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ORIGINAL RESEARCH

Effectiveness of the new mandatory mouthguard use and orodental injuries in Dutch field hockey

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ABSTRACT

Objectives

Up to 68% of field hockey players have experienced at least one orodental injury in their sport career. Therefore, the Royal Dutch Hockey Association (KNHB) made mouthguard use mandatory for field hockey players during competition and training from August 2015 onwards.

This study evaluates the effects of the new regulations on mouthguard use and the occurrence of injuries in Dutch field hockey.

Methods

A 35-item online questionnaire about mouthguard use and orodental injuries was sent to 13 field hockey clubs in the Netherlands. Absolute numbers and percentages of mouthguard ownership, mouthguard use, number and type of injuries were assessed. The results were related to comparable data before mandatory mouthguard use. Associations of gender and training frequency with the number of injuries were analysed with logistic regression.

Results

In total, 1169 hockey players were included in the study and almost all owned a mouthguard (females:99.6%, males:93.7%), which significantly increased after implementation ($p < 0.001$). 90.6% of the respondents wore a mouthguard during matches and 70.1% during training. Of the 1169 players, 68 (5.8%) experienced at least one orodental injury after the implementation with a total of 100 injuries. Injuries happened more often during matches (63.2%) than during training (36.8%). Lip cuts account for most of the injuries, the number of broken ($p = 0.116$) and knocked out teeth ($p = 0.026$) decreased.

Conclusion

Although mouthguard use already increased in recent years, the new regulations led to an additional increase and a successful change of attitude towards mouthguard use. Most importantly, the severity of orodental injuries decreased measurable.

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Wounds and injuries; hockey; mouth protectors; orodental; sports medicine; prevention

Introduction

In field hockey, injuries occur regularly and are a growing cause of concern for players and policymakers worldwide [1–3]. Head and face injuries account for an estimated 27–40% of all trauma in field hockey and one-third of them are orodental injuries [1,4–6]. Up to 68% of field hockey players have experienced at least one orodental injury in their sport career [7]. The injuries are a burden on players' health and impact not only their training and competition time but also other daily life activities [7].

To reduce the number of injuries, field hockey organizations have undertaken different preventive strategies, such as rule changes, advancements in warming-up techniques, and equipment modifications [8]. One of the key strategies has been the introduction of mouthguards to prevent orodental injuries of field hockey players. Research consistently shows the mouthguard offers significant protection against orodental injuries [9]. Meta-analysis indicates that the overall risk of an orodental injury is 1.6–1.9 times higher when a mouthguard is not worn, relative to wearing a mouthguard [9]. Although the use of mouthguards has been an advantageous strategy in decreasing the occurrence of orodental injuries, the implementation of mandatory mouthguard use in field hockey still needs to be improved [10]. A study among field hockey players has shown that before the year 2000 only 31.4% of the players wore mouthguards, and since then this percentage has increased but there is still a need for improvement so that it becomes optimal and everyone wears it consistently [7,11].

In 2014, a study from our institute performed among 1299 Dutch field hockey players reported a substantial number of players who had experienced at least one orodental injury during their field hockey career. However, only 66% of the players had worn mouthguards regularly during both training and competition [12]. Less players use mouthguards during training than during matches although a third of all hockey-

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Supplemental data for this article can be accessed here.

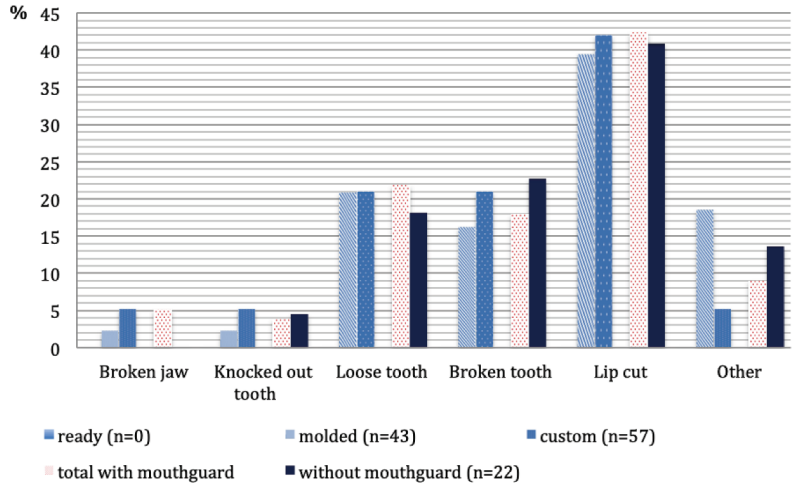

Figure 1. Severity of all orodental injuries occurred in the past 4 years (n = 100) stratified by mouthguard use presented in percentages.
Footnote: The percentages of orodental injuries do not add up to 100 since more than one answer was possible.

accidents happen during training [12]. Training is with teammates and matches are against people whose behaviour they are not familiar with, hence players their playing style may be different. During matches, the direct result is also more important to the competition than during training, but mouthguard use during training might also prevent a large part of orodental injuries. The majority of players indicated to change their attitude towards mouthguards if the regulation would be mandatory [12]. In response to this study, the Royal Dutch Hockey Association (KNHB) announced the mouthguard use as mandatory for all field hockey players during training and competition. The association committee also advised the players to wear the mouthguard during all hockey activities on the field, including matches, training, warming-ups and recreational hockey [12,13].

Field hockey is a highly dynamic sport and the advancement of the game must be partnered with an appropriate evaluation of the effectiveness of current regulations on athlete's safety. Therefore, in the present study, we investigate the effectiveness of the new regulations about mandatory mouthguard use among the Dutch field hockey players on the number and composition of orodental injuries. We assess subsequent changes in mouthguard use and the occurrence of orodental injuries. The results of the study can be used to improve existing preventive strategies and the development of future preventive interventions. We expect a change in attitude towards mouthguard use, after implementation of the rule about mandatory use. If it becomes more common to use a mouthguard, players will accustom to its use and will more likely accept mouthguards as a matter of course. As a result, we expect that the number and/or severity of orodental injuries is reduced [9,12].

Methods

Ethical approval

This study was performed in accordance with the Dutch Medical Research on Humans Act (WMO) and the ethical principles as stated in the Declaration of Helsinki [14]. The study protocol has been approved by the medical ethical committee of the Erasmus Medical Centre in Rotterdam, the Netherlands (MEC-2016-018). Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Study population

All field hockey players from the Netherlands, playing in the higher and lower level competitions were eligible to participate in the survey. A and B-juniors were selected from national (higher competition level) and district (lower competition level) leagues. Seniors were selected from the Premier League, first and sub-of the standard competition (higher competition level) and reserve/veteran competitions (lower competition level). The clubs that participated were the same clubs that participated in the study of Vucic et al [12]. In total 1362 field hockey players responded to the survey. Goalkeepers (n = 57) were excluded from the responses because stricter safety rules are applied to this group (such as the mandatory use of helmets). Incomplete questionnaires (n = 136) were excluded, and finally n = 1169 questionnaires were available for the present study.

Survey construction

In this study, an adapted version of the survey developed by the Injury Prevention Task Force of the KNHB was used. This questionnaire has previously been used to evaluate the patterns of orodental injury and the use of mouthguards in Dutch national field hockey [12]. For the current study, we removed 6 questions about whether mouthguard use should be mandatory and we added 8 questions about the compliance with and attitude towards mouthguard use. The final survey contained 35 questions, divided into the following categories (supplementary material): general information (7 questions),

Table 1. Sample characteristics of included field hockey players presented by gender (n = 1169).

Total (N, %)			
Characteristics	Female (n = 692)	Male (n = 477)	P- value
Age (years; mean SD)	25.1 (10.8)	31.4 (14.1)	**≤.01**
Competition			
Junior	209 (30.2)	109 (22.9)	.01
National/Super/IDC.	42 (6.1)	31 (6.5)	.12
1e t/m 2e class	66 (9.5)	35 (7.3)	
3e t/m 5e class	86 (12.4)	33 (6.9)	
Senior	483 (69.8)	368 (77.1)	
Young seniors	82 (11.8)	29 (6.1)	**≤ .01**
Seniors	298 (43.1)	194 (40.7)	
Veterans	96 (13.9)	114 (23.9)	
Veterans VL/Veterans L	7 (1.0)	31 (6.5)	
Other	15 (2.2)	10 (2.1)	
Training sessions per week			**≤ .01**
0x	11 (1.6)	24 (5.0)	
1x	401 (57.9)	300 (62.9)	
2x	199 (28.8)	101 (21.2)	
>3x	81 (11.7)	52 (10.9)	
Position			.21
Defender	230 (33.2)	180 (37.7)	
Midfielder	209 (30.2)	122 (25.6)	
Attacker	185 (26.7)	122 (25.6)	
Varying	68 (9.8)	53 (11.1)	
Have Mouthguard (N, %)	689 (99.6)	447 (93.7)	**≤ .01**
Yes since 2015	56 (8.1)	68 (14.3)	
Yes even before 2015	633 (91.5)	379 (79.4)	
No	3	30	
Type			0.74
Stock	14 (2.0)	7 (1.6)	
Mouth-moulded (boil and bite)	402 (58.4)	255 (57.0)	
Custom-made	273 (39.6)	185 (41.4)	
Frequency use			**≤ .01**
During matches only	148 (21.5)	108 (24.2)	
During matches and training	506 (73.4)	297 (66.4)	
Partly during matches	11 (1.6)	14 (3.1)	
During training	12 (1.7)	5 (1.1)	
Rarely	9 (1.3)	17 (3.8)	
Never	3 (0.4)	6 (1.3)	
Complaint when wearing a mouthguard			0.99
Yes	139 (20.2)	90 (20.1)	
No	550 (79.8)	357 (79.9)	
Think it is affordable (yes)	533 (77.0)	379 (79.5)	**≤ .01**

Differences were tested using a t-test for continuous variables and chi-squared tests for categorical variables. Absolute values and percentages are given from the non-imputed dataset.

orodental injury (10 questions), mouthguard use, incl. type of mouthguard (13 questions) and referees' perspective (5 questions). The players were asked to report the most severe injury of an accident. However players also reported multiple injuries, when they occurred at different accidents. The frequency of injuries and accidents is given in supplementary table 1. The consequence and type of injury were considered to assess the severity of the accidents. The consequence of the accident was ascertained via three alternatives, stopping the game, urgently visiting the doctor, and need for stitches. The type of injury was ranked from most severe to least severe and specified as follows: broken jaw, knocked-out tooth, broken tooth, loose tooth, lip cut, and other. Nine answers were classified as other (supplementary table 2). In both studies, mouthguard use during training and matches was calculated in the same way. The answers to the question about mouthguard use were: during matches, partly during matches, e.g., penalties, during training, rarely and never. The individual answer categories were grouped for the data analysis into: during matches, during matches + during training, partly during matches, during training, rarely and never.

Survey administration

The survey was administered digitally 4 years after the implementation of the new regulations about mouthguard use in field hockey. In this manuscript, we mainly evaluate the information on mouthguard use and injuries regarding the past 4 years. The information on the study sample used in this manuscript considers their status at the time of survey conduction. Age, competition, trainings per week, position, type of mouthguard, frequency of mouthguard use, and complaints about mouthguard use was based on their status at the time of survey conduction. Mouthguard ownership, time point, site, place, cause and severity of orodental injury was analysed separately for their entire hockey career and for the last 4 years. First, the questionnaire was sent out for pilot testing to one hockey club, Oranje-Rood. After initial review and approval, the KNHB forwarded the final invitation to participate in the survey to the management of 13 hockey clubs in the Netherlands (Pinoke, GHBS, Apeliotes, Hudito, Push, Qui Vive, Culemborg, Zwolle, HDS, Maarssen, Heesch, Apeldoorn and Kampong). The management of the clubs were instructed to distribute the invitations by mail to the individual members.

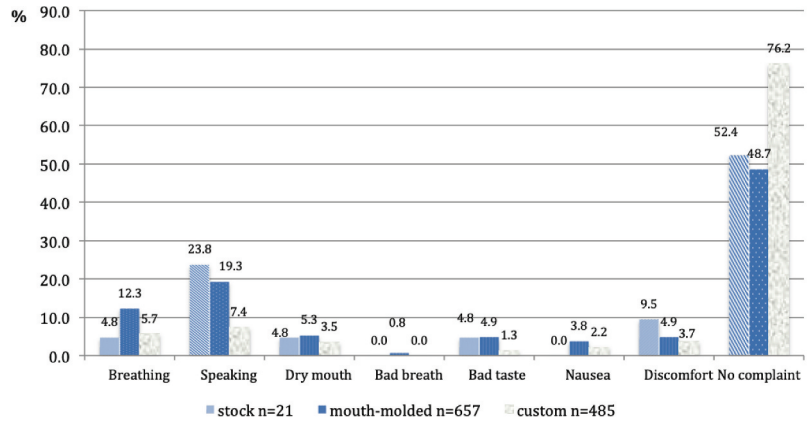

Figure 2. The association between athletes complaints by type of mouthguard presented in percentages.

Responses to the survey were collected and anonymously registered between May and July 2018 via the digital platform of the Erasmus Medical Centre, Rotterdam, the Netherlands.

Statistical analysis

Sample characteristics are presented stratified by gender and tested for differences using one-way ANOVA for continuous variables and Chi-squared test for categorical variables (Table 1). We built a logistic regression model to assess the influence of gender and number of trainings on the number of orodental injuries. We presented odds ratios (OR) with 95% confidence intervals (95% CI) for these associations.

Mouthguard ownership, mouthguard use, number and type of injuries, and gender differences in orodental injuries were compared between the current study population and hockey players before august 2015, i.e., before the introduction of the new regulation. Chi-squared test and test for heterogeneity were applied. The general characteristics from Vucic et al. can be found in supplementary table 3 [12]. A comparison between characteristics of the population of this study and the population of Vucic et al. can be found in supplementary table 4. Attitudes towards and perceptions on mouthguard use were analysed using descriptive statistics.

The analyses were performed with the statistical software SPSS V.25.0 (IBM Corp, Armonk, New York, USA, 2017) for Mac IOS. For all analyses, statistical significance was reached for p-value <0.05. Graphs were plotted in Microsoft Excel 2011 for Mac IOS.

Results

General characteristics

Descriptive characteristics of the study population are presented in Table 1. In total, 1169 players, 692 females and 447 males with a mean age of 25.1 years (SD = 10.8) and 31.4 years (SD = 14.1) respectively, participated in the study. The sample consisted of 73% senior/veteran (≥18 years) and 27% junior league (15–18 years) players. Most of the players were defenders (35%), midfielders (28%) and attackers (26%), and some

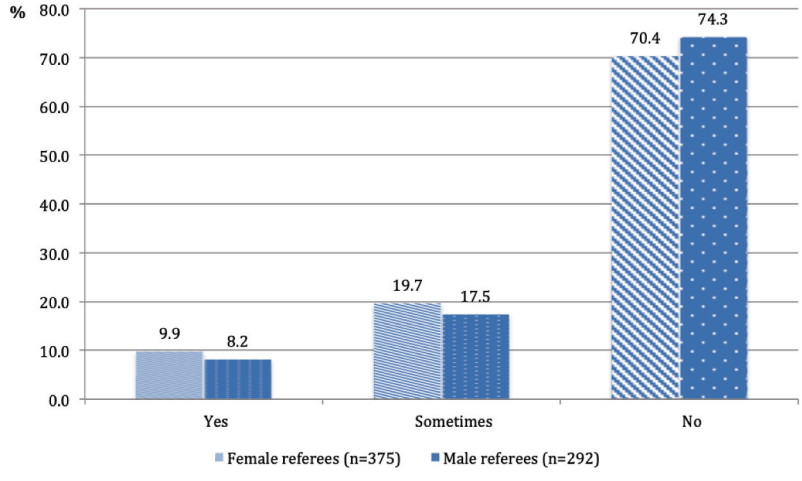

Figure 3. Efforts of referees to control the mouthguard use of players presented in percentages.

had a varying position (10%). The majority of the athletes had one hockey training per week (60%).

Player's attitude towards mouthguard use

Almost all hockey players reported to own a mouthguard (females: 99.6%, males: 93.7%). Of all respondents, 68.7% wore a mouthguard during both matches and training. Still, mouthguards were less often worn during training (70.1%) than during matches (90.6%) based on the data of all respondents. Female players wore mouth-molded mouthguards (also often referred to as boil and bite) significantly more often (58.4%) than a custom-made (39.6%) or a stock-mouthguard (2.0%). Except of 6.5% female and 19.7% male players, hockey players thought that the new regulations on mandatory mouthguard use are properly complied with.

Orodental injury

Descriptive data of orodental injuries and mouthguard use of included hockey players are presented in Table 2. Among all 1169 survey respondents, 68 hockey players experienced at least one orodental injury in the last 4 years, of which 2.1% of the players were injured in the past season and 3.8% of the players were injured between 2 and 4 years ago. In total, 100 injury occasions occurred between 2015 and 2019, thus after the implementation of the new regulations on mouthguard use. In the majority of the injury occasions, a mouthguard was worn (77.7%). Of all injuries, lipcuts were reported the most (41.6%) among players wearing a mouthguard (Figure 1). In the current survey, males did not differ significantly from woman in the occurrence of orodental injuries (OR = 0.59; 95% CI: 0.34,1.00). More than one training per week did not lead to more injuries compared to only one training per week (OR = 1.53; 95%CI: 0.84 to 2.82). Of all injuries, 63.2% occurred in matches and 36.8% during training. Hockey balls (63.5%) and hockey-sticks (35.1%) were the most common cause for orodental injuries. In 76.5% of the orodental injuries the player wasn't able to continue the match or training session and in 64.7% of the orodental injuries medical treatment was needed.

Table 2. Orodental injuries and mouthguard use of included hockey players by gender.

Characteristics	Female	Male	P- value
Orodental Injury* N,(%)	105 (15.2)	73 (15.3)	
Timepoint[a]			.033
Last season	18 (17,1)	6 (8.2)	
1–3 years ago	30 (28.6)	14 (19.2)	
4–10 years ago	23 (21.9)	29 (39.7)	
More than 10 years ago	34 (32.4)	24 (32.9)	
Orodental Injury post-implementation*	48 (45.7)	20 (27.4)	.013
Orodental Injury pre-implementation*	57 (54.3)	53 (72.6)	
Site of Injury**[a]			
Broken jaw	3 (4.2)	1 (3.4)	
Knocked out tooth	3 (4.2)	1 (3.4)	
Loose tooth	17 (24.0)	4 (13.8)	
Broken tooth	12 (16.9)	7 (24.1)	
Lip cut	28 (39.4)	14 (48.3)	
Other	8 (11.3)	2 (6.9)	
Competition level when injured[a]			.230
Junior	28 (58.3)	8 (42.1)	
Seniors	20 (41.7)	11 (57.9)	
Place of injury[a]			.850
During match	30 (62.5)	13 (65)	
During training	18 (37.5)	7 (35)	
Cause of injury[a]			.810
Hockey ball	33 (68.8)	14 (70.0)	
Hockey stick	14 (29.2)	6 (30.0)	
Collision	1 (2.1)	0 (0.0)	
Fall	0 (0.0)	0 (0.0)	
Severity[a]			
Unable to continue playing	36 (75.0)	16 (80.0)	.660
Required treatment	31 (64.6)	13(65.0)	.970
Required stitches	11 (22.9)	7(35.0)	.260
Wore a mouthguard during injury (yes)[a]	42 (87.5)	11 (55.0)	**.003**

Differences were tested using a t-test for continuous variables and chi-squared tests for categorical variables. Absolute values and percentages are given from the non-imputed dataset.

*If multiple injuries occurred at different time points, players were asked to report about the most severe case.

** More than one answer was possible.

[a]Percentage is based on the number of post implementation injuries

Player's perception about mouthguard use

Athletes had various complaints regarding the use of mouthguards (Figure 2). Overall speech impairment was the most reported complaint especially from players wearing a mouth-molded mouthguard. Players with a custom made mouthguard complained least of all. Although 39.2% of the females and 29.1% of the males replaced their mouthguard every 2 years, 24.8% of the females and 35.3% of the males did not replace their mouthguard for more than 4 years. Among all respondents, 22.0% considered the mouthguard expensive.

Of all hockey players, 56.9% of the females and 62.6% of the male players were sometimes active as a referee during hockey matches. The majority of them did not control mouthguard use regularly during refereeing activities (72.1%) (Figure 3). Among those who controlled mouthguard use, 38.7% sent the player off to return to the game only after wearing the mouthguard and 24.9% did not intervene at all.

Effectiveness of mandatory mouthguard use

Mouthguard ownership increased significantly ($p < 0.001$) after implementation of the new rule in both female and male hockey players with 8.1% to 99.6% and with 14.3% to 93.7% respectively. Although the percentage of mouthguard owners that use a mouthguard during matches has not increased (93.6%, to 93.2%) the percentage of respondents wearing a mouthguard during matches has increased (81.3% to 90.6%). The percentage of mouthguard owners that wears a mouthguard during training has decreased (77.3% to 72.2) but the percentage of respondents wearing a mouthguard during training has increased (67.1% to 70.1%). No statistically significant difference ($p > 0.05$) in frequency and severity of orodental injuries among players was shown between pre- and post-implementation (past 4 years) periods (Table 3). However, when post-implementation frequency and severity of orodental injuries was compared to the values of all-time pre-implementation, a statistically significant decrease of knocked-out teeth was shown (7.7%, $p = 0.026$). Further, the occurrence of broken-tooth injuries decreased from 9.0% to

Table 3. Proportions of the types of injuries before and after the implementation.

	Post-implementation	Pre-implementation last 4 years[a]	p-value last 4 years[b]	Pre-implementation all time[a]	p-value all time [b]
Broken jaw	4.0% (4/100)	8.1% (7/86)	0.854	3.9% (11/282)	0.965
Knocked out tooth	4.0% (4/100)	10.5% (9/86)	0.162	11.7% (33/282)	0.026
Loose teeth	21.0% (21/100)	24.4% (21/86)	0.624	21.2% (60/282)	0.967
Broken tooth	19.0% (19/100)	16.3% (14/86)	0.787	25.9% (73/282)	0.166
Lip cut	42.0% (42/100)	39.5% (34/86)	0.364	37.2% (105/282)	0.397

[a]Numbers are based on the study of Vuvic et al [12].
[b]p-values are based on chi-squared tests.

4.0%. After the moment of injury, 76.5% of the players were unable to continue the match.

Discussion

Main findings

Nowadays, almost all Dutch field hockey players own and wear a mouthguard during matches, which significantly increased after the new regulations were implemented in August 2015. Most of the hockey players think that the new regulations about mouthguard use are properly complied with. Although orodental injuries still frequently occur in Dutch field hockey, the severity of the injuries tends to decrease. There is still need for improvement for mouthguard use during training. Unfortunately, referees do not yet monitor mouthguard use consistently.

Effectiveness of the new regulations

Indeed the rule change had an effect on mouthguard use, which we consider a direct effect. After the implementation of the rule the percentage of mouthguard ownership increased. Subsequently the change in mouthguard use changed the severity of orodental injuries during hockey training and competition. We consider this as an indirect effect of the rule change. Thus, we attribute all effect to the rule change. Formerly males were more prone to experience an orodental injury during field hockey activities [12]. However, this has significantly changed when mouthguard use became mandatory. Generally, more hockeyplayers have a mouthguard and also wear it more often during matches and training. However, still less players wear a mouthguard during training compared to matches while a third of accidents happen during training. Although the number of orodental injuries has hardly changed we observed significant changes in the patterns of orodental injuries. There is an important decrease in the number of knocked out tooth and a substantial reduction of broken tooth when we look at the comparison between post implementation and pre-implementation all time. But when we look at the comparison between post implementation and last 4 years pre-implementation we see an important decrease only in the number of knocked out tooth. The acceptance of mouthguards in field hockey, which is the most important aim of the new regulation, has been accomplished since almost all players own and wear a mouthguard. Furthermore, the percentage of mouthguard use during training and matches based on the total number of respondents has also increased. As expected, the frequency of broken jaws and lip cuts did not change because mouthguards mainly protect the teeth and the gums but not the lips and the jaws.

Interpretations

The role of referees in the implementation of the new regulations is essential. Unfortunately, peers and referees check the wearing of mouthguards inconsistently. In our investigation, mouthguards were worn more often during matches than during training, emphasizing the importance of referees for the proper execution of new regulations. Therefore, special workshops developed for referees are needed to help them understand better their contribution toward the control of mouthguard use. Raising up the awareness of wearing a mouthguard and highlighting the role of match referees, especially of primarily player-referees, could improve the implementation of mandatory mouthguard use. It might then become a part of their playing style and they might consequently use it more often during training too.

Still, males wear mouthguards less often than women. It is yet unclear why males have more difficulties to accept the mouthguard. If the underlying reasons were mapped, it would be easier to increase the effectiveness of mandatory mouthguard use [15,16].

A considerably part of the players thinks a mouthguard is expensive, and therefore they seldom replace the mouthguard. Although the endurance of a mouthguard is around 2 years only one third of the players replace their mouthguard within 2 years [17]. Thus the majority of the players keep using a mouthguard which probably does not function optimally. Prevention strategies should consider to not only focus on the wear of a mouthguard but also on the correct maintenance and replacement.

Even after mandatory implementation of mouthguard use, lip cuts are still the most frequent orodental injuries. Field hockey associations are highly suggested to prioritize preventive strategies to decrease lip-cut injuries. We propose the manufacture of a mouthguard that in addition to dental and intraoral soft tissues also protects the lips.

The implementation of mandatory mouthguard use in field hockey is existing only in the last four years. Studies about the introduction of helmets among players of American football has shown that in terms of time, it can take more than 50 years before safety regulations become an integral part of a sport discipline [18]. Therefore, a final evaluation of the effectiveness of mouthguard use and orodental injuries is too early to be ascertained. When similar safety regulations will be introduced by other nations, the

implementation of mandatory mouthguard use in the Dutch field hockey would find support. If the use of the mouthguard is optimal in the Netherlands, the Netherlands can have a forerunner function for other countries. Because mouthguard use is not mandatory in other countries yet. This uniformity can make an even better contribution to the collective optimal use of the mouthguard. Field hockey and mouthguard use need to become inseparable, yet this is not the case.

Strength and limitations

This study covers the occurrence of orodental injuries in field hockey over the past 4 years since the new regulations were implemented in 2015, i.e., the time in which mouthguard use became mandatory. This time window might be too short to evaluate the implementation of mandatory mouthguard use and its effects on the occurrence of orodental injuries. However, we were able to compare the present results with the results from Vucic et al. who studied orodental injuries within a comparable time window before the implementation of mandatory mouthguard use [12]. As we did not yet find a difference in the number of accidents, but only in orodental injury, the current study should be repeated in several years. Furthermore there may even be a further reduction in the severity of orodental injuries. The data collection for this study was conducted retrospectively, thus, the present data rely on memory, which potentially introduced information bias in the presented results. Hockey players might have remembered or reported selectively whether they have worn mouthguards and/or have experienced orodental injury. Future studies on orodental injuries of hockey players would benefit from standard injury registries. Additionally this standard injury registry could be used to monitor and compare different hockey clubs more regularly. Another limitation of our study might have occurred, because we used retrospective questionnaires, which could have led to information bias. There is also a possible misclassification in the registration method since in some questions we only asked about the most severe injury but players could have had multiple injuries. A less severe injury may then possibly not be registered because there is a more severe injury. However in Vucic et al. the same registration method was used and the answers are therefore comparable [12].

Finally, this study had a relatively low response rate. It could be, that only players that perceive the new regulations as very important have replied to the survey, which might have caused the results to be more positive towards mouthguard use. The same accounts, when only players from clubs that implemented the new regulation particularly painstakingly. However this is common in survey research and comparable with the previous study conducted among Dutch hockey players [12]. The indirect distribution of questionnaires does not allow us to verify whether all hockey players received an invitation to participate in the survey since that task has been handed over to the management of the individual clubs within the KNHB. Hockey clubs that recognize the importance of mouthguard use might have distributed the survey more actively than clubs which value mouthguard use as less beneficial. On the other hand, the distribution of the questionnaire by the KNHB is also a strength of our study, since the questionnaire was presented by an authoritative institution. As the major strength of our study, we account the current research as the first investigation that provides scientific evidence about the effectiveness of mandatory mouthguard use in the prevention of orodental injuries during field hockey activities.

Future research

Field hockey is a dynamic and fast evolving sport. Therefore, mouthguard use and orodental injuries need to be monitored repeatedly during a longer follow-up time. After a longer period of time, a successful implementation might be less complied with the regulation, but on the contrary, the regulation could also become an indispensable part of the sport. The generation of an online database where all orodental injuries, and even other injuries are recorded at the time when the injury occurs would be of a big scientific worth. Such an ongoing database would help researchers to collect longitudinal data to monitor the implementation and effects of new safety regulations as well as the performance of individual clubs. The derived information can be used to develop and improve interventions on both the club and team level, as identified patterns of injury can direct the preventive strategies. Still, whether this kind of intervention is the most promising in the reduction of orodental injury is difficult to say, as it always also depends on the nature of injury to prevent. Especially when now the injury pattern in field hockey change due to increased mouthguard use, as has been indicated by our study, future intervention might benefit from a different strategy. As we have a substantial indirect effect of the current intervention via mouthguard use, we expect future interventions to be promising when they focus, in terms of the Haddon matrix, on equipment in the pre-event fase [19].

Conclusion

In conclusion, the new regulations changed the attitude among hockey players towards mouthguards use as recently almost each player owns and wears a mouthguard. There is still need for improvement for mouthguard use during training. Also, the severity of orodental injuries in Dutch field hockey is reduced since mouthguards became mandatory. Whether the implementation of mandatory mouthguard use will continue to generate a beneficial effect in the decrease of orodental injuries, needs to be evaluated in further studies.

Declaration of interest

No potential conflict of interest was reported by the authors.

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