

RESEARCH

Open Access



# Perceptions of the mouthguard in basketball, rugby, and soccer players. Qualitative study at a public university in Colombia

Edison Alveiro Acosta-Figueroa<sup>1</sup> and Luis Alberto Sánchez-Alfaro<sup>2\*</sup>

## Abstract

**Background/aim** Orofacial and dental injuries in athletes, both amateur and professional, are highly prevalent. Mouthguards are devices to prevent this type of injury; however, athletes believe that the mouthguard limits their performance in the game and decreases their confidence. This study analyzed the perception that some basketball, rugby and soccer players from a public university in Colombia have about the use of mouthguards.

**Material and Methods** Comprehensive qualitative study with ethnographic approach. Twenty-nine players participated. Three data collection tools were used: semi-structured interviews, field diary and discussion groups. Content analysis was carried out using a categorical matrix and triangulation of sources.

**Results** Participants perceive the mouthguard as a device to prevent orofacial and dental injuries, but unattractive to wear during competitions. Factors that determine the use or non-use of the mouthguard are player comfort and adaptability, communication and economic cost.

**Conclusions** Players' perception of mouthguards in soccer, basketball and rugby is multifactorial, and is mediated by the idea of contact risk during sports practice, prevention of orofacial injuries, influence on sports performance, comfort and adaptability to the mouthguard.

**Keywords** Oral health, Physical fitness, Athletic injuries, Preventive dentistry, Mouth protector

## Introduction

Injuries to the face, head and neck occur frequently during sports activities. The orofacial region is very prone to present more trauma during sports activities, presenting mainly soft tissue lacerations and dental injuries [1]. Dental injuries frequently occur in the anterior teeth of the upper jaw when the person has Angle class I (It is a normal sagittal occlusion: the mesiobuccal cusp of the maxillary first molar occludes with the mesiobuccal groove of the mandibular first molar) and II (The mesiobuccal cusp of the maxillary first molar occludes anterior to the buccal groove of the mandibular first molar). The risk is greater in the anterior lower teeth when the athlete has Angle class III (The mesiobuccal cusp of the

\*Correspondence:

Luis Alberto Sánchez-Alfaro  
lasancheza@unal.edu.co

<sup>1</sup>Collective Health Research Group, School of Dentistry, Universidad Nacional de Colombia, Bogotá, Colombia

<sup>2</sup>Department of Collective Health, School of Dentistry, Universidad Nacional de Colombia. Member of the Advisory Council of the UNESCO Bioethics Network for Latin America and the Caribbean, Bogotá, Colombia



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

upper first molar occludes posterior to the buccal groove of the lower first molar). There are fewer injuries in the lower jaw due to mandibular joint movements, which can absorb direct blows and collisions in a certain way [2, 3].

Dentofacial injuries may involve individuals or groups, recreational and sports physical activities, some injuries were not caused intentionally, however, they were related to sports and recreational activities in non-sports settings [2]. Dental injuries or traumas can occur at any age, with a higher frequency between 15 and 25 years. In this age range, half of the cases of oral injury occur in a sports field [2, 4].

Currently, the practice of sports activities has increased and for this reason the risk of injuries associated with various sports has also increased. Contact sports are associated with an increased risk of orofacial and dental injuries [5]. According to a meta-analysis carried out in Asia, with a sample of 14,457 professional players, the prevalence of orofacial and dental injuries combined was found to be 40.6%, while that of orofacial injuries was 17.1% and dental injuries were 15.9% [6]. And Liang and Chuang showed that in 4,419 basketball players, in the period 2003–2022, 32.6% of injuries due to falls and 20.1% of injuries due to contact with a ball were dental injuries [7].

There are several sports protocols, activities or devices focused on the prevention of orofacial and dental injuries. Among them is the use of mouthguards [8]. Mouthguards are elastic devices that are placed inside the mouth to reduce oral lesions, especially around the teeth. The most appropriate is the “custom-made mouthguard”. Its mechanism is to redistribute the forces of collisions, particularly on the teeth. In general, mouthguards are divided into three types: class I, class II, and class III. Class III mouthguards have better materials and designs due to their customized manufacturing process. They provide a neuromuscular protective effect. The class III mouthguard influences players’ performance by improving function and strength. This psychological effect gives the athlete more security, confidence, and a competitive advantage [9, 10]. Surprisingly, the most used mouthguard is class I. It offers a very low level of protection and can come off and obstruct breathing, causing asphyxiation [11]. Some studies suggest that the incidence of injuries is higher in men than in women, and they also occur more in professional players than in amateur players [12]. Many studies conducted in amateur and professional players of Football, Rugby, Hockey, Boxing, Martial arts, Basketball, Volleyball, Sports science students and Physical education teachers, show that dentofacial injury has a high prevalence, especially in young male athletes; however, although the number of people who think that mouthguards protect the athlete from traumatic dental injury is high and a considerable number of people who

think that mouthguards affect the performance of the athlete is positively, the use of the mouthguard is very low because it is considered to affect breathing or because it has fallen off during a competition [13–15]. Based on the above, the objective of this research was to understand basketball, rugby, and soccer players’ perception regarding the use of mouthguards.

## Materials and methods

Qualitative comprehensive study with ethnographic approach and content analysis. It investigated the experience of mouthguard use in basketball, rugby, and soccer players, using the tools provided by online and face-to-face ethnography [16]. According to the nature of qualitative research, the methodology used to select the sample was snowball sampling, which consisted of two steps: identifying the initial potential participants for each sport, and through them inviting other potential participants. The sample was completed upon reaching the saturation level of information.

The basic criteria for including players in the study were to be of legal age, to be practicing at least 6 months in one of the sports of interest and to belong to a sports team at the time of the study. The basic criteria for including players in the study were to be of legal age, to be practicing at least 6 months in one of the sports of interest and to belong to a sports team at the time of the study.

The players were invited to participate in the study verbally, making visits to the training sites within the university campus. The total number of participants was 29 athletes: 10 soccer players from the university team (six women, four men), 11 basketball players (six men, five women), and 8 rugby players (two women, six men). The soccer players’ experience ranged from 5 to 12 years, the basketball players’ sports trajectory was between 6 months to 15 years, and the rugby players’ training range was from three to nine years.

The data collection was carried out by the principal investigator of the study, who had no relationship with the participants. The fieldwork lasted 4 months (August, September, October, and November of 2021), always respecting the participants’ own dynamics in order not to intervene in their training, sports practices, or academic commitments. Interviews and discussion groups were conducted until the level of information saturation was reached, as required by qualitative research.

Three data collection tools were used: (1) semi-structured interview (online and face-to-face), which was designed for this study according to its specific objectives, consisted of a guide of open-ended questions about the experience with the use of mouthguards (Annex 1). All interviews were faithfully and completely recorded and transcribed. The transcripts were shared with the

participants for their comments and feedback. (2) Field diary with detailed notes on the verbal and non-verbal expressions of the participants during the interview process and group discussion. (3) Discussion groups with the participation of 7 to 10 athletes. These discussion groups were held in the sports setting of each sport (basketball, rugby and soccer). Prior to the fieldwork, a pilot test of the interview and discussion group scripts was carried out, which allowed adjustments to be made for greater precision in terms of achieving the proposed objective. Each interview was conducted individually, and the focus groups were separated by sport and by use or non-use of a mouthguard, and experience or non-experience of orofacial trauma. In this way, quality information was sought, and possible biases related to induced information among participants were controlled and social desirability.

Each participant was assigned a code before the data analysis to safeguard confidentiality. Two capital letters were assigned; the first letter identified the participant's sport F (soccer), B (basketball), and R (rugby), and the second letter corresponded to the participant's sex M (male) and F (female).

The transcriptions were made by the principal investigator of the study. No software was used for transcriptions. The transcriptions were made by the principal investigator of the study. The data collected were transcribed in their entirety; therefore, the unit of analysis was the total transcriptions.

The paradigm for analyzing the information was "content analysis," for which the guidelines of Rodríguez-Sabiote, Herrera-Torres, and Lorenzo-Quiles [17]. This was done in the traditional way, no software was used. The information collected in the interviews, discussion groups and field diary were initially analyzed under the prism of the three specific objectives of the study (Fig. 1). This allowed for a triangulation process of the information collected. For this process, a matrix was designed to facilitate coding and categorization (deductive categorical analysis following the pre-established theoretical categories according to the research objectives).

Then, the data was arranged and grouped, which allowed to carry out the content analysis (inductive and comprehensive analysis). The content analysis process, including coding, categorization, and interpretation of data, was carried out jointly by the two researchers in this study. This whole process made it easier to counteract some limitations or biases such as social desirability. After the coding process and content analysis, three categories were identified: knowledge about the mouthguard, use or non-use of the mouthguard, and perception of the mouthguard (Fig. 1). The results were socialized and discussed with the participants.

This study had some limitations, such as the small sample size, which is typical of qualitative research. Also, it was conducted with a group of athletes from a single university where many of the participants were also students and had many academic obligations.

## Results

We present the results in three dimensions or categories: knowledge about the mouthguard, use or non-use of the mouthguard, and perception of the mouthguard.

### Knowledge about the mouthguard

*"I know it at least from other sports, usually those with a lot of direct contact, such as boxing and mixed martial arts. Anything that has to do with martial arts, in general, is used; some basketball players, I have also seen that they use it from time to time." (FM).*

### Previous experience

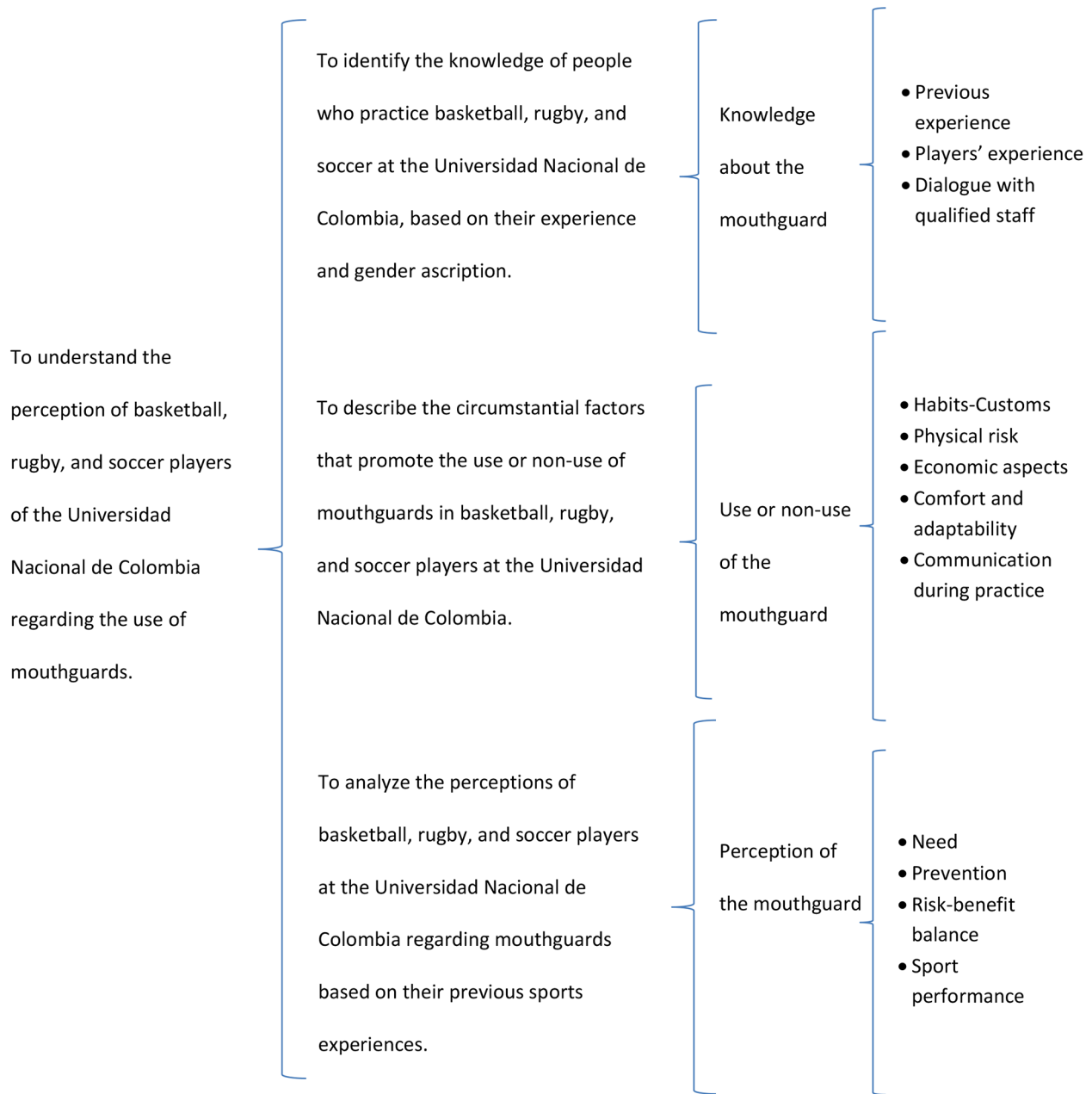
The first approach to knowledge about the mouthguard in soccer, basketball, and rugby players occurs through previous experiences (trauma and the need to use it). Coaches and players, concerned about the athletes' general health, suggest or provide technical information and functions of the mouthguard. Soccer players have less knowledge, basketball players intermediate, and rugby players receive the most information about the mouthguard.

*"Those who always explain them to us are the older ones, well, the team, like the coach, like where we can buy it, well, sports stores and how it is molded, but there are some who come with an information leaflet, and that's it." (RF).*

### Players' experience

Rugby players have several approaches to the mouthguard, from the internal regulations of the game where a call is made to use the element, not in a mandatory way, but with the suggestion emphasized as additional protection as a way of preserving player integrity.

*"Among us; for example, I have not seen any publication of the Colombian rugby federation of the Bogota league in social networks about the importance of using the mouthguard, so I think it is a very personal thing, from the coaches or the medical staff itself, or one's colleagues." (RF).*



**Fig. 1** Matrix for categorical data coding

Information about the mouthguard is limited. Little is known about the preventive function of the mouthguard; generally, the team manager is responsible for providing this information based on their knowledge and experience. Sometimes, they resort to their own research sources, such as the internet.

*“No, I think that everything can be found on the internet. It is already like one’s intention, the conviction that one wants to search whether one is interested or not.” (BF).*

**Dialogue with qualified staff**

Most players denied receiving information from dentists in their consultations or check-ups. The participating players perceive that the information provided by the dentist would be complementary and very useful since it should have a scientific basis on mouthguards. The participants were unaware that they should inform the dentist about the sports activity they perform or that they could inquire about indications to prevent injuries during the sports activity.

The best-known mouthguard among players is the boil-and-bite mouthguard, purchased regularly in sports stores or places suggested on internet sites. Very few players knew about the custom mouthguard and that this item is designed and made by a dentist, usually with the help of a laboratory.

*Well, the generic ones are cheaper, probably... I wouldn't know if the customized one has advantages or disadvantages, then probably I'll use a generic one.*

There was no evidence of any health promotion strategy related to the use of mouthguards.

*"It is not promoted, if you look for it, I guess you find it, but the information is not at a glance" (FF); "not much is known about the situation, so maybe if it were socialized a little more, there would be more awareness." (FF).*

The participating players, in general, consider the mouthguard as an element of difficult handling and adaptation. Despite this, most players would like to receive more information about mouthguards and that their implementation is more meaningful for athletes. They assume a close relationship between using the mouthguard and reducing mouth injuries or avoiding complications from treatments that the person who suffered the injury must receive.

*"Yes, actually yes, because the impacts or blows to the face are usually not so strong, but they are very frequent when one is defending or when the ball hits the face, so it should be of greater use." (BM).*

### Use or no use of the mouthguard

#### **Habits-customs**

The habit of using the mouth guard occurs more in rugby players. Its use is reiterated by the coach and the members of the same team; the contact between players is evident and known by the players.

*"It is a symbolic element of rugby...because it also shows the roughness with which it is practiced." (RM).*

Its use is more relevant in the sporting encounter; however, most players prefer to use it in training, even during warm-up.

*"We use it more under our own responsibility... in training, I hardly use it, because if we are not going*

*to collide, it is not so comfortable...for the matches, it is fundamental." (RM).*

#### **Physical risk**

In basketball and soccer, the use of mouthguards is limited due to the supposedly low probability of suffering a mouth injury. In addition, the insufficient information that players have makes it difficult for them to create the habit of using a mouthguard during sports activities.

*"Almost no one; I have not met the first person who does it, to tell the truth." (FF) "Very little, very little... but I have seen that in the NBA they use it a lot. Here at the university level and in Colombia, I have not seen it." (BF).*

The boil-and-bite mouthguard, because of accessibility and immediacy, is the most popular and used among the participants in this study. The economic factor weighs when it comes to choosing a customized mouthguard. The players state that the first option is class I. They evaluate its performance, and if it does not meet their expectations, they choose the customized mouthguard.

*"Well, the generic ones are cheaper, probably because of the price...I would not know of the advantages or disadvantages to using the customized one, then probably a generic one." (FF).*

*"The moldable ones can be remolded. Put it back in hot water and give it a normal shape." (RF).*

#### **Economic aspects**

For soccer, basketball, and rugby players, there is a belief that the customized mouthguard would involve work by the dentist and usually a laboratory, increasing the waiting time to obtain it. At the same time, the one purchased in sports stores is obtained immediately. In addition, it is thought that given the elaboration process by the dentist, the use of some scientifically-based techniques and instruments and materials for its creation, the cost of the mouthguard would be higher than the generic one.

*"For economic reasons, the generic one because the specialized ones, I think, can be very expensive. Also, for comfort and safety reasons, in other words, they would adapt much better to my jaw, and I even think they would be much safer than the ones I normally use." (RF).*

### **Comfort and adaptability**

Most players perceive the mouthguard as an uncomfortable element to use. Those who have had the experience of using it (class I) at least once expressed discomfort when speaking.

*“First, I thought it would be uncomfortable. It would have to get used to it and it would hurt at first inside the lips because it must be uncomfortable.” (BF).*

### **Communication during practice**

The class I mouthguard, properly adapted and stable in the oral cavity, allows communication during sports exercises.

*“When I didn’t have much experience, I felt the discomfort, the vomiting reflex. It has to be very comfortable to not think about the mouthguard during the game.” (RM).*

### **Perception of the mouthguard**

*“Yes, I think it would avoid it a lot... you know, I think...in a way it would be very useful because basketball is a contact sport, so obviously, when you have a very hard collision or something like that, it would be more useful.” (BF).*

### **Need**

In the case of soccer and basketball, the possibility of suffering an injury at the orofacial level tends to be minimized or made invisible; therefore, the need to implement the mouthguard is not understood. Most participating players have not experienced a significant collision or injury that damages their physical integrity.

*“I have not seen any accidents in which the teeth are compromised. There are obviously collisions with the head, but I have not seen any dental accidents, so for me, there is no need.” (FF).*

### **Prevention**

Given the high probability of being involved in collisions in rugby, the use of protective and preventive elements is emphasized from the beginning of the sports career. From the moment players decide to train rugby, they are given preventive instructions by the coach, including using the mouth guard as an element of protection and injury prevention.

*“It is the first law that we instill in the students. They have to use a mouth guard and gloves.” (RM).*

### **Risk-benefit balance**

The soccer, basketball, and rugby players in this study, in general, have an accurate opinion about the function of the mouthguard. They consider it a preventive element that can minimize injuries to the mouth in sports matches; therefore, it represents greater benefits. In soccer and basketball, the mouthguard is used after suffering an oral trauma to avoid going through a traumatic event or dental treatment again.

*“Suddenly, because of a problem, I don’t want to get hurt again, so that would be the priority, to prevent future oral problems.” (BM).*

### **Sport performance**

Player confidence is key to player performance. Participants believe that wearing the mouthguard can increase players’ confidence if the device is fitted. Playability and performance can be improved by the perception of safety provided by a properly designed and fitted mouthguard.

*“One can improve some aspects of basketball, such as reducing the fear of physical contact and blows, knowing that one’s teeth are already protected.” (BF).*

On the contrary, when it is perceived as an obstructive element or not adapted, it can cause discomfort and lack of concentration because they feel that the mouthguard can come out or move in the mouth and cause difficulty in breathing and speaking.

*“One gets more tired... it is more difficult to concentrate because one thinks about fatigue, but it is also obvious that one walks more slowly and it is more difficult to throw, run more slowly.” (BM).*

### **Discussion**

This study, carried out in Colombia, showed that using mouthguards in contact sports (soccer, basketball, and rugby) is closely related to physical risk, the possibility of trauma, or previous traumatic experiences. Its use is recognized as a functional but unattractive preventive device. Knowledge is built through experiences among players of the same or different sports, dialogue with health professionals, or qualified personnel. Determining factors for the use or non-use of the mouthguard are comfort and adaptability of the player during sports practice, poor communication, and cost of the customized

mouthguard with quality standards. Participants recognize the importance of minimizing injuries or trauma at the stomatognathic level and improving playability by developing strategies using the mouthguard; coinciding with the study by Udayamalee et al. (2023) carried out in Sri Lanka with the participation of 1340 schooling contact sports players (Football, Rugby, Hockey, Boxing, Martial arts and Basketball) [13] and a cross-sectional study carried by Vignesh et al. (2023) in 200 athletes in the India (Throw ball, Cricket, Volleyball, Basketball, Kabaddi and Karate) [18].

The study showed that players with more years and more experience in soccer, basketball, and rugby have greater knowledge about the mouthguard due to the proximity of the device, creating sports awareness of safeguarding personal physical integrity and that of the other players. They have been spectators of injuries in the orofacial region of their teammates or opponents. In that sense, this finding agrees with Exarchou et al. (2019) in their study conducted in Greece and the USA, who state that the players' knowledge about the mouthguard is proportional to the longevity of their sports career [19]. However, according to the Udayamalee et al. (2023) study the level of mouthguard usage is shallow [13] and in the Soğukpınar Önsüren et al. (2024) study, realized in Turkey, the participants did not have sufficient knowledge about the use of mouthguards, which is why the use of mouthguards should not be left to personal preference and their use should be mandatory in both medium-risk and high-risk sports [14].

In this study, it was evident that most athletes affirm that the best way to acquire information and advice on mouthguards is through the internet. Some study participants preferred to consult with their dentist or team coach. Likewise, the study by Exarchou et al. (2019), showed that Greek athletes used the same information search strategy on the internet more frequently and, to a lesser extent, the dentist. Athletes in the United States prefer to receive advice from their dentists [19]. On the other hand, for Soğukpınar Önsüren et al. (2024) it is necessary to teach on this topic in sports science faculties, including courses in the curriculum, organizing symposiums with posters and videos [14]. While for Liang & Chuang (2024) dentists, coaches and leagues organizers can play an important role in increasing access and awareness of the use and usefulness of mouthguards [7].

This research showed a high interest in learning more about the mouthguard. Participants were clear about their function and effectiveness. They feel that if the information is presented more consistently, there would be an increase in the use of mouthguards, developing the habit within the discipline, the national team, or the sports club. The soccer and basketball players received less information from physical trainers than

rugby players. This finding can be due to the regulations and recommendations of the leagues. It is understood that rugby has at least the indication to use preventive elements to maintain player integrity. For this reason, coaches are more involved in this issue and emphasize using the mouthguard. On the contrary, Sathyaprasad et al. (2018) and Vignesh et al. (2023) in India, showed that physical trainers in some sports attribute negative characteristics to the mouthguard, assuming that they negatively affect sports performance [20] or that the coaches did not insist on their use and also that they do not have mouthguards available [18].

In this study, it was evidenced, with the rugby players who were more experienced with the mouthguard that as long as the mouthguard is adapted and does not interfere, it can provide the sensation of confidence and better playability. Díaz-Valdés (2021) agrees with this. For them, using the mouthguard during sports practices considerably improves the adaptation and handling of the mouthguard itself [21]. Similarly, it is proposed by Vignesh et al. (2023) in his study carried out in India: The Gender (female), type of sports (throw ball-playing sports) and the experience of athletes influences the knowledge and use of protective devices [18].

The soccer, basketball, and rugby players all expressed the importance of the dentist as a source of information with preparation and a strong scientific basis on the mouthguard. However, some participants undergoing orthodontic treatment who perceived an increased risk of suffering a soft tissue injury from the metal elements or brackets never received any indication from their dentist to use the mouthguard as a preventive measure.

The American Dental Association promotes using mouthguards to reduce the risk of suffering injuries in different sports activities; however, this type of information does not reach all players or dentists. The participants suggest that dentists should recommend using the mouthguard to their sports patients during their appointments or clinical controls. They even suggest that the dentist should be part of the teams and work with the physiotherapist and the sports physician. This finding agrees with Ono et al. (2020) –study carried out in Japan with 115 players of American football, Rugby, Lacrosse, Karate, Nippon kempo, Soccer, Basketball and Handball–, who recognize that the use of the mouthguard is significant when there is a dentist on the team who is in charge of emphasizing and promoting the use of the mouthguard to the athletes, in this case, the personalized mouthguard [22].

The study identified that basketball and soccer participants, due to a lack of knowledge or limited information and of doubtful scientific basis, do not use the mouthguard or develop a habit of inefficient use of the mouthguard, which increases the risk of suffering an

injury orofacial level, both sports are considered medium risk contact sports. Selva et al. (2019) through a systematic review, agree with the relationship between a poor mouthguard habit and the increased risk of injury to the mouth, and affirms that in athletes this is the most probably due to insufficient knowledge of the benefits of mouthguards and limited use of mouthguards [23]. The participants in this research suffered injuries such as gum contusions, enamel microfractures, and cuts to the tongue and cheeks; however, they minimize or ignore the severity of the injury or attribute it to luck that it was not a major problem.

When participants, particularly in soccer, consider that there is no absolute need to prevent collisions that may affect physical integrity, they ignore the importance of the mouthguard and increase the probability of suffering an injury. This is like the findings of Kasum et al. (2023) in his study carried out in Croatia on soccer players although most participants (93.9%) were aware of mouthguards and 68.9% believed that they help prevent injuries while playing soccer, only a small percentage (16%) used them [24].

Most rugby players received a recommendation from the coach to use the protector and recognize that there is a high probability of suffering a collision or an injury in any part of the body, including the mouth area and adjacent tissues. Rugby players emphasize that the custom mouthguard should be worn in all contact sports, including soccer and basketball, so that the guard does not hinder playability. This indication is consistent with Azadani et al. (2023), in USA, and Mat Zainal et al. (2024) in Malaysia, who evidenced a lower occurrence of oral lesions when wearing a mouthguard [25], and also that the custom-made mouthguard not only prevents orofacial trauma, but players also adapt to its use, report greater comfort and greater support during use [26].

The class I, or boil-and-bite mouthguard, is the best known by the participating population. The cost (economic value) was found to be a limiting factor for choosing a personalized mouthguard since it is perceived that since a dentist designs it, the investment must be greater; however, none of the players had used or consulted about the value of a personalized mouthguard. This finding is comparable to what was reported in the Scoping Review by Tjønndal and Austmo Wågan (2021), who state that the high cost of acquiring a custom mouthguard is a barrier [27]. However, in this study, most participating players believe that the custom mouthguard would be the most suitable for preventing mouth injuries, as other studies suggest [7, 15, 18, 24, 26].

The soccer players in this study had not used the mouthguard during their sports careers and they think that wearing a mouthguard can negatively affect athletic performance. Of the basketball players, only two men

were aware of the mouthguard. The rugby players who had worn at least one boil-and-bite (Class I) mouthguard stated that it is an uncomfortable item because it induces salivation and the sensation of having it in the mouth can break the player's concentration and make breathing difficult, increasing physical fatigue. However, Rugby players who had worn a custom mouthguard did not report these difficulties, although they suggested it is a process of adapting to its use. Ahmed & Fine (2021) in UK, and Mat Zainal et al. (2024) in Malaysia, agree with this finding and report that Class III mouthguards, or custom-made by direct printing or intraoral scans, are easily adaptable, significantly improving player comfort, safety, and confidence [26, 28]. In this sense, in this study, some basketball players and most rugby players consider that wearing a mouthguard can generate more confidence in gameplay and strategy development since it decreases the fear of collision between players as they feel secure in their mouths.

For the players who participated in this study, verbal communication is key for effectively developing both offensive and defensive plays in their sports. The rugby players stated that it is possible to maintain adequate communication with the mouthguard if it is well-adapted. Those who used the mouthguard agree that maladaptation leads to difficulty handling the element since it can move inside the mouth, causing fatigue and imbalance. Similar data reported in Portugal by Moreira et al. (2019) [29] in basketball players, who had the perception that communication could be affected in training; however, these authors state that it has been shown that a properly designed mouthguard does not interfere in the development of athletes in terms of comfort in communication.

The soccer players in this study reported that they do not see the need to use the mouthguard in developing sports practice due to the low experience of traumatic events. However, in Kuwait, Qudeimat et al. (2019) in their study of the prevalence and severity of dental injuries in young soccer players, evidenced that 25% of the study participants (116 players) suffered a mouth injury [30].

One of the participants of this study answered the interview using the mouthguard (Class I) and emphasized that the mouthguard should be chosen according to the conditions of the athlete and be very well molded following the manufacturer's indications. Knapik et al. (2019) [31] in his meta-analysis, reported that the use of the mouthguard significantly reduced dentoalveolar injuries and concluded that the use of the mouthguard should be for all sports where the incidence of oral injuries is significant, such as contact sports and some non-contact sports with the risk of oral injuries.



For the players involved in this study, it is important to preserve their physical integrity and sports performance. The mouthguard can prevent the risk of suffering an orofacial injury. In this sense, based on the consensus of the Royal Society of Medicine of London, Scott et al. (2020) [32] revealed that the recovery of facial injuries is careful and complex regarding the time required for the athlete to return to optimal physical condition. They report that players who suffer severe trauma are prone to reopen wounds and therefore lose their place on the team.

It is important to clarify that this study had some limitations due to its qualitative nature. Among them, the study did not have a representative sample and a possible social desirability bias. Finally, in conclusion, it can be asserted that the mouthguard, according to the players participating in the study, is related to preventing mouth injuries during contact sports. The perception of the mouthguard in the group of participants (soccer, basketball, and rugby players) is multifactorial, highlighting the idea of risk due to contact during practice, the preventive characteristics of the attachment, sports values, sports performance (individual and group goals), comfort, adaptability, and individual disposition.

Further studies on the mouthguard are suggested regarding dentists' knowledge of mouthguards and the management of sports emergencies. In Colombia, there is a lack of exploration of sports dentistry and its application.

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13102-024-00903-8>.

Supplementary Material 1

### Acknowledgements

We thank all the participants in the study for their time and willingness during the research process and the Universidad Nacional de Colombia for hosting this project.

### Author contributions

The idea was conceptualized by the EAAF and LASA. The team comprising of all co-authors designed the research protocol and methods. Data analysis was performed by EAAF and LASA. The manuscript was prepared and revised by EAAF and LASA.

### Funding

None.

### Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

The Ethics and Research Methodology Committee of the Dental School of the Universidad Nacional de Colombia approved this study. All subjects gave informed consent before participating in the study. All methods were carried

out in accordance with the ethical standards established in the Universal Declaration on Bioethics and Human Rights.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

Received: 29 October 2023 / Accepted: 9 May 2024

Published online: 09 August 2024

### References

- Harris AW, Voaklander DC, Jones CA, Rowe BH. Time-to-subsequent Head Injury from sports and Recreation activities. *Clin J Sport Med*. 2012;22(2):91–7. <https://doi.org/10.1097/JSM.0b013e31823776cb>
- Tham RC, Cassell E, Calache H. Traumatic orodental injuries and the development of an orodental injury surveillance system: a pilot study in Victoria, Australia. *Dent Traumatol*. 2009;25(1):103–9. <https://doi.org/10.1111/j.1600-9657.2008.00720.x>
- Mantri SS, Mantri SP, Deogade S, Bhasin AS. Intra-oral Mouth-Guard in Sport Related Oro-Facial injuries: Prevention is better than cure! *J Clin Diagn Res*. 2014;8(1):299–302. <https://doi.org/10.7860/JCDR/2014/6470.3872>
- Tomislav T, Jerolimov V, Pandurić J. Dental/orofacial trauma in contact sports and intraoral mouthguard programmes. *Kinesiology*. 2007;39(1):97–105. <https://doi.org/10.1186/15892>
- Rouhani A, Ghoddsi J, Rahmandost MR, Akbari M. Prevalence of Traumatic Dental injuries among Contact Sport practitioners in Northeast of Iran in 2012. *J Dent Mater Techniques*. 2016;5(2):82–5. <https://doi.org/10.22038/jdmt.2016.6618>
- Tewari N, Saji S, Goel S, Srivastav S, Alani A, Mathur VP, et al. Prevalence of sports-related traumatic orofacial and dental injuries in Asian countries: a systematic review and meta-analysis. *J Sports ed Phys Fit*. 2023;63:000–000. <https://doi.org/10.23736/s0022-4707.23.14915-2>
- Liang L, Chuang S-K. Mechanisms of dental injuries in basketball, United States, 2003–2022. *Dent Traumatol*. 2024;40(2):144–51. <https://doi.org/10.1111/edt.12894>
- Levin L, Zadik Y. Education on and prevention of dental trauma: it's time to act! *Dent Traumatol*. 2012;28(1):49–54. <https://doi.org/10.1111/j.1600-9657.2011.01060.x>
- de la Teja-Ángeles E, Zurita-Bautista YE, Durán-Gutiérrez A. Dispositivos intraorales: guardas oclusales y férulas para pacientes en estado crítico. *Experiencia Del Instituto Nacional De Pediatría. Acta Pediátrica De México*. 2012;33(4):191–7. <https://www.redalyc.org/articulo.oa?id=423640338006>
- Jimeno FG, Gras R, Olivares AA, Fernández CC, Rodríguez AI. Protector bucal individualizado Mediante La técnica De formación Al vacío. A propósito de un caso. *Odontología Pediátrica*. 2014;22(3):195–208. <https://dialnet.unirioja.es/servlet/articulo?codigo=5127933>
- Patrick DG, van Noort R, Found MS. Scale of protection and the various types of sports mouthguard. *Br J Sports Med*. 2005;39(5):278–81. <https://doi.org/10.1136/bjism.2004.012658>
- Bueno J.C.A, Faro H, Lenetsky S, Gonçalves AF, Dias SBCD, Ribeiro ALB, et al. Exploratory systematic review of mixed Martial arts: an overview of performance of importance factors with over 20,000 athletes. *Sports*. 2022;10(6):80. <https://doi.org/10.3390/sports10060080>
- Udayamalee I, Amarasinghe H, Zhang P. Oro-dental trauma burden and mouthguard usage among contact sports players: a call for sports dentistry initiatives in Sri Lanka. *Dent Traumatol*. 2023;00:1–9. <https://doi.org/10.1111/edt.12916>
- Soğukpınar Önsüren A, Eroğlu H, Aksoy C. Faculty of sports science students, physical education teachers, and athletes' level of knowledge and attitude about mouthguards. *BMC Oral Health*. 2024;24:57. <https://doi.org/10.1186/s12903-023-03675-8>
- Haughey J, Fine P. 532 B052 – do athletes and their sports medicine team know when to replace a mouthguard? *Br J Sports Med*. 2024;58:A72–3. <https://doi.org/10.1136/bjsports-2024-IOC.125>
- Galeano Marín ME. Estrategias De investigación social cualitativa. El giro en la mirada (2ª edición). Universidad de Antioquia, Facultad de Ciencias Sociales y Humanas, Fondo Editorial FCSH; 2018.

17. Rodríguez Sabiote C, Lorenzo Quiles O, Herrera Torres L. Teoría y práctica del análisis de datos cualitativos. *Rev. SOCIOIAM* 2005;15(2):133–54. Disponible: <https://www.redalyc.org/pdf/654/65415209.pdf>
18. Vignesh TS, Chinni SK, Anumula L, Sannapureddy S, Kumar YP, Rohith VV. Knowledge, attitudes, and practices of mouth guards in the prevention of orofacial injuries in sports persons – A cross-sectional study. *J Interdiscip Dentistry*. 2023;13:84–9. [https://journals.lww.com/joid/fulltext/2023/13020/knowledge\\_attitudes\\_and\\_practices\\_of\\_mouth.7.aspx](https://journals.lww.com/joid/fulltext/2023/13020/knowledge_attitudes_and_practices_of_mouth.7.aspx)
19. Exarchou EL, Ioannis K, Nikolaos K. Use of mouthguards by Amateur Basketball Athletes in Greece and the USA. *Trauma Cases Reviews* 2019;11;5(1). <https://clinmedjournals.org/articles/tcr/trauma-cases-and-reviews-tcr-5-071.php?jid=tcr>
20. Sathyaprasad S, Philip PA, Vijaynath S, Neethu SK, Rekha R. Attitude and awareness of using mouthguard among physical instructors in Sullia: a questionnaire study. *J Dent Res Rev*. 2018;5:124–7. [https://journals.lww.com/jdrr/fulltext/2018/05040/attitude\\_and\\_awareness\\_of\\_using\\_mouthguard\\_among.5.aspx#:~:text=The%20results%20showed%20that%20in,during%20training%20and%20sports%20activities](https://journals.lww.com/jdrr/fulltext/2018/05040/attitude_and_awareness_of_using_mouthguard_among.5.aspx#:~:text=The%20results%20showed%20that%20in,during%20training%20and%20sports%20activities)
21. Díaz-Valdés L, Valle-Lizama R. Protectores bucales en la prevención de lesiones traumáticas dentomaxilofaciales en adolescentes durante prácticas deportivas. *Archivo Médico Camagüey*. 2021;25(4):11 p. <https://revistaamc.sld.cu/index.php/amc/article/view/7961>
22. Ono Y, Tanaka Y, Sako K, Tanaka M, Fujimoto J. Association between sports-related concussion and Mouthguard Use among College sports players: a case-control study based on propensity score matching. *Int J Environ Res Public Health*. 2020;17(12):4493. <https://doi.org/10.3390/ijerph17124493>
23. Selva Mani S, Aparna S, Madan Kumar PD. Prevalence of orofacial injuries in contact sports: a systematic review. *Int J Phys Educ Sports Health*. 2019;6(3):39–46. <https://www.kheljournal.com/archives/2019/vol6issue3/PartA/6-1-64-780.pdf>
24. Kasum M, Gavic L, Mandic P, Tadin A. Knowledge of traumatic dental injuries and mouthguard behavior among Croatian soccer players. *Dent Traumatol*. 2023;39(6):555–64. <https://doi.org/10.1111/edt.12862>
25. Azadani EN, Peng J, Townsend JA, Collins CL. Traumatic dental injuries in high school athletes in the United States of America from 2005 to 2020. *Dent Traumatol*. 2023;39(2):109–18. <https://doi.org/10.1111/edt.12800>
26. Mat Zainal MK, Liew AKC, Abdullah D, Soo E, Abdul Hamid B, Ramlee RAM. Changes in oral functions and speech when using custom-fitted mouthguards: an uncontrolled before-and-after study. *Dent Traumatol*. 2024;00:1–10. <https://doi.org/10.1111/edt.12939>
27. Tjønndal A, Austmo Wågan F. Athletes' and coaches' attitudes toward Protective Headgear as Concussion and Head Injury Prevention: a scoping review. *Front Sports Act Living*. 2021;25(3):680773. <https://doi.org/10.3389/fspor.2021.680773>
28. Ahmed I, Fine P. Injury prevention versus performance: has the time come to mandate the use of mouthguards in all contact sports? *BMJ Open Sport Exerc Med*. 2021;7(1):e000828. <https://doi.org/10.1136/bmjsem-2020-000828>
29. Moreira A, Fonte E, Clemente MP, Vasconcelos M. Orofacial Trauma Prevalence and Mouthguard Awareness in Basketball players. *J Orthop Trauma*. 2019;9(236053):6p. <https://www.ashdin.com/abstract/orofacial-trauma-prevalence-and-mouthguard-awareness-in-basketball-players-18107.html>
30. Qudeimat MA, AlHasan AA, AlHasan MA, Al-Khayat K, Andersson L. Prevalence and severity of traumatic dental injuries among young amateur soccer players: a screening investigation. *Dent Traumatol*. 2019;35(4–5):268–75. <https://doi.org/10.1111/edt.12470>
31. Knapik JJ, Hoedebecke BL, Rogers GG, Sharp MA, Marshall SW. Effectiveness of mouthguards for the Prevention of Orofacial Injuries and concussions in sports: systematic review and Meta-analysis. *Sports Med*. 2019;49(8):1217–32. <https://doi.org/10.1007/s40279-019-01121-w>
32. Scott N, Hughes J, Forbes-Haley C, East C, Holmes S, Wilson E, Et. Elite and Professional sports facial injuries management – a consensus report. *Br J Oral Maxillofac Surg*. 2020;58(10):e254–9. <https://doi.org/10.1016/j.bjoms.2020.08.046>

#### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.