# Dental injuries in inline skating – level of information and prevention

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Fasciglione D, Persic R, Pohl Y, Filippi A. Dental injuries in inline skating – level of information and prevention.

Abstract – Inline skating belongs like ice hockey, rugby, and boxing to sporting activities with high-risk of suffering tooth accidents. Because of high velocity and loss of balance, especially on uneven ground, the injury potential in inline skating is higher. The objective of this work was to conduct a comparative study between Switzerland and Germany. The questions focussed on the frequency of tooth accidents, their prevention by mouthguard and the level of information about emergency measures after dental trauma and the resulting consequences for athletes. Using a standardized questionnaire totally 612 individuals, 324 men and 288 women, in two countries belonging to three different divisions (fun, fitness and speed) were surveyed. Fifty-six (9.2%) of these 612 interviewees have already experienced a tooth injury while inline skating. More than half of all interviewed players (68.3%) were aware of the possibility of replanting avulsed teeth. Only 32.4% were familiar with the tooth rescue kit. Just 65.4% knew mouthguard and only 1.9% of those athletes ($n = 12$) wore a mouthguard while inline skating. The results show that the area of inline skating requires more information about preventing dental trauma through sports associations and dentists.

Key words: dental trauma; mouthguard; prevention; inline skating; tooth rescue kit

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Accepted 13 July, 2005

Due to high-risk sports like skateboarding and mountain biking the probability of suffering orofacial injuries has increased in the last years (1–5). Today up to 35% of all children and adolescents suffer dental accidents involving permanent teeth (6–9); especially to the front teeth of the upper jaw because of their exposed position (10–12). Most common sports tooth injuries are crown fractures (13, 14). Serious dental injuries like avulsion require extensive therapy and costs (15). The estimated lifelong costs for one avulsed tooth amount up to 18 000€. Skating belongs like American football, boxing, ice hockey and rugby to sports activities with high-risk for suffering dental trauma (16). Because of high velocity and loss of balance, especially on uneven ground, inline skating has a high incidence of such injuries. Most common skating injuries are hand fractures (17, 18). Conclusive data about frequency and type of dental injuries in inline skating are not available.

Wearing mouthguard leads to a significant reduction of orofacial injuries and jaw fractures (19–23). Studies about soccer showed that 32% of all players who didn't wear mouthguard suffered tooth accidents. However only 0.8% of those players who wore mouthguard experienced dental trauma (24). Tooth injuries in rugby could be reduced from 56 to 24% by wearing mouthguard (24). In most types of sports mouthguards are not an integrated part of the protective gear such as helmet, knee or elbow pads. The wearing of mouthguard is regulated in professional boxing, ice hockey, rugby, and American football. In inline skating the use of mouthguard is rare and there aren't any recommendations yet. In many types of sports with close body contact mouthguards are not widely accepted.

Points of criticism are especially communicative problems during play, breathing difficulties, mouth dryness and bothersome esthetics (25–28). These problems are reduced if mouthguards are custom-made (29). Custom-made mouthguards fit perfectly and therefore offer best protection (30–35). The most frequent reason for not wearing mouthguard is that most people think they don't need anyone (24, 36–39).

Because to date no inline skating data about tooth accidents has been provided, the objective of this work was to conduct a comparative study between Switzerland and Germany on a number of issues: the frequency of tooth accidents in inline skating, habit of wearing mouthguards and level of information about emergency measures after dental trauma and the resulting consequences for athletes.

## Materials and methods

Standardized interviews with 612 athletes were conducted in two countries (Switzerland and Germany). The participating athletes were divided in three different divisions: fun (beginner), fitness (spare time), and speed (advanced). In each division the study analyzed and evaluated more than 200 players, 100 men, and 100 women (Table 1). The interview contained 14 questions about experienced tooth injuries, tooth replantation, tooth rescue kit and mouthguard (Table 2). The questionnaire had already been used for similar studies (27, 36, 37). The investigator went through this list with each athlete separately in order to avoid players from giving same answers. Age, nation and division of each interviewee were recorded at the beginning of the interview. The interviews took mainly place at national championship races in Germany and Switzerland. Amateurs were surveyed in public parks. The statistical evaluation was done using the aspects of the nation (Switzerland, Germany), age, sex, and division (fun, fitness, and speed). By means of a general linear model, a variance analysis was carried out in order to determine significant dependencies. The software program used for the analysis was SPSS/WIN 11.0 (SPSS Inc., Chicago, IL, USA). The level of significance was set at $P \leq 0.05$.

Table 1. Interviewees in Switzerland and Germany

| Nation | Division | Number of individuals |
|---|---|---|
| Switzerland | Fun | 101 |
| | Fitness | 104 |
| | Speed | 102 |
| Germany | Fun | 102 |
| | Fitness | 102 |
| | Speed | 101 |
| Totally | | 612 |

Table 2. Questionnaire

| No. | Question |
|---|---|
| 1. | Have you ever seen an injury in inline skating? |
| 2. | If yes, what kind of injury? (fracture: collar-bone, hand, others/laceration: arm, leg, shoulder, others/others) |
| 3. | Have you ever experienced a dental injury while inline skating? |
| 4. | If yes, what kind of dental injury? (avulsion, crown fracture, dislocation) |
| 5. | Do you know that it is possible to replant an avulsed tooth? |
| 6. | In your opinion, within what time span does a tooth has to be replanted? |
| 7. | Are you aware that immediate action is essential for a successful outcome? |
| 8. | Do you know the tooth rescue kit? |
| 9. | Do you know that an avulsed tooth has to located for legal reasons? |
| 10. | In your opinion how high are the life-long subsequent costs for a lost anterior tooth? |
| 11. | Do you know a mouthguard? |
| 12. | If yes, which kind of mouthguard do you know? (stock, custom-made) |
| 13. | Do you wear a mouthguard? |
| 14. | If not, why? (communication, breathing, esthetics, no necessity) |

## Results

Totally 612 individuals, 307 in Switzerland (168 men and 139 women) and 305 in Germany (156 men and 149 women) were surveyed. The average age of all interviewees was 31.2 years. About 69.9% of all players have already observed an injury (Fig. 1). Statistical differences were found among divisions ($P < 0.001$): speed division athletes observed most injuries. Differences between sex were noted, too ($P = 0.007$): men observed clearly more

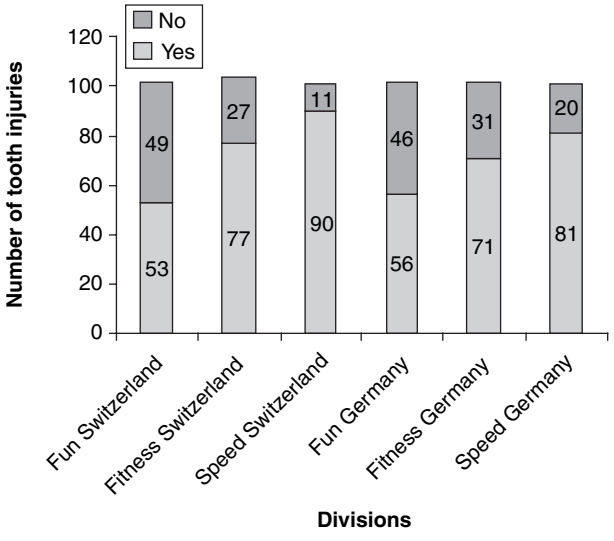


*Fig. 1.* Comparison of observed skating injuries according to divisions and nations.

injuries than women. Most common injuries were lacerations and fractures of the wrist. In response to the question 'Have you ever experienced a dental injury?' Fifty-six (9.2%) of the 612 interviewees answered with yes, 556 with no.

Statistical differences between nation ($P = 0.318$), sex ($P = 0.704$) and division could not be determined. Differences were only found among age ($P = 0.015$): most tooth injuries concerned athletes between 21 and 30 years (Fig. 2). Thirty-six athletes suffered crown fractures, 17 experienced dislocations and only three individuals avulsions (Fig. 3). Four hundred and eighteen (68.3%) of all interviewees were aware of the fact that avulsed teeth can be replanted. No statistical differences were found among divisions ($P = 0.186$), age ($P = 0.079$), sex ($P = 0.902$) and nation ($P = 0.149$). The answers to the question 'In your opinion, within what time span does a tooth has to be replanted?' varied considerably (Fig. 4). The average time given for reclamation of a tooth was 50.1 h in Switzerland and 55.3 h in Germany ($P = 0.003$). Statistical differences were found among sex ($P = 0.040$) and divisions ($P < 0.001$), too. One Hundred and ninety-eight (32.4%) of the 612 participants were familiar with the tooth rescue kit (Dentosafe, Iserlohn, Germany), which allows avulsed teeth to be preserved in a cell physiological environment. Statistical differences were determined between the two nations (Switzerland 57, Germany 141) ($P < 0.001$). The comparison of divisions showed differences, too ($P < 0.001$) (Fig. 5). One hundred and sixty-six of 612 (27.1%) interviewees knew that avulsed teeth have to be located for legal reasons because teeth are a part of the body. No statistical differences were determined between nations ($P = 0.338$), sex ($P = 0.600$), age ($P = 0.397$), and divisions ($P = 0.542$). The life-long subsequent costs after avulsion of an anterior tooth were estimated better in Switzerland (6193€) than in Germany

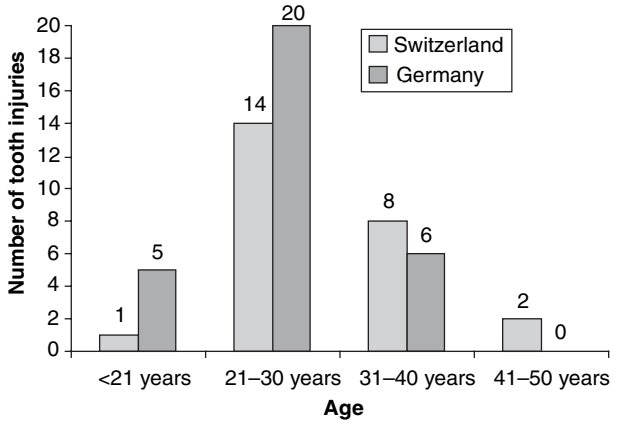


*Fig. 2.* Comparison of suffered tooth injuries according to age and nations.

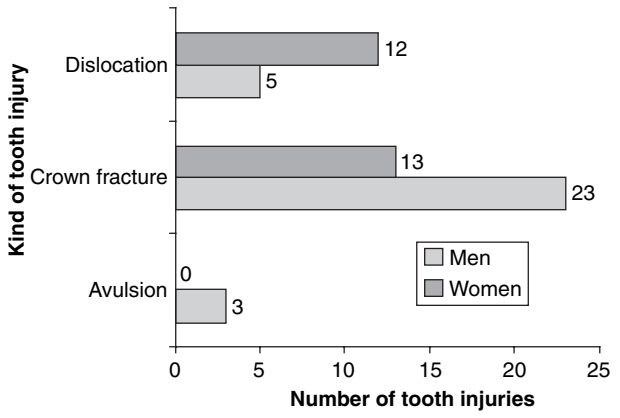


*Fig. 3.* Comparison between kind of suffered tooth injuries.

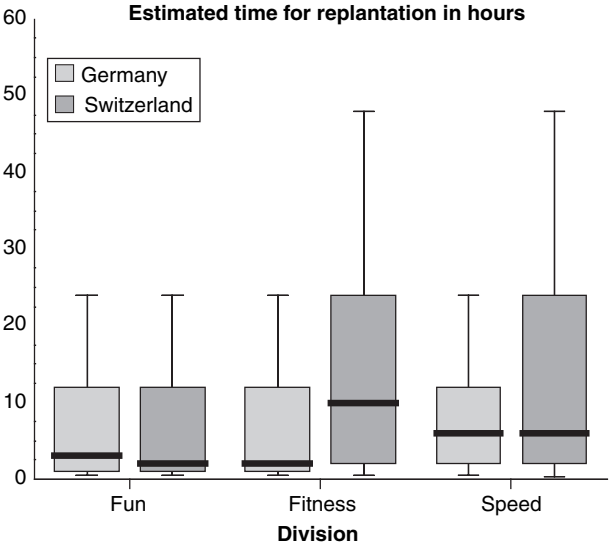


*Fig. 4.* Comparison of estimated time for replantation.

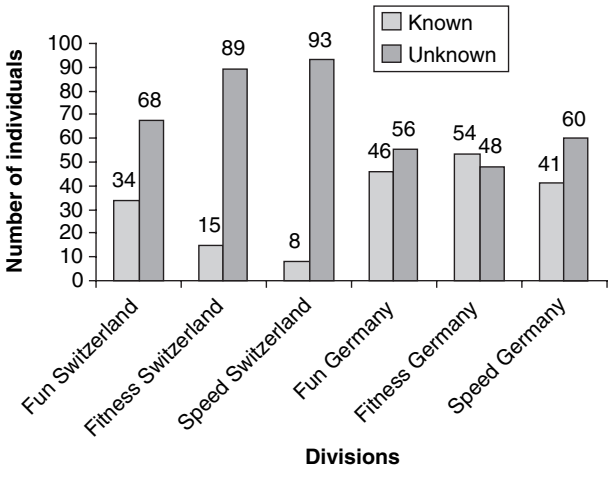


*Fig. 5.* Awareness of tooth rescue kit according to divisions and nations.

(4885€) ($P < 0.001$). A statistical difference concerning divisions ($P = 0.056$), sex ($P = 0.184$), and age ($P = 0.188$) could not be determined. The comparison of divisions showed that most answers stayed within a comparable range (Fig. 6). Only 400 of 612 (65.4%) individuals were familiar with mouthguard. The results showed statistical differences between divisions ($P < 0.001$), sex ($P = 0.012$), and age ($P = 0.38$). Among divisions speed athletes were informed best (Fig. 7). Concerning sex, men knew mouthguard better than women as well as younger athletes knew mouthguard better than older athletes. Statistical differences were also noted concerning type of mouthguard: in Switzerland the stock mouthguard was better known, in Germany the custom-made version ($P = 0.024$). Only 12 individuals answered yes to the question 'Do you wear a mouthguard?' The most frequent answer for not wearing mouthguard was by far ($n = 306$) 'I have never thought about dental trauma or about wearing mouthguard.' Other reasons like impaired communication, restriction of breathing or bothersome esthetics was rare. Statistical differences between the nations, sex, age, and divisions were not noted.

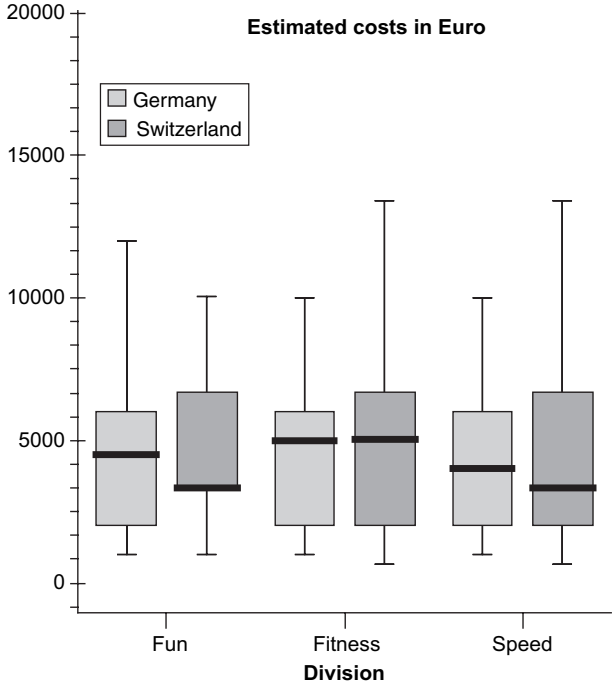


*Fig. 6.* Estimated life-long costs for a lost anterior tooth according to divisions.

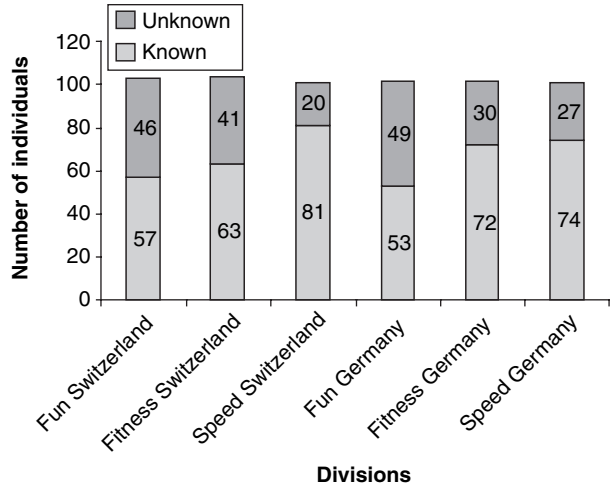


*Fig. 7.* Awareness of mouthguard according to divisions and nations.

## Discussion

This study focussed on athletes active in inline skating. Their interest in the survey was not outstanding. The topic of preventing tooth injuries does not receive much attention in the world of inline skating. Skating belongs to sporting activities with high-risk for causing dental trauma (16). In this work 9.2% ($n = 56$) of all interviewees suffered from a tooth injury. These numbers show that the orofacial injury risk is increased in inline skating. The comparison of results of similar studies about the prevalence of tooth injuries in squash (4.5%) and basketball (16.6%) allow the conclusion that skating has like handball (10.7%) a medium-risk for causing dental trauma. Crown fractures occurred most ($n = 36$). Dislocations ($n = 17$) and avulsions ($n = 3$) happened less. The reason for the increased occurrence of crown fractures in inline skating is the specific injury mechanism. Dental injuries are mainly caused by falls due to high velocity and loss of balance, especially on uneven ground. Dental accidents often have life-long consequences. Even if crown fractures are the most common dental injuries among inline skaters, serious periodontal damage after dislocation, intrusion or avulsion may result in the loss of the tooth, whether due to ankylosis or due to infection-related root resorption (39). More than half of all interviewed individuals knew that avulsed teeth could be replanted: 418 (68.3%) of the 612 interviewees were familiar with this type of therapy. This result is satisfactory, however it highlights the fact, that not all athletes are adequately informed yet. Only 198 (32.4%) of all interviewed athletes were aware of the tooth rescue kit. The tooth rescue kit represents an important link in the rescue chain geared towards heightening the success rate of reclamation after avulsion by supporting the regeneration of the periodontal ligament (40). The tooth rescue kit contains amino acids, glucose and vitamins and is available for purchase. This result is not

satisfactory because the high subsequent cost over a lifetime, which many interviewed athletes were aware of, can be substantially decreased by physiological tooth rescue. It should be provided at public sports facilities in order to improve the prognosis of avulsed teeth.

Only two-third of the participants (65.4%) were familiar with mouthguard. This result is very unsatisfactory. Similar studies about handball, basketball and squash showed that over 90% of all athletes knew mouthguard (27, 36, 37). And out of these 65.4% just 12 athletes (1.9%) wore a protective mouthguard while inline skating. The most common reason for not wearing mouthguard was that players had never thought about wearing mouthguard. Other studies showed similar results (24, 36–38). Furthermore breathing problems, impairment of communication and bothersome esthetics were mentioned. Unfortunately the attitude towards mouthguard changes only when dental trauma has already occurred (24, 40, 41). In this study 8 of those 12 persons who wore mouthguard started wearing mouthguard after having experienced a dental trauma. Ten of these 12 athletes wore custom-made mouthguards. In boxing, American Football, rugby and ice hockey the wearing of mouthguard is obligated on professional level; however for inline skating, especially on amateur level, such recommendations do not yet exist, even though inline skating belongs to high-risk sports types (16). The significant reduction of tooth injuries since the introduction of mouthguard in football (42–44) ought to have an imitative effect. The use of mouthguard should be demanded in all sports types with higher risk of orofacial injuries (3). In order to improve awareness and acceptance of mouthguard athletes require more information and education by sports associations and dentists. The facts that 34.6% didn't know mouthguard and only 32.4% were aware of the tooth rescue kit show the need of information in the area of inline skating. Using custom-made mouthguard can reduce the risk of dental accidents up to 14 times (1).

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