

## Review

# The Role of Sports and Protective Gear in Preventing Dental Trauma

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### Abstract

Sports-related dental trauma pertains to injuries occurring during sports or physical activities that affect the teeth, mouth, or surrounding oral structures. This prevalent type of sports injury can impact athletes of all ages across various sports and recreational pursuits. Crucially, preventive measures, including the use of protective gear like mouthguards and helmets, play a vital role in minimizing the risk of dental injuries during sports. Guidelines from authoritative bodies, such as the American Academy of Pediatric Dentistry's Policy on Prevention of Sports-Related Orofacial Injuries, underscore the significance of protective gear in reducing these injuries. This review critically evaluates the effectiveness of current protective gear, encompassing mouthguards, helmets, and facial shields, while also addressing challenges like user compliance and comfort issues. By conducting a thorough analysis, the aim is not only to contribute to the academic discourse on sports dentistry but also to offer practical insights and recommendations for enhancing protective measures. Emphasizing a comprehensive approach involving technological advancements, educational initiatives, and strict adherence to safety protocols, the integration of protective gear emerges as a pivotal element in safeguarding the oral health and overall well-being of athletes engaged in diverse sporting disciplines.

**Keywords:** *Sports, dental injury, protective gear, mouthguard, helmet, face shield*

**Introduction**

Sports-related dental trauma refers to injuries or damage to the teeth, mouth, or surrounding oral structures that occur because of participation in sports or physical activities. It is the most common type of sports injury and can affect athletes of all ages. It is a common occurrence in various sports and recreational activities. The causes of sports-related dental trauma are diverse and can include direct impact injuries, accidental collisions, and falls (1). Dental injuries due to contact or non-contact sports can have both immediate and long-term consequences. Immediate effects may include pain, bleeding, and damage to the teeth and soft tissues. Long-term consequences may involve the need for dental procedures, such as restorative work or tooth replacement, and potential impacts on oral health and aesthetics (2). The overall prevalence of dentofacial injuries due to sports ranges from 15.5% to 49.6%, based on multiple studies (3-5). Approximately 25% of these injuries are found in adolescents, however, no gender-based differences in prevalence were identified (6). Wrestling (83.3%) and boxing (73.7%) were the sports in which the highest number of dental injuries were reported (3).

Sports-related dental injuries can manifest in various forms, ranging from minor injuries to more severe conditions. Crown fracture or enamel chipping is a very common type of dental injury that can occur during physical activities or falls. A study from Iran reported that approximately 36.4% of all sports injuries were crown fractures (5). On the other hand, root fractures were reported to be the least common type of dentofacial injury resulting from sports activities (3). Another common injury is tooth avulsion, where the tooth gets displaced from its socket due to a forceful impact. The prevalence of tooth avulsions due to sports-related injuries was reported to be 5.6% (5). Tooth luxation is another type of tooth injury in which the tooth remains in the socket; however, it can be either intruded, extruded, or laterally displaced, depending on the cause of the injury. Other types of dental injuries include injuries to supporting structures such as soft tissues, alveolar bone, and periodontal ligaments. Moreover, serious injuries such as temporomandibular joint (TMJ)

injuries, jaw fractures, and craniofacial injuries also occur because of major sports-related accidents and can crucially impact the quality of life of an athlete (7).

Preventive measures, such as wearing protective gear like mouthguards, face shields, and helmets, are crucial for reducing the risk of sports-related dental injuries. Guidelines like the Policy on Prevention of Sports-Related Orofacial Injuries by the American Academy of Pediatric Dentistry have emphasized the importance of mitigating the risk of sports-related dental injuries by using protective gear during sports fields (8). Evidence suggests that despite 48.6% of athletes are aware of dentofacial injuries and the significance of protective gear, only 23.9% use protective gear in their routine (5). Among the most crucial pieces of protective equipment are the mouthguard, helmets, and face shields, which are specially designed to absorb and distribute impact forces that could otherwise lead to fractures, avulsions, and other craniofacial injuries (9). Through a comprehensive approach that combines technological advancements, educational initiatives, and a commitment to safety protocols, the integration of protective gear stands as a cornerstone in preserving the oral health and well-being of athletes across diverse sporting disciplines. Ultimately, the overarching goal is to underscore the critical role that sports and protective gear play in preventing dental trauma, advocating for advancements in gear design, increased awareness, and collaborative efforts between the dental and sports communities to ensure the holistic well-being of athletes.

**Methods**

Initiated on December 6th, 2023, this research project commenced after a meticulous examination of existing literature. A comprehensive literature review was conducted utilizing various databases, including PubMed, Web of Science, and Cochrane. The search strategy involved the application of diverse combinations of medical terminology, supplemented by manual searches on Google Scholar to identify pertinent research terms. The primary focus of this literature review was on

essential aspects, particularly the types of protective gear employed to prevent orofacial trauma in sports and their effectiveness. Additionally, the review addressed recommendations and suggestions to enhance athletes' compliance with the usage of such protective equipment. It is crucial to emphasize that the articles selected for inclusion in this study adhered to multiple criteria, ensuring a thorough and robust review process.

## **Discussion**

The use of protective gear during sports is essential for mitigating the risk of injuries and ensuring the safety and well-being of athletes. Various types of protective gear are designed to provide a physical barrier against potential impacts, reducing the likelihood and severity of injuries during sports activities. The effectiveness of protective gear is not only in preventing injuries but also in fostering confidence among athletes, allowing them to perform at their best without the fear of harm. Overall, the conscientious use of protective gear plays a pivotal role in creating a safer sports environment and promoting the long-term health and performance of athletes (10).

### ***Mouthguards***

Utilizing mouthguards as a preventive measure during sports is a fundamental practice aimed at reducing the risk of dental injuries. Mouthguards serve as a crucial barrier, absorbing and dispersing the impact forces that can result from accidental collisions, falls, or direct blows to the face. By creating a protective cushion between the upper and lower teeth, as well as the soft tissues of the mouth, mouthguards effectively minimize the chances of tooth fractures, avulsions, and other orofacial injuries (11, 12). Custom-fitted mouthguards, specifically molded to an athlete's dental anatomy, offer an enhanced level of protection compared to generic alternatives. The snug fit ensures stability during athletic activities, providing a comfortable yet secure shield (13). A recent systematic review estimated that sportsmen wearing mouthguards are 82-93% less likely to suffer from dental injuries (14). Another longitudinal study reported that a significantly lesser risk of orofacial injuries was

observed in athletes who were using mouthguards, ultimately leading to lesser maxillofacial referrals as compared to those athletes who were not using mouthguards (15). The overall dental injuries reported were significantly decreased with regular use of mouthguards among sports personnel (16), and subsequently, athletes avoiding the use of mouthguards were at a two times risk of dental injuries (17).

Furthermore, the use of mouthguards is not only about preventing injuries but also about preserving oral health in the long term. Athletes across various sports, from football to basketball, routinely rely on mouthguards as an integral component of their sports gear, highlighting their role as a practical and effective strategy in the broader context of sports safety and injury prevention (18).

### ***Helmets***

The use of helmets is a critical strategy in preventing dental injuries during sports, particularly in activities where the risk of head impacts is prevalent. Helmets serve as a protective barrier, not only safeguarding the head from potential concussions and traumatic brain injuries but also significantly reducing the risk of dental trauma. In contact sports like football, hockey, and cycling, where collisions and falls are common, helmets play a pivotal role in absorbing and dispersing the force of impacts (19). By covering the skull and providing a cushioning effect, helmets help mitigate the risk of facial injuries, including those affecting the teeth and surrounding structures. In instances where athletes experience falls or direct blows to the head, the helmet acts as a vital defense mechanism, minimizing the chances of tooth fractures, avulsions, and other orofacial injuries. Evidence suggests that using headgear and helmets significantly reduces the risk of head injury during sports such as skiing and snowboarding (20). Moreover, helmets decrease the risk of serious head injury in which collision with hard surfaces can be anticipated in sports like football, rugby, and cycling. These protective gears reduce the impact of the collision, eventually saving the athlete from severe brain and axonal damage due to the fall (21).

Athletes must wear helmets that meet safety standards specific to their sport, ensuring proper fit and optimal protection. Coaches, sports organizations, and regulatory bodies play a key role in promoting and enforcing the consistent use of helmets, emphasizing their importance not only for head protection but also in preventing dental injuries and preserving overall oral health during athletic endeavors (22).

### ***Face shields***

The use of face shields is an effective measure in preventing dental injuries during sports, particularly in activities where facial impacts are a concern. Face shields provide a comprehensive barrier that extends protection beyond the head, safeguarding the delicate structures of the face, including the mouth and teeth (10). In sports like baseball, softball, and hockey, where high-speed projectiles or direct contact with equipment are common, face shields act as a critical line of defense against potential dental trauma. These transparent shields cover the entire face, shielding the eyes, nose, and mouth from impact and reducing the risk of fractures, avulsions, and other orofacial injuries. Additionally, face shields are particularly valuable in sports that may not traditionally use helmets, ensuring that athletes in various disciplines have adequate protection against facial injuries (23). Full-face shields are known to protect sportsmen from facial injuries and significantly reduce the risk of dental trauma, without simultaneously increasing the risk of injuries to the neck and spine (16).

The integration of face shields, in conjunction with other protective gear, contributes to creating a safer sports environment, promoting athlete confidence, and ultimately reducing the incidence and severity of dental injuries during sports activities (23).

### ***Limitations and Recommendations***

While the use of protective gear is a cornerstone in minimizing the risk of dental injuries during sports, a nuanced understanding of its limitations is crucial for a comprehensive approach to athlete safety. Mouthguards and face shields, although indispensable, may not offer complete coverage of the entire oral and facial region, leaving certain

angles or directions of impact susceptible to dental injuries. Proper utilization is paramount, and the efficacy of these protective measures hinges on their correct placement and secure fastening during play (21). Athlete compliance poses a significant challenge, as issues related to discomfort, ill-fitting gear, or perceived performance hindrance can lead to inconsistent use, thereby diminishing the overall effectiveness of these preventive measures (24). Moreover, the durability and maintenance of protective gear significantly influence its protective capabilities. Over time, wear and tear, inadequate cleaning, or improper storage can compromise the structural integrity of the gear, reducing its ability to provide optimal protection. It underscores the necessity for athletes to regularly inspect and replace their gear to ensure sustained efficacy (25). Standardization of protective gear poses yet another challenge, with variations in standards across sports and regions leading to inconsistencies in the level of protection afforded. The absence of universal guidelines contributes to athletes using gear that may not be specifically designed to address the unique risks associated with their respective sports, potentially exposing them to avoidable risks (26).

Despite these limitations, it is imperative to underscore the overarching importance of protective gear as a fundamental tool in reducing the incidence and severity of dental injuries in sports. Recognizing these limitations prompts a call to action for athletes, coaches, and sports organizations to collaboratively address these challenges. Innovations in gear design hold promise for overcoming some of the limitations identified. Enhanced education initiatives that emphasize the correct usage and maintenance of protective gear are crucial for improving athlete compliance and ensuring optimal protection. While acknowledging the inherent limitations of protective gear in sports, it is essential to view these challenges as opportunities for improvement rather than insurmountable obstacles. By addressing issues of coverage, compliance, maintenance, and standardization, the sports community can collectively work toward enhancing the efficacy of protective gear. This concerted effort ensures that

athletes not only embrace the use of protective equipment but also benefit from innovations that prioritize both safety and performance.

A strategic approach involving the development of standardized safety protocols that can guide athletes, coaches, and sports organizations in selecting, using, and maintaining protective gear is crucial. These protocols can serve as a foundation for creating a universal set of guidelines, thereby minimizing inconsistencies in the level of protection provided across sports and regions. Collaborative efforts between sports organizations, dental health professionals, and gear manufacturers are essential to driving these innovations forward. According to the American Academy of Pediatric Dentistry guidelines related to dental injuries during sports, several recommendations can be implemented to enhance the use of protective gear in sports and prevent dental injuries (8).

Dental health professionals are poised to play a pivotal and proactive role in advancing health education initiatives surrounding the imperative use of protective equipment during recreational activities. Their expertise positions them as advocates for oral health awareness, and they can actively engage in community outreach programs, school seminars, and athletic events to disseminate information on the importance of protective gear. Encouraging the use of certified face protectors, especially among adolescents and young adults engaging in sports, becomes crucial for instilling lifelong habits of injury prevention. A strategic approach involves advocating for the mandatory use of mouthguards, face shields, and helmets in major global sports events, establishing a precedent that compels athletes to integrate these protective measures into their regular practice routines. The inclusion of dental and health professionals within the core committees of sports boards and athlete organizations is instrumental in championing comprehensive policy implementations. By having experts in oral health contribute to the decision-making processes, there can be a more holistic approach to athlete well-being, ensuring that protective equipment is not only recommended but mandated for optimal safety. Lastly, a sustained

commitment to funding research initiatives focused on the development of comfortable and effective sports protection gear is paramount. This investment can lead to groundbreaking innovations that address the current limitations of gear, resulting in a substantial decrease in dentofacial injuries attributed to accidents occurring during sports and other recreational activities. Through these concerted efforts, the collaboration between dental health professionals, sports organizations, and research institutions can foster a culture of injury prevention, ultimately safeguarding the oral health of athletes on a global scale.

## **Conclusion**

In conclusion, the utilization of protective gear in sports is paramount for the prevention of dental injuries, contributing significantly to the overall safety and well-being of athletes. This comprehensive review has highlighted the importance of various protective measures, including mouthguards, helmets, and face shields in minimizing the risks associated with sports-related dental trauma. As research and development continue to advance, innovations in gear design and materials will further contribute to optimizing protective measures.

## **Disclosure**

### ***Conflict of interest***

There is no conflict of interest.

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### ***Ethical consideration***

Non applicable

### ***Data availability***

Data that support the findings of this study are embedded within the manuscript.

### ***Author contribution***

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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