

# Pre-participation Dental Screening Examinations: Athletes' Misconceptions concerning Restorative Needs

Research Article

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## Abstract

**Background and Objectives:** A major league baseball organization (MLBO) incorporated pre-participation dental screening examinations as part of their spring training physicals among their minor league professional baseball players (MLPBP's). The administration of the MLBO recruited a dentist to perform dental screening examinations during Spring Training. The purpose of this study is to assess the MLPBPs' awareness of the need for restorative treatment.

**Methods:** Prior to the dental screening, each MLPBP was asked to complete a survey question anonymously and voluntarily. The question was: "Do you have any cavities, lost fillings, broken fillings, or broken teeth?". Dental screening examinations were performed in the athletic training room by direct clinical visual examination utilizing high intensity light, mouth mirror and tongue blades. Teeth were categorized as requiring restorative care based on: (1) carious lesions (2) lost restorations (3) fractured restorations, and (4) broken teeth. Caries lesions were identified classified via the International Caries Detection and Assessment System.

**Results:** 59 MLPBPs were examined. 38% of the players indicated that they had: (1) no cavities (2) no lost fillings (3) no fractured fillings, and / or (4) no broken teeth. The results of the dental screening examinations revealed that 90% of the players indicated they had: (1) carious lesions (2) lost restorations (3) fractured restorations, and / or (4) broken teeth. Thus, 62% of the MLPBPs were not aware of their oral health restorative needs.

**Conclusion:** The majority of the MLBPs were unaware of their carious lesions, lost restorations, fractured restorations, and / or broken teeth. Providing dental screening examinations during spring training can possibly identify existing problems and prevent the exacerbation of underlying dental conditions and untimely dental emergencies.

**Clinical Significance:** Dental screening examinations are an important component of spring training physicals. The majority of these professional baseball players were unaware of their restorative dental needs.

**Keywords:** Sports dentistry, Professional baseball players, Athletes, Dental caries, Spring training dental screenings, Pre-participation dental screening examinations

## Introduction

Participating in sports is a vehicle for individuals to be competitive, whether it be against themselves in relation to a previous performance of their own or against another athlete in an event. Additionally, sports and exercise provide individuals a manner to release stress from their daily lives and to incorporate physical activity to attain their personal fitness goals. For the many adolescents who have access, sports serve as an extracurricular activity and are a means to socialize with their peers [1]. Prevalence of sports participation is greatest in youth. Near-

ly six out of ten children in the United States participate in sports [2]. Among student athletes in high school, these individuals have demonstrated an increase in motivation, teamwork, and self-discipline [1].

With the passage of Title IX of the Education Amendments of 1972, nondiscrimination was mandated in admissions, access, and treatment in all educational programs offered by institutions that were the recipients of federal funds. This legislation was directly responsible for a higher volume of women's participation in sports and physical activities [3,4]. Due to this legislation, female participation in sports



increased substantially from 24.2% in 1973 to 42.9% in 2018 [3]. The result of this legislation was similar in female college sports with participation increasing 15% to 44% [5].

The preparticipation physical evaluation screening has been used to identify potential health conditions that could cause an athlete risk or harm while participating in organized sports [6]. To participate in any sport activity, it is a common and "sometimes" a legal standard to have a preparticipation physical evaluation for athletes to mitigate any potential risk factors that would cause the athlete serious or fatal consequences [7,8]. A preparticipation physical evaluation typically consists of measurements that include pulse rate, blood pressure, respiratory rate, and other common examinations to evaluate the health and level of fitness of an individual [9]. An issue with a preparticipation physical evaluation among many athletic trainers and physicians is the lack of a standardized preparticipation physical evaluation [6,7,10]. According to Conley et al. "Considerable debate exists as to the efficacy due to the lack of standardization in the process and the lack of conformity in the information that is gathered [6]." In review of various pre-participation examination documents, pre-participation dental screenings examinations do not appear as a component of the preparticipation physical evaluation form.

### Objectives of the Investigation

The general manager of a major league baseball organization innovatively incorporated pre-participation dental screening examinations as part of the organization's spring training physicals among its minor league professional baseball players (MLPBP). The administration of the major league baseball organization recruited a dentist to perform dental screening examinations in Spring Training. The purpose of this study was: (1) to assess the minor league professional baseball players' self-awareness of the need for restorative treatment and (2) to determine the clinical need for restorative treatment.

### Methods

Prior to the dental screening, each minor league professional baseball player was asked to complete a one-question survey anonymously and voluntarily. The question was: "Do you have any cavities, lost fillings, broken fillings, or broken teeth?" Dental screening examinations were performed in the athletic training room by direct clinical visual examination utilizing high intensity light, mouth mirror and tongue blades. Teeth were categorized as requiring restorative care based on: (1) carious lesions (2) lost restorations (3) fractured restorations, and (4) broken teeth. Caries lesions were identified and classified via the International Caries Detection and Assessment System (Figure 1). Descriptive statistics were used to analyze the data.

	AMERICAN DENTAL ASSOCIATION CARIES CLASSIFICATION SYSTEM						
	Sound	Initial		Moderate		Advanced	
<b>Clinical Presentation</b>	No clinically detectable lesion. Dental hard tissue appears normal in color, consistency, and gloss.	Surface clinically detectable lesion compatible with mild demineralization. Lesion limited to enamel or to shallow dentin only after drying. When established and active, lesions may be white or brown and enamel has lost its normal gloss.		Visible signs of enamel breakdown or signs the dentin is moderately demineralized.		Enamel is fully eroded and dentin is exposed. Dentin lesion is deeply/severely demineralized.	
<b>Other Labels</b>	No surface change or adequately restored.	Visually noncavitated		Established, early cavitated, shallow cavitated, intermediate.		Spread/demineralized, late cavitated, deep cavitated.	
<b>Infected Dentin</b>	None	Unlikely		Possible		Present	
<b>Appearance of Occlusal Surfaces (PS and Fillings)*</b>	ICDAS 0	ICDAS 1	ICDAS 2	ICDAS 3	ICDAS 4	ICDAS 5	ICDAS 6
<b>Accessible Smooth Surfaces, Including Cervical and Root†</b>							

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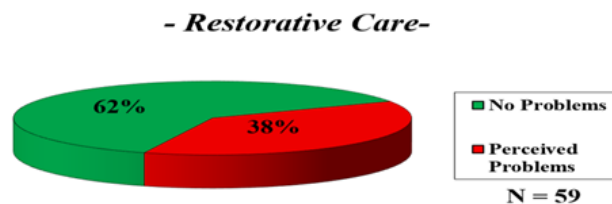
**Figure 1:** International Caries Detection and Assessment System.

This research study received IRB approval from the Roseman University of Health Sciences IRB.

### Results

Fifty-nine minor league professional baseball players completed the survey and received a dental screening examination. Data analysis of the survey revealed that thirty-eight percent of the players indicated

that they had: (1) no cavities (2) no lost fillings (3) no broken fillings, and / or (4) no broken teeth (Figure 2). However, the results of the dental screening examinations revealed that ninety percent of the players had: (1) carious lesions (2) lost restorations (3) fractured restorations, and/ or (4) broken teeth (Figure 3). Thus, sixty-two percent of the minor league professional baseball players were not aware of their oral health restorative needs.



**Figure 2:** Player Awareness of Dental Problems.



**Figure 3:** Results of Clinical Examinations.

## Discussion

### Background Information

Athletes' oral health appears to be poor in numerous sports [11-15] and oral diseases can limit athletic skills both during training and during competitions [12, 16-18]. Diet, weekly frequency and training hours, climatic conditions, and psychophysical stress conditions can produce significant variations in the oral health of athletes [12].

Specifically, a study among athletes revealed that restorative needs, such as caries, have an incidence of 49.1% among elite and professional athletes. In this oral health study, 352 United Kingdom professional athletes, who participated in eleven different sports, were examined. The incidence of caries was determined for the various sports [17]. As previously mentioned, the incidence caries was present in 49.1% of athletes. Of note, athletes who participated in team sports, had an increase in the incidence of caries at 2.4 times more than athletes who participated in individual endurance sports. Overall, 32.0% of the athletes reported an oral health-related impact on sport performance: oral pain (29.9%), difficulty participating in normal training and competition (9.0%), performance affected (5.8%) and reduction in training volume (3.8%). Difficulty participating in normal training and competition, performance affected and reduction in training volume has been recently documented in a study involving minor league professional baseballplayers [16].

This current study, however, assessed the MLPBPs' self-awareness of the need for restorative treatment as compared to the players' clinical need for restorative treatment, rather than causative factors for restorative care needs. This study establishes a need for dental screening examinations to become part of pre-participation physicals, since only 68% of players were unaware of their dental problems. The majority of the scientific literature states that increased rate of caries could lead to less time training and possibly being absent from competition [12, 16-18]. It is important for elite athletes to be as aware of their oral as they are of their physical health.

### Considerations in the Management of the Athlete as a Dental Patient

Many oral health problems occur in elite athletes. In this study, the



focus was on players awareness having cavities, lost fillings, broken fillings, or broken teeth. Incidence of caries can be associated with factors such as salivary pH [19], buffering capacity [19], secretory immunoglobulin A [20], smokeless tobacco use [21] and E-cigarette usage [22].

### Salivary pH and Buffering Capacity

One of the causes of the higher incidence of dental caries among athletes compared to non-athletes is due to the lack of salivary pH and buffering capacity. A recent study demonstrated the effects that sports activities had on these individuals. The study participants' measurements were recorded while riding a stationary bike for thirty minutes to simulate a typical workout. During the ride, each person was given different liquids to replenish hydration and other electrolytes. Due to increased CO<sub>2</sub> in the blood because of exercising, the salivary pH decreased with the increased level of CO<sub>2</sub> [23]. The study found that during and after physical exertion people who drink sports drinks have an increased risk of dental caries because of the lowered salivary pH and lowered buffering capacity. Combine those two factors with acidic sports drinks and the index of dental caries is higher in these individuals. Most athletes use sports drinks during and after training as well as in competition.

### Effects on the Immune System

Secretory immunoglobulin A (s-IgA) is an antimicrobial peptide. Immunoglobulin A (s-IgA) has been shown to be effective as a great defense against dental bacteria that cause carious lesions. *Streptococcus mutans* falls into this category [24]. A study on oral health was conducted involving 123 swimmers. The swimmers were broken into two groups, competitive swimmers vs noncompetitive swimmers [20]. It was found that there was a larger decrease in s-IgA among the competitive swimmers after training. Both test groups were measured in the same conditions. The main difference between the two groups were total hours training in the pool. A decrease in s-IgA is a major microbial risk marker. Decreasing s-IgA could have lasting effects to the athletes, for instance, an increase of oral diseases, primarily dental caries.

### Use of Smokeless Tobacco

Smokeless tobacco use has been increasing from less than 5% in 2008 to 17% in 2017 among younger individuals aged 15 to 21 [25]. A survey, conducted in 1987, established the baseline rate of current use of smokeless tobacco among major league professional baseball players to be 46%. In this study, 528 out of 650 major league baseball players from 25 out of 26 teams completed the survey [26]. This current use rate of smokeless tobacco did not decrease notably five years later. Professional baseball players (N=206) participated in an oral health study in 1992. Results of this study revealed that 43% of the players (N= 88) had used smokeless tobacco [27]. The most common form of smokeless tobacco used as reported by the professional baseball was moist snuff at (78.9%) then the second most common form of smokeless tobacco was loose leaf tobacco at (53.4%). The use of smokeless tobacco among professional athletes still exists. Smokeless tobacco has been found to cause dental caries in certain cases [28]. Gingival recession has been associated with the use of smokeless tobacco. Thus, root surface caries can be a factor. Although a large number of professional baseball players had used smokeless tobacco, it was difficult to state that the use of smokeless tobacco was the main contributor to dental caries [29]. However, the use of smokeless tobacco can be one of the factors along with others which can have lasting effects on athletes' oral health [30].

### E-cigarette Usage

The use of electronic cigarettes shows adverse effects on the oral cavity. An oral health research project measured the effects that electronic cigarettes had on *Streptococcus mutans* [31]. In this study, *Streptococcus mutans* cells were exposed to electronic cigarette smoke and

combustible cigarette smoke daily and evaluated after each day. After three days *Streptococcus mutans* had shown more growth compared to combustible cigarettes. The growth indicated greater adhesion to biofilm in teeth and greater risk of dental caries [23].

Electronic cigarettes have been the on the rise since their creation in 2006 [32]. Electronic cigarettes have a slick and attractive appearance that have not only helped with their marketing but also their prevalence on youth and young adults. Alarming, within a short span of seven years, the use of E-cigarettes has increased thirteen-fold among youths. Electronic cigarettes use among youth has increased from 1.5% in 2001 to 20.8% in 2008 [32].

Electronic cigarettes have also been reported among college athletes. In a recent health and substance use study comparing former college baseball players and current baseball players, two hundred and fourteen college baseball players reported various substances used in their lifetime. All college baseball players reporting were over the age of eighteen. Only two percent of former baseball players had used electronic cigarettes compared to current baseball players reporting that they had used electronic cigarettes at fourteen percent [33]. Just as smokeless tobacco has historically been associated with professional baseball players, a recent study involving 414 professional baseball players has demonstrated the emergence of E-cigarette use within the sport [34]. Prevention and intervention strategies need to be addressed among Caucasian players, while recruitment and active involvement of Black and Latino players into prevention programs is warranted [34].

### Limitations

A limitation of this research study was the relatively small sample size of the MLPBPs examined. This is due to the considerable difficulty of an individual researcher attaining the permission to work with more than one franchise. Typically, there will only be one dentist allowed to work with each franchise. Writing an IRB proposal collaborating 30 dentists, one from each MLB, to attain CITI certification and participate in such a project would be extremely difficult. However, in this study, the principal investigator and his team were privileged to be invited by the MLB in order to initiate a dental screening component as part of the MLB's spring training physicals.

Additionally, conducting research within the category of the elite athlete or professional athlete, no matter how large or small the sample size, is extremely challenging. It is very difficult to "gain access" to professional athletes. Not many health care researchers are allowed the privilege of working with professional baseball players. Medical directors receive numerous requests to do research with professional baseball players in spring training. The principal investigator has been told by medical directors that this number approximates 100. Among these requests, only two to three researchers are granted the opportunity. Encountering these facts severely limits the ability to conduct a research project involving numerous Major League Baseball Franchises in order to increase the sample size. Essentially the principal investigator "can get only what he can get". Nonetheless, this trend can be reliably extrapolated beyond the sample size of this study to the greater as other studies has caries.

### Conclusions and Future Considerations

Within an ideal preparticipation physical evaluation, a dental screening examination should be included. *The development of a pre-participation standardized dental screening form is paramount.* The attending physician should include a dentist to evaluate oral diseases, such as caries. If this were the case, pre-existing oral diseases could be treated early, before becoming an incapacitating issue for the athlete. The potential of loss of "practice-time" and "playing-time" could be then kept to a minimum.





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