PUBLICATION TRENDS AND LEVELS OF EVIDENCE IN OROFACIAL MYOFUNCTIONAL THERAPY LITERATURE

AMERICAN SPEECH-LANGUAGE HEARING ASSOCIATION

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My Disclosures

Financial

- I have no financial relationships to disclose.
- I am not promoting any product or group.

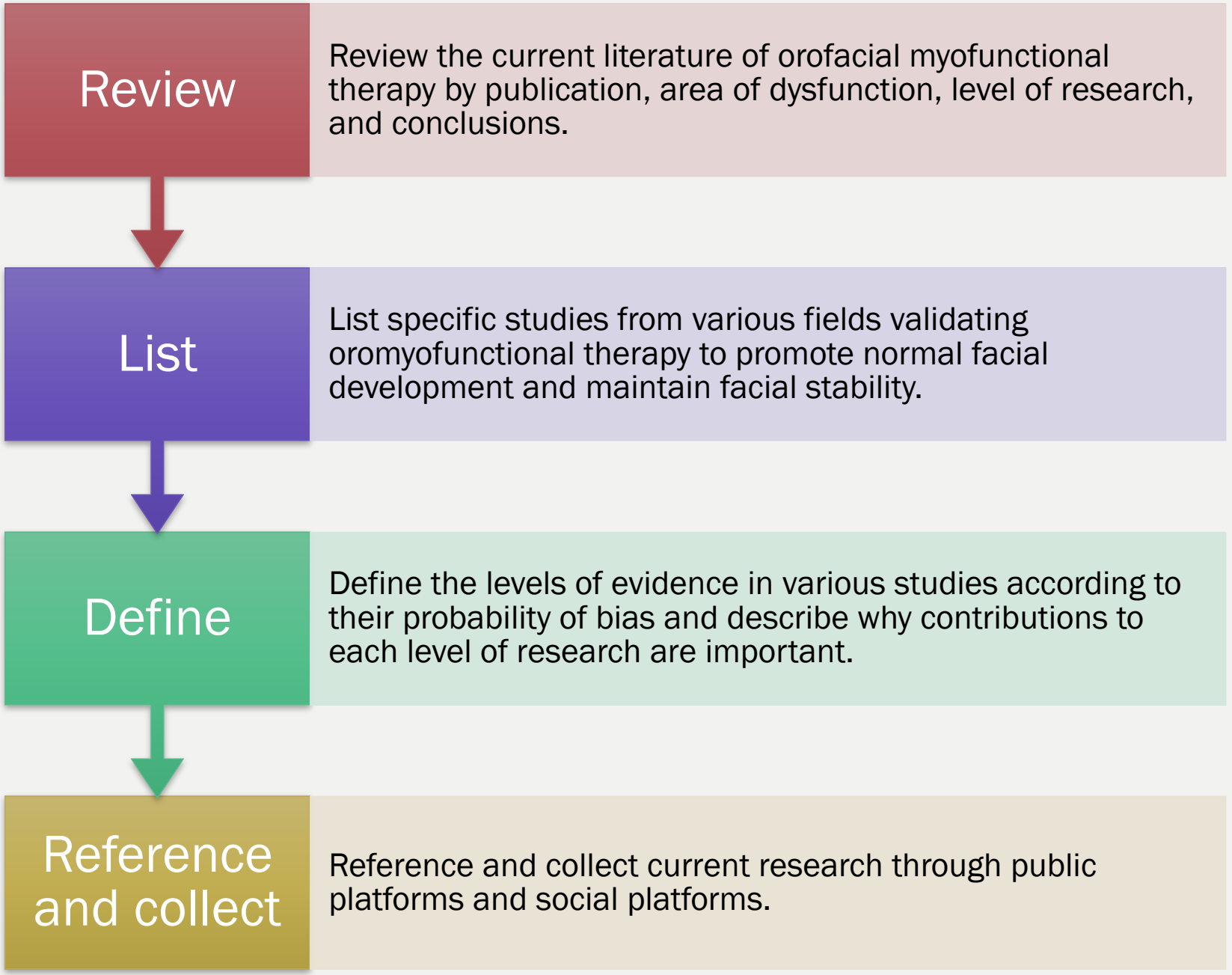
Non-Financial

- I am a past president and former board member of the Oregon Speech Language Hearing Association (OSHA).
- I am a member of the American Speech Language Hearing Association (ASHA).
- I am the administrator of the Oromyofunctional Study Group on Facebook

My Clinical Experience & Scope of Practice

- Articulation & Phonological Disorder
- Cleft Lip & Palate, Craniofacial Disorders
- Dysarthria, Dyspraxia, Cerebral Palsy, Head & Neck Cancer
- Facial Trauma, Facial Pain, TMD
- Obstructive Sleep Apnea, Airway Function Disorder
- Oral Prep, Oral Stage & Oropharyngeal Dysphagia
- Oromyofunctional Disorder, Orthodontic Relapse
- Pre & Post Frenectomy Rehabilitation
- Pre & Post Oromaxillofacial Surgical Rehabilitation
- Sensory-Motor Feeding Disorders, Picky Eating
- Stuttering & Dysfluency
- Voice & Resonance Disorders

Learner Outcomes



My Presentation Bias

I am full of bias.

I have an agenda.

I don’t think clinical decisions should be based primarily on Level 1 research, but on the body of research, clinical experience, and patient need.

I want to highlight positive research in this field.

I want to inspire this audience to produce more and better research.

I will always differentiate between fact and my highly biased opinion.

Presentation Summary

This systematic literature review examines clinical research from the past 25 years on the use and effectiveness of oromyofunctional therapy (OMT) to normalize facial function, promote optimum facial development, and relieve the symptoms of oromyofunctional disorder, oral and oropharyngeal dysphagia, articulation disorder, obstructive sleep apnea, temporomandibular disorder, and to stabilize the face and occlusion through the orthodontic and oromaxillofacial surgical process.

This review was presented in 2018 at the International Association of Orofacial Myology and was updated for this presentation with research published in the last two years.

Definition of Orofacial Myofunctional Disorder

D'Onofrio L. Oral dysfunction as a cause of malocclusion. *Orthod Craniofac Res*. 2019;22(Suppl. 1):43-48

Orofacial myofunctional disorder includes dysfunction of the lips, jaw, tongue, and/or oropharynx that interferes with normal growth, development, or function of other oral structures, the consequence of a sequence of events or lack of intervention at critical periods, that result in malocclusion and suboptimal facial development.

Definition of Oromyofunctional Therapy

Therapeutic exercise-based techniques, based on the principles of motor learning and neuroplasticity, to stabilize, tone, strengthen, or improve the range of motion of the skeletal muscles of the face and neck used to treat a range of orofacial myofunctional disorders.

Method

A comprehensive literature search of three databases (PubMed, ResearchGate, Google Scholar) and additional backward citation search identified 113 international peer-reviewed journals covering 27 medical and dental fields. The search was limited to research from the last 25 years and was focused on treatment.

Keywords searched included: oromyofunctional therapy, orofacial myology, myofunction, oral-motor, exercised-based therapy, kinesthetic therapy, functional physiotherapy, maxillofacial rehabilitation, myofascial rehabilitation, myofascial re-education, neuromuscular re-education, dentofacial orthopedics, facial exercise, swallowing exercise, oropharyngeal exercise, lingual exercise, jaw exercise, lip exercise, and tongue training.

A total of 247 articles were reviewed for relevancy. From that, 212 studies were chosen for analysis.

Studies considered relevant for this project were those directly addressing OMT use and efficacy as a treatment modality.

Studies were graded by their level of evidence and organized by impact area.

Exclusion Criteria

- Prevalence, protocol-based diagnostic studies, evaluation
- Implications of OMT
- Incorporating OMT in treatment but not measuring the OMT impact
- Commenting about OMT in the introduction or discussion section but not measuring the OMT impact
- Compensatory-based dysphagia techniques or specifically-branded dysphagia techniques
- Breathing exercises & breathing re-education (this should be included in future systematic analyses)
- Myofunctional dental appliances
- Animal studies

113 Journals from 27 medical & dental fields

- Brain research
- Chest diseases
- Dysphagia
- General dentistry
- Geriatrics
- Head and neck surgery
- Laser dentistry
- Neuroscience and neurorehabilitation
- Nutrition
- Oncology
- Orofacial myology
- Oromaxillofacial surgery
- Orthodontics
- Otorhinolaryngology
- Otology and neurotology
- Pediatric dentistry
- Pediatrics and neonatology
- Perinatology
- Physical medicine and rehabilitation
- Prosthetic dentistry
- Prosthodontic dentistry
- Rehabilitation medicine
- Respiratory medicine
- Sleep medicine
- Speech pathology and language disorders
- Stomology and oral health
- Temporomandibular disorder and Orofacial pain

113 Journals from 27 medical & dental fields

Acta Odontologica Scandinavica: 3
Acta Otolaryngoligica
Advances in Otorhinolaryngology
American Journal of Orthodontics and Dentofacial Orthopedics: 3
American Journal of Respiratory and Critical Care Medicine: 2
American Journal of Speech-Language Pathology: 6
Angle Orthodontist
Annals of Rehabilitation Medicine
Archives of Diseases in Childhood
Archives of Gerontology and Geriatrics
Archives de Pediatrie
Archives of Physical Medicine and Rehabilitation: 5
Brain Research
Bulletin of Tokyo Dental College
Case Reports in Otolaryngology
Case Reports in Pediatrics
Chest
Chinese Journal of Dental Research
Clinical Interventions in Aging: 4
Clinical Psychopharmacology and Neuroscience
Clinical Rehabilitation
Cochrane Database of Systematic Reviews: 4
CoDAS: 3
Communication Disorders Quarterly
Cranio: 4
Current Opinion in Otolaryngology and Head and Neck Surgery
Dental Press Journal of Orthodontics: 2
Developmental Neurorehabilitation
Disability and Rehabilitation
Dysphagia: 9
Egyptian Journal of Chest Diseases and Tuberculosis
Enliven: Pediatrics and Neonatal Biology
European Archives of Otorhinolaryngology: 2
European Journal of Orthodontics: 2
European Journal of Paediatric Dentistry: 8
European Journal of Translational Myology
European Respiratory Journal
Experimental Brain Research
Expert Review of Respiratory Medicine
Folia Phoniatrica
Folia Phoniatrica et Logopaedica
Frontiers in Neurology: 2
Head & Neck: 3
Infant Toddler Intervention
International Archives of Otorhinolaryngology
International Archives of Otorhinolaryngology, San Paulo
International Journal of Language and Communication Disorders
International Journal of Oral and Maxillofacial Surgery
International Journal of Orofacial Myology: 13
International Journal of Orthodontics Milwaukee
International Journal of Pediatric Otorhinolaryngology: 2
International Journal of Pediatric Research
International Journal of Speech-Language Pathology: 2
International Orthodontics: 2
International Journal of Laser Dentistry
Jornal da Sociedade Brasileira de FonoAudiologia
Journal of the American Geriatrics Society
Journal of Applied Oral Science: 2
Journal of Back and Musculoskeletal Rehabilitation: 2
Journal of Bodywork and Movement Therapy
Journal of Clinical Pediatric Dentistry
Journal of Clinical Otorhinolaryngology, Head and Neck Surgery: 2
Journal of Contemporary Dental Practice
Journal of Dental Health, Oral Disorders & Therapy
Journal of Dental Oral Health
Journal of Dentofacial Anomalies and Orthodontics: 2
Journal of the Indian Society of Pedodontics and Preventative Dentistry

113 Journals from 27 medical & dental fields

Journal of Oral Facial Pain and Headache
Journal of Oral Rehabilitation: 11
Journal of Orthodontics
Journal of Physical Therapy Science: 8
Journal of Prosthetic Dentistry: 2
Journal of Prosthodontic Research: 2
Journal of Speech, Language and Hearing Research
Journal of Physical Therapy Sciences
Language, Speech, and Hearing Services in Schools
Laryngoscope
Lasers in Medical Science
L'Orthodontie Francaise: 4
Medicina Oral, Patologia Oral y Cirugia Bucal: 2
Medicine
Minerva Stomatologica
Monographs in Oral Science
Nature and Science of Sleep
Nestle Nutrition Institute Workshop Series
NeuroRehabilitation: 2
Neurotherapeutics
New York State Dental Journal
Nutrition
Oncology
Orthodontic and Craniofacial Research
Otology and Neurotology
Pain Practice
Pain Research and Management
Pediatric Rehabilitation
Perinatology and Human Reproduction
Pro Fono
Progress in Orthodontics
Revista CEFAC: 2
Seminars in Speech and Language: 2
Shanghai Journal of Stomatology
Sleep
Sleep and Breathing: 5
Sleep Medicine: 3
Sleep Medicine Clinics: 4
Sleep Medicine Reviews
Sleep Science: 3
Tokai Journal of Experimental and Clinical Medicine
World Journal of Orthodontics

Top 13 Journals Publishing on OMT

- *International Journal of Orofacial Myology: 13*
- *Journal of Oral Rehabilitation: 11*
- *Dysphagia: 9*
- *European Journal of Paediatric Dentistry: 8*
- *Journal of Physical Therapy Science: 8*
- *American Journal of Speech-Language Pathology: 6*
- *Archives of Physical Medicine and Rehabilitation: 5*
- *Sleep and Breathing: 5*
- *Clinical Interventions in Aging: 4*
- *Cochrane Database of Systematic Reviews: 4*
- *Cranio: 4*
- *L'Orthodontie Francaise: 4*
- *Sleep Medicine Clinics: 4*

Levels of Evidence

Strength	Level	Design	Randomization	Control
High	Level 1	Randomized control trial (RCT)	Yes	Yes
		Meta-analysis of RCT with homogeneous results	No	
	Level 2	Prospective comparative study (therapeutic)	No	Yes
		Meta-analysis of Level 2 studies or Level 1 studies with inconsistent results	No	
	Level 3	Retrospective Cohort Study	No	Yes
		Case-control Study	No	Yes
		Meta-analysis of Level 3 studies	No	
	Level 4	Case Series	No	No
	Level 5	Case Report	No	No
		Expert Opinion	No	No
Low		Personal Observation	No	No

Hydrocephalus Association, 2018

By Levels of Evidence

- Level 1: 35
- Level 2: 23
- Level 3: 29
- Level 4: 50
- Level 5: 74

By 10 Areas of OMT Application

- Articulation: 9
- Dysphagia, Oral stage swallow, Feeding: 45
- Elderly & Special Populations: 19
- Non-nutritive Sucking & Chewing Habits: 6
- Occlusion & Orthodontic Retention: 26
- Oral Function & Chewing: 37
- Stability post Oromaxillofacial Surgery: 6
- Obstructive Sleep Apnea, Sleep Disordered Breathing, Upper Airway Resistance Syndrome: 43
- Temporomandibular Disorder: 15
- Tongue & Lip Ties: 6

OMT FOR ARTICULATION

OMT For Articulation

9 Studies

- Level 3: 3
- Level 4: 3
- Level 5: 3

OMT for Articulation

- McCauley RJ, Strand E, et al. Evidence-Based Systematic Review: Effects of Nonspeech Oral Motor Exercises on Speech. *American Journal of Speech Language Pathology*, 2009;18(4), 343-360.
  - *Level 3*
  - *Literature review of 15 studies between 1960 and 2007*
  - *"Insufficient evidence to support or refute the use of oral motor exercises to produce effects on speech was found in the research literature."*
- Ferreira TS, Mangilli LD, et al. Speech and myofunctional exercise physiology: a critical review of the literature. *Jornal da Sociedade Brasileira de Fonoaudiologia,* 2011 Sep;23(3):288-96.
  - *Level 3*
  - *Cochrane-method literature review 2000-2010 of 38 studies of all levels and methods*
  - *"There is a lack of knowledge about the effects of the myofunctional exercises used by clinicians. Also there is a lack of scientific evidence to determine the frequency at which they should be performed."*
- Lee AS, Gibbon FE. Non-speech oral motor treatment for children with developmental speech sound disorders. *Cochrane Database of Systematic Reviews,* 2015 Mar 25;(3):CD009383.
  - *Level 3*
  - *Literature review of 3 "biased" randomized controlled studies*
  - *"Currently no strong evidence suggests that nonspeech oral motor therapies are an effective treatment or an effective adjunctive treatment for children with developmental speech sound disorders. "*

OMT for Articulation

- Bigenzahn W, Fishchman L, Mayrhofer-Krammel U. Myofunctional therapy in patients with orofacial dysfunctions affecting speech. *Folia Phoniatrica et Logopaedica, 1992;*44(5):238-44.
  - *Level 4*
  - *Case series; 45 subjects*
  - *"Myofunctional therapy is highly instrumental also in phoniatrics as a special form of treatment for disorders of articulation."*
- Ray, J. Orofacial myofunctional therapy in dysarthria: a study on speech intelligibility. *International Journal of Orofacial Myology, 2002* Nov;28:39-48.
  - *Level 4*
  - *Case series; 12 subjects*
  - *"Post-therapy measures indicated significant improvements in the stated goals as well as in speech intelligibility for single words."*
- Ray J. Effects of orofacial myofunctional therapy on speech intelligibility in individuals with persistent articulatory impairments. *International Journal of Orofacial Myology, 2003* Nov;29:5-14.
  - *Level 4*
  - *Case series; 6 subjects*
  - *"Speech intelligibility increased significantly in all clients except the one diagnosed with developmental apraxia of speech."*

OMT for Articulation

- Everything from ASHA says there is no evidence base, so in more than 30 years there has not been one single high level paper on oral motor from a single speech pathology program. The lack of evidence is a self-fulfilling statement.
- There will not be Level 1 research by American universities in this area in the near future due to generational lack of interest.
- Field clinicians should produce more of Level 4 and Level 5 studies with normal and special populations.
- Multidisciplinary teams (with orthodontics or otolaryngology) should produce more Level 3 retrospective and case controlled studies.

OMT FOR DYSPHAGIA, ORAL STAGE SWALLOW & FEEDING

OMT For Dysphagia, Oral Stage Swallow, Feeding

45 Studies

- Level 1: 8
- Level 2: 7
- Level 3: 9
- Level 4: 15
- Level 5: 6

OMT For Dysphagia, Oral Stage Swallow, Feeding

- Kim KD, Lee HJ, et al. Effects of neck exercises on swallowing function of patients with stroke. *Journal of Physical Therapy Science,* 2015 Apr;27(4):1005-8.
  - *Level 1*
  - *Randomized control study; 26 subjects*
  - *"The study results suggest the effectiveness of proprioceptive neuromuscular facilitation-based short neck flexion exercises as a treatment for swallowing disorders in stroke patients."*
- Steele CM, Bayley MT, et al. A Randomized Trial Comparing Two Tongue-Pressure Resistance Training Protocols for Post-Stroke Dysphagia. *Dysphagia*, 2016 Jun;31(3):452-61.
  - *Level 1*
  - *Randomized controlled study; 6 subjects*
  - *"Improved penetration-aspiration does not necessarily accompany improvements in tongue strength, however tongue-pressure resistance training does appear to be effective for reducing thin liquid vallecular residue."*
- Koyama Y, Sugimoto A, et al. Proposal for a Modified Jaw Opening Exercise for Dysphagia: A Randomized, Controlled Trial. *Tokai Journal of Experimental and Clinical Medicine,* 2017 Jul 20;42(2):71-78.
  - *Level 1*
  - *Case controlled study; 16 subjects*
  - *"Modified jaw opening exercise is feasible without any adverse events in post-stroke patients, and it promotes anterior hyoid displacement during swallowing."*

OMT For Dysphagia, Oral Stage Swallow, Feeding

- Kim HD, Choi JB, et al. Tongue-to-palate resistance training improves tongue strength and oropharyngeal swallowing function in subacute stroke survivors with dysphagia. *Journal of Oral Rehabilitation,* 2017 Jan;44(1):59-64.
  - *Level 2*
  - *Prospective comparative study; 35 people*
  - *"This study demonstrated the effectiveness of tongue-to-palate resistance training in increasing tongue muscle strength and improving swallowing function in patients with post-stroke dysphagia."*
- McKenna, VS, Zhang B, et al. A Systematic Review of Isometric Lingual Strength-Training Programs in Adults With and Without Dysphagia. *American Journal of Speech-Language Pathology*, 2017 May 17;26(2):524-539.
  - *Level 2 meta-analysis*
  - *10 studies*
  - *Although isometric lingual strength training is a promising intervention for oropharyngeal dysphagia, the current literature is too variable to confidently report specific therapeutic benefits.*

OMT For Dysphagia, Oral Stage Swallow, Feeding

- OMT, known in this literature as exercise-based therapy, shows positive outcomes in oral stage and oral-pharyngeal stage swallowing.
- Higher level studies had more mixed results because exercises and the studies themselves are not clearly defined.
- Field clinicians should produce more of Level 4 and Level 5 studies with normal and special populations. Case studies in this area are interesting and include lots of special populations that help drive individualized care for these small groups.
- Multidisciplinary teams (with lactation, speech therapy, orthodontics and otolaryngology) should produce more Level 3 retrospective and case controlled studies.
- Hospitals and universities are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR THE ELDERLY & SPECIAL POPULATIONS

OMT For Elderly & Special Populations

19 Studies

- Level 1: 4
- Level 2: 1
- Level 3: 3
- Level 4: 4
- Level 5: 7

OMT For the Elderly & Special Populations

- Cardoso Jr, Teixeira EC, et al. Effects of exercises on Bell's palsy: systematic review of randomized controlled trials. *Otology and Neurotology,* 2008 Jun;29(4):557-60.
  - *Level 1*
  - *Meta-analysis of Level 1 research; 4 studies*
  - *"Because of the small number of randomized controlled trials, it was not possible to analyze if the exercises, associated either with mirror or electromyogram biofeedback, were effective."*
- Pereira LM, Obara K, et al. Facial exercise therapy for facial palsy: systematic review and meta-analysis. *Clinical Rehabilitation,* 2011 Jul;25(7):649-58.
  - *Level 1*
  - *Literature review of 6 randomized controlled studies; Meta-analysis of 1 study*
  - *"Facial exercise therapy is effective for facial palsy for the outcome functionality."*
- Lazarus CL, Husaini H, et al. Effects of exercise on swallowing and tongue strength in patients with oral and oropharyngeal cancer treated with primary radiotherapy with or without chemotherapy. *International Journal of Oral and Maxillofacial Surgery,* 2014 May;43(5):523-30.
  - *Level 1*
  - *Randomized controlled study*
  - *"Tongue strengthening did not yield a statistically significant improvement in either tongue strength or swallowing measures in this patient cohort."*

OMT For the Elderly & Special Populations

- Perry A, Lee SH, Cotton S, Kennedy C. Therapeutic exercises for affecting post-treatment swallowing in people treated for advanced-stage head and neck cancers. *The Cochrane Database of Systematic Reviews,* 2016 Aug 26;(8):CD011112.
  - *Level 1*
  - *Meta-analysis of 6 studies with small subject numbers found to have high bias*
  - *"No evidence that undertaking therapeutic exercises before, during and/or immediately after HNC treatment leads to improvement in oral swallowing."*
- Kang JH, Park RY, et al. The effect of bedside exercise program on stroke patients with dysphagia. *Annals of Rehabilitation Medicine,* 2012 Aug;36(4):512-20.
  - *Level 2*
  - *Case controlled study; 50 subjects*
  - *"Bedside exercise program showed an improvement of swallowing function and exhibited a positive secondary effect, such as mood state and quality of life, on subacute stroke patients with dysphagia."*
- Byeon H. Effect of orofacial myofunctional exercise on the improvement of dysphagia patients' orofacial muscle strength and diadochokinetic rate. *Journal of Physical Therapy Science,* 2016 Sep; 28(9): 2611–2614.
  - *Level 2*
  - *Case controlled study; 50 subjects*
  - *"Orofacial myofunctional exercise is effective in the rehabilitation of swallowing function in the oral phase in dysphagia patients by improving orofacial muscle strength and response rate."*

OMT For the Elderly & Special Populations

- Cai ZG, Shi XJ, et al. Efficacy of functional training of the facial muscles for treatment of incomplete peripheral facial nerve injury. *Chinese Journal of Dental Research,* 2010 13(1):37-43.
  - *Level 3*
  - *Case controlled study; 92 subjects*
  - *“The recovery rate of the treatment group was superior to the control group in the first year after severe nerve injury.”*
- Virani A, Kunduk M, et al. Effects of 2 different swallowing exercise regimens during organ-preservation therapies for head and neck cancers on swallowing function. *Head and Neck,* 2015 Feb;37(2):162-70.
  - *Level 3*
  - *Case controlled study; 50 subjects*
  - *“Findings indicate significant benefits of the exercise group's exercise regimen in reducing PEG dependence and oral intake difficulties."*
- Inal O, Serel Arslan S, et al. Effect of Functional Chewing Training on tongue thrust and drooling in children with cerebral palsy: a randomized controlled trial. *Journal of Oral Rehabilitation,* 2017 Nov;44(11):843-849.
  - *Level 3*
  - *Case controlled study; 32 subjects*
  - *“Functional chewing training is an effective approach on the severity of tongue thrust and drooling in children with cerebral palsy.”*

OMT For the Elderly & Special Populations

- Most of the really interesting research in this area is Level 4 and Level 5.
- Much of it is swallowing-oriented, but some is more global looking at other aspects of oral functioning.
- Research covers OMT treatment after neurological disorder, stroke, nerve damage, chemotherapy, and healthy elderly.
- Older populations are a significantly underserved group for OMT.
- Those working in rehabilitation, skilled nursing facilities, and nursing homes are in position to produce larger population studies of various levels of evidence.
- Hospitals and universities are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR NON-NUTRITIVE SUCKING & CHEWING HABITS

OMT For Non-Nutritive Sucking & Chewing Habits

6 Studies

- Level 2: 2
- Level 5: 4

OMT For Non-Nutritive Sucking & Chewing Habits

- Degan VV, Puppin-Rontai RM. Removal of sucking habits and myofunctional therapy: establishing swallowing and tongue rest postion. *Pro Fono,* 2005 Apr-Dec;17(3):375-82.
  - *Level 2*
  - *Control trial*
  - *"M*yofunctional therapy associated to the removal of sucking habits presented a better and faster improvement of the swallowing pattern and of the tongue rest position."
- Borrie FRP, Bearn DR, Innes NPT, Iheozor-Ejiofor Z. Interventions for the Cessation of Non-nutritive sucking habits in children. *Cochrane Database of Systematic Reviews,* 2015 Mar;3:CD008694.
  - *Level 2*
  - *Meta-analysis of 6 studies of lesser quality research*
  - *"There was insufficient evidence to recommend a treatment to stop non-nutritive sucking habits in children."*

OMT For Non-Nutritive Sucking & Chewing Habits

- Lots of oromyofunctional specialists have oral habit cessation programs. These need to be published and replicated and shared, and not proprietary. More research needs to be produced in prevalence, assessment, and treatment.
- Multidisciplinary teams (with speech therapy, orthodontics and otolaryngology) should produce more Level 3 retrospective and case controlled studies.
- Universities (speech pathology specifically) are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR OCCLUSION & ORTHODONTIC RETENTION

OMT For Occlusion & Orthodontic Retention

26 Studies

OMT For Occlusion & Orthodontic Retention

- Van Dyck C, Dekeyser A, et al. The effect of orofacial myofunctional treatment in children with anterior open bite and tongue dysfunction: a pilot study. *The European Journal of Orthodontics,* 2016 June;38(3):227-234.
  - *Level 1*
  - *Randomized controlled study; 22 subjects*
  - *"Orofacial myofunctional therapy can positively influence tongue behaviour. However, further research is recommended to clarify the success of OMT as an adjunct to orthodontic treatment and to identify possible factors influencing the outcome."*
- Jónsson T. Orofacial dysfunction, open bite, and myofunctional therapy. *European Journal of Orthodontics*, *2016* June;38(3):235-236.
  - *Level 2*
  - *Randomized control study of lesser quality research*
  - *"The results after 6 months of OMT and another 6 months of follow-up confirmed a significant improvement in tongue posture and anterior occlusal relationship."*

OMT For Occlusion & Orthodontic Retention

- Moschik CE, Pichelmayer M, et al. Influence of myofunctional therapy on upper intercanine distance. *Journal of Dental Health, Oral Disorders & Therapy,* 2015 3(1):1-7.
  - *Level 3*
  - *Retrospective study; 141 subjects*
  - *"The results indicate that tooth position can be changed by muscle therapy, even in non-growing subjects."*
- Smithpeter J, Covell D. Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy. *American Journal of Orthodontics and Dentofacial Orthopedics,* 2010 May;137(5):605-14.
  - *Level 3*
  - *Case case series; 76 subjects*
  - *"Orofacial myofunctional therapy in conjunction with orthodontic treatment was highly effective in maintaining closure of anterior open bites compared with orthodontic treatment alone."*

OMT For Occlusion & Orthodontic Retention

- If you want to know why dentists and orthodontists always shoot down your research, it's because the vast majority of OMT research produced for this field is Level 5, and evenly mixed between case studies and expert opinion, which is a poor foundation for clinical decision-making.
- Orthodontists and functional dentists are in ideal positions for produce Level 3 retrospective studies.
- Dental schools are in an ideal position to move this research forward, except they have never heard about OMT and if they have they will say there is no research base.

OMT FOR ORAL FUNCTION & CHEWING

OMT For Oral Function & Chewing

37 Studies

- Level 1: 6
- Level 2: 9
- Level 3: 2
- Level 4: 10
- Level 5: 10

OMT For Oral Function & Chewing

- Thompson DJ, Throckmorton GS, Buschang PH. The effects of isometric exercise on maximum voluntary bite forces and jaw muscle strength and endurance. *Journal of Oral Rehabilitation,* 2001 Oct;28(10):909-17.
  - *Level 1*
  - *Randomized control study; 28 subjects*
  - *"Increases in maximum bite force can be easily produced with training, but that actual strengthening of the jaw muscles is more difficult to achieve."*
- Van den Steen, L, Vanderwegen J, et al. Tongue-Strengthening Exercises in Healthy Older Adults: Does Exercise Load Matter? A Randomized Controlled Trial. *Dysphagia,* 2019 Jun;34(3):315-324.
  - *Level 1*
  - *Randomized control trial; 60 subjects*
  - *"* This RCT confirms the efficacy of TSE in healthy older adults."

OMT For Oral Function & Chewing

- Park JS, Hwang NK, et al. Effect of lingual strength training on oropharyngeal muscles in South Korean adults. *Journal of Oral Rehabilitation,* 2019 Nov;46(11):1036-1041.
  - *Level 1*
  - *Randomized control trial; 30 subjects*
  - *“Lingual strength training increases the thickness and the strength of oropharyngeal muscles.”*
- Lazarus C, Logemann JA, et al. Effects of two types of tongue strengthening exercises in young normals. Folia Phoniatrica et Logopaedica, 2003 Jul-Aug;55(4):199-205.
  - *Level 1*
  - *Randomized control trial; 31 subjects*
  - *"Results provide support for the theory that tongue strengthening exercises improve tongue strength in healthy young subjects.”*

OMT For Oral Function & Chewing

- Research on oral function and chewing is growing and much more is needed in this area.
- Because of the complexities of mechano-behavior and mechanical loading on the jaw, medical and dental universities are in an ideal position to provide high level research in this area in both normal and special populations.
- The lower level research was an even mix of case studies and expert opinion. More case studies and case series need to be produced.
- Field clinicians should produce more of Level 4 and Level 5 studies with normal and special populations
- Universities are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR STABILITY POST OROMAXILLO-FACIAL SURGERY

OMT For Stability post Oromaxillofacial Surgery

6 Studies

- Level 1: 1
- Level 4: 2
- Level 5: 3

OMT For Stability Post Oromaxillofacial Surgery

- Prado DG de A, Berretin-Felix G, et al. Effects of orofacial myofunctional therapy on masticatory function in individuals submitted to orthognathic surgery: a randomized trial. *Journal of Applied Oral Science*, 2018;26:e20170164.
  - *Level 1*
  - *Randomized control study; 48 subjects*
  - *"There were positive effects of orofacial myofunctional therapy on the clinical and electromyography aspects of chewing in individual submitted to orthognathic surgery."*
- Gallerano G, Ruoppolo G, Silvestri A. Myofunctional and speech rehabilitation after orthodontic-surgical treatment of dento-maxillofacial dysgnathia. *Progress in Orthodontics,* 2012 May;13(1):57-68.
  - *Level 4*
  - *Case series; 19 subjects*
  - *"Only through an interdisciplinary approach it is possible to intercept and re-educate all the functions that are not compliant with the structural changes and to eliminate a tendency to relapse of the dysgnathia."*

OMT For Stability Post Oromaxillofacial Surgery

- Pereira, JBA, Bianchini EMG.. Functional characterization and temporomandibular disorders before and after orthognathic surgery and myofunctional treatment of class II dentofacial deformity. *Revista CEFAC*, 2011;13(6):1086-1094.
  - *Level 4*
  - *Case series*
  - *"Temporomandibular dysfunction was present in most of the sample, with remission of the signs in 81% of the cases involved."*
- Perry BJ, Richburg BD, et al. The Effects of Lip-Closure Exercise on Lip Strength and Function Following Full Facial Transplantation: A Case Report. *American Journal of Speech Language Pathology,* 2017 Jun 22;26(2S):682-686.
  - *Level 5*
  - *Case study*
  - *"Results revealed improvements in labial strength, speed of lip movement, and range of motion during speech."*

OMT For Stability Post Oromaxillofacial Surgery

- Oromaxillofacial surgery is the only field that does not regularly recommend rehabilitation or exercise afterwards because it was thought that the facial muscles didn't require it.
- Multidisciplinary teams (with speech therapy, orthodontics, otolaryngology, oromaxiilofacial teams & craniofacial teams) should produce more Level 3 retrospective and case controlled studies.
- Hospitals and universities are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR SYMPTOMS OF OSA, SDB, UARS

OMT For Symptoms of OSA, SDB & UARS

43 Studies

- Level 1: 12
- Level 3: 8
- Level 4: 5
- Level 5: 18

OMT For Symptoms of OSA, SDB, UARS

- Camacho M, Certal V, et al. Myofunctional therapy to treat obstructive sleep apnea: a systematic review and meta-analysis. *Sleep*. 2015;38(5):669-675.
  - *Level 1*
  - *Meta-analysis of 9 studies*
  - *"Current literature demonstrates that myofunctional therapy decreases apnea-hypopnea index by approximately 50% in adults and 62% in children."*
- Camacho M, Guillleminault C, et al. Oropharyngeal and tongue exercises (myofunctional therapy) for snoring: a systematic review and meta-analysis. *European Archives of Otorhinolaryngology,* 2018 Apr;275(4):849-855.
  - *Level 1*
  - *Meta-analysis of 9 studies*
  - *"Myofunctional therapy has reduced snoring in adults based on both subjective questionnaires and objective sleep studies."*

OMT For Symptoms of OSA, SDB, UARS

- Diaferia G, Badke L, Santos-Silva R, et al. Effect of speech therapy as adjunct treatment to continuous positive airway pressure on the quality of life of patients with obstructive sleep apnea. *Sleep Medicine,* 2013 Jul;14(7):628-35.
  - *Level 1*
  - *Randomized control study; 100 subjects*
  - *"Speech therapy alone as well as in association with continuous positive airway pressure treatment might be an alternative treatment for the improvement of quality of life in patients with obstructive sleep apnea.*
- Diaferia G, Santos-Silva R, Truksinas E, et al. Myofunctional therapy improves adherence to continuous positive airway pressure treatment. *Sleep and Breathing,* 2017 May;21(2):387-395.
  - *Level 1*
  - *Randomized control study; 100 subjects*
  - *"Our results suggest that in patients with obstructive sleep apnea syndrome, myofunctional therapy may be considered as an adjuvant treatment and an intervention strategy to support adherence to continuous positive airway pressure treatment.*

OMT For Symptoms of OSA, SDB, UARS

- Guimaraes KC, Drager LF, et al. Effects of oropharyngeal exercises on patients with moderate obstructive sleep apnea syndrome. *American Journal of Respiratory and Critical Care Medicine,* 2009 May 15;179(10):962-6.
  - *Level 1*
  - *Randomized control study; 31 subjects*
  - *"Oropharyngeal exercises significantly reduce obstructive sleep apnea syndrome severity and symptoms and represent a promising treatment for moderate obstructive sleep apnea syndrome.*
- Ieto V, Kayamori F, et al. Effects of oropharyngeal exercises on snoring: a randomized trial. *Chest,* 2015 Sep;148(3):683-691.
  - *Level 1*
  - *Randomized control study; 39 subjects*
  - *"Oropharyngeal exercises are effective in reducing objectively measured snoring and are a possible treatment of a large population suffering from snoring."*
- Villa MP, Evangelisti M, et al. Can myofunctional therapy increase tongue tone and reduce symptoms in children with sleep-disordered breathing? *Sleep and Breathing,* 2017 Dec;21(4):1025-1032.
  - *Level 1*
  - *Randomized control study; 54 subjects*
  - *"Oropharyngeal exercises appear to effectively modify tongue tone, reduce sleep disordered breathing symptoms and oral breathing, and increase oxygen saturation, and may thus play a role in the treatment of sleep disordered breathing."*

OMT For Symptoms of OSA, SDB, UARS

- The best research to date on the efficacy of OMT comes from the sleep and breathing literature. With that knowledge has begrundingly come understanding in how ankyloglossia is implicated airway function disorders like obstructive sleep apnea, in OMDs, in speech disorders, and in craniofacial disorders (okay that's only me right now).
- Stanford is producing the best research on this topic now and it's spreading quickly around the world.
- All field clinicians should be screening for symptoms of daytime airway function disorders and sleep disordered breathing and these conditions should be monitored throughout the treatment process.
- Multidisciplinary teams (with speech therapy, orthodontics, otolaryngology, oromaxiilofacial teams & craniofacial teams) should produce more Level 3 retrospective and case controlled studies.

OMT FOR SYMPTOMS OF TEMPORO-MANDIBULAR DISORDER

OMT For Symptoms of Temporo-mandibular Pain

15 Studies

- Level 1: 4
- Level 3: 1
- Level 4: 7
- Level 5: 3

OMT For Symptoms of Temporomandibular Disorder

- de Felicio CM, de Oliveira MM, da Silva MA. Effects of orofacial myofunctional therapy on temporomandibular disorders. *Journal of Craniomandibular Practice,* 2010 Oct; 28(4):249-59.
  - *Level 1*
  - *Randomized control study; 30 subjects*
  - *"Orofacial myofunctional therapy favored a significant reduction of pain sensitivity to palpation of all muscles studied but not for the temporomandibular joints; an increased measure of mandibular range of motion; reduced Helkimo's Di and Ai scores; reduced frequency and severity of signs and symptoms; and increased scores for orofacial myofunctional conditions."*
- Ishiyama H, Inukai S, et al. Effect of jaw-opening exercise on prevention of temporomandibular disorders pain associated with oral appliance therapy in obstructive sleep apnea patients: A randomized, double-blind, placebo-controlled trial. *Journal of Prosthodontic Research,* 2017 Jul;61(3):259-267.
  - *Level 1*
  - *Randomized control study; 25 subjects*
  - *"Jaw-opening exercise prior to oral appliance therapy reduced the risk of temporomandibular disorder pain associated with oral appliance uses."*

OMT For Symptoms of Temporomandibular Disorder

- Machado BC, Mazzetto MO, et al. Effects of oral motor exercises and laser therapy on chronic temporomandibular disorders: a randomized study with follow-up. *Lasers in Medical Science,* 2016 Jul;31(5):945-54.
  - *Level 1*
  - *Randomized control study; 102 subjects*
  - *"Low level laser therapy combined with orofacial myofunctional exercises was more effective in promoting temporomandibular disorder rehabilitation than low level laser therapy alone was."*
- Makino I, Arai YC, et al. The effects of exercise therapy for the improvement of jaw movement and psychological intervention to reduce parafunctional activities on chronic pain in the craniocervical region. *Pain Practice,* 2014 Jun;14(5):413-8.
  - *Level 3*
  - *Case controlled study; 39 subjects*
  - *"A combination of jaw exercise and psychological intervention to reduce parafunctional activities is more effective than jaw exercise alone for the improvement of craniocervical pain without apparent organic abnormalities."*

OMT For Symptoms of Temporomandibular Disorder

- TMD and head/neck pain are complex disorders with structural, neural, muscular, and behavioral components. Multidisciplinary care is mandatory with these patients.
- Level 4 case series consistently showed positive outcomes associated with OMT.
- All field clinicians should be screening for symptoms of jaw, head, and neck pain and these conditions should be monitored throughout the treatment process.
- Multidisciplinary teams (with speech therapy, orthodontics, TMD dentistry) should produce more Level 3 retrospective and case controlled studies.
- Hospitals and universities are in ideal positions to advance Level 1 and Level 2 research.

OMT FOR TONGUE & LIP TIES

OMT For Tongue & Lip Ties

6 Studies

- Level 2: 1
- Level 3: 1
- Level 4: 1
- Level 5: 3

OMT For Tongue & Lip Ties

- Ferrés-Amat E, Pastor-Vera T, et al. The prevalence of ankyloglossia in 302 newborns with breastfeeding problems and sucking difficulties in Barcelona: a descriptive study. *European Journal of Paediatric Dentistry,* 2017 Dec;18(4):319-325.
  - *Level 2*
  - *Cross sectional study with control; 1102 subjects*
  - *“If a frenotomy is necessary, we recommend stimulating suction with myofunctional therapy before and after surgery to avoid scar retraction.”*
- Zaghi S, Valcu-Pinkerton S, et al. Lingual frenuloplasty with myofunctional therapy: Exploring safety and efficacy in 348 cases. *Laryngoscope Investigative Otolaryngology,* 2019 Aug 26;4(5):489-496.
  - *Level 3*
  - *Prospective study; 420 subjects*
  - *” Lingual frenuloplasty with myofunctional therapy is safe and potentially effective for the treatment of mouth breathing, snoring, clenching, and myofascial tension in appropriately selected patient candidates.”*

OMT For Tongue & Lip Ties

- There is a LOT of expert opinion on restricted oral frenula but very little in the way of validated measurement, assessment protocol use, treatment outcomes long term, and treatment protocols in use.
- Field clinicians should produce more Level 5 case studies in normal and special populations.
- Multidisciplinary teams (with speech therapy, orthodontics, TMD dentistry) should produce more Level 3 retrospective and case controlled studies.
- Universities and hospitals are too far behind to participate in high level research at this time.

Review Summary

This systematic review of the entire field validates OMT as an effective treatment modality applicable to ten areas of medicine and dentistry and it encourages continued efforts from field clinicians, researchers, and academics to explore application and efficacy.

More research on every level in the full scope of OMT needs to be produced, both academically and by field clinicians.

There are over 100 peer reviewed journals accepting OMT research studies at every level.

Access to peer reviewed research is easy. More of it is open access. It is being shared on social platforms by researchers themselves.

Academic and clinical research should be the foundation of our daily clinical practice.

Practice-based evidence is always what drives innovation in our field.

THANK YOU

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