

# A Systematic Review of Oral Myofunctional Therapy, Methods and Development of Class II Skeletal Malocclusion Treatment in Children

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## ABSTRACT

The purpose of this review is to conduct a detailed analysis of the literature on the use of myofunctional oral therapy tools for the treatment of Class II skeletal malocclusions. From March to May 2020, a comprehensive and systematic search was performed on the Medline (PubMed) and Google Scholar databases for works published since January 2010, using the following terms in the search: oral myofunctional tools; Class II skeletal malocclusions in children; treatment of class II bone malocclusion in children. Additional manual searches from other sources are also carried out. Only scientific articles in English are considered for this review. An electronic and manual search resulted in the identification of 61 articles. Based on the inclusion criteria, a full text copy of 30 articles was selected for analysis. Specific analysis was then made of 16 articles describing the effects produced using tools to treat Class II skeletal malocclusion and masticatory muscle dysfunction. Literature findings indicate that the

myofunctional oral therapy allows the treatment of several problems associated with the development of class II malocclusions. Although therapy induces mainly dentoalveolar changes that result in significant overjet reduction, this therapy also shows a positive effect on masticatory and perioral muscles. This method has been proven effective in obtaining significant corrections for class II skeletal malocclusions.

**Keywords:** Treatment of Class II Malocclusion; Myofunctional Oral Therapy; Children

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## INTRODUCTION

Class II malocclusion is often associated with one of the following: mandibular retrognathism, anterior displacement of the maxilla, increased posterior maxillary vertical dimension, mandibular fossa in the posterior position, maxillary constriction and a combination of factors. In general, maxillary and mandibular incisors are well positioned, different from maxillary incisors which tend to stand out. In class II skeletal malocclusions, mandibular retrognathism appears to be a major contributing factor.<sup>1</sup>

Kingsley (1879) was the first person to use the position of the mandible forward in orthodontic treatment. The detachable device developed by the author consists of continuous labial wire, the bite area extending posterior and molar clasps, and is considered a prototype of the oral myofunctional equipment. As he described it, the aim was not to protrude the mandibular teeth, but to change or jump bites in the case of excessive retrusive mandible.<sup>2</sup>

Myofunctional oral therapy equipment has been widely used in Europe since the 1930s, mainly focusing on changes in muscle conditions that affect the position and function of the mandible. This equipment, whether fixed or removable, is used to improve class II malocclusion while improving the shape and function of the upper and lower jaw, stimulating natural growth by transducing strength from muscle to basal bone and dentoalveolar processes, which affect neuromuscular complexes, and treat the mandible deficiency. Because the growth of the mandible forward is often limited by a narrow maxillary arch, myofunctional oral therapy is thought to correct sagittal differences with an expansion of the maxilla which allows the mandible to be placed forward.<sup>1,3</sup>

Oral myofunctional therapy is made to position the mandible anteriorly in Class II patients. Oral myofunctional therapeutic devices have components that are made to stimulate masticatory activity and the tongue, facial muscles, and change the position of the mandible to advanced positions and stimulate transverse development. In previous studies, various methods have been used to evaluate the effectiveness of oral myofunctional therapy. Devices for evaluating class II malocclusion treatments, such as Plaster Models, Lateral Cephalometry, and clinical analysis. The masticatory muscle activity before and after treatment has also been examined using, especially electromyography. This technique allows recording of electrical activity in the muscles, allows detection of possible muscle damage, puts corrective treatment in place and ensures whether soft tissue dysfunction or parafunction can be repaired.<sup>5-7</sup>

The principle of using myofunctional oral therapy devices as described previously is highly recommended for use in the growth and development of children. Especially in children with class II skeletal malocclusion cases.<sup>8</sup> Treatment that begins at the stage of mixed dentition can increase its effectiveness, minimizing the need for orthodontic treatment with permanent tooth extraction or orthognathic surgery has been widely reported.<sup>9</sup> Only a few scientific articles have been published that discuss the benefits of using oral myofunctional therapeutic tools for the treatment of class II skeletal malocclusions. In this way, this Systematic Review aims to carry out a detailed analysis of the available literature on the effects produced by the use of oral myofunctional tools for the treatment of Class II malocclusions in children.

## MATERIALS AND METHODS

### Search Methodology

Between March and May 2020, a comprehensive electronic search was performed in the Medline (PubMed) database and Google Scholar was conducted to select full-text scientific articles in English published since January 2010, using search terms: myofunctional oral therapy tools; skeletal malocclusion class II in children; class II skeletal malocclusion treatment in children. Additional manual searches from other sources are also carried out. It was applied as a predetermined search strategy: These terms are used in article search on PubMed and Google Scholar. The terms "myofunctional" and "class II skeletal malocclusion"

are found in each section of texts considered for article selection. For additional manual searches, the term "functional tool in skeletal class II" is used. According to inclusion criteria, the article is needed to describe the effects produced by functional devices in the treatment of class II malocclusions in children. An electronic and manual search resulted in the identification of 61 articles. The abstract is filtered beforehand to eliminate duplicates and articles that clearly fail to meet the search criteria. A copy of the full text of the remaining article is then examined methodically to determine whether the inclusion criteria are met (Figure 1). Retrospectives, controlled clinical trials and case studies are considered in this review.

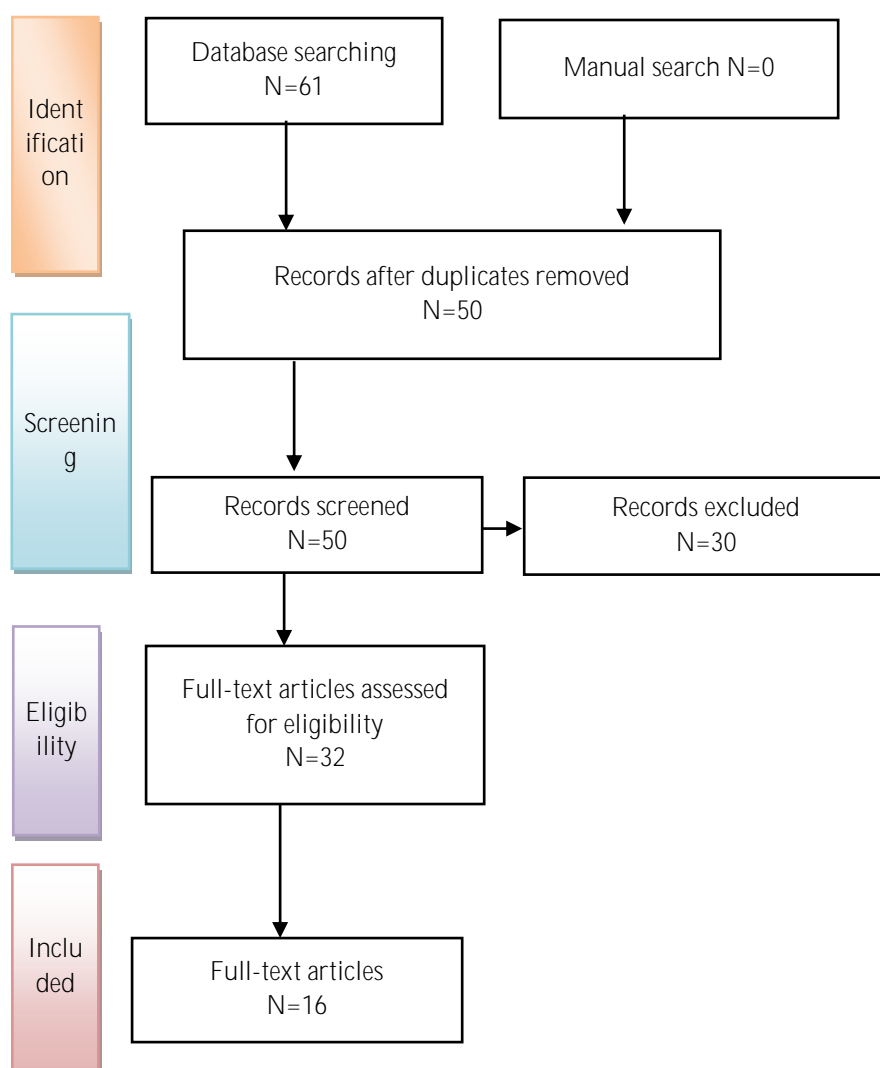


Figure 1: A flow chart describing the search methodology and numbers of articles included/excluded at each stage

### LITERATURE REVIEW

Broadly speaking, the literature review is divided into four parts: (i) Results of the corrective effects of oral myofunctional therapy; (ii) mandibular Posture and Growth and Maxilla Transversal Dimensions; (iii) dentoalveolar

effects produced by the treatment of oral myofunctional therapeutic devices; and (iv) changes in the upper airway. The study design and treatment protocols used in this study are shown in Table 1 and oral myofunctional therapy and treatment results in Table 2.

Table 1: Study design and treatment protocols

Reference	Type Of Study	Tool Name / Method For Evaluation	Age (years old);Duration of Treatment (months)
Yagci et al., (2010) <sup>5</sup>	Controlled clinical trial	Pre-Orthodontic Trainer/ Electromyography	7.8 - 11.5; 6
Das & Reddy (2010) <sup>10</sup>	Controlled clinical trial	Pre-Orthodontic Trainer /cephalometry	8 – 12 ; 15
Sreedevi et al., (2011) <sup>17</sup>	Case report	Pre-Orthodontic Trainer/clinical analysis	10; 24
Tripathi & Patil (2011) <sup>8</sup>	Case report	T4K/cephalometry Clinical analysis	10; 18
Uysal et al., (2012) <sup>6</sup>	Controlled clinical trial	Pre-Orthodontic Trainer/electromyography	9.8 ± 2.2; 7.43 ± 1.06
Pujar & Pai (2013) <sup>9</sup>	Case report	Pre-Orthodontic /cephalometry clinical analysis	11; 6
Satygo et al., (2014) <sup>7</sup>	Controlled clinical trial	Pre-Orthodontic/ electromyography	7.6 ± 1.3; 12
Baysal & Uysal (2014) <sup>12</sup>	Controlled clinical trial	Herbst and Twin Block/ cephalometric analysis	Herbst: 12.74±1.43; 15.81±5.96 TB: 13.0±1.32; 16.20±7.54
Neto et al., (2015) <sup>1</sup>	Case Report	Klammt's elastic open activator (KEOA)/cephalometric analysis	8-11; 12,6 -24
Burhan & Nawaya (2015) <sup>13</sup>	Randomized Controlled Trial	cephalometric analysis	10.2–13.5; 12
Čirgić et al.,(2016) <sup>14</sup>	Controlled Clinical Trial	clinical analysis	10.3; 12
Iwata (2016) <sup>15</sup>	Case Report	cephalometry clinical analysis	9.9; 12-24
Sharma et al., (2017) <sup>16</sup>	Case Report	cephalometric analysis	12-14; 24-48
Julyan&Coetsee (2018) <sup>17</sup>	Case Report	cephalometry clinical analysis	10; 12
Idris et al (2018) <sup>18</sup>	Randomized Controlled Trial	cephalometry clinical analysis	10.3 ± 1.4 ; 12
Shim et al., (2019) <sup>19</sup>	Case Report	cephalometry clinical analysis	7; 6
Entrenas I et al., (2019) <sup>20</sup>	case-control study	cephalometry clinical analysis	8-12; 18

Based on Table 1, it can be seen that Class II skeletal malocclusion treatments are effective in children of developmental age. In the treatment of skeletal class II malocclusion, the fastest time of treatment is six months for children aged 7-10 years. And takes the longest for 48 months at the age of 12-14 years. This shows that the earlier treatment is carried out using myofunctional oral therapy tools in children of growth and development, the faster the healing of skeletal malocclusion Class II.<sup>1-10</sup> Preventing the disorder can be difficult because most cases of malocclusion are hereditary. Parents of young children should limit

pacifier and bottle use to help reduce changes in the development of the jaw. Early detection of malocclusion may help cut down on the length (and severity) of the treatment needed to correct the problem. The treatment of malocclusion of teeth in children and adults typically results in correction of the problem. Early treatment in childhood will reduce the duration of treatment, and also make it less expensive. Adults can also get good results. However, treatment for adults will generally take longer and will be more expensive. The earlier you treat malocclusion, the better the outcome.<sup>11-20</sup>

Tables 2: Oral Myofunctional Therapy and Treatment Results

No	Tool's name	Tool Function	Tool Method	Treatment Results	Reference
1.	Preorthodontic Trainer (POT)	Stimulates growth of mandible of class II division I malocclusion	Twenty children were treated with a POT appliance, which had to be worn every day for 1 hour and overnight.	During the 6 months of POT treatment, the perioral and masticatory muscles of Class II, Division 1 patients improved significantly.	Yagci et al., (2010)

2.	Preorthodontic Trainer (POT)	The treatment of class II division 1 malocclusion	Instructed to wear the preorthodontic trainer everyday for 1 hour and overnight while they sleep for a period of 15 months	<ul style="list-style-type: none"> <li>• A significant reduction in ANB and OP-SN values was noted, indicating a significant reduction in the skeletal class II relationship in the patients wearing preorthodontic trainer.</li> <li>• There was a significant increase in the vertical dimensions of the face in general and the mandible in particular with the use of preorthodontic trainer.</li> <li>• A significant increase in both anterior and posterior facial heights was noted.</li> <li>• Decrease in the overjet accompanied by forward positioning of the mandibular incisors</li> </ul>	Das & Reddy (2010)
3	T4K	For reposition the mandible forward and improve tooth position. Muscular activity improvement of the facial muscles and a better posture of the lips were also pursued.	Instructions were given to gradually increase the appliance wear by 15 minutes per day to bring it to 1 hour in a period of 8 to 10 days and then to wear it every day for 1 hour and overnight	<ul style="list-style-type: none"> <li>• It improves tongue posture and lip seal.</li> <li>• There is no restriction on any diet as there are no chances of any breakages.</li> <li>• Abnormal lip and tongue pressures are eliminated thereby establishing normal growth.</li> </ul>	Tripathi & Patil (2011)
4	Pre-Orthodontic Trainer (POT)	Evaluate the effects of Pre-Orthodontic Trainer (POT) appliance on the anterior temporal, mental, orbicularis oris, and masseter muscles through electromyography (EMG) evaluations in subjects with Class II division 1 malocclusion and incompetent lips	Instructed to use the POT every day for 1 hour and overnight while they slept.	The results from the present EMG follow-up study of a sample with Class II division 1 malocclusion with incompetent lips indicated that treatment with POT appliance showed a positive influence on the masticatory and perioral musculature when compared to control.	Uysal et al., (2012) years-old

5	Preorthodontic trainer	Correcting the proclination of the maxillary teeth and relieving crowding in the mandible anterior teeth. Arch expansion was also desired to accommodate the erupting permanent teeth, correct the resting position of the tongue and improve the arch forms. Since dental and muscular problems were involved and the patient was in growing age,	Wear the appliance for 1-2 hours in the day for two weeks and then overnight also. The patient was followed up for every 15 days for first two months and later once in every month.	<ul style="list-style-type: none"> <li>• Reduced mentalis activity and less convexity of the profile as the proclination of the teeth was reduced.</li> <li>• The lips became competent.</li> <li>• There was an improvement in the upper and lower arches and.</li> <li>• There was an increase in the intercanine distance which was evident by accommodating the erupting canine in the arch.</li> <li>• Crowding was relieved in the mandibular anterior teeth.</li> <li>• The molar relation changed from end on molar relation to Angle's class I molar relation.</li> <li>• The overjet was reduced from 5.5 mm to 2 mm. There was reduction in the deep bite.</li> </ul>	Pujar & Pai (2013)
6	pre-orthodontic Trainer	Electromyographic Muscular Activity Improvement of class II division I malocclusion	instructed to wear the pre-orthodontic Trainer one hour during the daytime and at night when sleeping	The hypothesis that treatment with the pre-orthodontic Trainer significantly increases the amplitude of the EMG activity in the Temporalis and Masseter muscles at clench in patients with Class II, division 1 malocclusion has been confirmed. This study also demonstrated that the functional appliance is able to improve EMG muscular activity during the treatment to levels similar to those recorded for patients with normal dental occlusion	Satygo et al., (2014)
7	Herbst and Twin Block	To evaluate dentoskeletal effects of Herbst and Twin Block (TB) appliance therapies in Skeletal Class II malocclusion.	All patients were asked to wear the appliance full time, including during eating	Therapies with both appliances resulted in correction of Class II relationship, reduction of overjet, and improvement in skeletal discrepancy. The only statistically significant differences between treatment groups were recorded for mandibular incisor position and skeletal discrepancy. After treatment, incisor protrusion was higher in the Herbst group and skeletal discrepancy improvement was greater in the TB group.	Baysal & Uysal (2014)

8	Klammt's elastic open activator (KEOA)	To minimize dentoskeletal discrepancies with consequent improvement in facial esthetics during the first stage of mixed dentition	The appliance should be worn for as long as possible, except during meals and sports practice involving physical contact.	Klammt's elastic open activator (KEOA) improved the relationship between the maxilla and mandible, as well as overjet and overbite. In addition, Class I molar relationship was achieved, with space gain that allowed mandibular right second premolar to erupt and considerable change in facial profile.	Neto et al., (2015)
9	The Bite-Jumping Appliance (BJA) and the Twin-Block Appliance (TBA)	Treatment of skeletal Class II malocclusion	Instructed to wear the appliances at all times except meal time, and their parents were asked to control the appliance wears.	The current results revealed that both appliances are able to correct skeletal Class II malocclusion; that conclusion appears obvious from the significant decrease in the ANB angle and the overjet during the treatment.	Burhan & Nawaya (2015)
10	Prefabricated functional appliance (PFA) and a slightly modified Andresen activator (AA)	To Treatment of large overjet in Angle Class II: division 1 malocclusion with Andresen activators versus prefabricated functional appliances—a multicenter, randomized, controlled trial	The participants were instructed to use the appliance every night and 2 hours during daytime, 12–14 hours in total.	PFA's are as effective as AAs in correcting overjet, overbite, sagittal molar relation, and lip seal. The success rate in treatment with both appliances is, however, low	Čirgić et al.,(2016)
11	Prefabricated functional appliance (PFA)	<ul style="list-style-type: none"> <li>In the mandible, maximize anterior growth with PFA.</li> <li>In the maxilla, minimize anterior growth with PFA.</li> <li>In the maxillary and mandibular dentition, maintain the intermolar and intercanine widths, expand the canine width with PFA</li> </ul>	Patient who had used PFA in their deciduous and mixed dentition periods for two years to understand growth control of the maxillary-mandibular dentition, which was one of the effects of the functional appliance.	Patient showed correction of over jet, overbite, molar relationship, cephalographic $\angle$ ANB, and maxillary anterior tooth axis. However, this patient presented slight correction of $\angle$ SNB due to mandibular clockwise rotation. Furthermore, marked labial tipping movement of the mandibular anterior tooth axis was noted.	Iwata (2016)
12	Clear block appliance	Correction of class II malocclusion in growing patients	Instructed to wear the appliances at all times except meal time for 24 month-48 month	Clear block appliance significantly improved the class II skeletal and dental relationships with improvement in soft tissue facial contour, along with lip competency with decrease in the overjet and deep bite.	Sharma et al., (2017)
13	Twin Block	Twin Block, for growth modification and correction of her overjet and profil	The patient was instructed to wear the Twin Block at all times and to only remove it in order to clean it	The initial placement of the Twin Block with the posturing of the mandible showed early <b>improvement of the patient's</b> profile and appearance and motivated her to wear it. There was soft tissue strain present with the large amount of posturing necessary to position the mandible into a better position when the	Julyan&Coetsee (2018)

				appliance was first placed.	
14	Conventional functional appliance (a modified Activator) and myofunctional Trainer system (T4K)	To evaluate soft and hard tissue changes after 12 months of applying functional treatment for growing Class II division 1 patients using two different methods: the modified Activator versus the Positioner Trainer (T4K®).	The patient was instructed to wear the Conventional functional appliance and T4K for 12 months	<ul style="list-style-type: none"> <li>In the short-term, a 1-year treatment with the Activator appliance resulted in better skeletal changes compared to those of the T4K®, particularly the ANB angle decrease, the ramus height increase, and the greater lower facial height increase.</li> <li>In the short-term, a 1-year Activator treatment was significantly more effective than the T4K® in correcting the increased overjet and normalizing soft-tissue appearance particularly the facial convexity angle and the nasolabial angle</li> </ul>	Idris et al (2018)
15	MFT with a prefabricated appliance	The use of a myofunctional appliance for treatment Angle's class II division 2 malocclusion	The patient was instructed to wear the appliance daily for at least 2 hours during the daytime, and overnight while sleeping.	After 6 months of treatment, there was an increase in the APDI from 73.3° to 77.5°, which is within the normal range. Clinically, convexity of the lateral facial profile was also found to decrease.	Shim et al., (2019)
16	Twin Block	To correction of mandibular retrognathism with a TB appliance in growing patients	Instructed to wear the appliances at all times except meal time for 18 month.	A significant increase in UA size was observed in both the nasopharynx and oropharynx after early treatment with TB appliances in patients with mandibular Class II malocclusion. The effectiveness of TB treatment was demonstrated in patients with clinical manifestations suggestive of SAHS, mouth breathing, and/or snoring as all patients showed improved respiratory quality	Entrenas I et al., (2019)

From table 2. There are several types of Oral Myofunctional Therapy tools that can be used in the case of Class II skeletal malocclusion, namely twin blocks, modified activators, Preorthodontic Trainer, Herbst, clear block, and bite jumping appliance. Based on the literature, for the twin-block Oral Myofunctional Therapy tool effective in the treatment of skeletal class II skeletal malocclusions. Twin block (TB) in addition to correction of mandibular retrognathism with a TB appliance in growing patients.<sup>20</sup> The initial placement of the Twin Block with the posturing of the mandible showed early improvement of the patient's profile and appearance and motivated her to wear it. There was a soft tissue strain present with the large amount of posturing necessary to position the mandible into a better position when the appliance was first placed.<sup>17</sup> Then, the twin block appliances are able to correct skeletal Class II malocclusion; that conclusion appears obvious from the

significant decrease in the ANB angle and the overjet during the treatment.<sup>13</sup> It can also provide a significant increase in UA size was observed in both the nasopharynx and oropharynx after early treatment with TB appliances in patients with mandibular Class II malocclusion.<sup>20</sup> Meanwhile, appliance activators such as Klammt's elastic open activator (KEOA) improved the relationship between the maxilla and the mandible, as well as overjet and overbite. In addition, Class I molar relationships were achieved, with space gain that allowed the mandibular right second premolars to erupt and considerable changes in facial profiles in cases of Class II skeletal malocclusion.<sup>1</sup> In the short-term, a 1-year treatment with the Activator appliance resulting in better skeletal changes compared to those of the T4K®, particularly the ANB angle decrease, the ramus height increase, and the greater lower facial height increase. It was also reported that In the short-term, a 1-year Activator



treatment was significantly more effective than the T4K® in correcting the increased overjet and normalizing soft-tissue appearance particularly the facial convexity angle and the nasolabial angle.<sup>18</sup>

The Clear block tool significantly enhances grade II skeletal and dental relationships by increasing soft tissue facial contours, along with lip competence with reduced overjet and deep bite.<sup>16</sup> Then, for the Bite-Jumping Appliance the results revealed that the equipment was able to correct Class II skeletal malocclusion; That conclusion seems clear from the significant decrease in ANB angle and overjet during maintenance and twin blocks.<sup>13</sup> As for therapy with herbst equipment results in correction of Class II relationships, overjet reduction, and increased bone differences. The only statistically significant difference between treatment groups was noted for mandibular incisor position and bone differences. After treatment, the incisors were more prominent in the Herbst group and the increase in bone differences was greater in the Twin Block group.<sup>12</sup>

Using the Preorthodontic Trainer aids Functional or Prefabricated Equipment (PFA) is a significant reduction in the recorded ANB and OP-SN values, indicating a significant decrease in the class II framework relationship in patients using preorthodontic trainers. There is a significant increase in the vertical dimensions of the face in general and the mandible especially with the use of preorthodontic trainers. And a significant increase in anterior and posterior facial height was noted. The reduction in overjet is accompanied by the forward position of the mandibular incisors.<sup>10,15</sup> Use of this tool also demonstrates cephalographic correction  $\angle$  ANB, and anterior maxillary dental axis. However, this patient underwent a slight correction  $\angle$  SNB due to mandibular clockwise rotation.<sup>14</sup> Next, the marked labial end movements of the mandibular anterior dental axis are noted. However, for some literature reporting on this tool can overcome class II skeletal malocclusion but is no better than the use of twin blocks and activator appliances, especially in the age of growth and development.<sup>18,20</sup>

#### The Corrective Effects of Oral Myofunctional Therapy

Oral Myofunctional Therapy The effects produced by oral myofunctional treatments have been described in the literature. The effects of oral functional treatments on chewing muscles have been noted by Uysal et al., (2012). Electromyographic analysis (EMG) of division 2 division 2 skeletal malocclusion after treatment showed decreased temporal, mental, and increased activity of the anterior masseter muscle and orbicularis muscle when the patient was clenching. The results showed a beneficial effect of treatment on masticatory and perioral muscles. This result is corroborated by the study of Yagci et al., (2010). Likewise, the authors describe a significant increase in muscle and perioral mastication after treatment of my functional oral therapy<sup>5, 6, 21</sup>

Likewise, the activities of the Masseter and Temporalis muscles in class II division 1 patients treated with oral functional therapy were also examined by Satygo et al., (2014). The examination is carried out on the patient doing clenching. These results obtained treatment using oral

functional therapy significantly increases EMG muscle activity in Temporalis and Masseter muscles. The decrease in masseter muscle activity given by this treatment was also analyzed after two clinical follow-up studies<sup>7,22,23</sup>

#### Mandibular Posture and Growth and Maxilla Transversal Dimensions

Changes in posture and growth of the mandible and dimensions of the transverse maxilla are described in several studies. After evaluating class II malocclusions, patients treated with oral myofunctional devices and compared them with a control group consisting of untreated subjects. Then future mandibular growth is achieved with a significant increase in the vertical dimension of the face in general in groups of patients using oral myofunctional therapeutic devices. An earlier case report study revealed mandibular growth and increased inferior anterior facial height in patients treated with myofunctional oral therapy devices.<sup>1,26,27</sup> This characteristic is related to future growth of the mandible Sharma et al., (2017) .<sup>16</sup> Significant growth of the mandible produced by treatment using oral myofunctional therapy was also observed by Julyan & Coetsee (2018) .<sup>17</sup>

In a randomized controlled trial comparing the efficacy of traditional functional tools for the progress of the mandible (modified Activator) with myofunctional therapy using the Trainer of Kids (T4K®) tool in developing Class II division 1 cases through evaluation of soft and hard tissue changes in both . the group used a lateral cephalogram after 12 months of active treatment. Both groups showed significant skeletal changes but the Activator was significantly more effective with a greater SNB angle increase and a reduction in ANB angle and greater Wits assessment. Favorable skeletal changes with Activator therapy are referred to by many research reports (Idris et al., 2018) .<sup>18</sup> Different things are reported by Shim et al (2019), no significant skeletal effects were found. However, the treatment period was relatively short in both cases. Further research is needed to determine the long-term cephalometric outcomes of these treatments.<sup>19,28-30</sup>

#### The Dentoalveolar Effect Produced By The Treatment Of Myofunctional Oral Therapy

Various studies have compared groups of class II malocclusion patients treated with oral myofunctional devices with a control group consisting of untreated class II malocclusion patients.<sup>31,32</sup>

Using lateral cephalometric analysis, Julyan & Coetsee (2018) reported significant changes in the dentoalveolar pattern in subjects after treatment with myofunctional oral therapy tools including total total facial height increase, lower inclination proclamation, and reduction in overjet.<sup>17</sup> Likewise, overjet improvement, mandibular inclination in incisors and vertical dimensions of the face observed by Das and Reddy (2010) .<sup>10</sup> Although these authors report that the dentoalveolar effect seems to be more relevant, they conclude that significant small skeletal effects can also be achieved with therapy this.<sup>33,34</sup>

Retrognathism of the mandible causes an aesthetic appearance and the patient feels embarrassed. The age of patients who



are still in the growth and development phase is allowed along with the modification of the growth of the mandible because it is still in the growth and development phase. The age that will be included in the time span of growth and patients who are very cooperative also increase the prognosis of treatment results. One of the myofunctional tools that is able to direct the mandible anteriorly.<sup>3,35</sup>

The results of the examination supported by local analysis, study models and cephalometry and the presence of growth and development factors showed that the myofunctional oral therapy managed to guide the lower jaw to move anteriorly and widen the jaw arch. That matter occurs because the tongue is constantly guided by the maxillary guide wire so that it helps bring the jaw to the right position.<sup>34</sup>

Class II malocclusion division 1 Angle with mandibular retrognathia and protrusion of the upper incisors during growth and development can be treated early using functional tools. The treatment results are quite good with the achievement of 5.5 mm overjet, 3.5 mm overbite, permanent first molar relation to class I, changes in the patient's face profile and loss of bad habits of biting the lips and sucking the thumb. Cooperation, patience and high motivation between operators, parents and patients are needed to support the success of orthodontic removable care.<sup>2,33</sup>

#### Changes To The Upper Airway

Skeletal Class II malocclusion is a dentofacial deformity caused by a growth disorder of the bones frequently associated with mandibular retrusion relative to the upper facial structures. Patients with skeletal Class II malocclusion who have this deformity due to deficiency in mandibular growth present with a retrognathic mandible either because of growth vector or by mandibular deficiency length.<sup>36,37</sup>

From a dental perspective, the upper airway (UA) has received increasing attention in orthodontics. The anatomy and function of the nasopharyngeal airways are directly associated with craniofacial development. Due to this close relationship, mutual interaction is expected to occur between pharyngeal structures and the dentofacial pattern, validating the increasing interest among the orthodontic community.<sup>38</sup> The indication to treat the cause of obstruction should be established by a pediatrician, otolaryngologist, or allergist, although orthodontics and dentofacial orthopedics can also improve such obstructions; therefore, interdisciplinary coordination is essential. Malocclusion and other dentofacial abnormalities can also cause SAHS, with mandibular retrognathism as one of the most important risk factors in children.<sup>39</sup>

This study shows that correction of mandibular retrognathism with a TB appliance in growing patients not only improves the facial profile and intermaxillary relationship but also increases UA dimensions, thus reducing the risk of future respiratory problems and representing a suitable oral appliance to treat children with SAHS. However, few studies have shown the long-term effectiveness of TB appliances; therefore, their permanency remains to be determined.<sup>20</sup>

## DISCUSSION

Chewing muscle dysfunction is reported to be the cause and maintain the occurrence of class II malocclusion in the teeth and skeletal. The use of myofunctional oral therapy devices can treat dysfunctional habits, reduce the activity of excessive mental muscles and thrust the tongue, in addition to inducing nasal breathing.<sup>21,23</sup> In addition, these tools have components to guide tooth growth towards correct alignment and to provide improvements in growth the transverse maxilla while repositioning the mandible in adequate contact with the maxilla.<sup>1,18</sup>

Various research findings indicate that treatment with myofunctional oral therapy has a positive effect on mastication and perioral muscles. It is claimed to be effective for Class II skeletal malocclusion and masticatory muscles and facial soft tissue treatment in addition to having an impact on bone growth, which will affect the process and stability of orthodontic treatment.<sup>5, 22</sup> Research has shown that this tool can stimulate the growth of the mandible and increase vertical face dimensions.<sup>1,12</sup>

However, further research is needed to determine how significantly chewing muscle activity can affect the growth and development of the maxilla.<sup>31-33</sup> Nonetheless, myofunctional oral therapy devices may be equally effective for the treatment of class II, division 2 malocclusions at an early age and have been proven for class II, division 1 malocclusions. Additionally, this method is claimed to be a valuable tool for enhancing the development of dental arches. when a lack of transverse development is diagnosed at an early age.<sup>1,13,30</sup>

Literature findings show that the myofunctional oral therapy induces mainly dentoalveolar changes which result in significant overjet reduction and are thus effective for the treatment of class II malocclusions.<sup>1,11,13</sup>

Apart from that, it also report craniofacial abnormalities, including mandibular retrognathism, short mandibular body length and backward/downward rotation, can lead to decreased pharyngeal airway.<sup>20</sup> These findings indicate that nasopharyngeal obstruction may be related to changes in mandibular morphology. The study of upper airways and their relationship with mandibular position and size is extremely important in orthodontic diagnosis because of their association with obstructive respiratory disorders, especially sleep apnea. This knowledge is definitive to the indication of mandibular advancement, whether orthopedic or surgical, for treatment of these disorders.<sup>38-40</sup>

From the results of this review, it can be concluded that, although the selection of cases must be done very carefully, the myofunctional oral therapy tool allows treatment of several problems associated with the development of class II skeletal malocclusion, making it possible to discuss in various aspects. Significant correction of class II skeletal malocclusion can be achieved using oral myofunctional device therapy. Some myofunctional oral therapy devices such as twin block, herbst, T4K, and Preorthodontic Ttrainer are reported to be an option in the treatment of class II skeletal malocclusion.

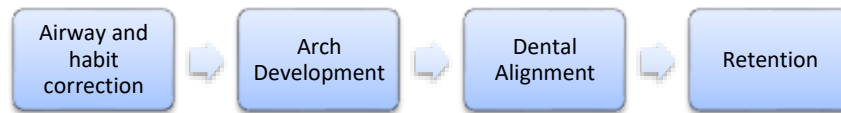


Figure 2: Flowchart Myofunctional orthodontic system packs correction of malocclusion

The use of myofunctional oral therapy in orthodontic treatment related to malocclusion including the skeletal skeleton of class II in either division 1 or 2 is increasingly developing. The myofunctional orthodontic system packs corrections of the airway and habits, the expansion of the arch and the alignment of the teeth into a comprehensive care system suitable for treating children aged 3-15 years according to figure 2.<sup>40</sup> However, further long-term follow-up studies must be carried out to verify the positive effect of treatment using myofunctional oral therapy devices in a large group of class II division 1 and 2 malocclusion subjects at one time using new investigative methods to compare and strengthen the results obtained with the technique used so far.

## CONCLUSION

Therapy induces mainly dentoalveolar changes that result in significant overjet reduction, this therapy also shows a positive effect on masticatory and perioral muscles. This method has been proven effective in obtaining significant corrections for class II skeletal malocclusions.

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