

# Facial exercises for rejuvenation: A systematic review

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## ABSTRACT

**Purpose:** this study aimed to verify the effects of facial exercises on facial rejuvenation through a systematic literature review.

**Methods:** eligibility criteria included a population of adults of both sexes, exposed to facial exercises, with a comparator group before and after facial exercises. The risk of bias was assessed following the Joanna Briggs Institute (JBI) guidelines.

**Literature Review:** a total of 608 articles were retrieved during the final database search, of which 7 were included after the selection process. All included articles demonstrated that wrinkles and expression lines improved after facial exercises or massages. The judgment of case series studies found they had a low risk of bias, and two case-control studies had a moderate risk of bias.

**Conclusion:** facial exercises effectively attenuated the signs of facial aging. However, more consistent evidence is needed for more robust conclusions based on randomized clinical trials.

**Keywords:** Aging; Esthetics; Face; Rejuvenation; Speech, Language and Hearing Sciences

A study conducted at the Universidade Federal do Rio Grande do Norte (UFRN), Natal, RN, Brazil.

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## INTRODUCTION

Studied by various areas, aging is a multifactorial process, affecting all body structures<sup>1</sup>. The onset and speed of age-related changes differ among body structures, individuals, and ethnic backgrounds<sup>2</sup>. Muscle changes such as loss of mass and strength may be present in muscle aging<sup>3</sup>, which can also occur due to inadequate movement of orofacial muscles or changes in the shape and function of the structures involved, resulting in wrinkles and expression lines<sup>1</sup>.

The face is highly valued as a part of the body mostly representative of the person, being the center of attention in the search for aesthetics. Hence, facial changes bring numerous concerns<sup>4</sup>. Invasive procedures have emerged as a solution to the apprehension for a youthful and perfect face, having long been the domain of plastic surgeons, dermatologists, dentists, beauticians, and biomedical scientists. Such interventions include botulinum toxin injections, chemical peels, dermal fillers, facelifts, laser treatments, eyebrow lifts, eyelid surgery, and other procedures<sup>5</sup>. However, there has been increasing interest in reducing aging and facial changes through alternative approaches, including facial exercises, seeking results by moving facial muscles through exercises or massages, performed by speech-language-hearing pathologists trained in aesthetic speech therapy<sup>6</sup>.

Aesthetic speech therapy arises from some people's expectations for natural, non-invasive, safer procedures<sup>1</sup>. The myofunctional approach works the muscles to balance orofacial functions, such as breathing, chewing, swallowing, and speaking, and tone the face and neck muscles<sup>5</sup>. Orofacial muscles can be worked in three ways: isotonic exercises, improving mobility and increasing oxygenation and range of movement; isometric exercises, increasing muscle strength; and isokinetic exercises, resisting contrary movement<sup>5</sup>.

The effects of orofacial muscle exercises for facial rejuvenation are debated. Some researchers claim they can reduce wrinkles and sagging skin<sup>7,8</sup>, regenerate tissues, and drain waste materials through increased lymphatic and blood circulation<sup>9</sup>. On the other hand<sup>9</sup>, they have potential adverse effects, as repetitive skin movements combined with natural aging can result in wrinkles, suggesting the need for a more cautious approach to facial muscle exercise as a facial rejuvenation strategy. Excessive skin manipulation or massage can increase the loss of elasticity, increasing facial wrinkles and sagging skin<sup>10,11</sup>.

Studies suggest that facial exercises reduce vertical wrinkles above the upper lip by training the middle part of the superior orbicularis oris muscle. They can also reduce the depth of nasolabial folds by training the zygomaticus major muscle, and eliminate a double chin while achieving a more defined jawline by training the suprahyoid muscles<sup>7,8</sup>.

However, most studies on aesthetic speech therapy with facial exercises assess the results non-quantitatively, such as through a questionnaire, visual observation, and patient satisfaction self-report<sup>1,6,8,12-14</sup>. The lack of studies showing that exercises actually improve facial muscle thickness requires a more precise investigation of the potential benefits.

A systematic review addressed the use of facial exercises for rejuvenation<sup>4</sup>. However, the search strategy was carried out in 2014, without considering the gray literature, performing a comprehensive search of terms, or analyzing the risk of bias. This justifies a new systematic review with greater methodological rigor on the topic. Therefore, this systematic review aimed to verify the effects of facial exercises on facial rejuvenation.

## METHODS

This systematic review was developed following the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)<sup>15</sup>.

### Inclusion criteria

This study used the PICOS strategy to select studies, as follows: Population (P) – adults of both sexes; Intervention (I) – orofacial exercises; Comparison (C) – before and after paired or unpaired orofacial exercises; Outcome (O) – facial rejuvenation; Study design (S) – randomized, non-randomized, quasi-experimental clinical studies, and cohort, case-control, or case series studies.

### Inclusion criteria

The review included studies whose population had adults of both sexes; with orofacial exercises (involving strength, movement, or manipulation of facial muscles) including or not facial massages; with a comparison group before and after paired or unpaired facial exercises; assessing the impact on facial rejuvenation, analysis of facial symmetry through photographs, radiographic examinations, three-dimensional models, computer software, and facial anthropometric

measures; randomized, quasi-experimental, and non-randomized clinical studies, and cohort, case-control, or case series studies. No study was excluded based on language, time of publication, gender, or ethnicity of the population.

### Exclusion criteria

Studies were excluded based on the following criteria:

1. Studies with children and older adults.
2. Studies involving invasive procedures such as chemical peels, botulinum toxin injections, dermal fillers, laser treatments, facelifts, eyebrow and eyelid surgery, and acupuncture techniques, and combined treatments or studies using facial muscle training devices.
3. Studies without a comparator group, not reporting facial rejuvenation, or with patient self-report.
4. Reviews, letters, books, conference abstracts, case reports, opinion pieces, technical articles, guidelines, reviews, or any other descriptive study.

### Information sources and search strategies

The study searched the Cochrane, EMBASE, LILACS, LIVIVO, PubMed/Medline, Scopus, Web of Science, Google Scholar, and ProQuest Dissertation and Theses databases (Appendix 1), consulted experts, and manually searched the bibliographies of the included studies and the references of the selected articles to identify possible studies not found in the electronic databases. Experts in the field were contacted by e-mail to find unpublished or potentially relevant studies.

Endnote® software (EndNote® X7 Thomson Reuters, Philadelphia, PA) was used to manage the references retrieved through the search strategy and remove duplicates. The database search was conducted on April 25, 2023, and updated on July 18, 2024.

### Selection of studies

Study selection occurred in two phases. In the first one, two reviewers (EOM and FSL) independently reviewed the titles and abstracts of all references located (Phase 1). Articles that did not meet the pre-established eligibility requirements were excluded. In the second stage, the same reviewers independently read all full-text articles selected in the first phase, following the same eligibility criteria. Both processes and study selection were completed using the Rayyan

Intelligent Systematic Review website, thus ensuring blinding of reviewers and study selection.

Before starting the reading in phase 1, articles were independently pre-selected based on a partial literature search (titles and abstracts), and the Kappa coefficient of agreement was calculated to ensure correct calibration between the reviewers. The initial reading was only started when the agreement values between the two reviewers were greater than 0.7, thus indicating good agreement between them.

### Data collection process and data listing

The two reviewers (EOM and FSL) collected the following data from the articles that were reviewed: authors, date of publication, country, and study design, characteristics of the target population, training program (number of sessions, frequency of sessions, and type of exercises), aesthetic myofunctional intervention, outcome assessment, and description of results.

When any pertinent data was incomplete or missing, attempts were made for 3 consecutive weeks to contact the authors by email to obtain relevant unpublished information.

### Risk of bias in the studies

The included observational studies were assessed for methodological quality using the appropriate Joanna Briggs Institute tool for each study type. Two reviewers assessed the risk of bias separately and judged the included articles, marking each assessment criterion with “yes”, “no”, “unclear”, or “not applicable”.

The risk of bias was classified as high when the study reached 49% “Yes”; moderate when it reached 50% to 69% “Yes”; and low when it reached more than 70% “Yes”<sup>16</sup>.

Two reviewers (EOM and FSL) performed this process independently, and a third reviewer (KVMT) was included for a tie-breaking vote when the two disagreed.

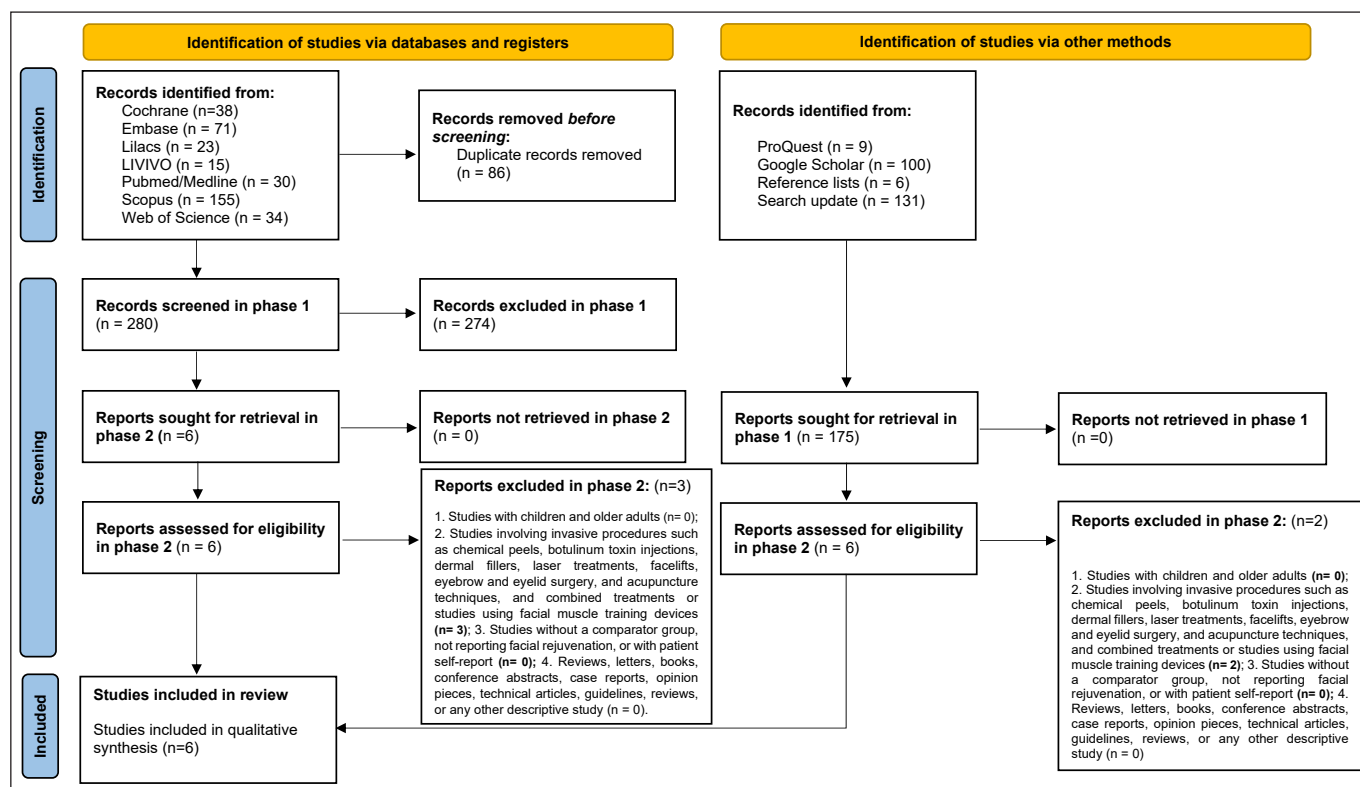
### Assessment of reporting bias

Given the impossibility of assessing publication bias through graphical analysis ( $n < 10$ ), a broad search strategy was carried out in several databases and the gray literature.

## LITERATURE REVIEW

Altogether, 608 articles were retrieved in the final database search, and 280 remained after removing the duplicates. After reading the titles and abstracts (phase 1), six articles were selected to be read in full

text. After manually searching the references of the included articles and consulting an expert, another six articles were added for full-text reading, totaling 12 studies. After the reading in phase 2, five articles were excluded (Appendix 2) and seven articles were included for qualitative synthesis (Figure 1).



**Figure 1.** PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

Three articles included in the review were in English, and four were in Brazilian Portuguese. Their countries of origin were Belgium, Brazil, and Japan (Table 1). The year of publication ranged from 2002<sup>14</sup> to 2022<sup>17</sup>, and the sample size ranged from 3 to 20 participants aged 29 to 66 years. There was a prevalence of females in the studies, although one article did not reveal its patients'

sex<sup>12</sup>. The articles used similar resources and unique outcome measures, including standardized pre/post-procedure photographs, questionnaires, assessments, performance protocols, visual analog scale, 3D-CT, and CT examination. Information on the characteristics of the included studies is provided in Table 1.

**Table 1.** Characteristics of the studies included in the review (n = 7)

Author, Year, Country	Characteristics of participants		Training program			Aesthetic myofunctional intervention	Assessment of results	Results	Type of study
	Sample	Age	Number of sessions	Frequency of sessions	Type of exercise				
Arizola HGA et al., 2012, Brazil <sup>6</sup>	11 F: 11 M: 0	40-50 years	10	Twice a week for 5 weeks	Not reported	-Facial muscle release management -Facial muscle stretching -Exercise for aesthetic speech treatment -Counter-resistance exercise	Clinical observation with photography and muscle palpation. A questionnaire was conducted on the changes perceived by patients and third parties.  Satisfaction before and after speech-language-hearing therapy was assessed using a 100 mm visual analogue scale.	Speech-language-hearing treatment provided facial changes perceived by clients, third parties, and specialists. After speech-language-hearing aesthetic treatment, 8 (72.7%) reported a good feeling and 2 (27.3%) perceived a more relaxed face.	Case-control
De Vos MC et al., 2013, Belgium <sup>18</sup>	18 F: 18 M: 0	47 years in the experimental group and 46 in the control group	49	Daily for 7 weeks	4 isometric exercises	An exercise to reduce horizontal wrinkles on the forehead (frontal muscle); an exercise to reduce vertical wrinkles above the upper lip (orbicularis oris); an exercise to reduce the nasolabial fold (orbicularis oris and zygomaticus minor muscles); and an exercise to reduce double chin and define the jaw better (masseter, sternocleidomastoid and mylohyoid muscles)	Judges evaluated the participants' images. There were 10 lay people (5 men and 5 women), aged 30 to 40 years.	The panel chose the image of the upper lip after therapy most often as the younger-looking one in the experimental group.	Case-control
Frazão Y et al., 2012, Brazil <sup>1</sup>	3 F: 3 M: 0	41, 48, and 49 years	12	Once a week + maintenance at home	Isotonic and isometric exercises and massages; adjustment of vocal intonation and amplitude of articulatory movements; drainage; reorganization of facial muscle dynamics	Not reported	Initial interview, filming chewing and swallowing functions; filming facial expressions in spontaneous speech and performing specific movements; photographic record	Reduction of exaggerated facial expressions in communication (n=3), the eyes were more symmetrical and there was a reduction in bags in the lower eyelid (n=1), a reduction in malar wrinkles, improved chewing and swallowing, and improved facial contour (n=1) The effectiveness of speech-language-hearing intervention in facial aesthetics has been proven.	Case series
Nishimura H et al., 2017, Japan <sup>13</sup>	20 F: 20 M: 0	30-54 years	Not reported	Not reported	Facial massage	Facial massage	The nasolabial folds, upper, lower, and lateral cheeks, and lower eyelids were analyzed based on photographs.	Facial massage caused morphological changes in several facial sites; soft tissues were moved upwards around the jaw; the thickness of the adipose tissue in the nasal ala increased after massage. The shapes of the facial expression muscles were also changed after massage. Apparently, massage did not affect the shape of the nasolabial folds but caused morphological changes in the cheek, changing the appearance of the nasolabial folds.	Case series
Okuda I et al., 2022, Japan <sup>17</sup>	5 F: 3 M: 2	29-37 years	14	Twice a day for 2 weeks	Massage	Massage	CT scan (analyzed by two radiologists)	The malar mound thinned and shifted cranially and horizontally. The SMAS height (the greatest vertical distance from the SMAS) increased. The rate of change in cheek thickness was significantly correlated with SMAS height. These changes were attributed to the lifting and tensor effects of facial massage.  SMAS: superficial musculoaponeurotic system	Case series

Author, Year, Country	Characteristics of participants		Training program			Aesthetic myofunctional intervention	Assessment of results	Results	Type of study
	Sample	Age	Number of sessions	Frequency of sessions	Type of exercise				
Paes C et al., 2007, Brazil <sup>12</sup>	10 Sex not reported	33-63 years (mean: 43.5)	16	1 meeting a week	Guidelines for facial care, isotonic, isometric, and isokinetic exercises, massages, facial manipulations, and stomatognathic functional balance, including masticatory training	Not reported	Medical history survey, assessment, photographic record, and a performance protocol	The projection measures of the nasolabial fold to the tragus on both sides decreased significantly. Positive results were found in the cheek and mouth areas. All patients noticed some change in their faces after speech-language-hearing treatment. Other people noticed some change in the faces of 7 patients but not in 3 – the ones who performed the exercises least frequently. Smoothness and relaxation occur after performing the isometric exercises Regarding wrinkles, 8 patients observed that they became smoother, and 4 patients reported having noticed greater firmness in facial tone. Sensation of lightness (n=6) and rest and rejuvenation (n=4)	Case series
Takacs AP et al., 2002, Brazil <sup>14</sup>	8 F: 6 M: 2	31-66 years (mean: 48.4)*	90	6 exercises once a day for 3 months	Six isometric exercises	Raising the eyebrows by wrinkling the forehead for 7 seconds; bringing the eyebrows together for 7 seconds; closing the eyes tightly for 7 seconds; protruding the lips for 7 seconds; lateralizing the corners of the mouth by opening the lip line for 7 seconds; contracting the right and left cheeks with resistance for 7 seconds.	Questionnaire. 11 individuals were given pre- and post-therapy photographs of each patient and were asked to specify the photographs in which the patient appeared younger and older	The exercises helped reduce wrinkles, expression lines, and facial sagging in all individuals, with varying degrees and locations of improvement. There was a reduction in the nasolabial fold (n=7); reduction in dark circles (n=5); reduction in sagging cheeks (n=4); reduction in transverse wrinkles on the forehead (n=3); reduction in wrinkles around the eyes (n=3); a rested, relaxed, and serene face (n=3); more defined lips, and a change in posture (n=1). Patients noticed firmer mouths and foreheads, thicker lips, a more relaxed expression, a rested face, bright and fresh skin, and lifted lines on the lips, eyes, eyebrows, and cheeks.	Case series

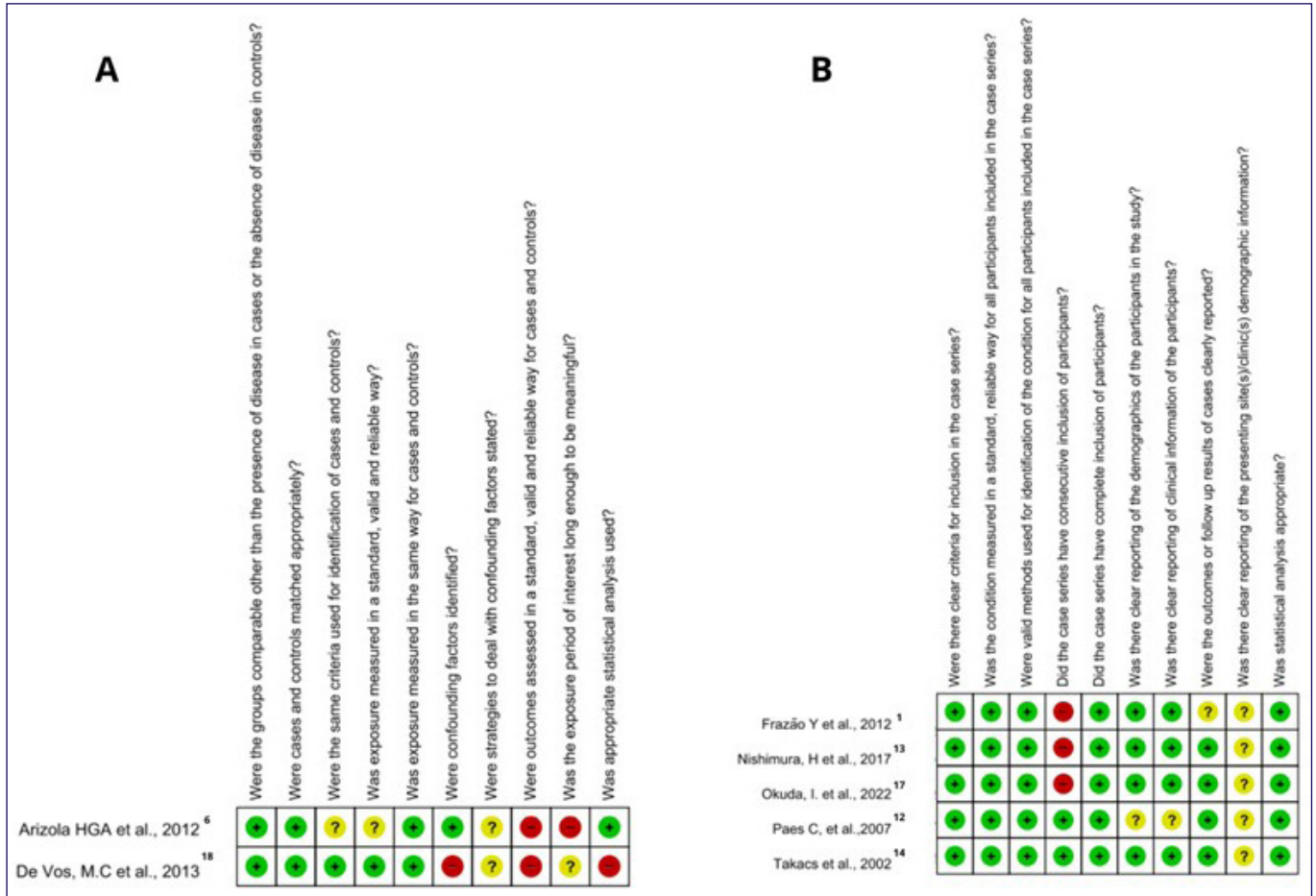
Captions: SMAS: superficial musculoaponeurotic system; 3D-CT: tridimensional computed tomography.

\*calculated by the authors



The risk of bias was judged as low in the five case series studies<sup>1,12-14,17</sup> and moderate in both case-control studies<sup>6,18</sup>. The domains with a moderate risk of bias were the lack of control of confounding factors and the

outcomes not assessed in a standardized, valid, and reliable way for the case and control group. The results of the risk of bias are described in Figure 2.



**Figure 2.** Assessment of the risk of bias using the Joana Briggs Institute tool for case-control (A) and case series (B) studies

Publication bias could not be analyzed with a funnel plot (n < 10). Thus, a broad search strategy was carried out in seven databases and the gray literature, including a database in a language other than English (LILACS), to reduce the probability of this bias occurring.

All included articles demonstrated improvements in facial rejuvenation after a facial exercise training program and massage. This treatment was considered positive and non-invasive, improving the patients' overall facial aesthetics<sup>1,6,12-14,17,18</sup>.

Performing isometric exercises systematically helped reduce wrinkles, expression lines, and facial sagging, with variation in the degree and location of the improvement. For instance, there was a reduction in the projection measures of the nasolabial fold<sup>1,12,14</sup>.

According to Arizola<sup>6</sup>, experts observed improvements in wrinkles around the eyes and on the forehead, facial contour, skin shine, and viscosity.

On the other hand, De Vos<sup>18</sup> found no significant differences in any of the five facial areas. Despite minimal improvements in the forehead and nasolabial fold, the orbicularis oris had the most significant differences compared to the other findings. They concluded that perhaps 7 weeks of daily exercise was not enough to produce visible results, or that the training was not intense enough.

In addition to exercises, facial massage is empirically known to induce good changes in facial appearance and sagging. After facial massage, a study<sup>17</sup> found that the malar mound thinned by  $-0.8\% \pm 0.45\%$  and displaced cranially and horizontally by  $3.9 \pm 1.94$  mm. The height of the superficial musculoaponeurotic system (SMAS), defined as the greatest vertical distance from the SMAS, increased by  $2.6\% \pm 2.6\%$ . The rate of change in cheek thickness was significantly correlated with SMAS height ( $r = -0.63$ ;  $P < 0.05$ ). These changes were attributed to the lifting and toning effects of the muscle. According to Nishimura<sup>13</sup>, massage appeared to have the greatest effect on nasolabial folds. Although some individuals experienced changes after massage, most of them experienced changes induced by it.

All the studies cited above had facial care guidelines, which could include isotonic, isometric, and counter-resistance/isokinetic exercises, and facial massage and manipulation. The frequency of exercises was generally based on a weekly meeting, with daily maintenance at home<sup>1,6,12-14,17,18</sup>.

Massaging positively changed facial aesthetics, making it more toned, thinner in some regions, and even thicker in the cheeks, besides changes in the nasolabial and nasolabial fold<sup>6</sup>.

Facial exercises for facial rejuvenation improve aesthetic aspects in general – e.g., by relaxing the face, decreasing exaggerated facial expressions, improving tone, reducing sagging cheeks and wrinkles (cheekbones, eyes, and forehead), reducing nasolabial folds, and improving the facial contour and dark circles<sup>1,6,12,14,18</sup>.

These results highlight the potential effect of facial exercise training programs, including exercise and massage, to improve facial rejuvenation non-invasively<sup>1</sup>. However, the discussion about such effects is complex due to the different methods<sup>6</sup>. They highlight confounding factors, especially in their analyses, and explain that this may have happened because 7 weeks of daily exercise were not enough to produce visible results, or the training was not intense enough<sup>18</sup>. They suggest that the training duration and intensity may have been insufficient to produce visible results in all facial areas.

Okuda<sup>17</sup> reported positive effects of facial massage on muscle tone and facial contour, whereas Nishimura<sup>13</sup> stated that massage may have more pronounced effects on specific areas, such as the nasolabial folds. The varied results between studies may be attributed to methodological differences, such as study duration, exercise frequency and intensity, and participant characteristics.

Takacs<sup>14</sup> obtained more defined lips in 12.5% of their findings. Another study reporting facial exercises<sup>19</sup> found similar facial improvement results – e.g., the upper vermilion with the lips together remained the same in 50% and increased in 50% by an average of 1.5 mm. The aesthetic gain analysis found the wrinkles smoothed and the muscle tension eased in 100% of the subjects.

Another relevant point is the importance of facial care guidelines after completing the facial exercise training program<sup>1</sup>. Daily maintenance at home can be crucial to sustaining the results and preventing the return of signs of facial aging<sup>6</sup>.

The mechanism of action of facial exercises on the body is similar to that of physical exercises. Blood flow increases considerably when the muscles are activated, increasing tissue oxygenation. Simultaneously, mitochondria concentration increases within the muscles, improving the body's antioxidant capacity, slowing the aging process, and making the skin firmer<sup>20</sup>.

Most of the exercises focused on the entire face, making it impossible to critically analyze the effect of specific exercises and their actions in specific areas. For example, no research correlated only the relationship between the tongue sweep exercise and its effect on an isolated area, such as the double chin. The result analysis of all studies shows that the effects of facial training improved the facial aesthetics among the study populations.



The limitations of this systematic review should be considered. Most of the included studies were clinical case series<sup>1,12-14,17</sup>, whereas the other two were case-control studies<sup>6,18</sup>. They did not adequately control confounding factors, either by statistical methods or appropriate sampling techniques. The lack of control of these factors can influence the observed effect estimate – for instance, the sample sizes were relatively low, ranging from three participants in a study<sup>3</sup> to 20 in another<sup>13</sup>, as well as the follow-up time of the included studies since most of them followed patients for 2 to 16 weeks. Therefore, it cannot be stated whether this time is enough to evaluate the real impact of this therapy on rejuvenation after the intervention. Moreover, the methodological heterogeneity makes it difficult to quantitatively summarize these findings, making it impossible to group them, or acting as a source of heterogeneity in the analysis. The five case series studies had a low risk of bias<sup>1,12-14,17</sup>, and the two case-control studies had a moderate risk of bias<sup>6,18</sup>.

This review did not use self-reports or questionnaires as a means of collecting data. This methodological choice was based on the need to minimize possible subjective biases and ensure the accuracy and objectivity of collected data. Although we recognize the relevance and widespread use of self-reports in health, especially to capture individual experiences and perceptions, the study approach aimed to prioritize objective methods that could provide greater reliability and validity to the results.

There is a need for a deeper understanding of the factors that influence their effects. Further research is indicated to determine the best approach in terms of duration, intensity, and specific types of exercises and massages to optimize results and meet individual patient needs. Further studies with appropriate sampling and randomization processes are recommended, thus allowing for increased reliability of the evidence. In addition to improving methods for better control of study quality, it would also be important to investigate the effect of specific exercises in isolation, observing their consequences on the entire face.

## CONCLUSION

Although the facial exercises used in this review led to facial rejuvenation and are considered an alternative to invasive procedures, the few studies and their available quality of evidence are insufficient to prove that the exercises have positive effects for this purpose. More evidence is needed – e.g., randomized

controlled trials, larger sample sizes, greater control of the duration of therapeutic facial exercise training, and different types of isolated exercise variations – before conclusions can be drawn about the evidence of facial exercises for facial rejuvenation.

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**Authors' contributions:**

EOM, FSL, RDS: Conceptualization; Data curation; Data analysis; Writing - Original draft.

AFMB: Conceptualization; Data curation; Data analysis; Project administration; Writing - Original draft.

LOL: Data analysis; Methodology; Writing - Original draft.

RVAC, CCC, CMA: Conceptualization; Data curation; Data analysis; Project administration; Methodology; Writing - Original draft.

KVMT: Conceptualization; Data curation; Data analysis; Project administration; Methodology; Supervision; Validation; Visualization; Writing - Original draft; Writing - Review and editing.

**Data sharing statement:**

This research did not generate or analyze any datasets; therefore, there is no data to be shared.

## Appendix 1. Database search strategy

Database	Search (April 25, 2023, updated July 18, 2024)
Cochrane	("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises") in Title Abstract Keyword AND ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital") in Title Abstract Keyword
Embase	('myofunctional therapy/exp OR 'myofunctional therapy' OR 'myofunctional therapies' OR 'orofacial myotherapy' OR 'oral myotherapy' OR 'orofacial myology' OR 'exercise therapy/exp OR 'exercise therapy' OR 'remedial exercise' OR 'remedial exercises' OR 'exercise therapies' OR 'rehabilitation exercise' OR 'rehabilitation exercises' OR 'facial massage' OR 'facial exercises' OR 'facial exercise' OR 'face yoga' OR 'orofacial exercises') AND ('facial expression' OR 'facial expressions' OR 'face expression' OR 'face expressions' OR 'esthetics' OR 'aesthetics' OR 'skin wrinkling' OR 'wrinkles' OR 'skin rejuvenation' OR 'facial rejuvenation' OR 'facial aging' OR 'esthetic logopedics' OR 'glabellar' OR 'glabellar lines' OR 'glabellar wrinkles' OR 'tear trough' OR 'infraorbital')
LILACS	("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises" OR "Terapia Miofuncional" OR "Miologia Orofacial" OR "Terapia por Exercício" OR "Exercício de Reabilitação" OR "Exercício Terapêutico" OR "Terapia por Ejercicio") AND ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital" OR "Expressão Facial" OR "Expressão da Face" OR "Expressão do Rosto" OR "Estética" OR "Envelhecimento da Pele" OR "Enrugamento da Pele" OR "Envelhecimento Solar da Pele" OR "Fotoenvelhecimento da Pele" OR "Expresión Facial" OR "Envejecimiento de la Piel")
LIVIVO	("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises") AND ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital")
PubMed/Medline	("Myofunctional Therapy"[Mesh] OR "Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy"[Mesh] OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises") AND ("Facial Expression"[Mesh] OR "Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics"[Mesh] OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital")
Scopus	(TITLE-ABS-KEY ("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises" ) AND TITLE-ABS-KEY ( ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital" )))
Web of Science	("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises") AND ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital")
Google Scholar	"Myofunctional Therapy" OR "facial exercise" AND "Facial Expression" OR "Esthetics" OR "Skin Wrinkling" filetype:PDF
ProQuest	("Myofunctional Therapy" OR "Myofunctional Therapies" OR "Orofacial Myotherapy" OR "Oral Myotherapy" OR "Orofacial Myology" OR "Exercise Therapy" OR "Remedial Exercise" OR "Remedial Exercises" OR "Exercise Therapies" OR "Rehabilitation Exercise" OR "Rehabilitation Exercises" OR "facial massage" OR "facial exercises" OR "facial exercise" OR "face yoga" OR "orofacial exercises") AND ("Facial Expression" OR "Facial Expressions" OR "Face Expression" OR "Face Expressions" OR "Esthetics" OR "Aesthetics" OR "Skin Wrinkling" OR "Wrinkles" OR "Skin rejuvenation" OR "Facial rejuvenation" OR "facial aging" OR "esthetic logopedics" OR "glabellar" OR "glabellar lines" OR "glabellar wrinkles" OR "crow's feet lines" OR "crow's feet" OR "crow's feet wrinkles" OR "tear trough" OR "infraorbital")

## Appendix 2. Excluded articles and reasons for exclusion (n=5)

Author, Year	Reason for exclusion*
Franco et al., 2002 <sup>1</sup>	2
Hwang et al., 2018 <sup>2</sup>	2
Khanna et al., 2002 <sup>3</sup>	2
Matos et al., 2010 <sup>4</sup>	2
Silva et al., 2010 <sup>5</sup>	2

\*1. Studies with children and older adults; 2. Studies involving invasive procedures such as chemical peels, botulinum toxin injections, dermal fillers, laser treatments, facelifts, eyebrow and eyelid surgery, and acupuncture techniques, and combined treatments or studies using facial muscle training devices; 3. Studies without a comparator group, not reporting facial rejuvenation, or with patient self-report 4. Reviews, letters, books, conference abstracts, case reports, opinion pieces, technical articles, guidelines, reviews, or any other descriptive study.

### Excluded References:

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