

## COMFORT AND ACCEPTABILITY OF DIFFERENT TYPES OF MOUTHGUARDS AMONG 7-12 YEARS OLD CHILDREN AT SKATING RINK

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### ABSTRACT

Participation in sports activities, besides having many beneficial effects, often increases the risk of traumatic injury to the dental and oral tissues. The single most important device for protecting the teeth and mouth during athletic activities is the use of an intraoral mouth guard. The intention of this study was to survey 7-12 year old children participating in skating, mainly to evaluate the significance of utilization of mouth guard wear over a period of 8-10 weeks and also to determine the acceptability of the three different types of mouth guards used. The results drawn from this study showed that 13% orofacial injuries were experienced by children during skating, and irrespective of the type of mouth guard used over a period of 10 weeks, none of the skaters had experienced an oral injury and this shows a significant finding with  $p < 0.01$  (Z test for proportions). The custom mouth guard was readily accepted by the skaters and their extent of use was also high when compared to mouth formed and stock mouth guards with  $p$  value  $< 0.05$ , which is statistically significant.

**KEY WORDS: Mouthguards (MG), Skating, Polyvinyl acetate-poly ethylene (PVAc-PE).**

### INTRODUCTION

Although the caries rate in children has fallen considerably in the last decade there has been a significant rise in the number of dental injuries. The major causes of these injuries vary considerably and include accidents in and around the home, playground injuries and injuries that result from violence. A significant number may result from the participation in contact sports, while other sport activities which are not necessarily associated with player contact may also place the participant at risk.<sup>1</sup> The American Society for Testing and Materials designation: Standard Practice for Care and Use of mouthguards<sup>2</sup> provides the following definition for a mouthguard as "a resilient device or appliance placed inside the mouth (or inside or outside), to reduce mouth injuries, particularly to the teeth and surrounding structures." They also established the classification system for athletic mouthguards as follows:

Type I: Stock mouthguards

Type II: Mouth formed mouthguards

Type III: Custom fabricated mouthguards

Team sports have been shown in the literature to result in more numerous injuries, but individual sports

result in more severe injuries.<sup>3</sup> Incidences of any oral injury in children are high at 8 years. Skating is categorized as a high velocity, high intensity, and non contact sport with increased possible encounters which mean increased possible orofacial injury episodes.<sup>4</sup>

### Objectives

1. To evaluate the significance of utilization of mouth guard wear over a period of 8-10 weeks and
2. To determine the acceptability of the three types of mouth guards that is stock, mouth-formed and custom fabricated among 7-12 year old children

### Materials and methods

This study was conducted at the Skating Rink, Davangere in association with the Department of Pedodontics, College Of Dental Sciences, Davangere. With the permission of the coach and upon his agreement, a survey protocol was designed based upon Walker, Jakobsen and Brown study<sup>5</sup> and was approved by the Ethical Committee under the jurisdiction of Rajiv Gandhi University of Health Sciences.

At the skating rink, by calling upon all the parents a survey form was given with multiple choice questions regarding their knowledge about injuries experienced by their children during play, awareness about MG and attitudes regarding protection. This served as a baseline questionnaire. With the intention to reduce the barriers for mouthguard wear, an intervention program was undertaken immediately following administration of the baseline questionnaire. This consisted of a power point presentation, written material and posters describing the role and different types of MG available. Along with the survey form, parents were asked to provide demographic information about their child's name, age, sex, address for communication and their consent about their willingness to participate in this study.

A total of 60 skaters in the age group of 7-12 years old who opted for the program were assigned one of the three types of MG based upon random sampling method. For the stock and mouth formed mouthguards, which were available in most sporting goods store and were purchased from Olympic Sports, Bangalore. These mouthguards did not require services at the dental clinics. The stock mouth guards are preformed and were worn directly as manufactured. They had to be held in place by clenching the teeth together. For the mouth formed mouth guards, which are thermoplastic in nature and were placed in boiling water until they are softened. After insertion into the mouth these were molded to oral and dental structures. If a tighter fit was desired this material was resoftened and remolded. A slide presentation of the above procedure were shown to the parents and both the stock and mouth formed mouthguards were distributed among the sample selected.

For the custom fabricated mouthguards, children required visits to the dental clinic. An alginate impression of the entire maxillary arch was taken in a perforated stainless steel tray to ensure the best possible adaptation of the mouthguard. The dental model was poured immediately using a thick mix of dental stone and a base poured using a base former. The cold, wet dental model was centered on the vacuum forming machine- Biostar (Scheu-Dental, Germany). A square sheet of PVAc-PE with dimensions of 0.20"- 5"x5" (Ultra Dent, Jordan) was positioned on the vacuum machine and heated until the sheet showed 1-2 inch sag. The heat was switched off as the vacuum was switched on while the softened material was compressed over the dental model. The vacuum was kept on for approximately 2 minutes, during which time the softened material was hand adapted using a wet paper towel. When the model was completely cool, excess material was trimmed with scissors and peeled away and final finishing of rough edges was accomplished. Following a try-in in the mouth, the mouth guard was adjusted if necessary and then delivered to the athlete.

Regardless of the type of mouth guard used, skaters were instructed to store mouthguards in a plastic container when not in use, wash the mouthguards daily with cold or

lukewarm water and rinse it with any commercially available mouth wash before insertion into the mouth

Follow-up questionnaires with reply paid envelopes were given to the parents to be returned at the end of the session (8-10 weeks). These included queries regarding injury experienced during mouthguard wear, extent of use and problems encountered during their use. The results obtained were statistically analyzed and compared.

## Results

### **Distribution table- baseline and follow-up respondents**

Of the 65 baseline questionnaires distributed among the parents of the skaters in the age range of 7-12 years, about 60(92%) parents had provided complete responses and had given consent for their child's participation in the study. The skaters selected were categorized into boys and girls, upon their gender and as amateurs and professionals, based on their competitive levels. The sample distributions at baseline and follow-up were tabulated according to the categories and are shown in **Table.1**. There was a 100% response by the skaters (60 skaters) to the follow-up questionnaire and the sample distribution was similar to that of baseline respondents.

### **Characteristics of participants- baseline and follow-up**

The number of oral injuries reported during skating by the children at baseline were 8(13%) among the total participants and at the time of follow up there were no reported oral injuries during skating irrespective of the type of mouth guard worn. Comparing both the groups, the p value was <0.01; Z= 3.84 using the Z test for proportions, which is statistically significant (**Table.2**).

Out of the total 60 skaters the stock mouth guards were worn by 24 (40%) skaters, mouth formed mouth guard by 17 (28%) skaters and the custom made mouthguard by 19 (32%) skaters respectively. **Table.3** indicates whether the particular type of mouthguard was used or not used at the end of follow-up. The differences among the groups were statistically significant with p value<0.05 and  $\chi^2=26.4$ .

The responses regarding not using the particular type of mouthguard are shown in **Table.4**. The p value was <0.05 with  $\chi^2=30.2$  for the groups which is statistically significant.

## Discussion

Although mouth protection was introduced for athletes over 100 years ago, only a few sports require participants to use mouthguards. The American Dental Association and Academy of Sports Dentistry recommended a properly fitted mouthguard for a variety of

**Table .1. – Distribution Table : Baseline and Follow-up Respondents**

GENDER	BASELINE						FOLLOW-UP					
	AMATEURS		PROFES-SIONALS		TOTAL		AMATEURS		PROFES-SIONALS		TOTAL	
	n	%	n	%	n	%	n	%	n	%	n	%
BOYS	20	33	15	25	35	58	20	33	15	25	35	58
GIRLS	18	30	7	12	25	42	18	30	7	12	25	42
TOTAL	38	63	22	37	60	100	38	63	22	37	60	100

**Table .2. Injuries Experienced Before and After Use of Mouthguards**

EXPERIENCED	BASE LINE		FOLLOW-UP		p VALUE
	BEFORE USE OF MOUTHGUARD		AFTER USE OF MOUTHGUARD		
	n	%	n	%	
YES	8	13	0	0	<0.01 S
NO	52	87	60	100	
TOTAL	60	100	60	100	

Z Test for proportions Z=3.84; S= Significant INJURY

**Table.3.- Used/ Not Used Percentage**

GROUP	n	USED		NOT USED		p value
		n	%	n	%	
STOCK	24	4	17	20	83	<0.05 S
MOUTH FORMED	17	7	41	10	59	
CUSTOM	19	19	100	-	-	

Chi square test  $\chi^2=26.4$ ; S= Significant

**Table 4 – Not Used Percentage**

GROUP	n	DISCONTINUED		ASKED FOR CHANGE		p value
		n	%	n	%	
STOCK	24	8	33	12	50	<0.05 S
MOUTH FORMED	17	5	29	5	29	
CUSTOM	19	-	-	-	-	

recreational activities and sports which includes skating, as the participants are at risk for oral injuries.<sup>2</sup> In spite of the risk associated with this sport, there has not been enough literature to support the fact regarding the number of oral injuries sustained and the appropriate use of mouthguards. The most possible reason being that it is not being practiced by majority of the populations and the number of participants taking it up on a professional level also is minimal.

The three types of MG used in our study are the stock, mouth formed and custom fabricated mouthguards. The stock mouthguards were purchased over the counter from the sporting goods stores. They were the least expensive and came in variety of styles and colors. They were ready to wear and only one size was intended for all users.

The thermoplastic variety of mouth formed mouthguard which is a preformed copolymer of PVAc copolymer was also purchased from the sports store and they ranged in price from inexpensive to moderately expensive. It was fabricated by placing the mouthguard form into boiling water to soften the material. The softened material was then placed into the athlete's mouth, where it was molded with finger pressure to improve retention.

Custom fabricated mouthguards were professionally made over a dental cast of the athletes arch. These MG are considered to be more protective because they conform more closely to the athlete's mouth, and the material thickness covering the critical occlusal table can be better controlled during laboratory findings. The advantages of PVAc-PE used for the custom mouthguard fabrication over PVC and other liner materials is that it has a higher elongation and rebound properties.<sup>6</sup>

Among the total number of 60 skaters at baseline, there was 100% response at the end of 10 weeks follow-up. The response rate was different to that observed by Cornwell et al<sup>7</sup> who noted 59% responses at the follow-up. A higher follow-up in our study can be explained on the basis that a smaller study group was examined, for which the intervention program was effective and removing the financial barrier by providing free MG was also a major incentive.

Levin et al noted less than 2.5% of dental injuries among Israeli population practicing roller skating.<sup>8</sup> In the present study 13% orofacial injuries were reported during skating which includes both the hard tissues and soft tissue lacerations. The lower percentage of injuries as noted by Levin et al<sup>8</sup> when in comparison with our study can be attributed to the fact that the study population included 18-19 year old who had an injury at that time or had to recollect at what age the injury had occurred. In our study the injuries experienced during that particular time were taken into account and more over the condition of the playing fields and the quality of the skates also affect the amount of risk to which the athlete is exposed.

The observations in this study were taken after the first time use of MG by the participants, whereas in comparisons with other studies,<sup>8,9</sup> the participants had used some kind of mouth protection before the start of the study. None of the participants using either of the mouthguard type had suffered an oral injury at the return of ten week period questionnaire, indicating that mouthguards provide adequate protection to the orofacial structures. Similar findings were shown by Deyoung et al and the observations relied solely on the activities during the study period.<sup>9</sup>

The interest of the child towards the mouthguard used among the stock, mouth formed and custom group were 17%, 41% and 100% in our study as against 0%, 87% and 82% in the study among Iowa soccer team children conducted by Walker et al.<sup>5</sup> The low percentages of interest among the child towards the stock and mouth formed mouthguards in our study could be because of the quality of the materials used, which were purchased from the local market.

## CONCLUSIONS

The following conclusions can be drawn from this study:

- 13% orofacial injuries were experienced by the children in the age group of 7-12 years during skating.
- Irrespective of the type of mouthguard used during skating, mouthguards provided adequate protection against oral injuries.
- A properly constructed custom made mouthguard minimized the common complaints and were seen to be better accepted than the stock and boil and bite varieties.
- Unfortunately there are no standards for mouthguards and many with little and unproved values are being marketed in India.
- Further research is required to assess the relative protection afforded by the various types of mouthguards currently available.

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