i>Somewhat disagree</i>	6	3.4
<i>Disagree</i>	1	0.6

Research Question Four: Who influences collegiate athlete mouthguard use at a large Midwestern university?

Two survey items were asked to assess *cues to action* for mouthguard use among collegiate athletes. Responses included parent, coach, athletic trainer, dentist, teammate, or someone else. Several participants chose more than one option for each question. Over 52% (n= 93) responded that no one influenced their decision in mouthguard behavior, while majority of participants reported that they got their information about mouthguards from a dentist (n= 96, 54.5%). Qualitative data for who gave participants information about mouthguards was collected from the ‘Someone else’ (n = 3, 1.7%) option, with responses including “grandparents” and “referees”. Qualitative responses for who influences mouthguard use were collected for the option ‘Someone else’ (n = 6,

3.4%), with responses including “league rules” and “myself”. See Table 6 for the responses of these two survey items.

Table 6

Cues to Action

Survey questions	n	%
<hr/>		
From whom have you received information about the importance of mouthguards?		
<i>Parent</i>	67	38.1
<i>Coach</i>	52	29.5
<i>Athletic trainer</i>	41	23.3
<i>Dentist</i>	96	54.5
<i>Teammate</i>	8	4.5
<i>Someone else</i>	3	1.7
<i>I have not received information about mouthguards</i>	42	23.9
<hr/>		
Who has primarily influenced your decision to wear a mouthguard?		
<i>Parent</i>	37	21.0
<i>Coach</i>	31	17.6
<i>Athletic trainer</i>	19	10.8
<i>Dentist</i>	28	15.9
<i>Teammate</i>	2	1.1
<i>Someone else</i>	6	3.4
<hr/>		

Survey questions	n	%
<i>No one has influenced my decision</i>	93	52.8

Research Question Five: What are the perceived barriers of mouthguard use among collegiate athletes at a large Midwestern university?

Two survey items were used to determine the *perceived barriers* of mouthguard use. If participants responded that they *Always* wear mouthguards, they could choose not to answer the barrier questions. Because of this option, 21 participants did not respond to these two survey items. Valid percentages were given in the results. Participants were given several options to choose from, and many chose multiple responses. The most common reason for not wearing a mouthguard was that the participants were not required to (n= 102, 65.8%). Similarly, when asked what it would take for them to wear a mouthguard, majority of participants responded if it was required or a rule of sport (n= 100, 65.4%). The other most common reason for not wearing a mouthguard was that wearing mouthguards made it difficult to breathe or talk (n= 98, 63.2%). Almost 60% (n= 89) responded that they would wear a mouthguard if they personally experienced a dental/mouth injury.

Qualitative responses were collected when participants responded ‘Other’ for reasons they do not wear mouthguards, with responses including wearing some other type of protection (facemask or helmet), playing a position with limited contact or when participating in non-contact drills during practice, not receiving one, preferring not to wear one, and forgetting to put the mouthguard in. Qualitative responses were also given

for the ‘Other’ option when asked what it would take for the participants to wear a mouthguard, including if mouthguards were “easier to breathe and talk with”, and if mouthguards were “not so bulky”. Table 7 illustrates the responses for the perceived barrier survey items.

Table 7

Perceived barriers

Survey questions	n	%
<i>What are the reasons you decide not to wear a mouthguard?</i>		
<i>I am not at risk for dental injuries</i>	11	7.1
<i>I do not think mouthguards work</i>	1	0.6
<i>I am not required to wear a mouthguard</i>	102	65.8
<i>My coach does not tell me to wear a mouthguard</i>	68	43.9
<i>No one else on my team wears a mouthguard</i>	60	38.7
<i>Mouthguards are uncomfortable to wear</i>	78	50.3
<i>It is difficult to breathe or talk when wearing mouthguards</i>	98	63.2
<i>I do not like the way I look when I wear a mouthguard</i>	42	27.1
<i>I think mouthguards inhibit my sports performance</i>	23	14.8
<i>Mouthguards are too expensive</i>	4	2.6
<i>I do not know where to get a mouthguard</i>	3	1.9
<i>I have not received any information about mouthguards</i>	17	11.0
<i>Other</i>	16	10.3
<i>I would begin to or consistently wear a mouthguard if...</i>		

Survey questions	n	%
<i>I had more information about my risks of not wearing one</i>	32	20.9
<i>They were required or if they were a rule of sport</i>	100	65.4
<i>My coach told me to</i>	84	54.9
<i>If everyone else wore one</i>	52	34.0
<i>They were issued with my uniform and equipment</i>	29	19.0
<i>My dentist told me to wear one</i>	37	24.2
<i>My certified athletic trainer told me to wear one</i>	49	32.0
<i>They were more comfortable</i>	63	41.2
<i>They did not compromise my performance</i>	25	16.3
<i>If they were less expensive</i>	5	3.3
<i>If I personally experienced a dental/mouth injury</i>	89	58.2
<i>If I witnessed a teammate/opponent sustain a dental/mouth injury</i>	40	26.1
<i>Other</i>	5	3.3

Research Question Six: What is the level of self-efficacy among collegiate athletes regarding mouthguard use?

One survey item was used to determine the *self-efficacy* collegiate athletes have regarding mouthguard use, using a Likert-type format. Majority of participants at 46% (n= 81) *Agree* that they are confident in their ability to consistently and correctly wear a mouthguard. Table 8 illustrates the responses to this survey item.

Table 8

Self-efficacy

Survey Question	n	%
I am confident in my ability to consistently and correctly wear a mouthguard.		
<i>Agree</i>	81	46.0
<i>Somewhat agree</i>	34	19.3
<i>Unsure or neutral</i>	37	21.0
<i>Somewhat disagree</i>	12	6.8
<i>Disagree</i>	12	6.8

Summary

The purpose of this study is to determine the attitudes, perceptions, self-efficacy, and behaviors of mouthguard use among collegiate athletes at a large Midwestern university. The researcher examined the behaviors of mouthguard use among collegiate athletes at one large Midwestern university. The constructs of the Health Belief Model were used to design a survey that would assess perceived risks, perceived benefits, perceived barriers, cues to action, and self-efficacy regarding orofacial trauma and mouthguard use. Descriptive statistics in the form of frequencies and percentages were used in data analysis to answer the six research questions. The results conveyed that majority of the participants do not have a mouthguard, and majority of those who do have one chose not to wear one. This is despite high perceptions of risks and benefits, and self-efficacy.

Chapter V: Discussion, Conclusions, and Recommendations

Overview

This chapter presents a summary of the study discussions, conclusions, and recommendations for health educators. It will also give recommendations of mouthguard studies for future research.

Discussion and Conclusions

Based on previous research and the present study, the lack of mouthguard use among athletes is evident, even with the high risks for sports-related orofacial trauma and the preventative benefits when wearing them. This information, along with the key details about what collegiate athletes understand about mouthguards, their perceptions of how beneficial or important mouthguard use is, who influences their decision, barriers of use, and their confidence level in mouthguard use can be used to create interventions aimed towards mouthguard promotion.

The Community Preventative Services Task Force used a systematic review to state that previous community-based interventions promoting mouthguard use needed to be in the form of educational approaches, promotional activities, and/or environmental or policy approaches (The Community Guide, 2013). Collins et al. (2015) states that broadly focused interventions have been unsuccessful and need to be evidence-based, targeting what athletes understand about the importance of mouthguards, to make the most impact in increasing behaviors. Key components of evidence-based interventions include being focused on the need of the population (e.g. lack of mouthguard possession

and behaviors), professional expertise (e.g. medical and dental professionals), and scientific evidence will be important to increase collegiate athlete perceptions (American Dental Association, 2020a). The present study showed very similar results compared to the literature in terms of mouthguard behaviors, perceptions, barriers, and influences, which could be used to create more evidence-based interventions in mouthguard promotion. The Health Belief Model was used in designing this study, with a focus on health motivation and the importance of changing behaviors to prevent health concerns (Rimer & Glanz, 2005). This theoretical framework can also be useful in creating a successful, targeted intervention on increasing mouthguard use to prevent sports-related dental problems, specifically at the collegiate level.

The present study found that a significant number of athletes do not consistently wear mouthguards during practice or competition. The literature on mouthguard use shows similar results. For example, Tiryaki et al. (2017) found that only 6.3% of basketball players used mouthguards, Collins et al. (2015) reported that only 12.3% of basketball, softball and baseball players wore mouthguards, and Dursen et al. (2015) found that 97.1% of soccer players had never used a mouthguard. The present study found a similar trend that only 9.7% of participants *Always* wore mouthguards during practice and 26.1% *Always* wore mouthguards during competition. Even though these percentages are low, 46% of participants *Agree* that they are confident in their ability to consistently and correctly wear a mouthguard, which indicates higher self-efficacy levels for these individuals.

The present study found that almost 60% of all the athletes surveyed do not have a mouthguard. This information is significant for defending the need for more effective interventions to increase behaviors. If over half of the athletes do not have a mouthguard, access to properly fitted mouthguards needs to be one of the first addressed issues. As adults, collegiate athletes are more independent in making decisions; however, for athletes to make the decision to wear a mouthguard, they first need to have one of their own. Getting mouthguards as part of their uniform, establishing relationships with local dentists to work with the athletes, or utilizing local dental programs (e.g. dental, dental hygiene, or dental assisting schools) can all be options for providing mouthguard access to athletes.

Although the prevalence of mouthguard use was found to be low in the athletes sampled, there was a high level of *perceived risks*, with over 90% of participants agreeing that a dental/mouth injury can occur in their current sport, and 70.5% agreeing they were at risk of sustaining such injuries in their sport. The same can be said about the high level of *perceived benefits*, with 86.4% agreeing that mouthguards can be beneficial in preventing dental or mouth injuries. These findings are similar to the results from the study by Galic et al. (2018), who found that over 93% of participating athletes responding that mouthguards are beneficial, yet only 41% wear mouthguards during sports activities. Tiryaki et al. (2017) also found that 95% of basketball players responded to mouthguards being protective, but only 6.3% used them. This indicates that there seems to be a disconnect between their perceptions of the risks and their perceptions of how susceptible they are to the injury and how severe these injuries can be.

Surprisingly, even though the results show that participants have high risk perceptions of not wearing mouthguards and high benefit perceptions of mouthguards preventing orofacial trauma, over 50% of the athletes surveyed indicated they would begin to wear a mouthguard if they personally experienced an orofacial injury. When it comes to increasing the preventative behaviors of mouthguard use, this data indicates there may be a lack of *perceived susceptibility* and *perceived severity* among the collegiate athletes surveyed. According to the Health Belief Model, *perceived susceptibility* and *perceived severity* are important in forming the threat and fear individuals feel when they believe they are susceptible to a condition and the extent of the consequences when they are not participating in a preventative behavior (Miles, 2008). The Health Belief Model indicates that the perception of threat will then motivate action to change the behavior, in order to prevent the condition (Miles, 2008). These results give reason to believe that the importance of preventing orofacial trauma and the consequences of the severity of orofacial trauma need to be more effectively addressed for this population and athletes in general. According to Rimer & Glanz (2005), possible intervention strategies to improve *perceived susceptibility* include helping individuals change their risk perceptions and adapting risk information to individual's behaviors. *Perceived severity* can be improved by giving specific consequences of the condition (Rimer & Glanz, 2005). To reach the collegiate athlete population, this could be possible by including a dentist as part of the sports medicine team to promote oral health, including mouthguard promotion (FDI World Dental Federation, 2019). The scientific evidence used for evidence-based interventions can include giving the athletes the

statistics of orofacial trauma risks while participating in contact sports, the lasting consequences, explanations of financial burdens, and real case studies of sports-related dental trauma.

With all the research about how orofacial trauma can have a lasting effect on physical, psychological, social, and financial aspects throughout an athlete's life (Young et al., 2015; Tuna & Ozel, 2014; Collins et al., 2015, Kracher & Knowlton, 2017; Dursun et al., 2015; Council of Clinical Affairs, 2018; Sathyaprasad et al., 2018), it is not only important to give athletes all the facts about their susceptibility to injury and the severe consequences they are facing when not wearing mouthguards during sports activities, but to also increase the accessibility of properly fitted mouthguards. For improving the prevalence of mouthguard use, the present study shows that there needs to be more of a focus on the susceptibility and severity of orofacial injuries and increased access to mouthguards to make an impact in mouthguard promotion.

Interventions focused on these aspects can be beneficial in changing mouthguard use behaviors, which will also lead to a decrease in the incidences of orofacial trauma. An example of an evidence-based intervention that has showed success was for the prevention of dental caries, through the “school-based dental sealant delivery programs”, which brought preventative services directly to the population in need (Guide to Community Preventive Services, 2019). This idea of going to the population in need has also been used in promoting mouthguards at the high school level. For example, the Greater Cleveland Dental Society created a fully funded program called “Safe Smiles” where dental professionals and students volunteered to provide education and custom

fitted mouthguards to high school athletes (Manchir, 2016). In another example, The University of Iowa College of Dentistry partnered with community schools to provide custom-fitted mouthguards to junior high and high school athletes at a discounted rate of \$15 (Iowa City Press-Citizen, 2014). These programs are examples of how improving access to mouthguards can be a step in the right direction towards increasing mouthguard behaviors.

The most common reason given for not wearing mouthguards was that the participants are not required to wear one (n = 102, 65.8%); which is similar to findings by Collins et al. (2015), who found that 65.3% of participants also indicated that the reason they did not wear mouthguards was because they were not required to. Collins et al. (2015) states that mandatory regulations requiring mouthguard use has been the only successful intervention to date, probably due to consequences if not compliant. Only four collegiate sports are required by the NCAA to wear mouthguards, including football, ice hockey, field hockey, and lacrosse (NCAA, 2014). However, previous research has found that other contact sports also have a great risk for sports-related dental trauma. For example, Collins et al. (2015) indicate that baseball and basketball athletes are at a high risk, and Dursun et al. (2015) indicate the high risk of orofacial trauma while participating in soccer. The Community Guide (2013) states that one of the methods of interventions in promoting mouthguards can involve policy approaches to enforce the requirement to wear mouthguards during sports participation. Surprisingly, the athletes in the present study were not necessarily on board with mouthguard requirements. While 65.4% said they would wear mouthguards if they were required or a rule of sport, only

31% agreed that mouthguards should be required in their current sport. This information is useful in understanding how accepting and motivated the athletes will be in requirement changes. However, being mandated by policy requirements and enforcement may not be the only methods to impact the increase of mouthguard behaviors.

Cues of Action is one of the constructs of the Health Belief Model that focus' on the individuals or factors that prompt action—in the present study, this includes those who informed the athletes about the importance of wearing mouthguards or those who influenced mouthguard behaviors. In the present study, when the participants were asked what it would take for them to consistently wear a mouthguard, 47.7% responded if their coach told them to. Results from the survey indicated that almost 30% of participants received information about mouthguards from their coach and 17.6% felt like coaches have influenced their decision to wear mouthguards. Collins et al. (2015) reported that 87.3% of participants who played basketball, softball, and baseball had never received information about mouthguards from their coaches, and Tiryaki et al. (2017) found that only 2% of the basketball players surveyed were advised by their coaches to wear mouthguards. The responsibility, however, should not solely be on the coaches to promote mouthguard behaviors. Galic et al. (2018), commented that coaches, parents, and dentists should all play a role in the promotion of mouthguards to athletes. Over 50% of participants in the present study responded that dentists had given them information about mouthguards, yet only 15.9% felt like dentists influenced their decision in using mouthguards. When looking at the influence from parents, 38.1% responded that parents gave them mouthguard information, but only 21% felt as though

parents influenced their decision. Collins et al. (2015) found that 64.5% of the athletes surveyed had never received information about mouthguards from their parents.

Surprisingly, over 50% of participants in the present study responded that no one has influenced their decision in wearing a mouthguard. This data is important when developing interventions, indicating that not only the target population should be the aim of the intervention, and that mouthguard promotion needs a team approach of influencers to be more effective. Including key influencers (e.g. parents, coaches, and dentists) in the interventions and encouraging them all to share the responsibility in mouthguard promotion can be valuable in impacting the decisions of athletes to participate in the preventative behaviors.

Recommendations for Health Educators

The combination of the low prevalence of mouthguard use and the high incidences of sports-related dental trauma, stress the importance of formal interventions to increase mouthguard behaviors. Due to the variety of backgrounds among collegiate athletes, it is essential for them to have proper education on how to prevent orofacial trauma, and to increase their perceptions and beliefs of mouthguards. It is essential for these interventions to be a collaboration of the many different individuals supporting athletes.

For health educators, it is important to not only encourage mouthguard behaviors to athletes through educational interventions on risks and benefits of injury prevention, but to also educate key influencers, and providing them with resources to appropriately support athletes in choosing healthy behaviors to prevent injuries. An important resource

should be a dentist who is collaborating with the sports medicine team. To make sure all athletes, coaches, and athletic trainers have accurate information, these educational interventions should be ongoing throughout the athlete's collegiate career and can be presented at yearly athletic compliance meetings, in which all are involved in. The team affiliated dentist will also play a role in evaluating mouthguards to make sure they fit properly and comfortably, answer questions, and encourage behaviors. This will all ensure consistency in information given.

Over 50% of participants in the present study specified that they would wear mouthguards if their coach told them to, and over 30% indicated the same about athletic trainers. This indicates that coaches and athletic trainers will be important influencers to emphasize in interventions. Coaches and athletic trainers can be essential in mouthguard use by being a positive influence in reminding athletes of the importance to prevent orofacial injury, to hold them accountable for their behaviors, and to increase their confidence in making healthy choices. These influencers can play a vital role in behavior changes and enforcing rules.

Another role for health educators will be to make sure athletes have access to properly fitted mouthguards. Funding from the NCAA or individual conferences to make mouthguards part of an athlete's uniform, creating a budget from the university's athletic department, creating an athletic fee to cover costs, or applying for grants to pay for discounted mouthguard fabrication are all ways that can assist in the financial burden of accessing custom mouthguards. A dentist can play a big role in an intervention, also by educating athletes on how to prevent orofacial trauma. Collaborating with a dental

educational setting and having student dental clinicians make custom fit mouthguards can be a more affordable, and possibly a more convenient choice. Providing options for athletes to access mouthguards will be essential in the intervention process, specifically mandating for uniform requirements.

It was found in the present study that one of the most common reasons athletes do not wear mouthguards is because they are not required to. The requirements for collegiate sports have been set by the National Collegiate Athletic Association, and only for four sports (NCAA, 2014). The university of interest does not have additional mouthguard regulations; however, it follows the guidelines set by the NCAA (Minnesota State University Department of Athletics, 2015). Health educators can use research, both previous and current, to advocate for more rules, policies, and regulations in mouthguard use at the collegiate level. Enforcement from coaches and referees needs to be a focus in making sure that rules are being followed by the athletes. More detailed regulations for mouthguard educational requirements and funding for athletic mouthguard access can be valuable for increasing preventative behaviors and decreasing orofacial trauma.

Recommendations for Future Research

This study is limited to collegiate athletes participating in contact sports at one large Midwestern university. The sample size in this study is considerably small compared to the total number of collegiate athletes, which makes it difficult to consider the results generalizable. Some of the sports of interest in the study had a small sample size that completed the survey, and therefore contributed only a small percentage to the

overall. Future studies could look at other universities to get a larger sample size and a more equal representation of from each contact sport.

Additionally, including coaches to the sample could be beneficial in improving mouthguard behaviors by better understanding their perceptions on the topic, regarding their backgrounds on mouthguard importance, regulations, barriers, and availability. Coaches are the important bridge between the athletes and the rules that they are expected to follow. The NCAA handbook states that the athletes and coaching staff “need to be educated” on the importance of mouthguard use, and that the rules need to be enforced (NCAA, 2014, p. 111). If the coaches do not also have high levels of perceived risks and perceived benefits, it is difficult to expect them to play the important role of influencing and enforcing mouthguard use to their athletes.

The timing of the study was also a limitation. Some of the athletes were involved in sports that were not in season. This not only made it more difficult to contact the coaching staff and set up a time to meet with the participants, but also decreased the number of athletes available to survey with senior athletes no longer participating. Some of the athletes were in the end of their season which made them difficult to survey due to their intense playoff schedules. During the time of survey distribution, there was also a major pandemic, which limited the time frame originally planned for the research in this study. Future research may want to spread out the survey distribution time over several months to allow the option of taking the survey during their off season or at the beginning of their season when their schedules are not as intense, to help eliminate some of these limitations.

Some of the questions from the survey were not presented clearly to the participants. The survey allowed for participants to skip question #4 and 5 on reasons for not wearing mouthguards if they *Always* wore a mouthguard. However, some of the participants stated that they only always wore mouthguards during practice or competition, but not both, and then still skipped the barrier questions. This limited the number of responses for barriers of mouthguard use. Future research should modify the survey to specify that they must *Always* wear mouthguards during practice and competition to be able to skip the barrier questions.

Data analysis for this study focused on descriptive statistics to answer the research questions and determine frequencies and percentages from the total sample. It could be beneficial if future research focused on the descriptive statistics for each individual sport, age, and/or gender, to see if there are significant differences of mouthguard use between these demographic characteristics. Comparing the behaviors of mouthguard use for those who participate in sports where mouthguard use is required versus those who do not have a requirement would also be interesting. Breaking the data down by specific sports could also help create more specific evidence-based interventions that could make a greater impact on improving mouthguard behaviors. Further research may also want to analyze data using regressions to see how strongly variables are related.

The survey questions in this study for barriers of mouthguard behaviors, simply ask the participants to circle their reasons for not wearing mouthguards. Most participants circled several barriers, which does not explain which barriers are the most significant to each participant. Future research may want to have the participants rate the

more common reasons for not wearing mouthguards, to better know which barriers need to be addressed first.

Future research may want to focus on how much of an impact league rules play on influencing mouthguard use. This can be done by seeing if athletes participating in sports with mouthguard requirement know that their sport mandates mouthguard use. This can help determine the need for more enforcement of mouthguard requirements. Another focus for future research could be on determining what is considered the normal culture for contact sports regarding mouthguard use and changing the culture to improve behaviors. “There is some connection to the sports context where the safety culture of certain sports is often compromised by a competitive intensity which leads to athletes risking their physical safety in a “win at all costs approach” (Payne, Reynolds, Brown, & Fleming, 2003, p. 23). One study discussed the significant role leadership can play in the changes of safety culture (Chen et al., 2019). Changing the culture could be impacted by role models for the athletes. Athletes in a higher level or possibly professional athletes could influence mouthguard use. Further research could look at how much of an impact this influence could have on younger athletes.

In a growing world of competitive sports and with over 500,000 collegiate athletes, the behaviors of wearing mouthguards will continue to be the focus of preventing orofacial trauma. With evident literature on the protective role of mouthguards, it seems clear as to what athletes need to do to protect themselves from injury. However, the number of athletes not participating in mouthguard behaviors is significant. Evidence-based interventions will continue to be important in changing these

behaviors. Having a better understanding of the athlete perceptions on the risks of sports-related orofacial trauma, the benefits of mouthguards, the barriers of use, who is influencing them, and their self-efficacy on mouthguard use, will be important in making these interventions more effective.

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Appendices

Appendix A

Permission to Use Survey Instrument



Prosser, Heather J
 Mon 11/18/2019 9:35 PM
 Dawn.comstock@ucdenver.edu ✓



Dr. Comstock,

My name is Heather Prosser. I am currently a graduate student at Minnesota State University, Mankato, studying community health education. I am working on my thesis and have chosen to study the knowledge, attitudes, and behaviors of collegiate athletes regarding mouthguards and sports-related dental trauma. When reviewing existing literature, I came across your study, "*Mouthguard BITES (Behavior, Impulsivity, Theory Evaluation Study): What Drives Mouthguard Use Among High School Basketball and Baseball/Softball Athletes.*" I am wondering if you would be willing to share your survey with me and if you would grant me permission to possibly use some of your questions as I am creating my own survey? Although, our studies are slightly different (I am not looking at impulsive delay discounting), I think that your questions related to athlete knowledge and attitude towards mouthguards will be a great reference for me as I draft my survey. I greatly appreciate your time and look forward to hearing back from you.

Kind regards,
 Heather Prosser
 heather.prosser@mnsu.edu



Comstock, Dawn <DAWN.COMSTOCK@CUANSCHUT
 Z.EDU>
 Sat 11/23/2019 4:40 PM
 Prosser, Heather J ✓



Hi Heather,

Happy to share – feel free to use anything you would like from the attached survey tool we used in that study. Our series of questions were crafted specifically to enable us to place the high school athletes into the most appropriate level of the precaution adoption process model.

Take care,
 Dawn

R. Dawn Comstock
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 Program for Injury Prevention Education & Research (PIPER)
[13001 East 17th Place, Mailstop B119](https://www.cuanschutz.edu/locations/13001-East-17th-Place-Mailstop-B119)
[Aurora, CO, 80045](https://www.cuanschutz.edu/locations/13001-East-17th-Place-Mailstop-B119)
 303-724-7881
dawn.comstock@cuanschutz.edu



Prosser, Heather J
Mon 11/18/2019 9:48 PM
tea.galic@gmail.com



Dr. Galic,

My name is Heather Prosser. I am currently a graduate student at Minnesota State University, Mankato, studying community health education. I am working on my thesis and have chosen to study the knowledge, attitudes, and behaviors of collegiate athletes regarding mouthguards and sports-related dental trauma. When reviewing existing literature, I came across your study, *"Knowledge and attitudes about sports-related dental injuries and mouthguard use in young athletes in four different contact sports—water polo, karate, taekwondo and handball."* I am wondering if you would be willing to share your survey with me and if you would grant me permission to possibly use some of your questions as I am creating my own survey? I think that your questions related to athlete knowledge and attitude towards mouthguards will be a great reference for me as I draft my survey. I greatly appreciate your time and look forward to hearing back from you.

Kind regards,
Heather Prosser
heather.prosser@mnsu.edu



Tea Galic <tea.galic@gmail.com>
Tue 11/19/2019 1:59 AM
Prosser, Heather J



Dear Heather,

sure, you can use my survey. If you need anything else just let me know.

Sincerely,
Tea Galic

Assist Prof Tea Galić, DMD, PhD
Study of Dental Medicine
University of Split School of Medicine
Šoltanska 2, 21000 Split
Tel. [021/557-846](tel:021557846) Fax. [+385 21 557 955](tel:+38521557955)
e-mail: tea.galic@mefst.hr and tea.galic@gmail.com

Appendix B

Institutional Review Board Letter of Approval



February 14, 2020

Dear Emily Forsyth:

Re: IRB Proposal -entitled "[1564790-3] Perceptions of mouthguard use among collegiate athletes at a large Midwestern university"
 Review Level: Level I[]

Your IRB Proposal has been approved as of February 14, 2020. On behalf of the Minnesota State University, Mankato IRB, we wish you success with your study. Remember that you must seek approval for any changes in your study, its design, funding source, consent process, or any part of the study

that may affect participants in the study (see <https://omni.mnsu.edu/irb/revision.html>). Should any of the participants in your study suffer a research-related injury or other harmful outcomes, you are required to report them to the Associate Vice-President of Research and Dean of Graduate Studies immediately at 507-389-1242.

When you complete your data collection or should you discontinue your study, you must submit a Closure request (see <https://omni.mnsu.edu/irb/closure.html>). All documents related to this research must be stored for a minimum of three years following the date on your Closure request. Please include your IRBNet ID number with any correspondence with the IRB.

Cordially,

A handwritten signature in black ink, appearing to read "Bonnie Berg".

Bonnie Berg, Ph.D.
 IRB Co-Chair

A handwritten signature in black ink, appearing to read "Jeffrey Buchanan".

Jeffrey Buchanan, Ph.D.
 IRB Co-Chair

A handwritten signature in black ink, appearing to read "Mary Hadley".

Mary Hadley, FACN, Ph.D.
 IRB Director

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Minnesota State University, Mankato IRB's records.