

# The use of mouthguards in grappling sports: a survey of grapplers in the United Kingdom

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## Key points

Grapplers are at risk of dental trauma.

Little research currently looks at how high this risk is.

General dental practitioners have a role in prevention in this patient group by recommending and fabricating mouthguards.

## Abstract

**Background** Mouthguards are routinely used in many sports, however their use in grappling sports has not really been examined to date, and to the authors' knowledge, there is no available data on the level of dental trauma experienced by this group.

**Materials and method** The authors approached six different grappling schools, as well as leaving an invite on a grappling event page for volunteers to fill out a short survey.

**Results** Around 81 respondents took part in the survey, with nearly 25% reporting that they never wore a mouthguard during grappling, and less than 50% not wearing a mouthguard all the time. Sixty-three percent of respondents had either seen dental and peri-oral injuries, or had experienced dental injuries as a result of grappling.

**Conclusion** More work is needed to investigate whether mouthguards have a positive effect on the dental injury experience, and to establish the percentage of grapplers who at some point will be affected by dental trauma.

## Introduction

Mouthguards were originally designed and developed in 1890, by Woolf Krause and his son Philip Krause in London as a means of helping boxers to prevent lip lacerations.<sup>1</sup> Since then, mouthguard use has become more widespread, eg used in rugby, hockey, American football and many other sports. Interestingly, most of the evidence supporting their use is anecdotal and/or involves low numbers of participants. However, one study prospectively looked at 70,936 athlete exposures in college basketball, of which 8,663 wore mouthguards. Athletes using mouthguards were significantly less likely to have dental injuries and/or dentist referrals compared to athletes who did not

wear the mouthguards. However, in this study, there was no difference in soft tissue injuries around the mouth.<sup>2</sup> Mouthguards are thought to work by not only absorbing the shock via deformation of the material of the mouthguard, but also by covering the sharp edges of teeth thereby preventing soft tissue injury, and providing support for the teeth by filling in space around the teeth, as well as helping to maintain the tooth position relative to the tooth socket, helping to maintain the periodontal ligament. This also may help prevent the loss of avulsed teeth.<sup>3</sup> It should be noted, however, the effectiveness of mouthguards at preventing dental and peri-oral injuries remains slightly controversial, with some studies finding no difference in injury incidence, yet others finding that mouthguard use significantly reduced injury rates.<sup>4,5</sup> Likely reasons for these differences are how the trauma is classified and how it is measured (are patients examined or is it self-reported?).

There are three main designs of mouthguards. Stock mouthguards which are the simplest form of mouthguard, and can

be used 'straight off the shelf'. The second type of mouthguard are referred to as 'boil and bite' or 'mouth formed' mouthguards, where the mouthguard is heated, and then formed to the patient's mouth, or whereby a gel is placed within the mouthguard and formed around the patient's dentition. The third type of mouthguard is a custom-made guard, whereby an impression is taken, and a mouthguard produced using this with either a vacuum-formed polyethylene or another similar thermoplastic. More complex designs can involve the use multiple laminated layers of the thermoplastic held together under high pressure and temperature.<sup>3,6</sup> The custom-made mouthguard would typically be provided in the UK by a GDC-registered dental healthcare professional.

Many sports recommend wearing a mouthguard; however, to the authors' knowledge, no guidelines on the use of mouthguards in grappling sports, such as judo, wrestling and Brazilian jiu jitsu (BJJ), currently exist, and there are few reports on the use of mouthguards in these sports. Persson's study highlighted an increase in anterior maxillary

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teeth trauma in wrestlers, and as such it would seem reasonable that mouthguards may be beneficial to these individuals.<sup>7</sup>

Grappling is the use of close quarters fighting techniques to subdue, pin, or cause injury to an opponent without the use of strikes. Typically these sports involve a combination of clinching (attempting to off-balance an opponent), takedowns (manipulating an opponent so that both players end up on the ground), throws (where one grappler lifts his opponent and forcibly places him on the ground), pinning (holding an opponent down in a controlled position), and submissions (whereby one grappler attempts to force his/her opponent to forfeit the match by inflicting pain or injury or by causing their opponent to lose consciousness, eg with a choke). Common grappling martial arts include judo, BJJ and wrestling but grappling is often incorporated into other martial arts, such as MMA (mixed martial arts).

Judo, BJJ, wrestling, mixed martial arts and other grappling sports differ in their rulesets and in the techniques used. BJJ tends to focus on techniques involving chokes, strangles and hyper-flexion of the joints, judo tends to involve the use of throwing-based techniques, wrestling typically involves take-downs and pinning, and mixed martial arts (MMA) involves a combination of all the above with striking.<sup>8,9,10</sup> It should be noted, however, that there is overlap between all of these disciplines, for example, pins and chokes are commonly used within judo, but they are used to a lesser extent in BJJ.

## Aims

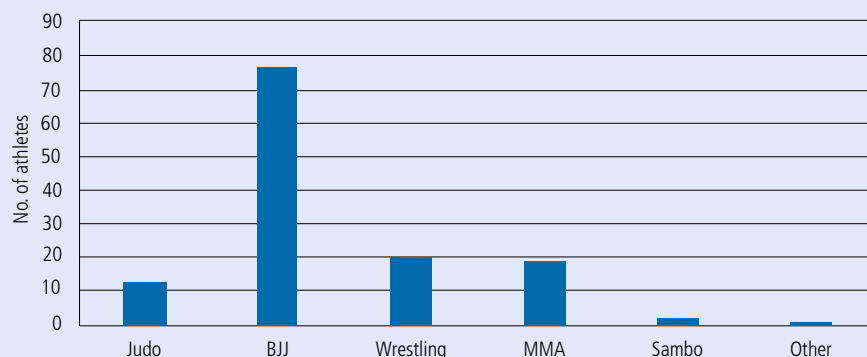
The aim of this study was to get some data on the prevalence of mouthguard use in grappling sports in the United Kingdom, to ascertain if practitioners of these sports are experiencing dental injuries and identify some of the barriers for mouthguard use.

## Materials and methods

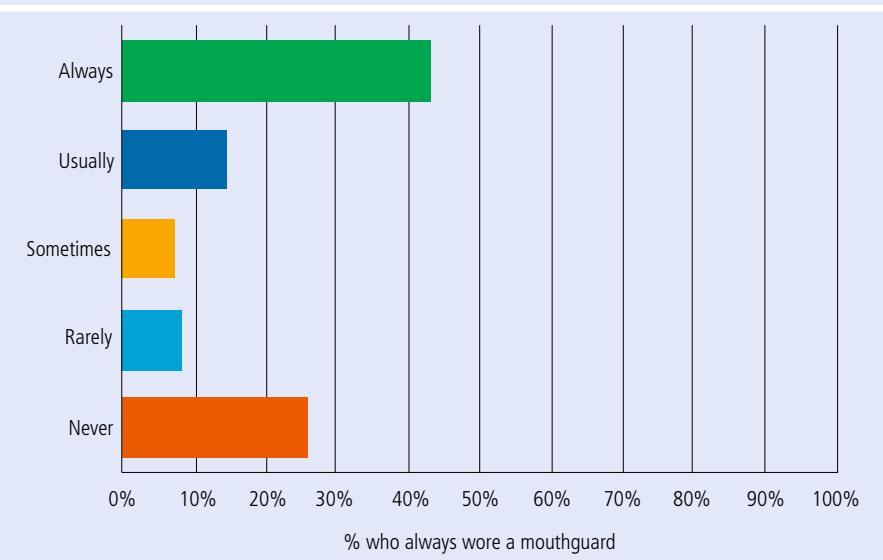
### Study cohort

Data collection was via a short online survey whereby willing volunteers would answer a few questions about their experiences using mouthguards in grappling sports. Volunteers were recruited by approaching coaches of various judo/wrestling/BJJ schools (schools approached were Tillery combat, Redditch Judo Kwai, Beeches Martial arts, 10<sup>th</sup> Planet Redditch, Wrekin Star Judo club and Teiko

**Fig. 1** Total number of martial arts represented by our cohort. Note that many wrestlers, judoka and MMA athletes also train in BJJ and so this is thought to perhaps be a reason for a high number of athletes appearing to train in BJJ, even though numerous different schools of martial arts were invited to partake in this study. There were 81 athletes in total of which 77 trained BJJ to some extent



**Fig. 2** Shows how often practitioners of grappling sports wore a mouthguard. Just under 50% always wore a mouthguard, with nearly a quarter not wearing a mouthguard at all



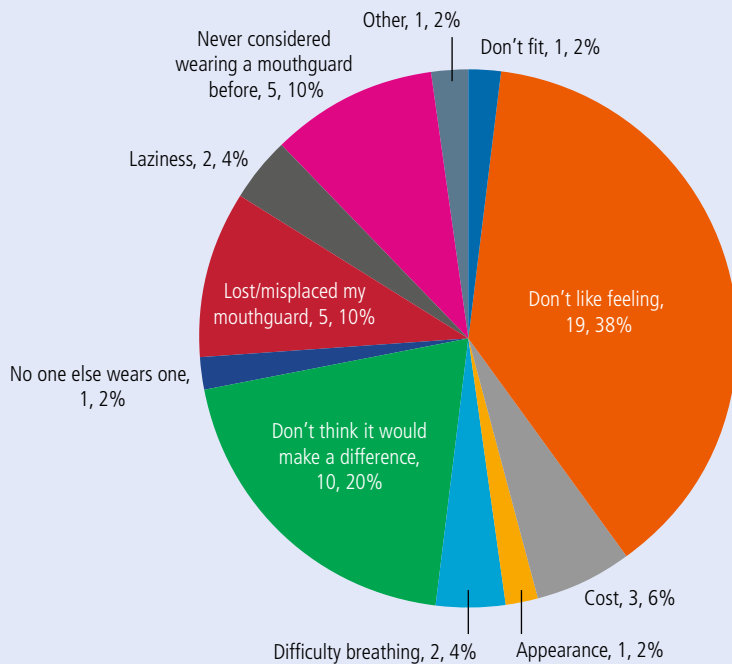
gemu) as well as using UK-affiliated BJJ, judo and wrestling national social media pages where competitions, events and seminars are advertised. Volunteers did not receive any financial rewards for taking part in the survey, and no confidential information such as age, location or names were taken or recorded. A total of 81 volunteers took part in this survey. The survey responses were collected electronically in a totally anonymous fashion.

### Questionnaire

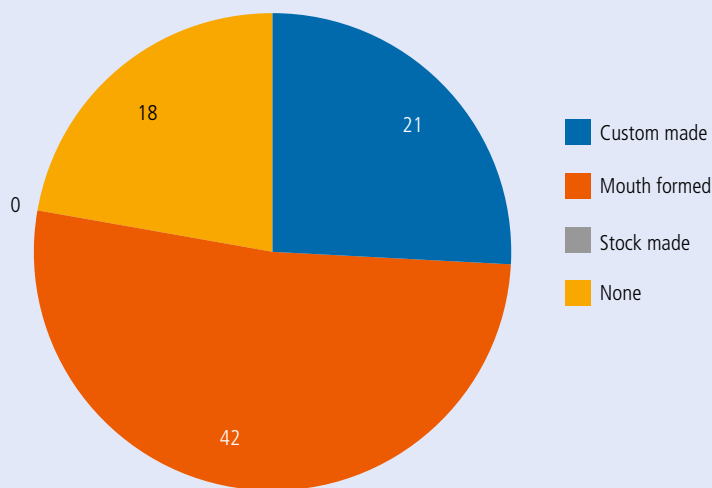
The questionnaire consisted of five MCQ questions, and an area for free text. The survey was designed to be short and quick to complete due to concerns that participants might not fill out the survey if it was too long.

The questions asked related to the type of grappling art performed (to attempt and differentiate different attitudes within the different martial arts communities, as well as the differences in trauma experience). The frequency of mouthguard use, the type of mouthguard used (images were used showing the different types of mouthguard available, including stock, mouth-formed mouthguards, and custom-made mouthguards), the reasons for not wearing a mouthguard, and the individuals experience of either being involved in, or seeing someone else sustain dental or oral trauma. The questions were MCQ based, but respondents were able to select 'other' and state another reason for most questions. Respondents were also invited to give some comments about their

**Fig. 3** Pie-chart showing the main reasons given by practitioners for not wearing a mouthguard. Most practitioners didn't like the feeling of wearing a mouthguard or felt that doing so would not make a difference. Note: this question was only asked of practitioners that did not report wearing a mouthguard in the first place



**Fig. 4** A breakdown of the type of mouthguard used. No users reported using a stock mouthguard, with mouth-formed (or 'boil and bite') mouthguards being the most common



experiences wearing mouthguards within their respective sports.

### Data analysis

Data from the completed questionnaires were entered into an Excel document, and were analysed using Chi-square statistical analysis. Qualitative comments and answers were grouped into themes to try and observe trends.

### Results

Overall 81 respondents filled out the survey, with 95% of respondents practising BJJ (77 out of 81 respondents). The next most common martial arts were wrestling, MMA and judo (total numbers 21, 19, 13 respectively, Fig. 1). Thirty-seven respondents (45.7%) stated that they trained in more than one discipline, with the average number of 1.64 disciplines per

person. It may not be surprising that such a large proportion of respondents trained in BJJ as many judoka (judo practitioners) and MMA fighters and wrestlers commonly cross-train in BJJ. In our results, only four judoka claimed not to also train in BJJ, whereas everyone else who responded trained in BJJ to some extent. Due to this, statistical analysis of the frequency of mouthguard use and experience of trauma in each different sports group is difficult to accurately perform due to such a high percentage of athletes also belonging to the BJJ group.

### Which grappling martial art/sport do you take part in (tick all the apply)?

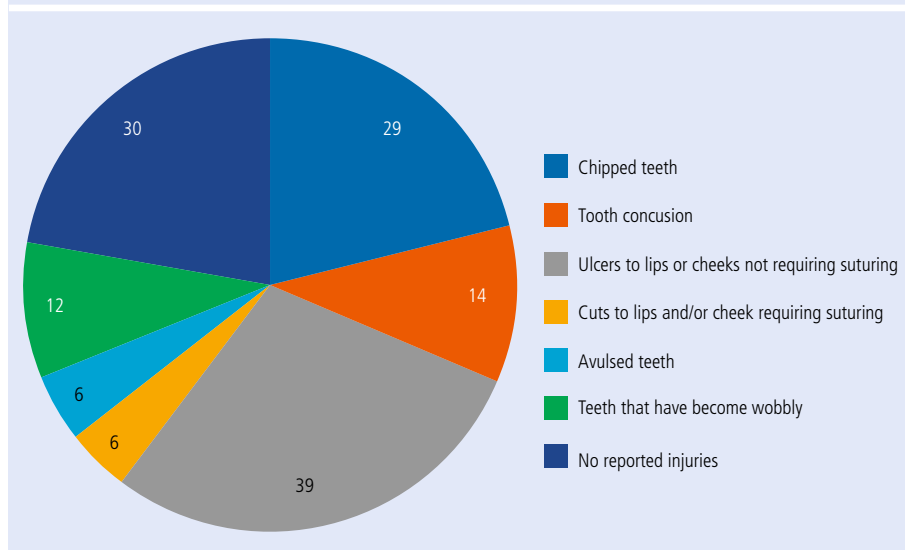
Nearly half (43.75%,  $n = 35$ ) of respondents stated that they always wear a mouthguard while participating in these sports. Worryingly, over a quarter (26.25%,  $n = 21$ ) stated that they never wore a mouthguard. Five individuals stated that they wore a mouthguard for sparring and/or competition, but did not wear a mouthguard for drilling of techniques as they felt the risk was lower due to the controlled environment (see Fig. 2).

The most common reason for not wearing a mouthguard was a dislike of the feeling when wearing a mouthguard. The next most common reason was the fact that most practitioners felt that wearing a mouthguard would not make a difference (see Fig. 3). Whether this is because practitioners did not consider themselves to be at risk when taking part in these sports, or whether they felt that a mouthguard would be ineffective at stopping injury from taking place is not clear from the results of this study.

### How often do you wear a mouthguard while taking part in grappling sports?

The most commonly worn mouthguard was a mouth-formed mouthguard (otherwise known as a 'boil and bite') ( $n = 52$ , 71.23%), with 21 respondents (28.77%) using custom-made mouthguards. No respondents in this survey reported using a stock mouthguard. The remaining athletes reported not attempting to wear any mouthguard at all (see Fig. 4). There was no statistical significance between the type of mouthguard used and trauma experience. There was also no difference in trauma experience and frequency of wearing a mouthguard. It is unknown if the mouthguards were being worn at the time of injury. It is also possible that people who have seen or experienced dental injury may have been motivated to get a mouthguard.

**Fig. 5 Reported trauma to the oral tissues. Please note some respondents reported more than one injury type. Chipped teeth and oral ulcers were the most commonly reported injuries**



**Fig. 6 (a) Shows how force may be applied to the dental and oral tissues during a choke. Note the upward pressure onto the jaw and lip line which may have results in force application to the teeth had the grappler not been wearing a mouthguard. (b) Shows an example of a traumatic ulcer to the lip on another grappler which was sustained from a similar manoeuvre. The traumatic ulcer correlates with the position for the lower right canine tooth. Both images kindly supplied by 10<sup>th</sup> planet Redditch and used with permission**

An unexpected result from this survey was the number of grapplers who reported either sustaining or witnessing trauma to the dental and oral tissues while grappling (see Fig. 5). Thirty-seven percent of respondents reported that they had *not* seen or experienced some form of trauma to the oral tissues. However, the vast majority of respondents stated they had seen or experienced some form of dental or peri-oral trauma while partaking in their sport; the most common damage to the oral tissues being lip and/or cheek ulcers, and chipped teeth respectively. Around 20.1%

reported either seeing or experiencing tooth avulsion, lacerations to the oral tissues and wobbly teeth (thought to be either subluxated or luxated teeth). As all these injuries are likely to require treatment at some point, these results have implications on clinicians treating these patients, as well as for the patients themselves. This highlights that patients would potentially benefit from mouthguards to help prevent further damage.

Participants highlighted that a cause for damage to the lips was partly due to choking techniques which can result in the lips being

forced into the teeth, resulting in ulcers and cuts. One individual also highlighted that, during training, occasionally two groups of sparring individuals would collide, stating that such an incident was the cause for him or her having tooth avulsion, a lip laceration and wobbly teeth afterwards.

## Discussion

Grappling martial arts typically do not include repeated blows to the facial region unlike most other contact martial arts, such as boxing. However, as the results from this study imply, there are still significant forces that can end up being transmitted through this region. Ulcers and cuts to the lip can be common, especially when one grappler can be applying a choke, which can result in the lips being forced into the teeth (see Fig. 6). Furthermore, to the authors' knowledge, no other paper has investigated the possibility of dental trauma in this group, with most literature on dental trauma in sport looking at sports such as boxing, rugby or hockey.<sup>11</sup> One of the limitations of this study is that we cannot state exactly how many individuals within these sports have personally experienced dental trauma due to the fact that the question also analysed witnessed trauma, as when designing the questionnaire, it was assumed that dental trauma would be a relatively infrequent occurrence. Furthermore, for the same reason, we did not ask about the number of traumatic episodes, and the specifics of long-term implications, such as treatment required, long-term damage to teeth and other possible outcomes. More work is likely to be needed in this area to begin to estimate the level of risk involved.

## Conclusions

From the results of this survey, it would suggest that grappling sports can be considered as a risk factor for damage to the oral tissues. Although most of this damage appears to be to the oral soft tissue, this study shows that the dental tissues are also at risk of damage.

Based on these results, it would seem logical for dental practitioners to advise participants of these sports to wear some form of mouthguard. In this study, around 10% of individuals who did not regularly wear mouthguards stated that the main reason they did not wear a mouthguard is that they had not considered it before, and another 20% stated that they did not feel that grappling sports put them at risk

of damage to the oral and dental tissues, and thus wearing a mouthguard would not make a difference.

This potentially means that as dental professionals we may be able to prevent the incidence of dental and oral trauma in this patient group via an effective preventive message. Furthermore, by undergoing professional fabrication of custom-made mouthguards, it is possible that some patients may find this type of mouthguard to be more comfortable, and thus be more likely to wear them.

Further work would be required to adequately quantify this risk, and to determine

whether athletes were wearing mouthguards at the time of dental injury.

#### Acknowledgements

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