

# Lip Muscle Training Exercises for Orthodontic Patients: A Review Article

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## Abstract:

Lip exercises are an adjunctive approach in orthodontics, designed to improve muscle tone, function, and balance around the oral cavity. These exercises specifically target the orbicularis oris and other orofacial muscles, contributing to better overall treatment outcomes. The primary benefits of lip exercises include functional improvement, enhanced stability of orthodontic results, and aesthetic enhancement. By strengthening the lip muscles, these exercises can correct dysfunctional swallowing patterns, improve speech articulation, and help maintain proper tooth positioning, thus reducing the risk of relapse. Implementation of lip exercises involves routine practices such as lip presses, resistance training with lip trainers, and stretching exercises. Consistent practice, often under the guidance of an orthodontist or speech therapist, is crucial for achieving noticeable improvements. When combined with comprehensive orthodontic treatment and myofunctional therapy, lip exercises can significantly contribute to both the functional and aesthetic success of orthodontic interventions. In summary, lip exercises are a valuable component of orthodontic care, offering support in achieving stable and lasting treatment outcomes. Their integration into a holistic treatment plan ensures that patients receive comprehensive care that addresses both muscular function and dental alignment.

**Keywords:** Lip exercises, Lip training, Lip lengthening exercises.

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## INTRODUCTION

The enhancement of dentofacial aesthetics is the most common motivation for pursuing orthodontic procedures. It is currently acknowledged that in order to achieve ideal occlusions with novel orthodontic treatments, one must move from the Angle model of optimal occlusion attainment to a more aesthetically focused paradigm of the soft tissues, which has been predicated upon the patient's total benefit. "Smile represents a very important means through which the people convey the emotions," according to Hulse. The majority of

orthodontic literature and diagnoses have been made using the patient's profile and lips at rest.<sup>1</sup>

The relationship between the lip structure, gingival scaffold, and teeth can be characterised as a "perfect smile." Teeth must be perfectly aligned and the gingival margins must be healthy and in harmony with the lip for there to be an ideal smile aesthetic zone.<sup>2</sup>

The excessive gingival display is brought on by gingival hypertrophy, a short upper lip, or a combination of the aforementioned conditions. Treatment options for the short lip range from injections of type A botulinum toxin, lip

repositioning, hyaluronic injection, myectomy, or combinations of many of those, all of which are primarily focused on limiting muscle movements<sup>2</sup> A contemporary muscle-training system has been created, and the use of devices known as exercises which are partially orthodontic has facilitated myofunctional treatment. This apparatus has been used to exercise the perioral muscles isometrically, and it will be covered in detail in the study.

**Historical aspect:** The incorporation of lip exercises into orthodontic practice has evolved over several decades, reflecting broader trends in understanding orofacial muscle function and its impact on dental health and orthodontic treatment outcomes.

### Early Developments

**1)1900s - Early 20th Century:** The initial focus in orthodontics was primarily on mechanical adjustments of teeth without much consideration of muscle function. However, pioneers like Edward Angle began to explore the role of facial musculature in orthodontic treatment.

### 2) Mid-20th Century:

The relationship between orofacial muscles and dental alignment gained attention. Researchers and clinicians started recognizing that improper muscle function could lead to malocclusions and treatment relapse. Myofunctional therapy emerged, emphasizing the importance of correct oral and facial muscle function in overall oral health. This period saw the development of various exercises aimed at improving tongue posture, swallowing patterns, and lip strength

### 3)1950s - 1970s:

Scholars like Dr. Walter Straub and Dr. Daniel Garliner significantly contributed to the field by promoting myofunctional therapy, which included lip exercises. The concept of the "oral screen," a device used to train the lips and associated muscles, was introduced and gained popularity among orthodontists as an adjunctive tool.

### 4)1980s - 1990s:

Advances in understanding muscle function and its impact on orthodontic stability led to more structured programs integrating lip exercises into

orthodontic treatment plans. Studies by Graber and others highlighted the importance of muscle training in preventing orthodontic relapse, emphasizing the need for long-term retention and stability.

### 5)2000s - Present:

Contemporary orthodontics increasingly incorporates a multidisciplinary approach, combining mechanical tooth movement with functional training of the orofacial muscles. Advances in imaging and diagnostic tools have provided better insights into muscle function, allowing for more personalized and effective myofunctional therapies, including lip exercises. Evidence-based practices have been developed, supporting the efficacy of lip exercises in enhancing treatment outcomes and stability.

### 6) Technological Integration:

The development of specific devices and tools, such as resistance trainers and digital monitoring systems, has made the implementation of lip exercises more accessible and measurable.

**Lip Exercises:** Simply put, lip exercises are therapies that make use of gymnastic or neuromuscular re-education exercises.<sup>3</sup>A. P. Rogers, a Canadian student of Angle who tried to apply the modelling impact of the functional stimuli to orthodontics, proposed the myo-functional therapy to the American Society of Orthodontists in 1918. Since the 1930s, Roger has created an exercise routine that is still used today to treat hypertonicity in the orofacial musculatures: salted hot water exercise. This exercise dilates blood vessels and also improves appearance by causing the facial muscles to relax. Ingervall conducted a study on the impact of lip training in 1982 and discovered that it had a positive effect on the morphology of the lips, increasing both lip height and decreasing the inter-labial gap.<sup>4</sup>

### Why Perform Lip Exercises?

Lip exercises were beneficial in the following ways: (a) improving the patient's posture; (b) helping the patient develop good habits; and (c) strengthening and thickening the muscles, which aids in the formation of a lip seal.<sup>5</sup> (b) expanding the lip's size and enhancing its functionality in people with small, uncooperative lips. (d) greatly reduces obstructive

sleep apnea by strengthening the lip muscles and increasing the lip closure force; (c) corrects short upper lips, which is one of the primary reasons of gummy smiles.<sup>6</sup>

### Indications of Lip Exercises in Orthodontics

Lip exercises are utilized in orthodontics to address various functional and structural issues related to the orofacial muscles and their impact on dental and facial structures. Here are the primary indications for incorporating lip exercises into orthodontic treatment:

#### 1. Malocclusions Related to Orofacial Muscle Imbalance

**Deep Bite:** Lip exercises can help manage and prevent the relapse of deep bite by strengthening the orbicularis oris muscle, thus aiding in the proper positioning of the anterior teeth.



**Fig 1: Incompetency of lips seen in deep bite**

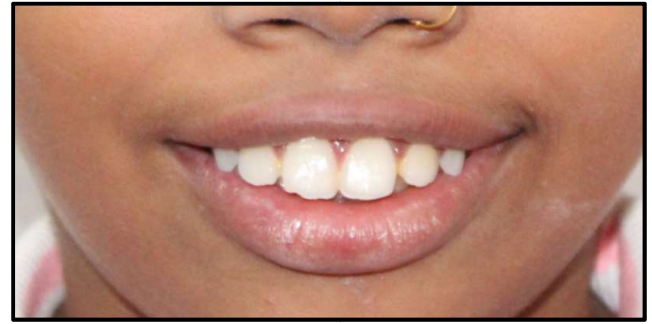
#### 2. Incorrect Swallowing Patterns

**Tongue Thrust:** Lip exercises are often used in conjunction with other myofunctional therapies to correct tongue thrust swallowing patterns, which can contribute to malocclusions and instability of orthodontic corrections.

#### 3. Lip Incompetence

**Habitual Mouth Breathing:** Strengthening the lip muscles helps in achieving and maintaining lip competence, which is essential for proper nasal breathing and overall oral health.

**Short Lip Length:** Improving lip closure and muscle tone can enhance facial aesthetics by achieving a more harmonious and balanced facial profile. (fig. 2)



**Fig.2: Short Upper lip length**

#### 4. Prevention and Management of Orthodontic Issues in Growing Children

**Guidance of Normal Growth and Development:** In growing children, lip exercises can aid in guiding the proper development of the jaws and dental arches, potentially reducing the need for more extensive orthodontic interventions later.

#### Development of the Lips

The age of the person is one factor that must be taken into account before resolving a lip incompetency issue. The lips' vertical growth in the mixed dentition phase lags behind the facial skeleton's vertical growth. The lower lip grows more quickly between the ages of nine and thirteen, finishing its growth by the age of eighteen-nine. In contrast, the upper lip grows more steadily and reaches its full capacity by the age of seventeen to nineteen. The thickness of the lips rises in adolescents and gradually decreases in adulthood. An essential component of treatment is learning to distinguish between real lip incompetence and normal lip separation associated with mixed dentition<sup>7</sup>. According to Lehman's 2019 observations of men and women's natural smiles, we can see that women's lip lines are on average 1.5 mm higher than men's, with an average of 1-2 mm of gingival display, which is regarded as normal.<sup>7</sup> Any amount more than 2 mm might be regarded as a "gummy smile" and could be a cause of the lips' poor seal. The average length of the philtrum at full growth is 23 mm for males and 20 mm for females. Despite their age difference, males appear to have stronger lips than females.

### Anatomy of the Lip

The insertions, origins, and placements of the muscles in the perioral region have been classified according to major structures.<sup>9</sup>

Group 1 consists of the muscles that insert into the modiolus, which is the fibrous junction site where seven muscles are joined. It is situated lateral to each mouth angle and slightly superior to them.

- i. Orbicularis oris: this muscle contracts to compress lips and force them against teeth; the deep orbicularis oris is what gives lips their sphincter function.
- ii. Zygomaticus major: it elevates during contraction and then moves commissure laterally.
- iii. Levatorangulioris: responsible for elevation of commissures.
- iii. Risorius: draws a lateral commissure before smiling sardonically.
- v. Buccinator: presses lips and cheeks up against teeth.
- vi. Depressor angulioris: these cause the commissure to move laterally and depress.
- vii. Platysma pars: It is conceivable that this is among the major muscles which cause depression of the lips.

**Group 2:** Upper lip insertion muscles: these muscles come from the maxilla below the infraorbital foramen and insert into the orbicularis muscle of the upper lip. These muscles are used to elevate the upper lip.

**Group 3:** Lower lip insertion muscles: these muscles come from the border of the lower jaw and insert into the skin of the lower lip. They depress the lower lip.

- i. Levatorlabii superioris: raise your upper lip and evert it.
- ii. Levatorlabii superioris alaeque nasi: this lifts the upper lip and dilates the nostril.
- iii. Zygomaticus minor: this muscle elevates and pulls the commissure laterally, which helps to create the nasolabial fold.

### Different Lip Exercises

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### Different Lip Exercises

#### 1. Lip Puffing exercise

This exercise is pushing liquid or air between the upper and lower lips while maximally pouting the lips (Figure 3). It needs to be done five to ten times every day<sup>5</sup>, or after four to five pumps of hot salt water back and forth behind the lips, spit the water out and repeat. One half glass of water at a time is used. The lip puffer has a beneficial effect on hypertonicity and can be used without the use of water by inhaling. As much air as possible is forced behind the lips, kept there for a brief period of time, and then released.<sup>3</sup>



Fig.3: Lip puffing exercise

#### 2. Orbicularis oris and circum oral muscle exercise

The patient is asked to close their mouth and extend their upper lip over their lower lip. The holding period of 30 seconds, applied 15-20 times per day, will increase the tonicity of the upper lip.<sup>5</sup>

#### 3. The gum drop exercise

One huge gum drop roughly one ounce is taken. Taking an 18- to 20-inch string depending on the patient's height. The string ends are held by lips and one is fastened to the drop. The other end is behind the teeth. The patient is asked to bend forward with their hands behind their backs until their face is parallel to the floor and a string is stretched. The patient is then asked to expand their mouth and extend their lips as far down as they can. This procedure is performed five to ten times a day.<sup>5</sup>

#### 4. The card pull exercise

The patient tries to pull a card while holding it with one hand. They try to firmly grasp the card between their upper and lower lips at the same time.<sup>5</sup>

#### 5. Exercise with button pulls

After taking a button with a diameter of between one and two inches, a thread is threaded through the button's holes (Figure 4). The patient is asked to place the button under their lips, pull the thread out, then firmly seal their lips to resist it.<sup>3,5</sup>



Fig. 4: Button pull exercise

#### 6. Tug of war with buttons

A thick thread is threaded between the two 1.5-inch flat buttons that is available. The patient is holding one button, and the other person is holding the other button. Suction must be used to hold the button in place. You can increase pressure gradually. It is not

advisable to tilt the patient or give them rapid movements as this could cause injury.<sup>3</sup>

**7. Holding cotton rolls**

Cotton rolls are used to create a lip bumper behind the lip that is bothering you. Which has been recommended for fully everted lips, excessively developed mentalis, and in situations where the short, retruded upper lip is unresponsive to other exercises.<sup>3</sup>

**8. Oral screen**

It can be characterised as a myo-functional device used for muscular exercise. An acrylic screen that is custom-made and extends below the user's upper and lower lips as well as in front of their teeth is known as an oral screen (Figure 5). The metal loop that is linked to this lip-training tool encourages the user to physically draw it against their lips. Additionally, it was applied to the rehabilitation of individuals with oral motor dysfunctions. For the study and clinical applications, various-size oral screens were used; nonetheless, the majority of studies haven't established the exercise's intensity.

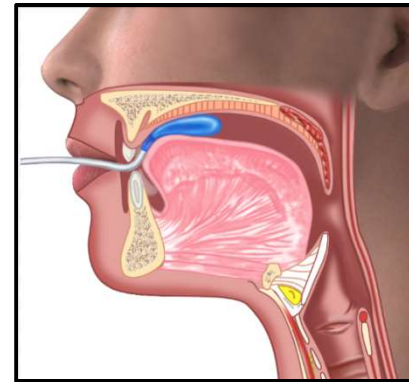


**Fig. 5: Oral Screen**

**9. The Iowa Oral Performance Instrument (IOPI)**

This instrument was created in 2001 and is used to evaluate the strength of the tongue, cheek, and lip muscles. This means that, unlike the previously stated devices, this one digitally offers the bio-feedback in kilo-pascal units. As a result, it may be used to develop the lip muscles via the bio-feedback features for oral motor exercise. For this reason, unlike lip trainers, this device can prescribe a specific intensity for lip strength training. A similar tool was

used in the study for the lip strengthening regimens and evaluations. IOPI employs a tongue bulb to measure force. An procedure that was used to measure lip muscle strength involved sandwiching the bulb between two wood blades. With this arrangement, pressure applied by the lips may be evenly distributed over the whole surface of the bulb.<sup>8</sup>(Figure 6)



**Fig.6: The Iowa Oral Performance Instrument (IOPI 10. Lip muscle strength fixation device Patakara® lip trainer**

Rubber and plastic that are flexible and durable were used to make this device. Considering the shutting of both the lips against that force, set to lower and upper lips loads a force that expands those lips. The attachment handle is attached to the bottom and top of the device so that users can gently pull it. This generates force towards the lip muscles in proportion to the instructions given. The training consisted of four sessions per day, lasting five minutes each, for a total of two months. The results showed an improvement in lip-closing strength, but it immediately returned to the baseline values after the participant stopped the programme.

**11. Hypoxic training of the lip**

A traction plate is placed within the upper and lower vestibules of the mouth and fastened with strings to a weight equivalent to 80% of the orbicularis oris's maximum tensile strength. The practioners ask the subjects to bite with their teeth rather than their lips as they stand and tilt their heads forward. This exercise is hanging the weight for five seconds with only your lips supporting it, then doing it five times with your hands supporting it (Figure 7). The

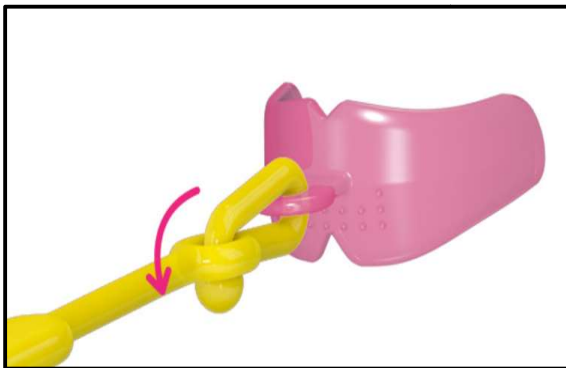
subjects completed this type of training each day for a period of four weeks. A weight equal to 80% of the new value was used in place of the previous one in the instance when it had increased two weeks into the training. Each participant was given a check-list to ensure they had completed the training each day and maintained their enthusiasm to do it.



**Fig 7: Hypoxic lip training**

## 12. Myobrace lip trainer

The goal of this device's design is to strengthen the lip's muscles and create a tight enough lip seal. Lip incompetence and symptoms of inadequate muscular tone around the orbicularis oris muscles have been observed in a number of cases. It is required to use this trainer for five minutes twice a day.



**Fig. 8: Myobrace lip trainer**

1. The strap is fastened to this apparatus by pushing it upward through an opening on the Myobrace tab.(figure 8)
2. It is forced down through the strap's hole. To secure the strap in place, it is pulled at the end.

3. Lip bumpers are inserted on the lower side of the appliance.
4. The lips are pressed together tightly over the Lip Trainer, and the strap is pushed on it while being held horizontally.
5. If the device slips out, it is reinserted into the mouth with the lips applying just enough pressure to keep it there.
6. To vary this workout and strengthen both the upper and lower lips independently, pull the strap slightly higher and then downward.
7. Continuation of this exercise is done for five minutes.

## DISCUSSION

The development of several malocclusion types, such as the open bite and maxillary protrusion, as well as articulation errors and periodontal disease brought on by dry mouth are all consequences of lip incompetence. On the other hand, the growth and development of the craniofacial complex is significantly influenced by the lips' proficiency. Thus, addressing those problems may benefit from lip incompetence improvement. One method of training for correcting lip incompetence is lip exercises. Changes in the muscle's cross-sectional area, muscle mass, and fibre type composition, in addition to variations in neural adaptations and shifts in task proficiency, have been identified as the cause of the increase in skeletal muscle strength that has resulted from training. Neural adaptation has been proposed as the cause of the strength improvements made during the early training stages, even in the absence of obvious hypertrophy<sup>15</sup>. The type II muscular fibres that make up 71.80% of the orbicularis oris muscle are fast-twitch fibres appropriate for activities involving instantaneous muscle contractions associated to muscle strength. Furthermore, the muscle is composed of 28.20% type I muscle fibres, which are slow-twitch fibre types appropriate for aerobic exercise linked to muscle endurance. These two factors could be the cause of an increase in the sealed lip ratio associated with hypoxic orbicular oris muscle training. One of the possible causes is the type I muscle fibre reinforcement, which increases the orbicular oris's muscular endurance rather than its strength during aerobic exercise. An additional

plausible explanation for elevating the sealed lip ratio through hypoxic muscle training could be the strengthening of the type II muscular fibres, improving the orbicularis oris muscle's strength and endurance.

## CONCLUSION

Lip exercises in orthodontics aim to improve muscle tone, function, and balance around the oral cavity, contributing to better orthodontic outcomes. These exercises target the orofacial muscles, particularly the orbicularis oris, to enhance lip strength and coordination.

### Benefits:

1. **Functional Improvement:** By strengthening the lip muscles, these exercises can help correct dysfunctional swallowing patterns and improve speech articulation.
2. **Enhanced Stability:** Improved lip muscle tone can contribute to the stability of orthodontic results by maintaining proper tooth positioning and reducing the risk of relapse.
3. **Aesthetic Enhancement:** Stronger lip muscles can lead to better lip posture and aesthetics, contributing to an improved facial profile.

### Implementation:

1. **Routine Exercises:** Incorporating simple exercises like lip presses, resistance training with a lip trainer, and stretching can be effective.
2. **Consistency:** Regular practice, often guided by an orthodontist or a speech therapist, is essential for noticeable improvements.
3. **Holistic Approach:** Combining lip exercises with other orthodontic treatments and myofunctional therapy ensures comprehensive care.

In conclusion, lip exercises play a supportive role in orthodontics, enhancing both functional and aesthetic outcomes. When integrated into a holistic treatment plan, they can significantly contribute to the long-term success and stability of orthodontic corrections.

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