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## Correlations between dyslalia and orthodontics

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# Correlations between dyslalia and orthodontics

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## Abstract

Several studies have tried to demonstrate the relationship between dyslalia and some alterations in the stomatognathic system. This article is aimed at combining the results of the various studies investigated, and to define what are the specific occlusal alterations that have been related to this speech disorder over time. Moreover, studies conducted on patients with this phonetic alteration who are undergoing orthognatic treatment and the relative results were considered. The purpose of this article is also to give a comprehensive view of the current results achieved since now, which can contribute to the implementation of the treatment of dyslalia with the cooperation of several specialists, such as orthodontists and logopedists.

## Discussion

Dyslalia is a disorder of speech, that causes the wrong articulation of phonemes. This type of alteration of language may be classified as evolutionary, functional, audiogenic and organic. In particular, functional dyslalia can be classified as substitution dyslalias, which define an error in speech articulation where a sound is replaced by another; omission dyslalias, when the articulation of the phoneme is unknown and is not replaced by another phoneme; insertion dyslalias refer to the replacement of a sound by another sound that does not correspond to the specific word; distortion dyslalias occur when a phoneme is articulated incorrectly but is not replaced by a specific phoneme. [1]

Different studies have proposed possible correlations between dyslalia and alterations in the stomatognathic system. The basic correlation is the air is emitted from the lungs and is channelled through the airways to produce sounds that formulate the speech. [2]

In addition, it is worth to note that the action of all components of the stomatognathic system cooperate in the articulation of phonemes. [3]

An important function is carried out by the tongue and its movements, the shape of the palate and the dental arches, the teeth and the lips, and the movements of the jaw, under the directives of the ATM and the skeletal muscles, which cause the alteration of the phonemes, modifying the spatial trajectories during the functions. [2,4]

Concerning occlusal problems, it is emerged that a big overjet can play a role in predisposing to dyslalia. The

identification of dyslalia is based on the auditory and visual analysis of tongue movements. Children with an overjet > 4mm have a greater prevalence of speech diseases than children without it ( $p = 0.0117$ ), and with a unilateral crossbite. Frequently there are distortions of the phonemes /s/ e /z/. [2]

It has also been demonstrated the association between the presence of an anterior open bite (AOB) or head-to-head bite and the phonemic /s/z/t/d/l/ alteration of pronunciation. [5]

The AOB is the more common malocclusion in patients with dyslalia [10], because it causes the alteration of the emission of phonemes. [6,7]

Indeed, the 80% of movements during the speech articulation are made in the anterior section of the oral cavity. [8]

The patient modifies the lips joint during all the functions of the stomatognathic system. The movements of the tongue, the teeth and the altered palate compromise the ability to properly communicate some phonemes. [7,8]

The study [9] was conducted on a group of patients. 26.5% of them showed a light AOB, 66.7% a moderate AOB and 6.8% a severe AOB, while dyslalia was found in 77.4% of the patients. However, it was not possible to associate the severity of occlusal alteration with the severity of the disorder. [9]

Fimbo studied a group of 410 patients with an AOB, and the 63% of these suffered from dyslalia. [6]

Another study evaluated the impact of language occlusion, in which two groups of patients were compared: i) patients seeking orthodontic treatment and ii) patients who did not undergo orthodontic intervention.

It has been found that there is a significant impact on the phonemes /s/n/t/ in patients seeking orthodontic treatment and there is also a great presence of other stomatognathic-related disorders such as oral respiration, open mouth, sucking of lips and in all patients the anterior posture of the resting tongue was observed.

Any alteration of the position of the teeth, mandible, or maxilla could negatively affect the production of the phonemes, especially in children during speech-language development. [11] The group seeking orthodontic treatment had addental production of sounds, because of the articulation of sounds with the tongue tip against the central incisors instead of the upper alveolus. This dynamic of speech articulation is confirmed by the anterior position of

tongue, which is constant in the group with occlusal alterations. [11]

Another study conducted at the University of Milan on a group of 880 children aged 6 to 10 confirmed the correlation between dyslalia and malocclusion.

The presence of Class III occlusion, diastema, increase in overjet, presence of open and deep bite, asymmetry have an association with dyslalia. The presence of crowding and anterior cross bites has moderate tendency to be associated with this disorder; other type of malocclusion, as the Class II or the upper incisors protrusion, or the posterior cross bite and TMD have low tendency to be associated with dyslalia. Furthermore, the presence of speech disorders is not constant, but a correlation has been found between the severity of malocclusion and in particular the greater frequency of dyslalia the greater the relevance of the disorder. [12]

It is important to point out, however, that many patients with serious occlusal alterations do not exhibit dyslalia or other phonetic alterations, even if a correlation has been established between these two things, because of the existence of a compensation mechanism. [13,3]

In the research work [13], in which is reported the case study of patients with sigmatism before orthodontic therapy, the relationship with frontal alterations and the phonemic /s/ alteration was evaluated. [13]

The therapy recommended by several studies is a combined therapy with multidisciplinary approach involving the cooperation of orthodontists and speech therapists. [12,13]

The alterations of the speech have been evaluated also before and after the orthognatodontic surgical treatment. The 60% of these patients demonstrated preoperative articulation errors. The /s/ speech sound and the sibilant class in general, were often found altered in the subjects' speech. These alterations were observed in a group of the patients. All those who showed these phonetic alterations reduced or eliminated these errors in postoperative evaluation. No one experienced deterioration in their articulation. However, it is not easy to reach some conclusions about the effects of surgery on speech. [3, 14, 15]

## Conclusion(s)

From the examination of various studies there is a correlation between occlusal alterations and alterations in phonetics, such as dyslalia. The most frequent associated malocclusions are the increase of overjet over 4 mm and the anterior open bite, resulting in an alteration in the phonetic mechanism. Not all

studies associated the severity of malocclusion with the frequency and severity of phonetic alteration. All of them, however, agree on the need of a combined treatment made by the cooperation of different specialists, such as speech therapists and orthodontists.

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