

# Obstructive sleep apnea: focus on myofunctional therapy

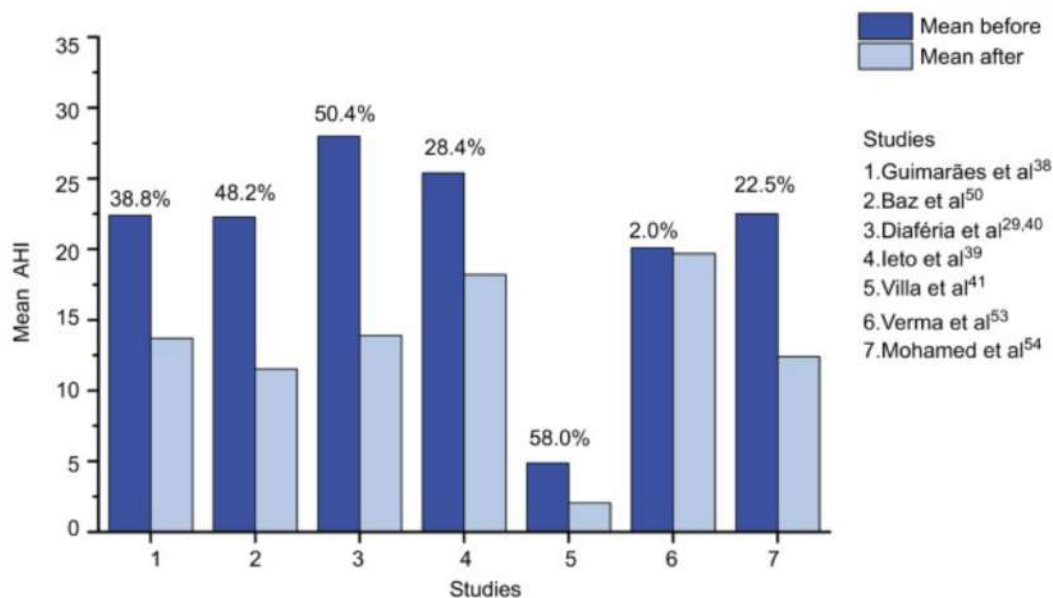
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## Abstract

**Purpose:** Orofacial myofunctional therapy (OMT) is a modality of treatment for children and adults with obstructive sleep apnea (OSA) to promote changes in the musculature of the upper airways. This review summarizes and discusses the effects of OMT on OSA, the therapeutic programs employed, and their possible mechanisms of action.

**Methods:** We conducted an online literature search using the databases MEDLINE/PubMed, EMBASE, and Web of Science. Search terms were “obstructive sleep apnea” in combination with “myofunctional therapy” OR “oropharyngeal exercises” OR “speech therapy”. We considered original articles in English and Portuguese containing a diagnosis of OSA based on polysomnography (PSG). The primary outcomes of interest for this review were objective measurement derived from PSG and subjective sleep symptoms. The secondary outcome was the evaluation of orofacial myofunctional status.

**Results:** Eleven studies were included in this review. The studies reviewed reveal that several benefits of OMT were demonstrated in adults, which include significant decrease of apnea–hypopnea index (AHI), reduced arousal index, improvement in subjective symptoms of daytime sleepiness, sleep quality, and life quality. In children with residual apnea, OMT promoted a decrease of AHI, increase in oxygen saturation, and improvement of orofacial myofunctional status. Few of the studies reviewed reported the effects of OMT on the musculature.



## Smartphone-based delivery of oropharyngeal exercises for treatment of snoring: a randomized controlled trial

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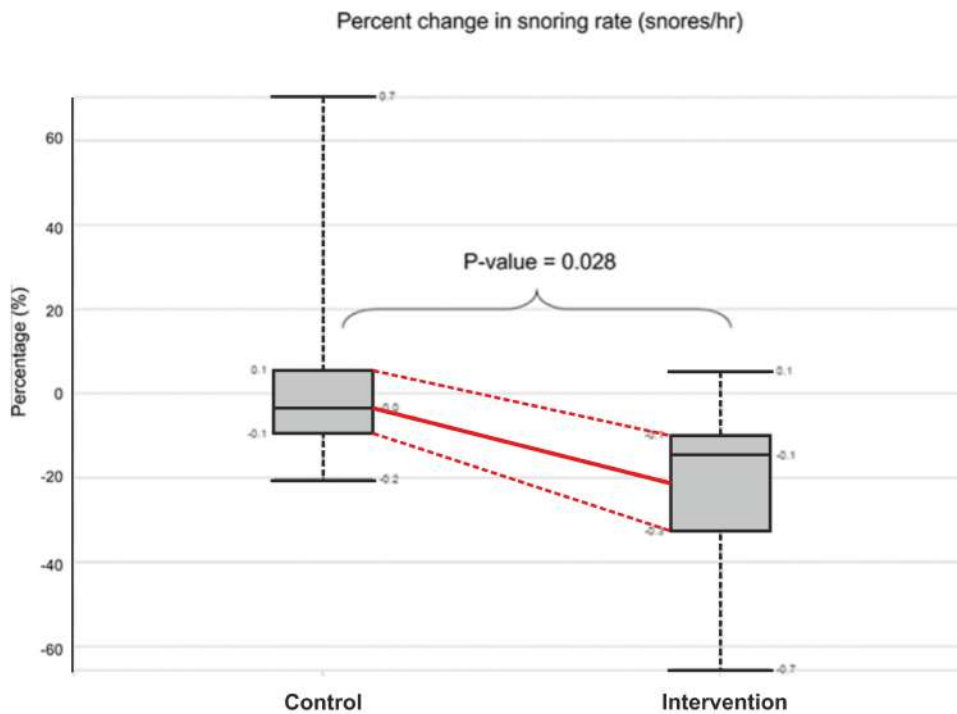
### Abstract

**Purpose:** Upper airway exercises for snoring treatment can be effective but difficult to administer and monitor. We hypothesized that a brief, relatively simple daily upper airway exercise regimen, administered by a smartphone application, would reduce snoring and encourage compliance.

**Methods:** Targeted vowel sounds causing tongue base movements were incorporated into a voice-controlled smartphone game application. Participants with habitual snoring, apnea hypopnea index (AHI)  $\leq 14$  events/h, and BMI  $\leq 32$  kg/m<sup>2</sup> were randomly assigned to perform 15 min of daily gameplay (intervention group) or 5 s of daily voice recording (control group) and to audio record their snoring for 2 nights/week for up to 12 weeks. Sounds above 60 dB were extracted from recordings for snore classification with machine learning support vector machine classifiers.

**Results:** Sixteen patients (eight in each group) completed the protocol. Groups were similar at baseline in gender distribution (five males, three females), mean BMI ( $27.5 \pm 3.8$  vs  $27.4 \pm 3.8$  kg/m<sup>2</sup>), neck circumference ( $15.1 \pm 1.6$  vs  $14.7 \pm 1.7$  in.), Epworth Sleepiness Score ( $8 \pm 3.5$  vs  $7 \pm 4.0$ ), and AHI ( $9.2 \pm 4.0$  vs  $8.2 \pm 3.2$  events/h). At 8 weeks, the absolute change in snoring rate ( $> 60$  dB/h) was greater for the intervention group than the control group ( $-49.3 \pm 55.3$  vs  $-6.23 \pm 23.2$ ;  $p = 0.037$ ), a 22 and 5.6% reduction, respectively. All bed partners of participants in the intervention group reported reduced snoring volume and frequency, whereas no change was reported for the control group.

**Conclusions:** Smartphone application-administered upper airway training reduces objective and subjective snoring measures and improves sleep quality.



# Effects of Oropharyngeal Exercises on Patients with Moderate Obstructive Sleep Apnea Syndrome

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**Rationale:** Upper airway muscle function plays a major role in maintenance of the upper airway patency and contributes to the genesis of obstructive sleep apnea syndrome (OSAS). Preliminary results suggested that oropharyngeal exercises derived from speech therapy may be an effective treatment option for patients with moderate OSAS.

**Objectives:** To determine the impact of oropharyngeal exercises in patients with moderate OSAS.

**Methods:** Thirty-one patients with moderate OSAS were randomized to 3 months of daily (~30 min) sham therapy (n = 15, control) or a set of oropharyngeal exercises (n = 16), consisting of exercises involving the tongue, soft palate, and lateral pharyngeal wall.

**Measurements and Main Results:** Anthropometric measurements, snoring frequency (range 0–4), intensity (1–3), Epworth daytime sleepiness (0–24) and Pittsburgh sleep quality (0–21) questionnaires, and full polysomnography were performed at baseline and at study conclusion. Body mass index and abdominal circumference of the entire group were  $30.3 \pm 3.4$  kg/m<sup>2</sup> and  $101.4 \pm 9.0$  cm, respectively, and did not change significantly over the study period. No significant change occurred in the control group in all variables. In contrast, patients randomized to oropharyngeal exercises had a significant decrease ( $P < 0.05$ ) in neck circumference ( $39.6 \pm 3.6$  vs.  $38.5 \pm 4.0$  cm), snoring frequency ( $4[4-4]$  vs.  $3[1.5-3.5]$ ), snoring intensity ( $3[3-4]$  vs.  $1[1-2]$ ), daytime sleepiness ( $14 \pm 5$  vs.  $8 \pm 6$ ), sleep quality score ( $10.2 \pm 3.7$  vs.  $6.9 \pm 2.5$ ), and OSAS severity (apnea-hypopnea index,  $22.4 \pm 4.8$  vs.  $13.7 \pm 8.5$  events/h). Changes in neck circumference correlated inversely with changes in apnea-hypopnea index ( $r = 0.59$ ;  $P < 0.001$ ).

**Conclusions:** Oropharyngeal exercises significantly reduce OSAS severity and symptoms and represent a promising treatment for moderate OSAS.

Clinical trial registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT 00660777).

## AT A GLANCE COMMENTARY

### Scientific Knowledge on the Subject

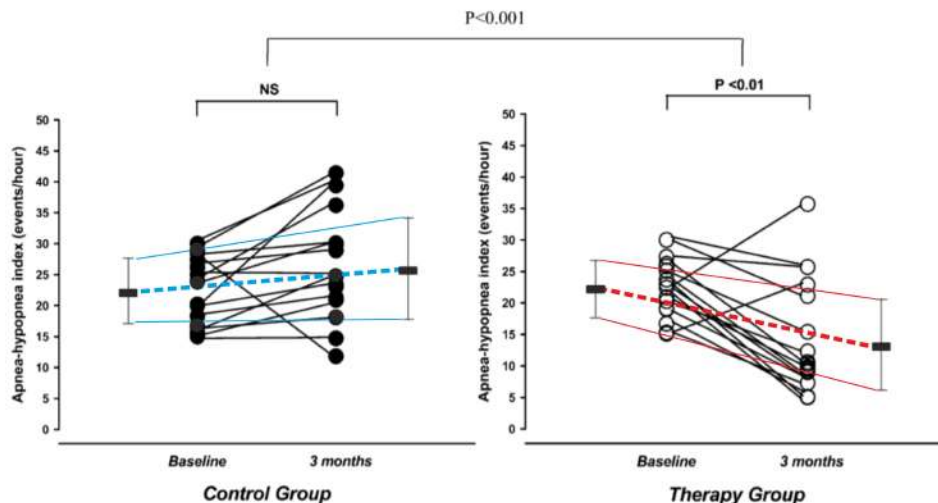
Continuous positive airway pressure is the treatment of choice for obstructive sleep apnea syndrome (OSAS) but is not suitable for a large proportion of patients. Alternative treatments for OSAS have shown variable results.

### What This Study Adds to the Field

This randomized controlled trial showed that oropharyngeal exercises developed for the treatment of OSAS significantly reduced OSAS severity and symptoms. This novel modality of OSAS treatment represents a promising approach for moderate OSAS.

for patients with severe OSAS, in whom the apnea-hypopnea index (AHI) is greater than 30 events/hour. However, for moderately affected patients (AHI between 15 and 29.9 events/h), CPAP therapy may not be suitable for a significant proportion of patients. Alternative treatments for moderate OSAS include mandibular advancement, weight loss, and surgery; these treatments have variable results (5). Therefore, it is necessary to test the efficacy of other modalities of treatment for moderate OSAS, particularly considering that this subset of patients makes up a significant percentage of the OSAS population.

The genesis of OSAS is multifactorial and includes anatomical and physiological factors. Upper airway dilator muscles are



**Figure 1.** Individual values for apnea-hypopnea index (AHI). In the control group, the AHI from baseline to 3 months (from  $22.4 \pm 5.4$  to  $25.9 \pm 8.5$  events/h) was similar. In contrast, the AHI significantly decreased in the group randomized to oropharyngeal exercises (from  $22.4 \pm 4.8$  to  $13.7 \pm 8.5$  events/h;  $P < 0.01$ ). The differences between groups remained significant ( $P < 0.001$ ). Short horizontal lines and bars are mean  $\pm$  SD. NS = not significant.



## Singing Exercises Improve Sleepiness and Frequency of Snoring among Snorers—A Randomised Controlled Trial\*

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### ABSTRACT

**Objectives:** To assess the effectiveness of regular singing exercises in reducing symptoms of snoring and sleep apnoea. **Methods:** A prospective single blinded randomised controlled trial was conducted in the otolaryngology department of a UK teaching hospital (Exeter). 127 adult patients with a history of simple snoring or sleep apnoea were recruited. 93 patients completed the study. Patients were excluded because of severe sleep apnoea (apnoea index > 40), or morbid obesity (BMI > 40). The study group completed a self-guided treatment programme of singing exercises contained on a 3CD box set, performed for 20 minutes daily. Outcome measures included the Epworth Sleepiness Scale, the SF-36 generic quality of life assessment tool, visual analogue scales (VAS range 0 - 10) of snoring loudness and frequency, and visual analogue scale of compliance (for intervention group). **Results:** The Epworth scale improved significantly in the experimental group compared to the control group (difference -2.5 units; 95% CI -3.8 to -1.1; p = 0.000). Frequency of snoring reduced significantly in the experimental group (difference -1.5; 95% CI -2.6 to -0.4; p = 0.01), and loudness of snoring showed a trend to improvement which was non-significant (difference -0.8; 95% CI -1.7 to 0.1; p = 0.08). Compliance with exercises was good; median

frequency of snoring reduced significantly in the experimental group (difference -1.5; 95% CI -2.6 to -0.4; p = 0.01), and

