

# Effect of myofunctional therapy in children with harmful oral habits in presence of dentomaxillary anomalies: scoping review

## Efecto de la terapia miofuncional en niños con malos hábitos orales en presencia de anomalías dentomaxilares: revisión de alcance

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**ABSTRACT:** Most dentomaxillary abnormalities (DMA) are produced or favored by harmful oral habits (HOH), altering the neuromuscular balance. Myofunctional therapy (OMT) has been suggested as an adjunctive therapy, so this research focuses on the effect of OMT in DMA and to know the effect of orofacial myofunctional therapy (OMT) in children with HOH and its influence in development of dentomaxillary anomalies. A research in five databases was performed (Scopus, Pubmed, Cochrane, Scielo and EBSCO) with language restrictions (English, Portuguese, Spanish). Publications between January 2010 to June 2020 were included. From an initial search of 676 articles, 14 studies were selected according to the inclusion criteria, which showed changes in patients who received myofunctional therapy in the resolution of DMA. 85% of the selected publications reported positive changes to eliminate the harmful oral habits using orofacial myofunctional therapy. 42% of these studies reported a decrease in the recurrence of craniofacial alterations through myofunctional therapy. OMT is effective for patients with atypical swallowing and lingual interposition. However, HOH such as oral breathing, finger sucking, amongst others, had no conclusive statements, as the level of evidence obtained regarding these HOH was moderate, in addition to constituting a limited number of publications related to this topic.

**KEY WORDS:** Myofunctional therapy, Malocclusion, Oral habits.

### INTRODUCTION

The craniofacial complex is related to sophisticated balance between form and function, in which the neuromuscular system and occlusion play a fundamental role. The relationship between neuromuscular balance, growth and craniofacial development is based on Moss's theory of functional matrix, which refers to the fact that the functional demands of soft tissues determine the growth and development of associated bone structures (Kyrkanides *et al.*, 2011). The shape of the bone will be directly related to its

function. However, this balance can be altered by genetic and environmental factors which can trigger the development of dentomaxillary abnormalities (DMA).

Non-physiological habits or HOH correspond to the main cause of establishment and/or increase in severity of DMA and are defined as abnormal practices acquired by the frequent repetition of the same act, which at first are carried out consciously and then become an unconscious behavior (Agurto *et al.*, 1999; Beraud *et al.*, 2004). Therefore, as time

goes on, eradication makes it difficult. Among the most common HOH that we can mention are oral breathing, atypical swallowing, suction (thumb, pacifier) and labial interposition (Smith & Crocker, 2002; Espinoza *et al.*, 2011; Muller & Piñeiro, 2014; Zakirulla *et al.*, 2020).

Considering that DMA are the third most prevalent oral pathology reported by the World Health Organization (WHO), prevention, interception and treatment of them is relevant. Treatment of DMA can vary according to the age of the patient and the degree of alteration of that anomaly, involving an interdisciplinary team that includes interceptive and corrective orthodontics for occlusal restoration, and also physiotherapist or speech therapist through orofacial myofunctional therapy. OMT corresponds to a set of procedures and techniques involved in orofacial myofunctional disorders that affect the dynamics of the stomatognathic system, its balance and functioning (Mariana & Morales-Chávez, 2009). The goal of OMT is to re-educate HOHs, improve patient aesthetics, restore proper posture and improve altered orofacial muscle tone, restoring orofacial functions to its normal course. For this matter, appliances are used in addition to hand therapeutic exercises that aim to improve strength with both isotonic and isometric exercises, improve flexibility (stretching) and coordination and/or motor control of orofacial functions. For this, it'd be important to include or consider OMT in DMA treatment, since the neuromuscular imbalance could remain despite orthodontic therapy, with a consequent recurrence (Gallerano *et al.*, 2012).

Due to the relationship between DMA, TMO and HOH it is necessary to study and expose, through updated literature, how can OMT contribute to orthodontic treatments, prevent DMA recurrence, and its influence in craniofacial growth and development in children.

The aim of this research was to know the effect of myofunctional therapy in children with harmful oral habits in craniofacial growth and development and to identify the role of myofunctional therapy in the interception and correction of craniofacial alterations in patients with harmful oral habits.

## MATERIAL AND METHOD

### Search Strategy

We developed the search based on five most recognized

databases in the health area, these being Scopus, Pubmed, Cochrane, Scielo and EBSCO. This review was guided by the question "What is the efficacy of myofunctional therapy in children with poor oral habits on craniofacial growth and development?"

The PICOT method was used: being "P" (Patient), "I" (Intervention), "C" (Comparison), "O" (Outcome), "T" (Time).

The keywords used in the search were "Myofunctional therapy AND oral habits" and then "Myofunctional therapy and malocclusion." Articles from the last 10 years (January 2010 to June 2020) were applied as search criteria to obtain updated evidence on the subject. In addition, publications were only included in the English, Spanish and Portuguese languages. The articles selected for Scoping Review were analyzed and guided by PRISMA-ScR checklist. The selection of articles based on the inclusion and exclusion criteria was analyzed by 2 reviewers.

### Article selection

For the articles selection, were included articles indexed in databases (Pubmed, Scielo, Ebsco, Scopus, Cochrane), published between the period of January 2010 to June 2020 in English, Spanish and Portuguese languages. Were excluded authors opinions, letter to editor, articles including subjects with bad oral habits over 12 years old and duplicate articles in the databases.

## RESULTS

### Study Selection

The initial search in the database was carried out from the Prism-ScR protocol obtaining a total of 676 articles. Subsequently, the first filter corresponding to the range of years of the 2010-2020 publications was carried out, leaving 213 articles (Fig. 1). Articles not related to the English, Spanish and Portuguese languages were deleted giving a total of 200 articles. Then 98 articles were excluded by duplication leaving a total of 102 articles. Subsequently, articles were excluded according to the abstract, and those that were not related to the topic of the scope review were eliminated, giving a total of 48. Articles not available for download and those that were comments were excluded obtaining a total of 37 articles. Among them another filter

was used, eliminating 9 articles that had no relevance to the topic once they were read in full and on the other hand eliminating 14 because they were not within the age range of analysis (6 to 12 years, mixed temporary dentition). Finally, the total number of articles to be analyzed is 14. The stages of article selection are described in Figure 1, Flowchart.

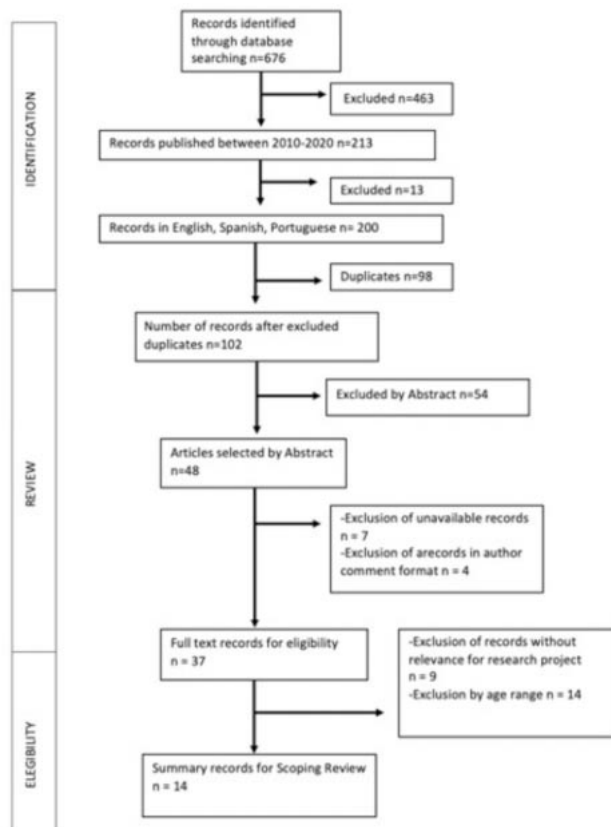


Fig. 1. Flow Chart PRISMA-ScR.

### Study Characteristics

The 14 studies included in this analysis were characterized in a table indicating the year of study, type of harmful oral habits, age range, type of myofunctional duration, BMD and effect (Table I).

All included studies were published between January 2010 and June 2020, with a higher percentage in 2010 and 2012. Duplicate articles were excluded based on manual review by two authors external to the research, in order to reduce the bias of this intervention. Most of the articles that refer to HOHs deal with atypical swallowing. The age of the patients in the selected publications is from 6 to 12 years,

taking into account the inclusion criteria applied. Myofunctional therapy with appliances was the most commonly used in the selected studies. The duration of treatments is greater than or equal to 12 months.

### Classification of the evidence

The type and level of evidence of the articles selected in this Scoping Review was achieved using the classification proposed by David Sackett, which ranks the evidence in grades from 1 to 5; 1 being the “best evidence” and 5 being the “worst” (Pachori *et al.*, 2012).

### Descriptive analysis

In the analysis of the 14 selected articles, the BMDs in the presence of HOH that were most analyzed were, anterior open bite, altered overbite and overjet, Molar Class II Angle ratio and crossbite. After the implementation of BMT, changes in time were observed through cephalometric analysis, comparison of photographs of the beginning and end of treatment, electromyography, Acoustic pharyngometry and adequate positioning of soft tissues.

It was observed that BMT is more effective in temporary dentition and mixed dentition of the first phase compared to mixed dentition of the second phase. BMT favored in restoring neuromuscular balance by returning the proper positioning of the tongue and on the other hand of the soft tissues. The role of direct BMT in patients with ADM and HOH was not clearly reported in several studies. Regarding the recurrence of HOH, it was obtained that in 28.8% of the articles analyzed (Table II).

### DISCUSSION

Myofunctional therapy in children with HOH had a positive effect. Changes were obtained in orofacial musculature once these patients were subjected to OMT. This is evidenced through the correction of DMA in the presence of a HOH among which the most common were atypical swallowing and lingual interposition (Condò *et al.*, 2012; Van Dyck *et al.*, 2016).

The most prevalent dentomaxillary anomalies were anterior open bite, Angle Class II division I, which were treated by OMT, obtaining favorable results, restoring neuromuscular

Table 1. Characteristic of included studies.

Article	Type of HOH	Age range	Type of OMT	Treatment duration	DMA	Effect	Rd therapy	Residua	Level of evidence
Aefry, 2015	Thumb sucking	11 years	Palatal crib + OMT	12 months (first 7 months palatal crib + MT; then 5 months only TM)	Anterior open bite (AOB)	Open bite correction, stability and better control for notreported tongue position	not reported	NO	C4
Koleisi et al., 2018	Mouth breathing, tongue thrust, atypical swallowing	6 - 12 years	Early orthodontic + OMT	Unclear	anterior open bite (AOB)	malocclusion correction, however to draw conclusions notreported more records are required.	not reported	not reported	A1a
Candó et al., 2022	Atypical deglutition	Group 1: aged 7 years old between 4 and 7 years old Group 2: aged between 8 and 12 years old	Eruptive guide, appliance HabitCorrector TM	12 months	Unclear	Early intervention in atypical deglutition with Habit Corrector TM is able to produce significant results in pre- and post-treatment phases of deglutition. Significant results in the late phase of deglutition and in the first phase of mixed dentition, rather than in the late phase of mixed dentition.	not reported	not reported	A1b
Liet et al., 2019	Mouth breathing, lip sucking habits	10 year old	Myofunctional trainer and fixed appliances	27 months	Class II, Division 1 malocclusion	The superiority of myofunctional training in the case was notreported to minimize mouth breathing and lip sucking habits train the oral musculature, stimulate mandibular growth, and make braceswork more efficiently.	not reported	NO	C4
Green, 2013	Thumb sucking and tongue thrust	9 year old	Exercises therapy	9 months	Posterior crossbite anterior open bite	Significant improvement in oral postures, influencing notreported improved al and anal growth and development	not reported	not reported	C4
Bronson & Bronson, 2014	Mouth breathing	mean age = 6 years	ALF (Advanced Force)	7.8 months	Anterior posterior crossbite	ALF be effective for the correction of crossbite in primary notreported and early mixed dentition cases. All five of our young cases demonstrated crossbite correction, facial symmetry improvement and cervical posture improvement.	not reported	not reported	C4
Tripathi & Patil, 2011	Lip trap, atypical deglutition	10 year old	TM T4K	18 months	Class II malocclusion	Overjet was corrected and lip trap was completely eliminated along with straight facial profile and fully competent lips. The post-treatment cephalometric analysis showed a class I molar and skeletal relationship 2. It improves tongue posture 3. It improves lip and tongue pressures are eliminated thereby establishing normal growth.	not reported	not reported	C4
Van Deck et al., 2016	Atypical deglutition	7.1 - 10.6 years	OMT	6 months	anterior open bite (AOB) and transversal crossbite	OMT can positively influence tongue behavior. However, OMT as an adjunct to orthodontic treatment and to further research is recommended to confirm our results	NO.	NO.	A1b
Yago et al., 2010	Mouth breathing, tongue thrust, thumb sucking	7.8 to 11.5 years	the preorthodontic trainer (POT)	6 months	Class II, division 1 malocclusion	During the 6 months of POT treatment, the perioral and masticatory muscles of Class II, Division 1 patients improved significantly.	not reported	not reported	B2a
Pactori et al., 2012	Lip interposition	101 o 115 years	Patient 1 and 3: myofunctional appliances therapy (cervator) patient 2: twin block	20 months	Class II, division 1 malocclusion	Sagittal correction (skeletal class II), improvement in facial profile and lip incompetence antireduction of the severe overjet and deep overbite	not reported	not reported	C4
Clavarella et al., 2010	Atypical Deglutition	8 years	"Envelope Nocturne" (ELN)	Unclear	Anterior Open Bite	tongue reaches physiologic position during swallowing and it is possible to have a low dental contact without tongue interference	not reported	not reported	C4
Celli et al., 2014	Lip and tongue interposition	10.2 year	Myofunctional treatment (exercises) and Lip bumper	24 months	Anterior open bite	malocclusion correction and no relapse	not reported	NO	C4
Thakur et al., 2021	Mouth breathing	11,7 +/- 1.1 years	Twin block appliance	unclear	Class II division 1 malocclusion	The study showed a dentive upper airway improvement in skeletal Class II division 1 subjects with TB myofunctional therapy with the achievement of positive functional changes, esthetics, and a higher quality of life	not reported	not reported	A1b
Pratha & Naveen, 2019	mouth breathing, tongue thrusting, thumb sucking	Children (no inform age range)	MARA, XbowTM (Crossbow) 2. Fatigue-Resistant Device (FRD) Power Scope Class II Corrector	unclear	Unclear	prevention of malocclusion starting from childhood through myofunctional appliances can prevent complications in future	not reported	not reported	C4

Table II. Sackett level of evidence.

Level of evidence	Type of Study
1a	Systematic review of randomized controlled trials (RCTs)
1b	Individual RCTs with narrow confidence interval
2a	Systematic review of cohort studies
2b	Individual cohort studies and low- quality RCTs
3a	Systematic reviews case- control studies
3b	Case- controlled studies
4	Case series a poor-quality cohort and case-controls studies
5	Expert opinion

balance as indicated in the study by Condo and Cols (Condo *et al.*, 2012) results showed positive correction with respect to overbite, overjet, molar relation, inclination of the upper and lower incisors, position of the jaw. On the other hand, the results obtained in the study coincide with those of the study by Tripathi & Patil (2011) in relation to the correction of DMA, where they mention that the overjet was corrected and lip trap was completely eliminated along with straight facial profile and fully competent lips. posttreatment cephalometric analysis showed a class I molar and skeletal relationship.

OMT achieves neuromuscular balance, so it is fundamental in the correction of DMA. The results of our study agree with other authors where the effect of myofunctional therapy is analyzed. In a study by Begnoni, 2020, atypical swallowing treatment was analyzed through OMT where it is stated that OMT produced a significant improvement in mandibular dynamics, redistributing muscle activity and reducing the duration of the total act of swallowing.

Highlighting the importance attributed to OMT in the treatment of DMA in patients with HOH is that although the correction of alterations in the dental position is performed by conventional orthodontics, it is necessary to achieve stability at the muscular level, where a reorganization of muscle forces is obtained, involving the tongue, lips and cheeks. The pressure of these forces, along with genetic factors will determine the position of the teeth. This can be supported by Moss's functional theory, which indicates that muscle forces play an important role in maintaining the dental position (Kyrkanides *et al.*, 2011; Koletsi *et al.*, 2018).

It has been seen that orthodontic treatments in patients with HOH have failed if only the dental problem is solved and not in a complementary way muscle stability. This explains the results of the study showing that the use of OMT in combination with orthodontic treatment to achieve better results in the correction of dentofacial disorders in individuals with orofacial abnormalities (Homem *et al.*, 2014).

In the results of the study, it was observed that patients treated with OMT presented stable results over time, showing a decrease in recurrence of DMA (Celli *et al.*, 2014; Asiry, 2015; Van Dyck *et al.*, 2016). This can also be reflected in cases of post-orthodontic treatment patients who did not undergo BMT where recurrence of AMD was observed over time (Van Dyck *et al.*, 2016).

In the study of Asiry (2015), the recurrence of AMD (anterior open bite) was evaluated in a patient who was treated in the first instance with myofunctional appliances (palatal cradle) and with daily myofunctional exercises performed at home, supervised by the parents (exercises that include placing the tip of the tongue behind the palatine rugae and lowering the tongue forcefully to produce a snap and then the next exercise performed in the same way but the Difference is where the force of the tongue is exerted, which in this case is upwards. 3 repetitions a day should be performed each of 10 times, and it can be verified at 2 years after treatment absence of previous open bite (Asiry, 2015). On the other hand, in another study, by Li *et al.* (2019) the case of a 10-year-old patient with the presence of Class II Molar and poor oral habit of oral breathing and labial interposition was observed, which was treated with myofunctional therapy (with T4B apparatus, using it at least 2 hours in wakefulness and when sleeping) and orthodontics. He was followed for 4 years and no recurrence of BMD was observed, maintaining a neuromuscular balance and the HOH being eradicated. In this way, BMT is important so that the results are maintained over time and there is no failure of therapy both in the functional and aesthetic field, where it often affects the child psychosocially.

In cases of patients with lingual interposition, BMT is useful in terms of its correct positioning, however this is not a substitute for orthodontic treatment. BMT is a complementary therapy to orthodontic treatment in patients with abnormal tongue behavior. Although the positive effect

of BMT in restoring neuromuscular balance in cases of patients with atypical swallowing and lingual interposition could be demonstrated, there is still no high-quality evidence that mentions the effectiveness of BMT in cases of patients with harmful habits of oral breathing, digital suction among others. The updated literature mentions this effect; however, the level of evidence is moderate, in addition to constituting a limited number of publications.

The target population has an age range of 6 to 12 years directly related to the period of growth and craniofacial development where it is easier to modulate such growth. This explains the role in time that BMT is applied, since greater effectiveness was observed in patients with temporary dentition and mixed dentition of the first phase compared to the mixed dentition of the second phase. As noted by Condò *et al.* (2012) the clinical results obtained suggest that early intervention in atypical deglutition produces significant results in primary dentition and in the first phase of mixed dentition, rather than in the late phase of mixed dentition. In addition, the earlier the HOH is intercepted, the easier it is to eradicate considering that at first it is a conscious behavior that as time passes becomes unconscious and therefore more difficult to eliminate (Condò *et al.*, 2012).

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Orofacial myofunctional therapy must be performed in a personalized manner according to the requirements of each patient to obtain favorable results, which will depend on the severity of the patient's DMA and on the other hand the development time in which their dentition is (temporary dentition, mixed dentition (first or second phase) must be

considered. It is for this reason that in the analysis of the studies a very wide range was found with respect to the duration of OMT being this from 4 to 22 months, according to the requirements of each patient, which makes it clear that OMT cannot be protocolized.

A fundamental aspect to consider to obtain success in treatment is that there is commitment on the part of the parents or caregivers and the patient (Tripathi & Patil, 2011; Green, 2013; Asiry, 2015). That is, they properly follow the instructions provided by professionals on the use of myofunctional devices or the modality of myofunctional exercises at home, considering the times and doses of the exercises indicated according to the prescription for each patient.

In this scope review, it was possible to demonstrate the positive effect provided by using myofunctional therapy in AMD in the presence of HOH for the craniofacial growth and development of patients where there was resolution of the AMD in conjunction with other therapies, for which its use is proposed. use in DMA correction. The neuromuscular balance achieves a balance with myofunctional therapy, so it is essential in the correction of ADM

In patients with HOH, treatment at the neuromuscular level is as important as the orthodontic treatment itself, since it will resolve the cause of the AMD. This could be observed in the results of the study where patients treated with BMT presented stable results over time, showing a decrease in recurrence of AMD (Celli *et al.*, 2014; Asiry, 2015; Van Dyck *et al.*, 2016). Thus, BMT is important for the results to be maintained over time and there is no failure of the therapy both in the functional and aesthetic spheres, where it often affects the child psychosocially.

The recent interest in interdisciplinary work promotes the use of OMT and with it new studies. This work approach requires the participation of the dentist, since he or she is in charge of detecting DMA and its cause; and on the other hand, a group of professionals from the health area such as physiotherapist speech or otolaryngologists to carry out a joint therapy which is effective in resolving the alterations that the patient presents.

One of the limitations in this study was the great heterogeneity of types of therapies, so it is not possible to make a comparison between them. Therefore, it is recommended for future research to carry out rigorous clinical studies where there is greater specificity regarding the present HOH, with a significant population, among other factors.

**FACUSSE OMP, GONZÁLEZ AG, ROZAS MO, KAPLAN HM, MORGADO TJ.** Efecto de la terapia miofuncional en niños con malos hábitos orales en presencia de anomalías dentomaxilares: revisión de alcance. *Craniofac Res.* 2022; 1(2):135-142.

**RESUMEN:** Gran parte de las anomalías dentofaciales (DMA) se producen o favorecen por hábitos orales nocivos (HOH), alterando el balance neuromuscular. La terapia miofuncional (OMT) ha sido sugerida como terapia adjunta, por lo que esta investigación se orienta a el efecto de OMT sobre las DMA y conocer el efecto de la OMT en niños con HOH y su influencia en el desarrollo de las anomalías dentomaxilares. Se realizó una investigación en 5 bases de dato (Scopus, Pubmed, Cochrane, Scielo and EBSCO) con restricción de lenguaje (inglés, portugués y español). Publicaciones entre enero 2010 y junio 2020 fueron incluidas. Desde la búsqueda inicial de 676 artículos, 14 estudios fueron seleccionados de acuerdo a los criterios de inclusión, los cuales mostraron cambios en pacientes que recibieron OMT en resolución de la DMA. El 85% de las publicaciones seleccionadas reportaron cambios positivos en la eliminación de hábito oral nocivo usando OMT. El 42% de los estudios reportaron reducción en la recurrencia de las alteraciones craneofaciales. OMT es efectivo para pacientes con deglución atípica e interposición lingual. Sin embargo, los HOH como respiración oral, succión digital, y otros, no tienen disposiciones concluyentes debido a el nivel de evidencia obtenida, que fue moderada, junto a la limitada cantidad de publicaciones relacionadas con este tópico.

**PALABRAS CLAVE:** Terapia miofuncional, maloclusión, hábitos orales.

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