MYOFUNCTIONAL THERAPY: A CONTEMPORARY REAPPRAISAL

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Abstract

Myofunctional therapy plays a significant role in the orthopaedic correction of malocclusions, particularly in growing patients, by utilizing and modifying functional forces generated by the orofacial musculature. These therapies aim not only to correct dental irregularities but also to address underlying etiological factors such as abnormal muscle activity, tongue posture, and oral habits. Over time, myofunctional appliances have evolved from traditional functional devices to modern prefabricated systems, offering improved patient comfort, reduced chairside time, and enhanced clinical efficiency.

This review highlights the contemporary concepts of myofunctional therapy, focusing on various appliance systems including pre-orthodontic trainers, thermoformable and non-thermoformable trainer systems, Myobrace appliances, functional activators, and the Equilibrator Oral System Appliance (EQ O.S.A.). The mechanisms of action, clinical protocols, indications, and therapeutic effects of these appliances are discussed in detail. Additionally, conventional functional appliances such as the Bionator and Twin Block, including modified designs like the Essix Twin Block, are reviewed with respect to their skeletal, dentoalveolar, and neuromuscular effects.

Despite certain limitations such as dependence on patient compliance and restricted tooth movement capability, myofunctional therapy remains an essential component of interceptive and preventive orthodontics. Current approaches emphasize early intervention and correction of functional abnormalities to achieve stable, long-term outcomes. A comprehensive understanding of appliance selection, timing, and patient cooperation is crucial for optimizing treatment success.

Keywords

Myofunctional therapy, Functional appliances, Orthodontics, Myobrace, Pre-orthodontic trainers, Twin Block appliance, Bionator

Introduction-

In the orthopaedic correction of malocclusions, myofunctional appliances are essential, especially for developing children and adolescents. These appliances use the natural forces produced by regular orofacial activities like chewing, swallowing, and breathing to affect jaw growth and dento-alveolar development. Appliances are made to use the natural forces

produced by regular orofacial activities like breathing, swallowing, and chewing to affect jaw growth and dentoalveolar development. Originating from early European orthodontic concepts, both fixed and removable versions of these devices have undergone significant development over time and are currently regarded as essential components of corrective and interceptive orthodontics. (1)

The orthodontic treatment result is achieved by the application of forces and / or the stimulation and redirection of the functional forces within the craniofacial complex. (American Association of Orthodontists, 1993). The orofacial musculature is the source of these functional forces. Every muscle that is connected to the mandible affects how it moves and positions itself. These muscles are referred to as jaw muscles and fall into two groups: the inframandibular muscles, which are the mandible's depressors (digastric m., geniohyoid m., mylohyoid m., stylohyoid m., sternohyoid m., omohyoid m., sternothyroid m., thyrohyoid m.), and the supramandibular muscles, which are the mandible's elevators (masseter m., temporal m., medial and lateral pterygoid m., medial and lateral pterygoid m.). The skin is attached to or influences the facial expression muscles. Among these, the buccinator and mentalis muscles carry out primary tasks like closing and opening the lips as well as supporting roles during speech, mastication, and food intake (DuBrul, 1980). Some of these muscles are multipennate and could be further subdivided, but current understanding of their function prohibits this. (2)

Despite the fact that functional appliances are primarily used to correct malocclusions, Gokce and Kaya (2016) list a number of disadvantages of these devices, including their bulk, limited ability to align teeth, inflexible material construction, requirement for taking impressions and laboratory work, lack of patient and parental compliance, frequent discomfort, and patients simply giving up on the treatment. Boyd et al. (2021) examined case reports and explained the nature of the issue and practical solutions for early childhood malocclusion phenotypes and related orofacial myofunctional disorders.(3)

Changes in the sagittal and vertical mandibular positions lead to orthopedic and orthodontic changes as well as variations in muscular forces. Although many cephalometric research have examined the effects of myofunctional appliance treatment in growing subjects, only a small number of studies have addressed the question of the best time to treat this kind of therapy.(4)

Types of Trainers

A prefabricated functional appliance composed of non-thermoplastic silicone or polyurethane that acts on muscular dysfunction and corrects malocclusions even at a young age is known by the literary term "Pre-Orthodontic Trainer" (POT, Myofunctional Research Co., Queensland, Australia).

For Class II patients, the mandible is positioned anteriorly when fabricating the POT appliance. Its structural elements are designed to favourably stimulate the activity of the tongue, masticatory, and facial muscles, changing the mandibular posture to a forward.

According to the manufacturer's claims, pre-orthodontic trainers, also known as myofunctional trainers, are new kinds of prefabricated, detachable functional appliances that train and exercise the orofacial muscles into their proper positions and create equilibrium among the forces applied to the dento-alveolar system (Ramirez and Farrell, 2005). More than any other functional appliance that aids in tooth alignment and promotes proper growth and development of the craniofacial system, these appliances have the potential to retrain the masticatory and facial muscles, influencing the position of the tongue.

Other Trainer SystemTM appliances followed the 1992 announcement of T4K® (Pre-Orthodontic Trainer for KidsTM) by Myofunctional Research Company in Australia. It includes a range of appliances for different age groups. Phase I appliances are composed of silicone, while phase II appliances are constructed from more durable materials such as polyurethane.[3]

Current Myofunctional Applications Trainer System

Non-Thermoformable Trainer System

The non-thermoformable trainer system consists of prefabricated myofunctional appliances designed for growth guidance, habit correction, and adjunctive orthodontic management across different age groups.[5]

Infant Trainer (2–5 years):

A single-size prefabricated appliance aimed at promoting normal jaw development during early childhood. It encourages nasal breathing, correct tongue posture, and elimination of deleterious oral habits such as thumb sucking and mouth breathing. The appliance is typically worn twice daily for 20 minutes and can be sterilized in boiling water.[5]

T4K – Trainer for Kids (6–11 years):

Indicated as a pre-orthodontic appliance for myofunctional habit correction and eruption guidance. It is useful in mild Class II, mild Class III, anterior open bite, and mild anterior crowding cases. The appliance incorporates features such as a tongue tag, tongue guard, lip bumper, and buccal shields to eliminate muscular etiological factors. It is contraindicated in severe skeletal discrepancies, posterior crossbite, and nasal airway obstruction. Daily wear combined with functional exercises is recommended.

Lingua (12–15 years):

A modified upper arch exerciser used alongside fixed appliances. It promotes stable maxillary expansion and proper tongue positioning while minimizing soft tissue irritation through a bracket channel design. It is worn throughout the day except during meals.

T4B – Trainer for Braces (12–15 years):

Designed for use with fixed appliances in both arches. It aids in Class II correction, reduces tongue thrusting and mouth breathing, and facilitates passive maxillary expansion. It may be

combined with elastics or headgear and helps reduce bruxism and temporomandibular discomfort during treatment.

T4CII – Trainer for Class II Correction (12–15 years):

A more retentive appliance with extended bracket channels, indicated for moderate to severe Class II cases before or during fixed treatment. It is typically worn 1–4 hours daily and overnight.

T4A – Trainer for Alignment (≥15 years):

Indicated for permanent dentition, particularly in mild Class II Division 1 cases with minor crowding (2–3 mm) and overjet up to 5 mm. The appliance is used 3–4 hours daily and overnight in two phases—initial alignment followed by retention. It may also serve as a post-orthodontic retention appliance.[5]

Thermoformable Trainer System

T4F (Functional Trainer)

A double-layer prefabricated appliance with thermoformable EVA outer layer and semi-rigid polyurethane inner core. It is customized indirectly on dental models during mixed dentition. Adaptation involves molding to the maxilla, guiding the mandible forward, recording the bite, and cooling to set the shape.

Advantages include reduced chairside time and elimination of laboratory procedures. It can be remolded to accommodate erupting teeth. Indications include retention after arch expansion and Class II correction, interim retention between treatment phases, and temporary retention during functional appliance replacement.[6]

T4U (Multifunctional Trainer)

Similar in structure to T4F, with EVA outer layer and polyurethane inner skeleton. The inner core maintains shape during boiling-water adaptation. It can function as a temporary retainer, mouthguard, or upper occlusal splint. The adjustment procedure is similar to T4F.

Myobrace System

A prefabricated double-core appliance system designed primarily as an alternative to fixed orthodontic treatment in children aged 5–15 years. It aims to eliminate etiological factors of malocclusion and guide arch development during mixed dentition. Indicated in mild Class II cases with 4–6 mm crowding and overjet up to 5 mm. The outer layer is soft silicone, while the inner DynamiCore (nylon-based) core provides arch development and anterior alignment without bonding. Correct size selection is based on the combined width of maxillary incisors. Recommended wear is a minimum of 2 hours daily and overnight. Fixed appliances may be preferred in non-compliant patients.[5]

MBS (Myobrace Starter)

A standard-size appliance for poorly developed arches and severe crowding. It lacks individual tooth slots. Used for 6–12 months before transitioning to Regular Myobrace.

MB (Regular Myobrace)

Available in six sizes, with individual tooth slots and DynamiCore inner core to promote arch development and dental alignment in late mixed and early permanent dentition. [5]

Functional Activators and the EQ O.S.A (Equilibrator Oral System Appliance)

Functional activators were introduced in the 1950s by Soulet and Besombes as orthopedic-functional appliances aimed at restoring craniofacial harmony. Initially fabricated from natural rubber, these appliances utilized elasticity to guide jaw growth by "freeing, stimulating, and directing" skeletal development. Over time, multiple designs and materials evolved, expanding their therapeutic applications.

Mechanism of Action

Functional activators balance skeletal bases using matched upper and lower planes that position teeth through propulsion, retropulsion, and transverse expansion. Their elastomeric nature enables:

- Mild orthopaedic correction
- Minor dental alignment
- Neuromuscular re-education

They act by improving masticatory efficiency, stimulating proper tongue posture (retro incisal papilla spot), and modulating perioral muscle tone. These appliances are also reported to aid in managing obstructive sleep apnea syndrome (OSAS) by improving airway dynamics.[7]

The EQ O.S.A. Appliance

The EQ O.S.A. (Equilibrator O.S.A.), developed by Ovidi, Aprile, and Santi and commercialized by Eptamed SRL, represents a modern orthopaedic-functional device. Defined in 2005, it demonstrates a broad therapeutic range and has shown favourable clinical outcomes.

Design and Material

The appliance is available in three hardness levels:

- White – soft natural rubber
- Lavender – medium elastomeric resin
- Mint – hard elastomeric resin

Size selection is based on the transverse measurement between palatal cusps of maxillary first premolars:

- OSA 3 (24–27 mm, mixed dentition)
- OSA 4 (28–31 mm, mixed dentition)
- OSA 5 (32–36 mm, permanent dentition)

Clinical Protocol

- Worn overnight and 1 hour during the day
- Two 15-minute exercise sessions daily (morning and evening)
- Exercises include controlled breathing with gentle biting (e.g., Souchard's frog position)[8]
- Appliance replaced approximately every 6 months
- Follow-up every 45 days

Therapeutic Effects

The EQ O.S.A. stimulates growth through muscle-generated elastic forces and promotes:

- Reduction of overjet and overbite
- Correction of tongue thrust and atypical swallowing
- Improvement in breathing and posture
- Enhanced masticatory function
- Alignment of dental arches

It acts on the neuromyofascial system and is suggested to balance cranial tension (including the sphenobasilar synchondrosis, as described in osteopathic philosophy). Proper tongue positioning during swallowing, combined with perioral muscle forces, contributes to dental and skeletal stability, potentially reducing relapse.

Clinical Significance

Functional orthopedic approaches increasingly emphasize etiopathogenesis rather than isolated dental correction. By addressing tongue posture, mouth breathing, and muscular dysfunction, appliances like the EQ O.S.A. aim to provide long-term stability and holistic functional improvement in growing patients.[9]

BIONATOR

The **Bionator**, developed in the 1950s by Wilhelm Balters, is a removable functional orthopaedic appliance designed to correct skeletal Class II malocclusion. It primarily acts by advancing the mandible and modifying orofacial muscle function during growth.

Mechanism of Action

The Bionator functions through:

- **Anterior displacement of the mandible**, stimulating mandibular growth
- Mild **restriction of maxillary forward growth**
- Modification of **orofacial muscle posture**

Dentally, it produces:

- Retroclination of maxillary incisors
- Mild proclination of mandibular incisors
- Reduction of overjet
- Correction of Angle Class II molar relationship

The appliance is removable; therefore, **patient compliance is essential** for successful outcomes.

Treatment Protocol

Stage I: Functional Phase

- Appliance: Balters Bionator
- Indication: Skeletal Class II Division 1 malocclusion
- Duration: 11 months
- Worn full-time (initially removed during school hours for speech adaptation)

During this phase, mandibular growth was stimulated, leading to reduction in facial convexity, overjet, and skeletal discrepancy.[10]

Stage II: Fixed Mechanotherapy

After a 7-month interval, comprehensive orthodontic treatment was initiated using:

- 0.022 × 0.028-inch Roth prescription straight-wire appliance
- Initial leveling with 0.014-inch NiTi archwires
- Progression to stainless steel archwires (0.016–0.020 inch)
- 0.019 × 0.025-inch stainless steel wires with Class II elastics

This phase lasted 18 months and aimed at achieving optimal intercuspation and finishing.

Retention Protocol

- Mandibular lingual fixed retainer (0.028-inch stainless steel wire)
- Maxillary wraparound retainer (full-time for 6 months, then nighttime for 6 months)

Treatment Outcomes

- Conversion from Angle Class II to Class I molar relationship
- Normal overjet and overbite
- Coincident dental and facial midlines
- Improved lip seal and straight facial profile

Cephalometric changes included:

- Reduction in ANB angle from 6° to 3°
- Decrease in facial convexity angle from 7° to 1°
- Favorable mandibular growth direction.[10]

Conventional Twin Block and Essix Twin Block

- The conventional Twin Block appliance, developed by William J. Clark, is widely used for the correction of skeletal Class II malocclusion through forward mandibular positioning. In the described protocol, a single-step mandibular advancement was performed with an edge-to-edge incisal relationship and 2–3 mm anterior bite opening. Patients were instructed to wear the appliance full-time (24 hours/day), with 6-week recall intervals. Inter-occlusal acrylic was trimmed progressively, and treatment was discontinued when overjet and overbite were reduced to 1–2 mm.
- The Essix Twin Block differs mainly in fabrication. Vacuum-formed 1 mm Essix sheets are adapted over upper and lower casts after eliminating undercuts. Acrylic bite blocks meeting at approximately 70° are constructed over the Essix shells. No wire components are required. The wear protocol and recall schedule are similar to the conventional Twin Block.

Conventional Twin Block Protocol

- Single-step mandibular advancement during wax bite registration
- Edge-to-edge incisor relationship with 2–3 mm anterior bite opening
- Full-time wear (24 hours/day), including mealtimes
- Recall every 6 weeks
- Progressive trimming of inter-occlusal acrylic
- Passive labial bow throughout treatment
- Discontinuation when overjet and overbite reduced to 1–2 mm

Lateral cephalograms were taken pre-treatment and post-functional therapy. Composite cephalometric analysis was used to evaluate skeletal and dentoalveolar changes. All tracings were performed by the same operator to minimize intra-examiner error.

Essix Twin Block Protocol

The Essix Twin Block differed primarily in fabrication:

- Working models trimmed to eliminate buccal and labial undercuts
- Lower model additionally trimmed lingually
- 1 mm Essix sheets vacuum-formed individually over upper and lower casts
- Trimmed 3 mm beyond gingival margins and polished
- Construction bite recorded intraorally accounting for sheet thickness
- Acrylic bite blocks fabricated at 70° angle
- No wire bending required

The wear protocol and discontinuation criteria were identical to the conventional Twin Block group.[11]

Skeletal Effects

- The conventional Twin Block demonstrated slightly greater restriction of forward maxillary growth, suggesting a mild headgear effect. In contrast, the Essix Twin Block showed a significantly greater increase in SNB angle, indicating enhanced mandibular advancement. Since no significant difference was found in Sella–Nasion length between groups, the skeletal changes were attributed to appliance effects rather than differences in overall growth.

Dentoalveolar Changes

- Both appliances produced proclination of mandibular incisors, which was the most prominent dental effect. Despite full coverage of lower incisors in the Essix design, no significant reduction in proclination was observed; in fact, slightly greater proclination was noted compared to the conventional Twin Block. This may be due to inadequate anterior acrylic support in the Essix design and mesial forces generated by mandibular advancement.
- Upper incisor retroclination and maxillary growth restriction tended to be more evident in the conventional group, though differences were not statistically significant.

Vertical Changes

- Vertical skeletal changes differed between appliances. The conventional Twin Block showed a tendency toward increased vertical dimensions post-treatment. In contrast, the Essix Twin Block demonstrated a more favorable horizontal growth pattern with a significant improvement in Jarabak ratio. Complete dental coverage in the Essix appliance may have contributed to slight intrusion and favorable mandibular autorotation, making it potentially advantageous in vertical growers.

Patient Compliance

- Functional appliance compliance remains a clinical challenge. Patient-reported outcomes indicated that the Essix Twin Block caused fewer speech difficulties, less discomfort, and better aesthetics. Additionally, reduced wire bending and decreased chairside time make it a more convenient option for both clinician and technician.

Clinical Considerations

- The conventional Twin Block may be preferable when greater maxillary growth restriction is desired. The Essix Twin Block appears advantageous in patients requiring enhanced mandibular advancement, improved vertical control, and better appliance acceptability. Further studies with larger samples are required to confirm long-term outcomes.[12]

References-

1. Sinha R, Nagar S, Kumar A, Wadhawan A, Ayub Y, Tahseen S. Effectiveness of Myofunctional Appliances in Orthodontics: A Systematic Review. Bharati Vidyapeeth Journal of Dentistry and Allied Sciences. 2025 Oct 1;2(4):138-49.
2. Kaklamanos E, Athanasiou A. Orofacial muscle response to orthodontic treatment: A comprehensive review. Hel. Orthod. Rev. 2002; 5: 83-109
3. Khazal A, Alhafidh NN, Hassan LA. Pre-orthodontic Myofunctional trainers Appliance System: a review. Al-Rafidain Dental Journal. 2022 Mar 1;22(1):46-55.
4. Singh S, Singh M, Saini A, Misra V, Sharma V, Singh G. Timing of myofunctional appliance therapy. Journal of Clinical Pediatric Dentistry. 2010 Dec 1;35(2):233-40.
5. Gökçe B, Kaya B. Current approaches in myofunctional orthodontics. Journal of Musculoskeletal Disorders and Treatment. 2016;2:022.
6. Fukumoto A, Otsuka T, Kawata T. Simple myofunctional therapy using ready-made mouthpiece device before and after orthodontic treatment. Chin J Dent Res. 2016 Jan 1;19(3):165-9.
7. Ortu ELM, Cattaneo R, Marzo G, Gatto R, Monaco A. Electromyographic evaluation of a patient treated with extraoral traction: a case report. European Journal of Paediatric Dentistry. 2016;17(2):123–8.
8. Marchili N, Ortu E, Pietropaoli D, Cattaneo R, Monaco A. Dental Occlusion and Ophthalmology: A Literature Review. The Open Dentistry Journal. 2016; 10:460–8.
9. Aprile G, Ortu E, Cattaneo R, Pietropaoli D, Giannoni M, Monaco A. Orthodontic management by functional activator treatment: a case report. Journal of Medical Case Reports. 2017 Dec 2;11(1):336.

10. Rédua RB. Different approaches to the treatment of skeletal Class II malocclusion during growth: Bionator versus extraoral appliance. Dental press journal of orthodontics. 2020 May 29;25:69-85.
11. Jena AK, Duggal R, Parkash H. Skeletal and dentoalveolar effects of twinblock and bionator appliances in the treatment of Class II malocclusion: a comparative study. Am J Orthod Dentofacial Orthop. 2006;130:594–602.
12. Singh A, Chain S, Kulshrestha R, Gupta M, Passi D, Singh M. Comparison between conventional Twin block and a modified Essix twin block in adolescents with Class II malocclusion. International Journal of Dentistry Research. 2016;1(1):1-5.