Acceptability of Mouth Protectors by High School Football Players

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OPINIONS of high school football players concerning mouth protectors were studied in 1962 by the bureau of dental health of the District of Columbia Department of Public Health for the Division of Accident Prevention, Public Health Service. Five parochial schools in the District participated: Archbishop Carroll, Gonzaga, Maret, St. Albans, and St. John's.

The study attempted to determine (*a*) degree of use of mouth protectors, (*b*) troubles, if any, resulting from use, (*c*) differences in acceptability between latex and vinyl custom-fitted protectors, and (*d*) whether use of protectors could be predicted from responses to pre-season questions.

The five schools had a total of 406 football players, all of whom were provided with custom-fitted mouth protectors at no cost to them or the schools. Previous research (*1*) had shown that mouth protectors reduce the probability of mouth or tooth injury; therefore it was assumed that they would provide protection for these players.

A mandatory rule requiring that mouth protectors be worn during high school varsity games, adopted by the National Federation of State High School Athletic Associations, does not apply to these five schools. Wearing of the protectors by the players in this study was primarily on a voluntary basis, since four of the five coaches indicated that they made no effort to enforce their usage.

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Procedures

From September 1 to 19, 1962, each of the 406 players was assigned at random a latex or vinyl mouth protector when impressions were being taken of their teeth. At this time also, a pre-season questionnaire was given to the players.

To explore the possible prediction of those who would have difficulties in using the mouth protectors, pre-coded response alternatives to the following four pre-season questions were to be correlated with reported use during the coming football season.

1. Have you ever used a mouth protector of any kind?
2. In your opinion, what are your chances of having your mouth or teeth injured in playing football?
3. If your mouth or teeth were injured, how important would this be to you?
4. In your opinion, to what extent will a mouth protector keep your mouth or teeth from being injured or hurt?

A post-season questionnaire was distributed by the coaches after the close of the football season. The questionnaire was self-administering, but instructions on time and place of administration inadvertently were not provided for the coaches. It was presented in the locker rooms or, occasionally, to a few players at a time in a classroom. Although the time and

method of administering the questionnaire are limiting features of this study, I believe that they do not negate the results reported.

The post-season questionnaire was completed by 294 players who were still participating in the game. Of these, 160 completed the form on November 15, 16, and 19, 1962, just after the close of the season. Responses to a question on reported use of mouth protectors for this subgroup were compared with those of the remaining 134 players who completed the questionnaire in December and early January 1963. The chi square comparing the two distributions on reported use was not statistically significant (chi square=0.55, 3 degrees of freedom). Time of administration, therefore, may not constitute a serious limitation, although some caution in interpreting data is obviously required.

Tabulation of the data was a simple matter of counting frequency of responses to pre-coded questions. Of the open end questions, coding was effected systematically for only the question, "What troubles, if any, did you notice in using your mouth protector?" Here, 14 categories of responses were coded:

1. No response
2. No troubles
3. Initial difficulty which went away
4. Interfered with breathing
5. Interfered with speech
6. Produced nausea or gagging
7. Tasted or smelled bad
8. Throat or protector dry
9. Irritated gums or mouth
10. Uncomfortable, trouble not specified
11. Bit or chewed through
12. Tore or worn through
13. Did not fit
14. Other

Two other employees and I independently judged each response according to this 14-category code. Multiple responses, of which there were 70, also were coded with these categories. Perfect agreement was obtained by the judges for 67.4 percent of 255 responses (39 no-response cases were not counted in computing these percentages, to prevent over-inflation of the agreement present); 27.0 percent agreement for two judges; and 5.5 percent agreement where each of the judges coded the response in different codes.

The above percentages tend to understate the amount of agreement present, since any deviation in coding was counted as a disagreement. This is particularly true for the 70 multiple-coded responses where agreement on one or two of the codes did not count unless all codes agreed perfectly. For the 5.5 percent of the responses for which the judges diverged, I reviewed the responses again and assigned each to a final code.

Some of these narrow codes were combined into broader categories for statistical analysis. Codes 4 to 10 were combined into a general "discomfort" category. Codes 11 to 13 were combined into a "wear-and-fit" category. To provide for combinations of these two categories, it was necessary to add, for the multiple-coded responses, an additional category for combination of "discomfort" and "wear-and-fit." The codes for statistical analysis were:

1. No response
2. No troubles
3. Initial difficulty which disappeared in time
4. Discomfort
5. Wear-and-fit
6. Combination of discomfort and wear-and-fit
7. Other

Results

Reported usage. To determine the extent of usage of mouth protectors, two post-season questions were asked: "How regularly did you wear your mouth protector during games between schools?" "How regularly did you wear your mouth protector during practice sessions?" Responses to these questions indicated that mouth protectors were worn more frequently during games between schools than during practice sessions. For example, 35.4 percent of the players reported they wore their protectors "practically always or always" during practice sessions, whereas the corresponding percentage for usage during interschool games was 53.1 percent.

Furthermore, there was a strong relationship apparent in individual use of mouth protectors on the two different occasions. For example, of 98 players who reported use "practically always or always" during practice, 92 also gave the same reply for interschool games. Likewise, of 86 players who reported they "never or hardly ever" wore their protectors during practice, 65 ignored them to the same extent for interschool games. In view of the strong relationship apparent here, for subsequent anal-

yses, only use of protectors during interschool games was considered.

Reported troubles and relation to reported usage. The broad categories of reported troubles in the use of mouth protectors were cross-tabulated with reported usage during games between schools. Only 22.0 percent of the sample reported either no troubles or minor difficulties which disappeared with time. The largest category of troubles in the use of the mouth protector (34.7 percent of this sample) was discomfort. The most common specific complaints of discomfort were gagging and nausea, interference with breathing, and irritation of gum or mouth. Some 11.6 percent of the players reported wear-and-fit troubles, which included biting or chewing through the protector and tearing and undue wearing of the protector. Another 10.8 percent reported a combination of discomfort of some kind and wear-and-fit problems. The "other" category of troubles, comprising 6.9 percent of the sample, included players who reported that they lost their mouth protectors or did not wear them.

A total of 45.5 percent reported discomfort, and a total of 22.4 percent reported wear-and-fit troubles. However, there is some overlap of players in these percentages since the 10.8 percent who reported a combination of discomfort and wear-and-fit difficulties are included in both categories.

The data suggest that a relationship exists between reported troubles and usage. For example, of those players who had discomfort with the use of their mouth protectors, only 38.5 percent reported that they used their mouth protectors in games between schools "practically always or always." On the other hand, of those who reported no troubles in the use of their mouth protectors, 79.6 percent reported that they "practically always or always" wore them.

Use of the "other" code would have introduced a spuriously high relationship in the statistical test of significance between reported troubles and reported usage, because some players reported no usage rather than the kind of trouble they had actually experienced. The following response categories were combined for the chi square tests of significance: "never or hardly ever" and "occasionally"; "usually" and "practically always or always"; "no troubles" and "initial difficulty, but it went away." The chi square of 14.09 obtained in this fashion was significant at the 0.01 level.

The results indicated that football players with no troubles, or troubles which disappeared, reported significantly higher use of their mouth protectors. Conversely, those with discomfort of various kinds reported significantly less use. On the other hand, there did not appear to be a relationship to usage for no response, wear-and-fit, and a combination of wear-and-fit troubles with discomfort of various kinds. It was somewhat surprising to me that those who reported a combination of discomfort and wear-and-fit troubles did not report usage similar to those with discomfort alone.

Latex versus vinyl mouth protectors. Random assignment of these two types of custom-fitted mouth protectors provided opportunity to compare them on the acceptability criteria of usage and comfort. In addition, an opinion item of the degree of protection believed afforded by mouth protectors was included as a further indication of acceptability for comparison of latex and vinyl.

Chi squares were computed comparing the frequency distributions for latex and vinyl, and no significant differences were observed. With respect to these criteria, within the limitations of this study, latex and vinyl appeared equally acceptable to the football players.

Prediction of use. The four questions from the pre-season questionnaire were cross-tabulated with reported usage during games between schools, and chi squares were computed.

A chi square significant at the 0.05 level was obtained between pre-season use of mouth protectors and reported use during games between schools. Players who had worn mouth protectors before the football season began were more likely to report higher usage during the football season. No significant relationships with usage were observed for the opinion items on chances of mouth or tooth injury or for the importance of mouth or tooth injury. However, the pre-season opinion item of protection afforded by mouth protectors against injury tended to predict later usage. A chi square of 7.82 is required for significance at the 0.05 level, and the chi square obtained was 7.54. The direction of response was that football players who, prior

to the season, believed that mouth protectors provided "a lot" of protection were more likely to report greater use of mouth protectors than players who had indicated that a mouth protector provided "little" or "some" protection.

Discussion

Use of mouth protectors. More than 50 percent of the sample reported that they wore their mouth protectors "practically always or always" during interschool games. From the standpoint of prevention of dental injury, the percentage should have been 100. From a practical standpoint, however, this degree of compliance on a voluntary basis reflects a relatively high level of acceptance of mouth protectors, particularly since 45.5 percent reported discomfort of various kinds.

Roughly one-fourth to one-third of the group reported less use than is considered desirable. Those who reported that they "never or hardly ever" wore their protectors in interschool games represented 28.2 percent of the total sample, and another 7.2 percent wore their protectors "occasionally."

The attitudes of coaches concerning mouth protectors may be a crucial factor in determining their use. We have no systematic data about this factor, but certain results bear on the issue.

The five participating schools differed widely with respect to use of mouth protectors. The chi square comparing frequency of use for these schools was 35.30, significant at the 0.001 level. Two of the schools contributed disproportionately to the chi square. In one school, only 10 percent of the group were problem users, and in another school 57 percent had difficulties.

The only contact I had with the coaches of the schools was a brief telephone conversation with each. One of the five coaches indicated reservations concerning mouth protectors, and in his group the 57 percent reported difficulties. The coach of the school in which only 10 percent of the players experienced difficulties said that he attempted to enforce use of the protectors. This casual observation is only suggestive, however, and further research would be necessary to validate it. Nevertheless, from a program standpoint, it seems desirable, without additional research, to attempt to influence coaches toward the use of mouth protectors.

Troubles with use. The kinds of troubles reported with mouth protectors were consistent with those described informally by coaches. From a quantitative standpoint, it is interesting that the most frequently reported discomforts were interference with breathing, nausea or gagging, and irritation of gum or mouth. Other discomforts included interference with speech, bad taste or odor, and dry throat or dry protector. These difficulties may reflect to some extent improper fit which could have been corrected by dental attention after the inital fitting.

Players who reported wear-and-fit difficulties represented 22.4 percent of the sample. This figure may reflect a crude estimate of the need for replacement of the mouth protectors, since these categories primarily include statements by players that they bit through their protectors or that the protectors wore through.

Latex versus vinyl. The data consistently suggested that, within the limits of this study, latex and vinyl custom-fitted mouth protectors were equally acceptable to the players. Additional criteria of wear and cost factors, which were not studied here, may provide a basis for the preference of one type over the other.

Prediction of use. The few opinion items administered pre-season to correlate with later use were conceived as exploratory measures. If some of these were successful, it might encourage a larger effort to develop this approach. The question on prior use of mouth protectors, which showed a significant relationship with the usage criterion, is not an opinion item. The question was conceived as an indirect measure of the player's positive motivation toward mouth protectors, since slightly more than 90 percent of those with prior mouth-protector experience had bought these on their own. Other types of items may show ability to predict, and these could be developed. The opinion item on the amount of protection afforded by mouth protectors tended to show a significant relationship with use. Opinion items, then, may be of value.

Prediction of use is also related to whether a football player is a member of the varsity or junior varsity. The varsity players tended to have less favorable opinions of the degree of protection afforded by mouth protectors. Even

more critically, they also tended to report less usage than the members of the junior varsity. When the group was split into varsity and junior varsity and classified into problem users, the varsity contained 43 percent problem users, as opposed to only 30 percent for the junior varsity.

Opinion of protection. Pre-season opinion of protection afforded by mouth protectors seemed to change drastically by the end of the football season. Before the season, only 4.8 percent believed that mouth protectors provided "little" protection against mouth or tooth injury. By the end of the football season, when all players had gained experience with mouth protectors, 28.9 percent indicated that mouth protectors gave them "little" protection.

Since only about one-third (34.9 percent) of the group had prior experience with mouth protectors, the pre-season question of opinion of protection may have been somewhat academic. If a substantial relationship were found between pre-season opinion of protection and use of mouth protectors, the major aspect of acceptability, then the large shift in opinion of protection observed would be important. However, the relationship approached significance only at the 0.05 level, indicating some correlation, but weak in magnitude.

Two open end questions were not reported under "Results," but they bear indirectly on the opinion of protection afforded by mouth protectors. The players were asked to describe any instances when the mouth protectors failed to protect them. In a separate question, they were asked to describe any times when the mouth protector reduced the severity of an injury which occurred or prevented injury from occurring.

Only 10 of the 294 players reported times when the mouth protector failed to provide protection. On the other hand, 70 players indicated instances when the mouth protector either prevented injury or reduced severity where an injury occurred. Two incidents reported under failure of mouth protectors to provide protection occurred when the mouth protectors were bitten through. For example: "When it was bitten through, I got elbowed in the teeth and they were numb but uninjured." Even that response is counted among the 10 failures, although there is a reasonable doubt that this should be so classified.

The 70 reports of incidents when the mouth protector reduced or prevented injury ranged from very specific instances, such as "when I was running the ball, I ran directly into an opponent face first and just got a big lip," to highly general instances, such as "when tackling."

These findings tend to reinforce results from the pre-coded questions, and lead to the general conclusion of much greater acceptance of mouth protectors than of rejection in this high school football group.

Summary

A total of 406 football players in 5 parochial high schools in Washington, D.C., were randomly provided with latex or vinyl custom-fitted mouth protectors before the start of the 1962 football season. At the end of the season, 294 players were still participating in the game, and all had worn their protectors primarily on a voluntary basis.

Responses of the 294 players to questionnaires indicated that more than half wore their mouth protectors "practically always or always" during games between schools. One-fourth to one-third of the group did not wear their protectors to the extent considered desirable for protection against oral and dental injury. Players in this category reported that they "never or hardly ever" or "occasionally" used them during inter-school games.

Only 22 percent of the sample reported no troubles or very minor troubles with use of mouth protectors. The most common discomforts reported for all categories of use included interference with breathing, nausea or gagging, and irritation of gums or mouth. Approximately 45 percent of the sample reported these and other kinds of discomforts. Twenty-two percent reported wear-and-fit difficulties, the most common of which was biting or wearing through of the protector. There was a significant relationship between reported troubles and reported usage. Those with discomfort were less likely to report frequent use of the protector.

No significant differences were indicated between the groups using vinyl or latex protectors with respect to use, difficulties, or opinion of protection afforded.

Conclusions

1. In high schools where use of mouth protectors is not mandatory, a large percentage of football players regularly wear protectors provided for them, despite the discomforts a substantial number experience.

2. Latex and vinyl custom-fitted mouth protectors appear to be equally acceptable.

3. Which players will have difficulties with mouth protectors may possibly be predicted from their responses to pre-season questions concerning prior use and opinion of protection afforded.

4. The attitudes of coaches toward mouth protectors may play an important role in their acceptability by various high school football groups.

REFERENCE

(*1*) Moom, D. J.: Football mouth protectors. Indianapolis Dist Dep Soc J 15: 10–13, February 1961.

Mouth Guards for Football Players

To prevent damage to the mouth and teeth in football, the Public Health Service has cautioned high school and college players to wear mouth protectors. Use of such devices in both practice and games would materially reduce football injuries, according to Donald J. Galagan, Assistant Surgeon General of the Public Health Service and chief of the Division of Dental Public Health and Resources. These devices would prevent most football injuries to the mouth and teeth, which comprise more than one-half of all injuries sustained in this contact sport.

Galagan also urged a dental checkup for all football players, since sound teeth are less susceptible to injury than those in bad condition. A visit to the dentist and the use of the effective, inexpensive mouth protector will do much, he said, to reduce the incidence of injuries to the mouth and teeth and greatly improve the safety of contact sports.

Last year the National Alliance Football Rules Committee adopted a rule making the wearing of mouth protectors mandatory for all players under its jurisdiction. The number of schools requiring players to wear the protectors is increasing each year.