MARY BILLINGS, MS, CCC, COM

SPEECH-LANGUAGE PATHOLOGIST
CERTIFIED OROFACIAL MYOLOGIST

Billings Speech Pathology Services, LLC

making a difference... one child at a time

DISCLOSURES

FINANCIAL:

Owner: Billings Speech Pathology Services, LLC

Private practice

IAOM Continuing Education Instructor:

IAOM"Make the Connection" 28-Hour Pre.Certification Requisite

Subject Matter Expert Speaker & Consultant:

Orofacial Myofunctional Disorders

Greater Kansas City Dental Society

paid honorarium

Billings Speech Pathology Services, LLC

making a difference... one child at a time

DISCLOSURES

NONFINANCIAL:

Past President of the Board of Directors: (IAOM)

Board of Directors - Oral Motor Institute

Adjunct - Rockhurst University

MEMBERSHIPS:

ASHA, IAOM, OMI, AAPPSPA, AAPMD

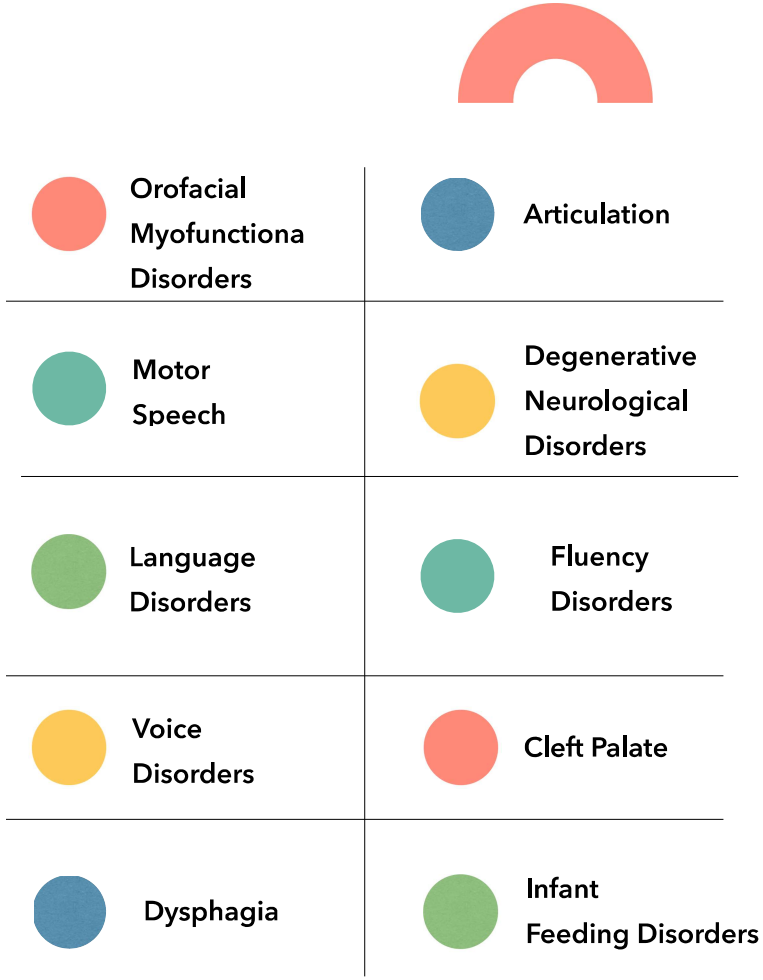
About the Speaker

BACKGROUND:

- Speech-Language Pathologist, MS,CCC
- Certified Orofacial Myologist

EXPERIENCE:

- 15 years in acute care, hospitals, rehabilitation, skilled nursing facilities, home health, outpatient
- 25 years in private practice: ages birth to 60+



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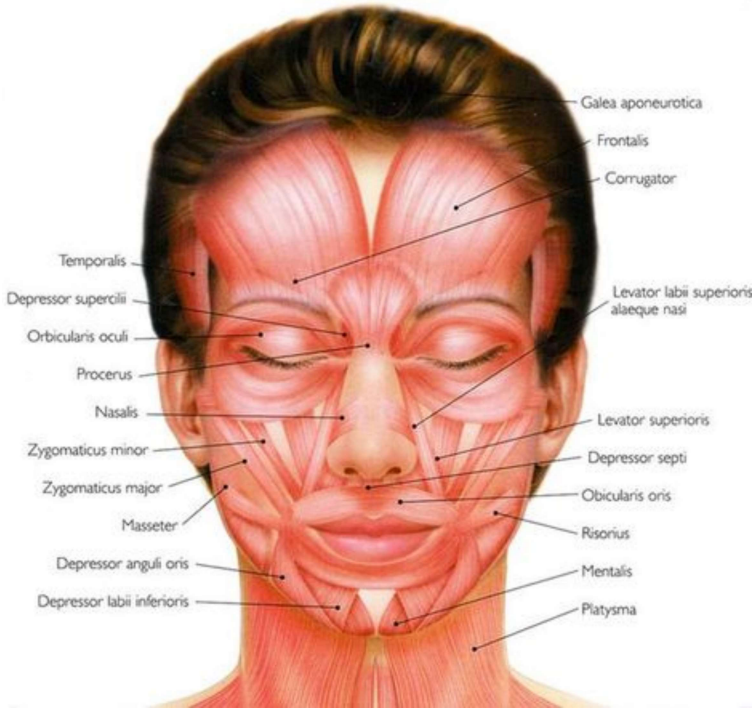
Understanding Orofacial Myofunctional Disorders: Looking Beyond the Structure

Mary Billings MS, CCC-SLP, COM®
Speech Language Pathologist
Certified Orofacial Myologist

Learning Outcomes



Think beyond structure — 1 — Function

Think beyond occlusion — 2 — Stability

Think dynamically over time — 3 — Compensation

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Learning Outcomes

4 Define an Orofacial myofunctional disorder

5 Understand the ***PRIMARY*** and ***SECONDARY*** functions of the oral mechanism and how they intertwine

6 Learn the multi-factorial origins of OMDs and their contributions to TMD and facial pain

7 Learn Tools to screen for OMD's in your patients

8 Understand the importance of multidisciplinary approach to successful treatment

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Orofacial Myofunctional Disorders

The big "BUZZ" in healthcare has been around since 1850's

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Orofacial Myofunctional Disorders

Historical Retrospective

George Caitlin

1870

Artist, lawyer, author

Among the first to recognize how specific oral habits impact facial development.. Caitlin published "Shut Your Mouth and Save Your Life".

"I am compelled to believe, and feel authorized to assert, that a great proportion of diseases prematurely that affect human life, as well mental and and physical deformities and destruction of the teeth, are caused by the abuse of the lungs."

William Norman Kingsley

1888

Orthodontist

Major early contributor to field of orthodontics

Created the first obturator for cleft palate

Recommended correction of myofunctional problems as "foundational" for effective orthodontic practice

Julius Wolfe

1892

German surgeon and researcher

"Bone in a healthy person or animal will adapt to the loads under which it is placed"

Became known as "Wolfe's Law" in dentistry

Edward Angle

1902

Orthodontist

Classification System:

Class I; Class II; Class III.

Opposed dental extractions

Though he had no conception of the role of the tongue in deglutition, he did a remarkable job providing an accurate description of tongue habits and movements required for health swallow

Philemon Truesdale

1920

Dentist

Was the first to introduce the idea that dental deformities were related to pressures exerted during the swallow (1924)

Identified 3 specific types of atypical patterns:during deglutition; abnormal function of lips and jaw; abnormal function of tongue, lips and jaw

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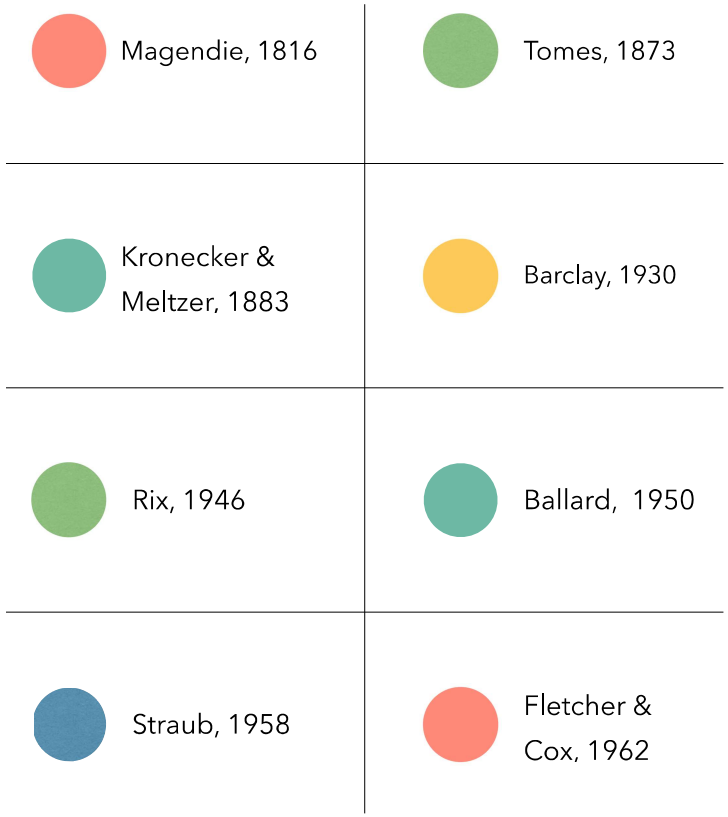
Orofacial Myofunctional Disorders

Historical Retrospective

Medical and early speech pathology based references related to the role of:

- deglutition
- oral and esophageal forcing propulsion
- laryngopharynx and esophageal movement
- tongue position and negative versus positive oral pressure



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Orofacial Myofunctional Disorders

Historical Retrospective

Raymond Begg & Charles Tweed

Appliance based thinking….

- Medical and early speech pathology based references related to the role of: (1924-1928) Graduates of Angle's school whose views directly contradicted those of Angle. Tweed was an outspoken advocate for tooth extraction and introduced it into his practice. Begg advocated for reintroduction of extractions into American orthodontics.

- Their views were successful and largely adapted by dental orthodontic specialists throughout the 1940's and 1950's until extraction and appliance intervention became the norm and the role of myofunctional patterning was set aside.

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Orofacial Myofunctional Disorders

Historical Retrospective

"Walter Straub supplied me with a new direction, a different point of reference. I began to think in terms of muscle function, not speech production, despite the fact that Straub's therapy was based almost entirely on articulation drilling. I began to dig into dentistry, borrow books, ask question and watch over the shoulders of local dentists as they worked."

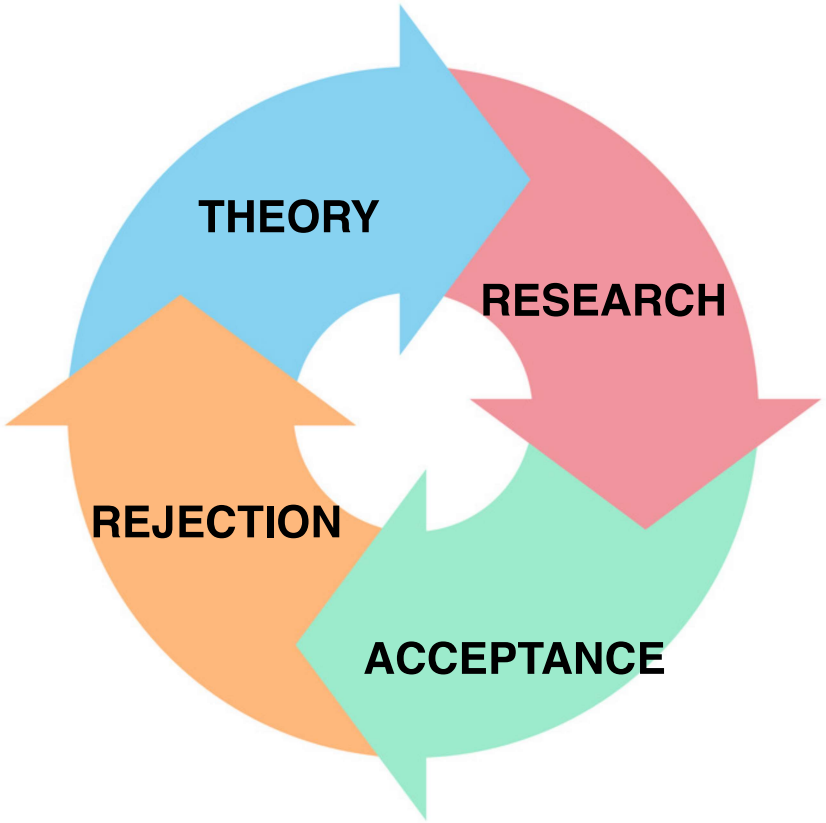
Marvin Hanson, Ph.D, CCC

Walter Straub, DDS

Therapy & Appliance based thinking….

(Hanson, M, Mason, R, 2003)

Evolution of Treatment



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Specialization

1971-2021

MARVIN HANSON	RICHARD BARRETT	WILLIAM ZICKEFOOSE	GALEN PEACHEY
ASHA Ph.d	ASHA SLP	ASHA, MS SLP	ASHA, MS SLP
Academic, Researcher, Author - Orofacial Myofunction Disorders	Author - Orofacial Myofunction Disorders	Author, Instructor, Clinician	Author, Instructor, Clinician

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IAOM INTERNATIONAL ASSOCIATION of OROFACIAL MYOLOGY

MEMBERSHIP

IAOM:

Current membership is comprised of speech-language pathologists, dental hygienists, dentists, orthodontists and medical doctors. (Other rehabilitative specialists like physical therapists are considered on a case by case basis only).

IAOM INTERNATIONAL ASSOCIATION of OROFACIAL MYOLOGY

CERTIFICATION

The IAOM is the only existing 3rd party accreditation program in existence. Its credential COM® is a USPT Trademark!

- IAOM instructor must meet curriculum requirements and establish clinical experience criteria
- Independent Board of Examiners tests clinical competencies
- Continuing Education requirements exist or COM® is subject to revocation

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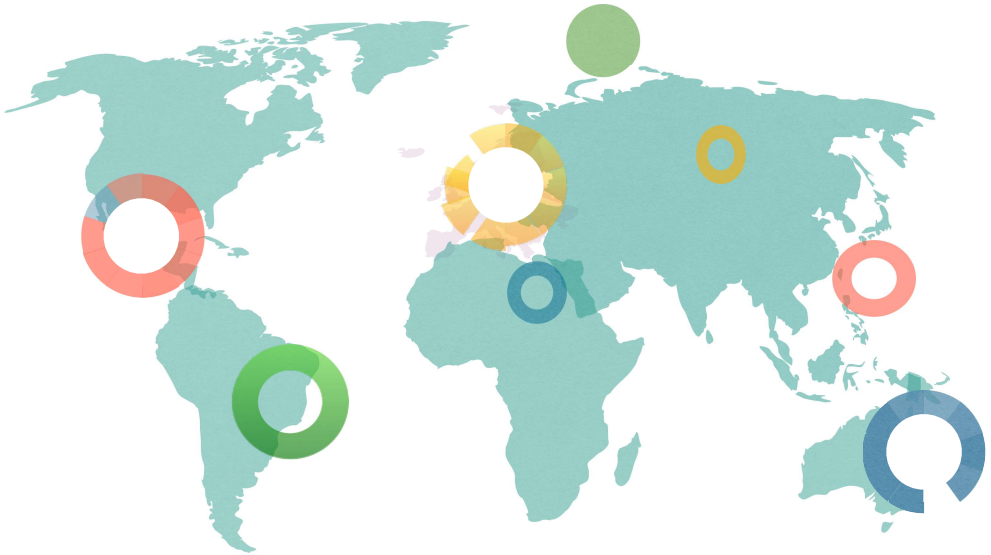
“Excellence is never an accident. It is the result of high intention, sincere effort, intelligent direction, skillful execution and the vision to see obstacles as opportunities.”

- Aristotle

Orofacial Myofunctional Disorders

Perspectives 2021



STRUCTURALISTS

Argue that since the soft tissues of the mouth are adaptable to anatomical configurations and mechanical devices (braces, dentures) that organization of oral patterns like tongue thrust can be ignored… because they will adapt to a new environment

PATHOLOGISTS

View the body for diagnosable anomalies and data-driven Pathologies that can be treated by established protocols.

FUNCTIONALISTS

Cite evidence that functional movements over prolonged periods of time will actually precipitate structural adaptations ("bone will adapt to load") and that the body structure re-forms to meet the long term functional demands, thereby establishing synchrony between function and structure

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Professionals Focused on Function

Physical medicine specialists are taught to view the body through its development and across the lifespan. This perspective explains that: “form follows function” (Muscle always wins).

01. Osteopathics

02. Physical Therapists

03. Sports Physiologists

04. Chiropractors

05. Occupational Therapists

06. Massage Therapists

07. Speech-Language Pathologists

08. Certified Orofacial Myologists

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Truths in Dentistry

Reflectively:

01. Serving patients ***in the moment*** when they make themselves accessible.

02. Human beings are often terrible at following ***"long term"*** plans

03. An Individuals perspective on what constitutes dental hygiene seems ***"personally"*** defined

04. Inaction often has ***consequences***

05. ***Pain hurts*** and an individual's perception of of pain of forces rejection

06. Dentistry strives for ***symmetry and balance***

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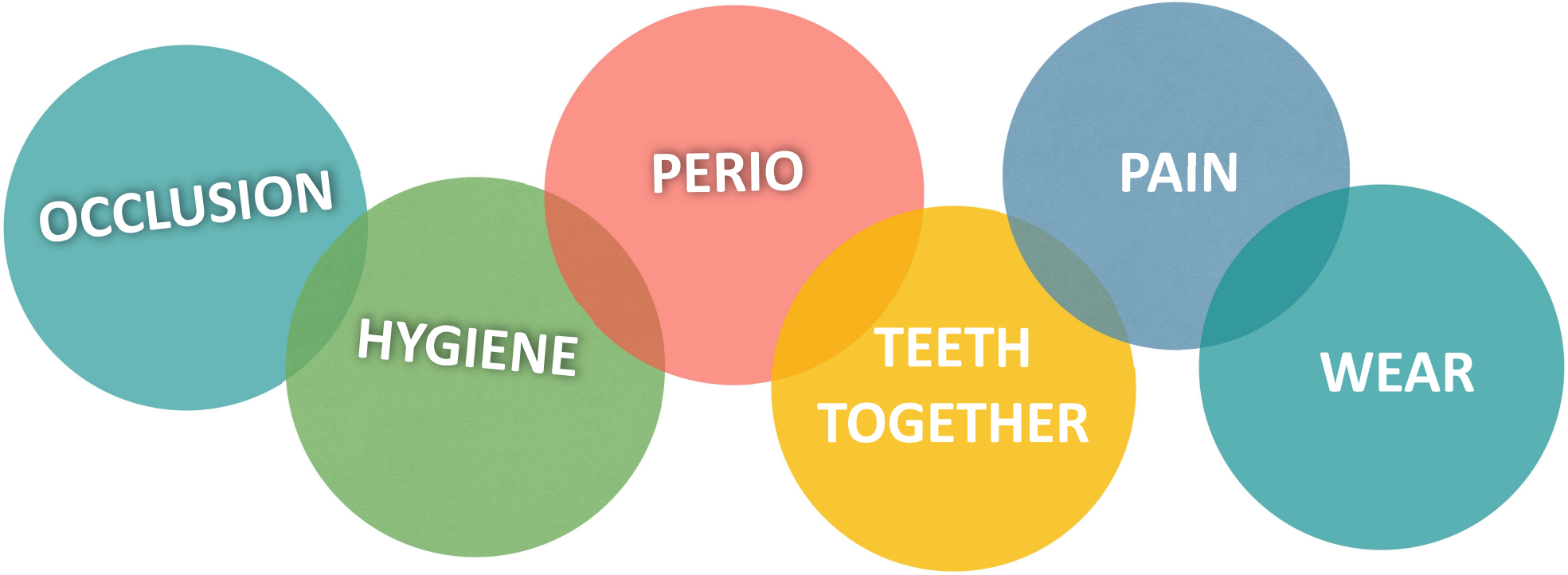
Dentistry



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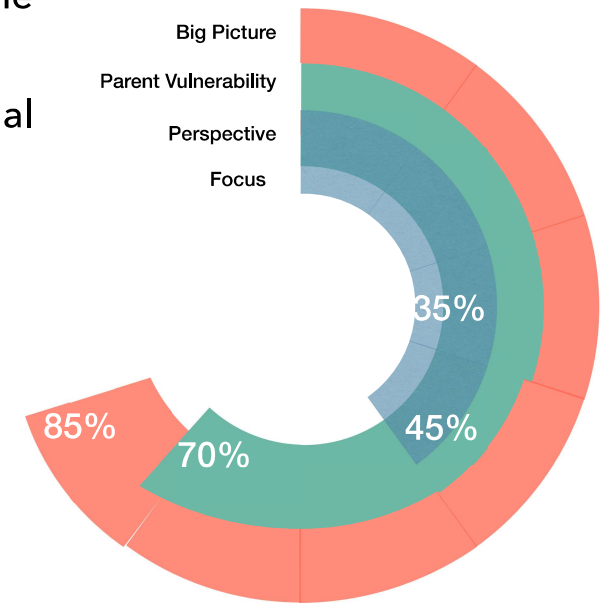
Dentistry is Focalized

- One can be so much ‘in the moment' they will often miss the ‘bigger’ picture. (Example: pain)
- Understand that parents are highly vulnerable to professional any advice given in a particular moment
- If a person is only viewed reclined in a dental chair it’s not possible to properly assess head and neck posture or discern how it impacts the mandible or other functions
- The mouth, as it presents in that moment (usually a starting point in dentistry) may actually be its end result



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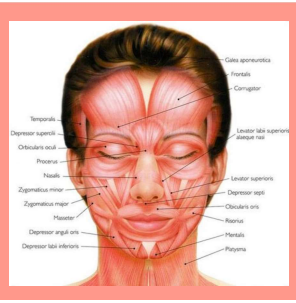
The Face is Moving Target



A calm lake
or a
pinball machine

No one stops
growing or
changing

The mouth is a dynamic system sitting on top of deeply connected systems

Posture (sitting, standing, head, neck) influence occlusion

The swallow developed as a child can create facial pain as an adult

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Functional Dynamics

- The muscles of the tongue are the only groups to be both contra and ipsa laterally indicated
- Oral muscles are used in different combination at different intensities for: breathing, chewing, swallowing, oral care, communication
- Temporomandibular activity radiates through the head, face, down the neck and into the fingertips

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Form and Function

Why DOES that giraffe have such a long neck?

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Malocclusion & Pain: The result of poor Oral Function

D'Onofrio, L., 2016

Teeth Are Magical Bones

Lips are the Face's Braces

The Tongue is a Natural Palatal Expander

Lingual Palatal Suction Allows the Jaw to Float Like a Hammock

Jaw Can (and Do) Grow Down and Backwards

If Oral Function is Not Noralized, Oral Structure is at Risk

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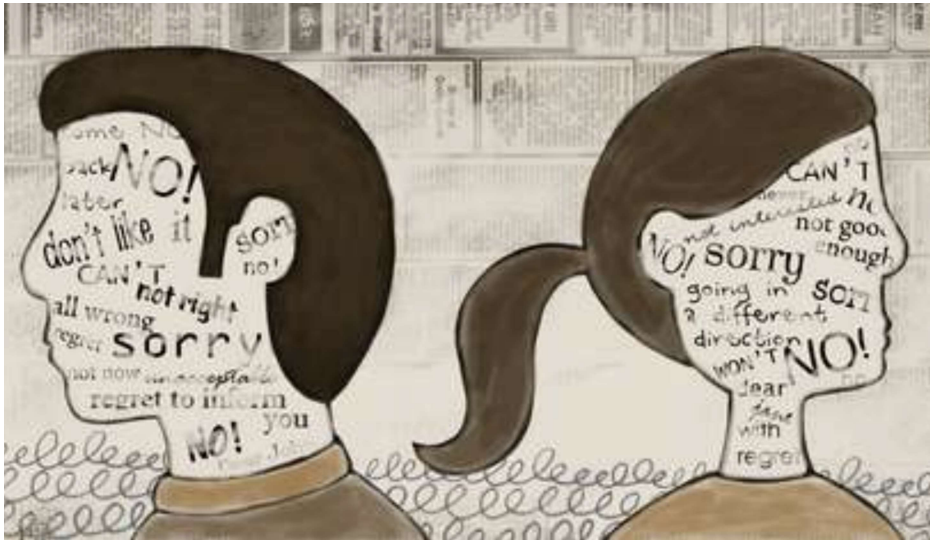
> “What we often already know is what keeps us from learning.”
>
> - Claude Bernard

Form and Function



Our perspectives are sometimes colored by our experiences, our focus, our ***learning process***

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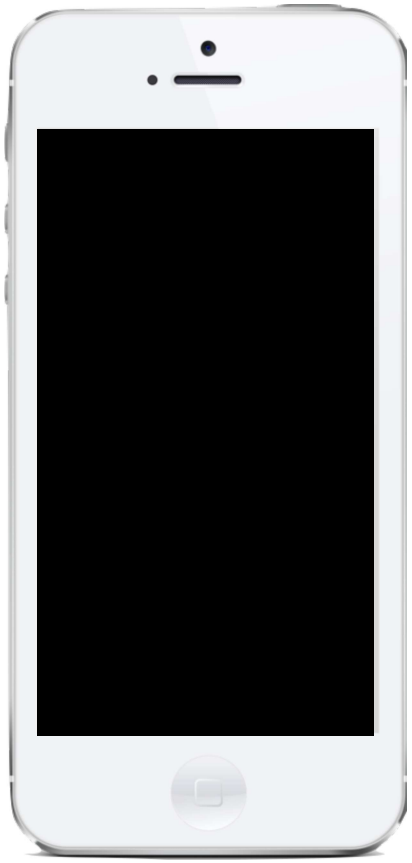
Speaking of Learning…….remember when….



What does IDK, LY & TTYL mean?

I don't know. Love you. Talk to you later.

Fine, I'll ask your sister.

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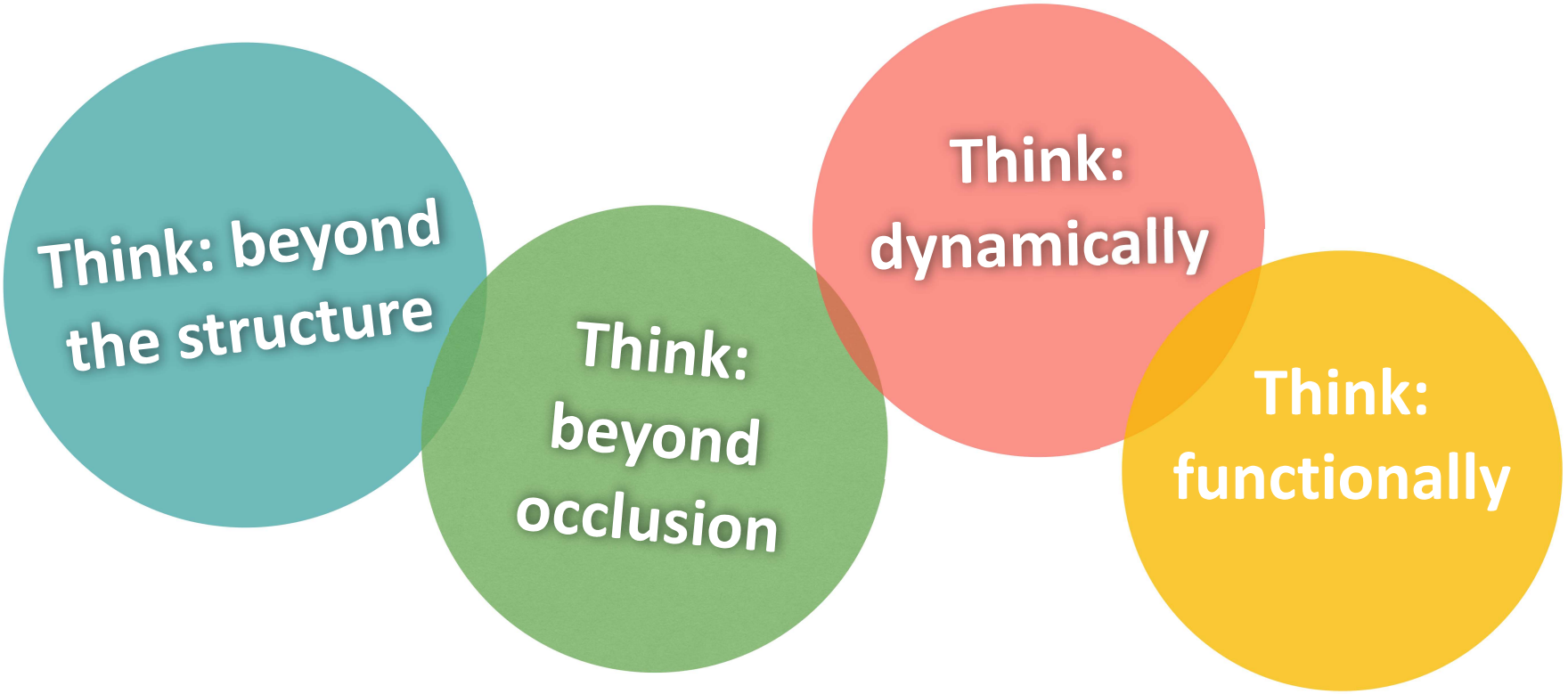
Think Beyond…



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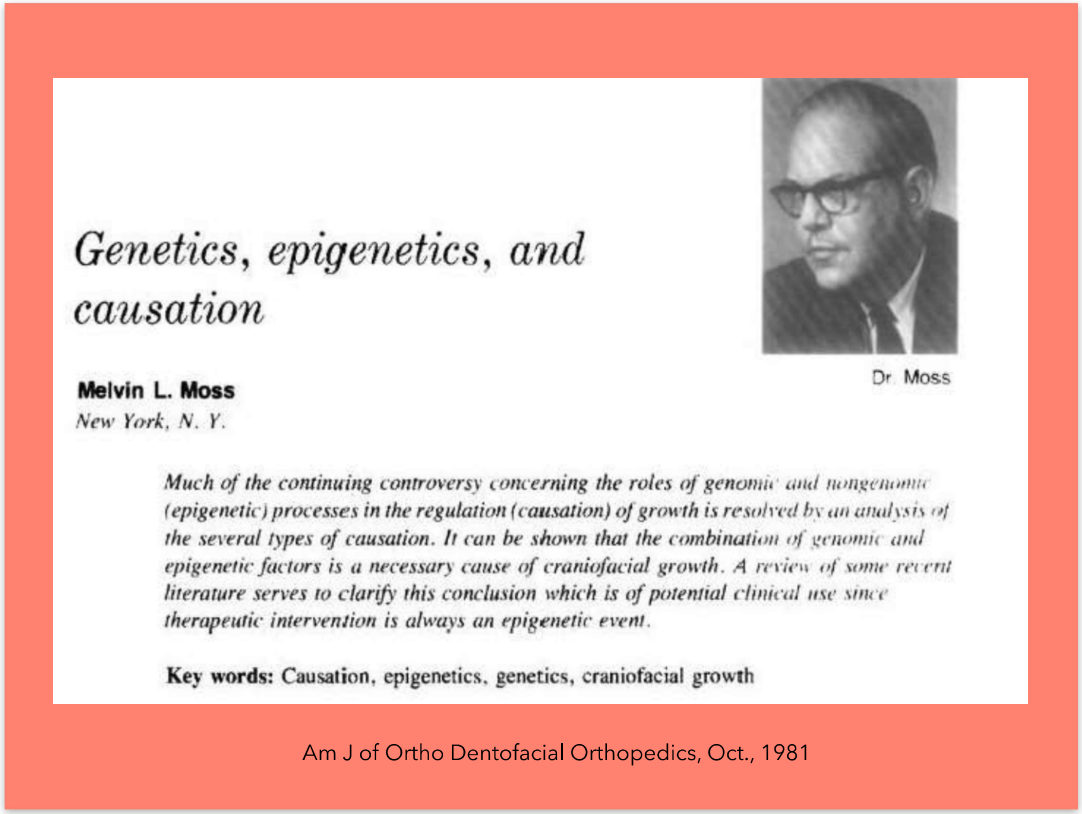
Moss' Functional Matrix Hypothesis



Genetics, epigenetics, and causation

Dr. Moss

Melvin L. Moss
New York, N. Y.

Much of the continuing controversy concerning the roles of genomic and nongenomic (epigenetic) processes in the regulation (causation) of growth is resolved by an analysis of the several types of causation. It can be shown that the combination of genomic and epigenetic factors is a necessary cause of craniofacial growth. A review of some recent literature serves to clarify this conclusion which is of potential clinical use since therapeutic intervention is always an epigenetic event.

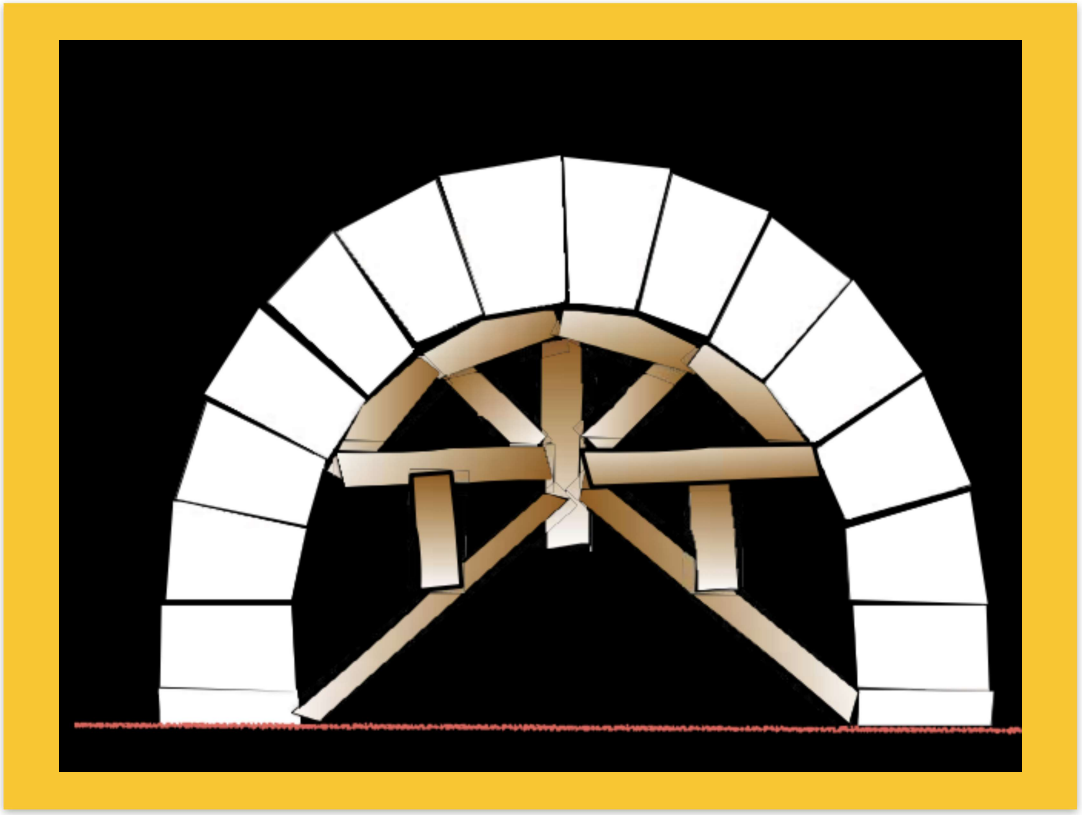
Key words: Causation, epigenetics, genetics, craniofacial growth

Am J of Ortho Dentofacial Orthopedics, Oct., 1981

The genome does not contain all the information needed to regulate growth

Structure and function work together to guide development (epigenetic)

How Do You Build An Arch



The Roman Arch Construct

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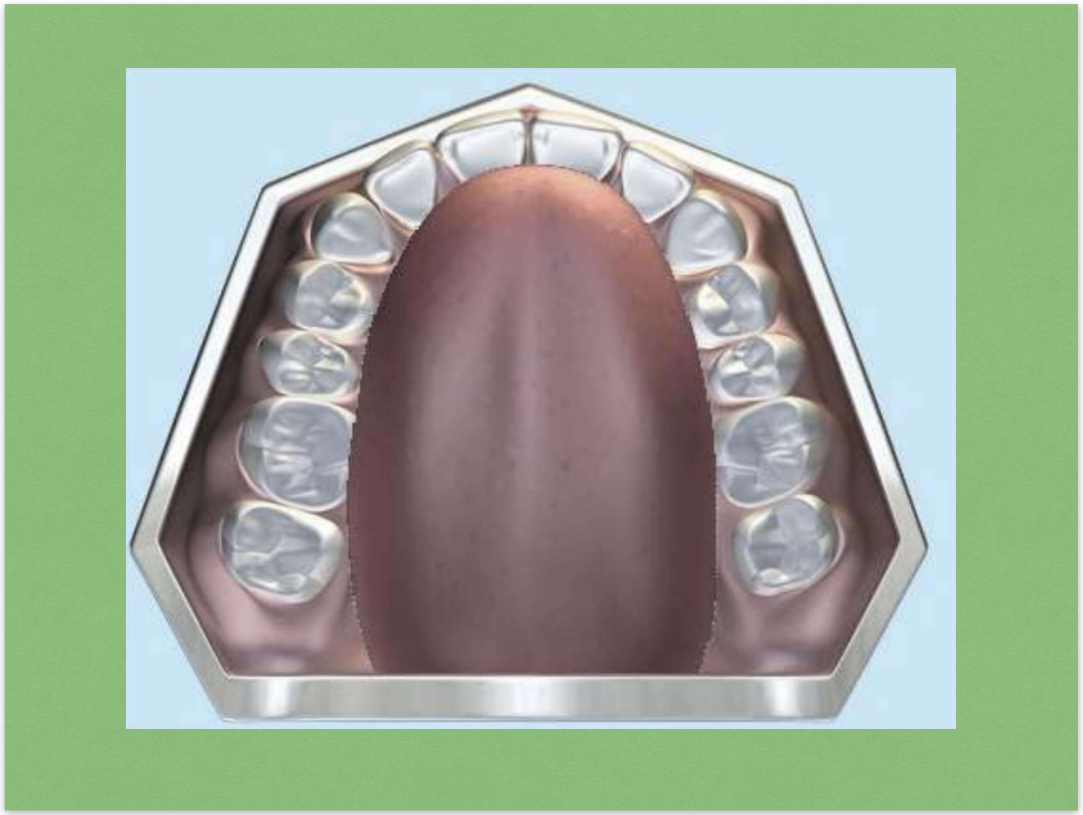
What IS the Scaffold for the Maxilla?



When the tongue rests on the roof of the mouth, the teeth erupt on the dental arch around the tongue providing symmetry

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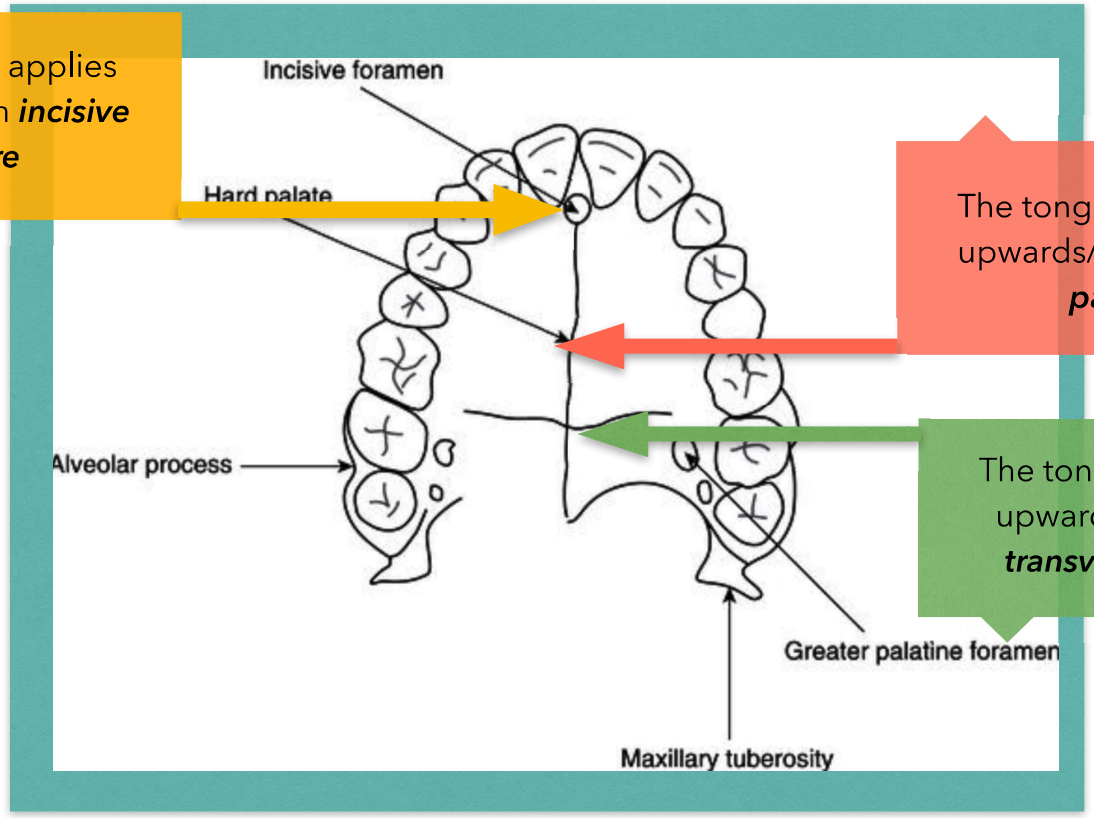
How Do You Build An Arch

The lingual complex applies pressure anteriorly on ***incisive foramen suture***



The tongue applies pressure upwards/laterally at the ***mid-palatal suture***

The tongue applies pressure upwards/posteriorly at the ***transverse-palatal suture***

During Breastfeeding, Swallowing and Resting Posture Position

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Craniofacial complex (mouth)…the very essence of our humanity.
…allows us to speak and smile; sigh and kiss;
smell, taste, touch, chew, and swallow
cry out in pain;
and convey a world of feelings and
emotions through facial expressions

Slide courtesy of Satish S Kumar, DMD, MDSc, MS., IAOM, ppt 2020
Quote taken from US Dept of HHS: Oral Health in America. A Report of the Surgeon General,Rockville, MD., NIDCR, September, 2000.

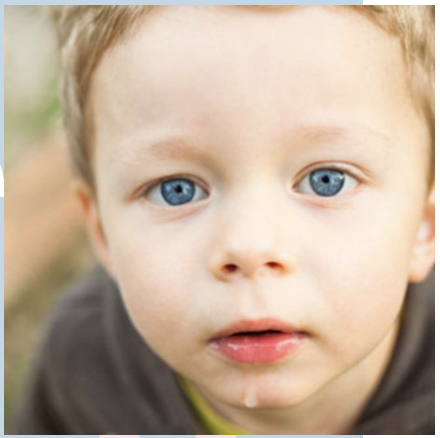
OMD Definition

"Orofacial myology is the study of the oral and oropharyngeal complex, their associated movements and how those movements affects the functions of respiration, mastication, bolus formation and transit, speech patterns and oral rest postures. Orofacial Myofunctional Disorders are multi-factorial in nature. They are often the consequence of a series of events, lack of, or interruption of developmental milestones at critical periods that result in oral dysfunction, craniofacial growth changes and resultant malocclusion.

Mary Billings, MS,CCC,COM®

2017

ASHA OMD Practice Portal



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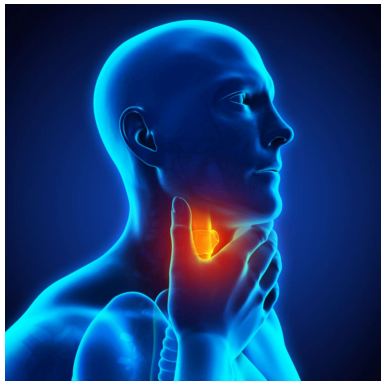
Primary Functions



BREATHING

SWALLOWING

"Biologically, the primary function of the oral mechanism is for respiration (breathing) and deglutition (swallowing/eating). Overlaying (or secondary) functions of the oral mechanism include speech articulation, voicing, musical instrumentation, humming, etc. Therefore, if the primary functions are not typical, the secondary functions may be compromised as a result.

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Prevalence

Occurrence

Newborns, infants, and toddlers: SSB, torticollis; plagiocephaly; labial or lingual frenula; cleft; ANS disruption

Preschoolers: airway obstruction; mouth-breathing; tongue tie; crossbite; speech disorders; picky or restrictive eating

School-aged children: sensory-motor disorders; restricted oral frenulum ; sleep disordered breathing; picky or restrictive eating

Teens: malocclusion; temporomandibular dysfunction; sleep disordered breathing; headaches; bruxing; grinding

Special Populations: craniofacial disorders; Downs Syndrome; autism; genetic syndromes

Adults: facial trauma; surgical involvements; malocclusion; TMJ; tooth loss; obstructive sleep apnea

Geriatric Adults: trauma; aging; bone loss; muscle loss; tooth loss ; obstructive sleep apnea

PREVALENCE

INCIDENCE

Abreu, Rocha, Lamounier & Guerra, 2008. Aniansson et al, 1994; Neskey, Eloy & Casiano, 2009. Riche, Baker, Madlon-Kay & DeFor, 2005. Barros de Arruda Telles, Ferreira, Magalhaes & Scavone-Junior, 2009. Dimberg, Lennartsson, Doderfeldt & Bondemark, 2001. Grabowski, Kunst & Stahl, 2007. Bounce, etc al, 2001; Felcar, Bueno, Masan, Toresan & Cardorso, 2010. Heimer, Tomisiello, Katz & Rosenblatt, 2008. Murry, 2002, Okuro et al 2011. Parker et al, 2010

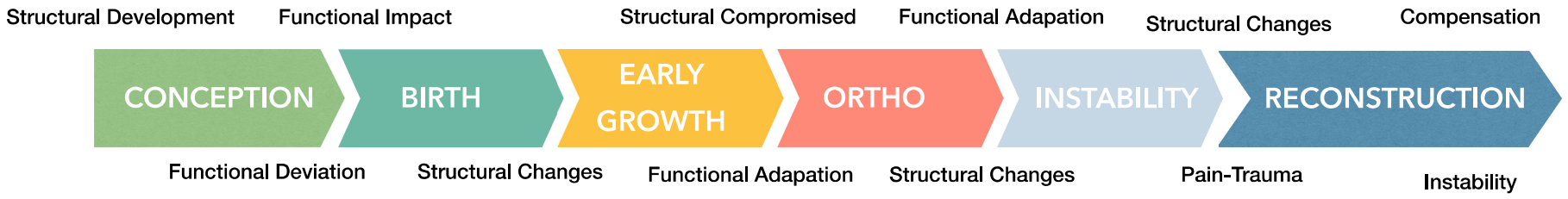
Casade of Dysfunction

- Airway Obstruction/Accommodation
- Structural Dysmorphology/functional limitations
- Idiosyncratic Behaviors

Etiologies: Form & Function

Form Follows Function

Casade of Dysfunction



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> “Oral function disorders, airway obstruction, and soft tissue restriction can and do occur throughout our entire lives.”
>
> - L. D’Onofrio, 2016

Dysfunction Cascades

BABIES

- Decreased feeding
- Coordination
- Tongue Tie
- Reflux
- Gastrointestinal issues
- Projective Vomiting
- Gassy Baby
- Colic
- Head shape
- Lack of Movement
- Torticollis
- Failure to Thrive
- Delayed Milestones
- Rapid and shallow breathing

TODDLER

- Toe Walking
- Poor Overall Coordination
- Reflux
- Asthma
- Accident Prone
- Sensory Integration Deficits
- Food Avoidances
- Sucking Habits
- Over-reactive to Stimuli
- Retained Primitive Reflexes
- Abnormal Chewing/Swallowing
- Speech Delays

OLDER

- Chronic Mouth Breathing
- Enlarged Tonsils
- Enlarged Adenoids
- Sleep Disordered Breathing
- Behavioral Issues
- Picky Eating
- Bedwetting
- Anxiety
- Learning Disorders
- Chronic Headaches
- Teeth Grinding
- Vision Changes
- Dentofacial Changes
- Malocclusion

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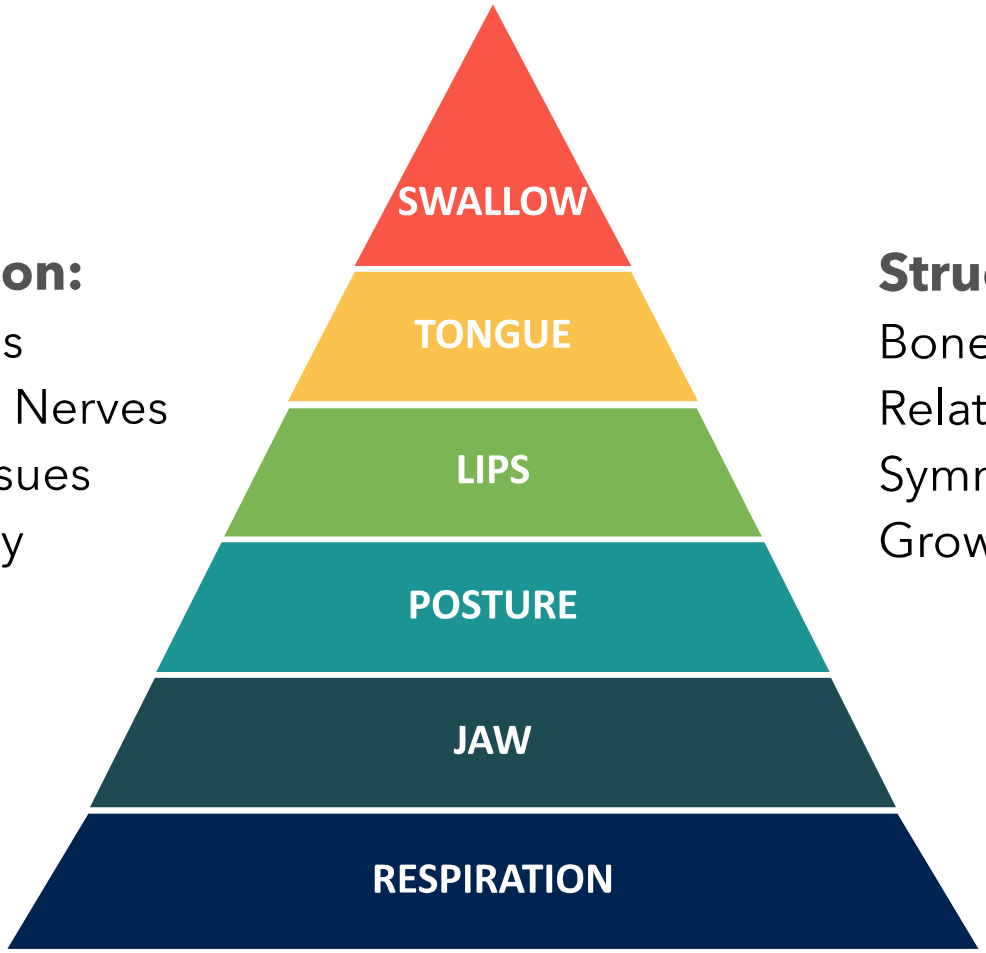
OROFACIAL MYOFUNCTIONAL DISORDERS

Understanding the Foundation

Stomatognathic Hierarchy

Function:
Muscles
Cranial Nerves
Soft tissues
Mobility



Structure:
Bones
Relationships
Symmetry
Growth patterns

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Respiration System

RESPIRATION, body posture, over-breathing, mouth breathing, nasal airway obstruction, velopharyngeal insufficiency, nasality concerns, noxious habits, other structural deficiencies

RESPIRATION is the foundation of the orofacial complex

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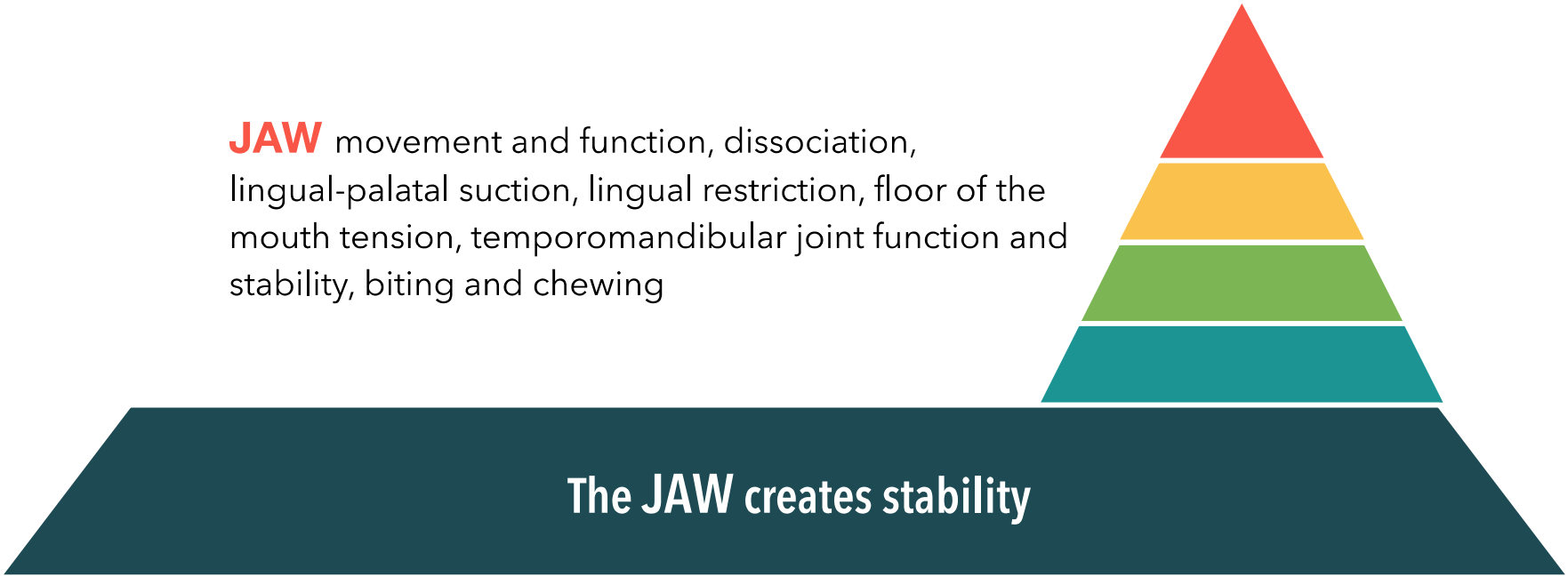
Jaw System

JAW movement and function, dissociation, lingual-palatal suction, lingual restriction, floor of the mouth tension, temporomandibular joint function and stability, biting and chewing



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Posture System

POSTURE: abdominal, diaphragmatic, thoracic, cervical, cranial position, jaw, lips and cheeks, tongue

The BODY POSTURE establishes the strength and stability needed for support

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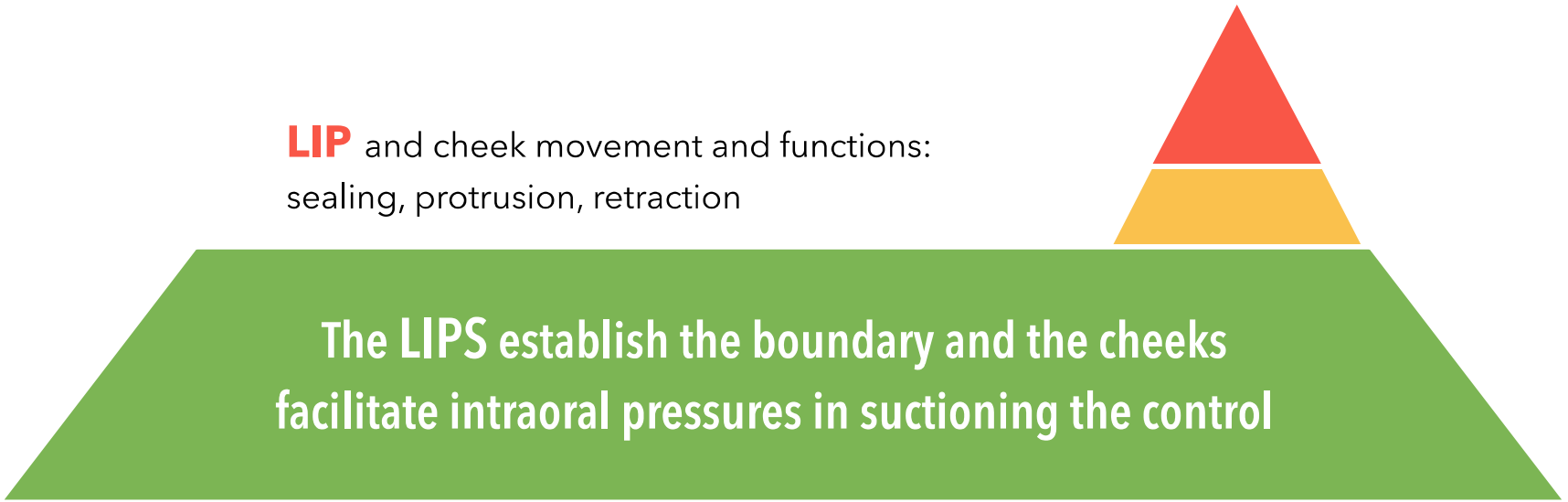
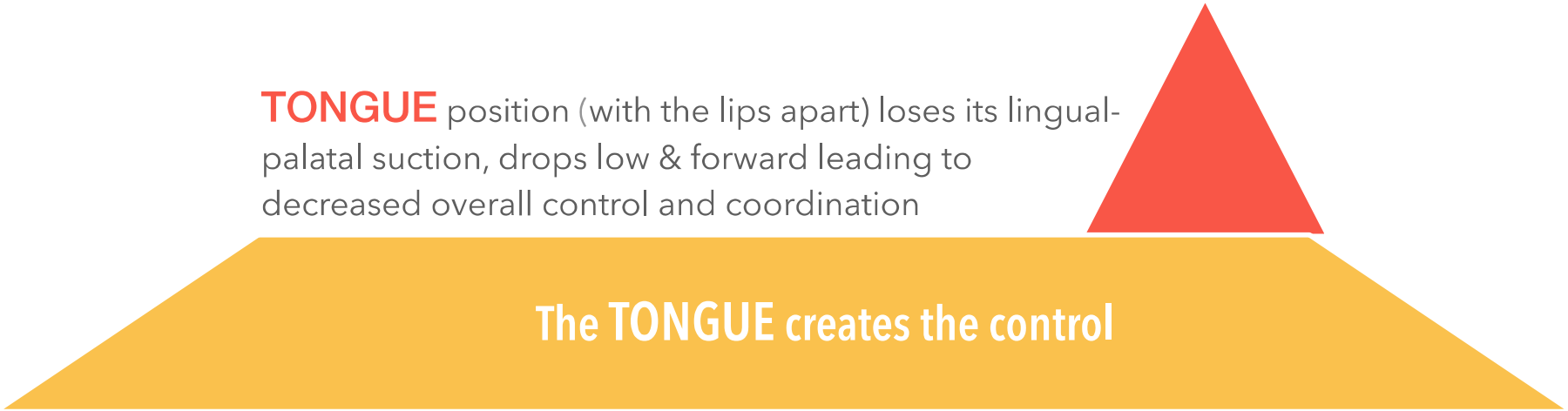
Facial Muscle Lip System

LIP and cheek movement and functions:
sealing, protrusion, retraction



Tongue System

TONGUE position (with the lips apart) loses its lingual-palatal suction, drops low & forward leading to decreased overall control and coordination



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Swallow System

Swallow: Oral phase deals with
mastication, deglutition, control, collection, transfer

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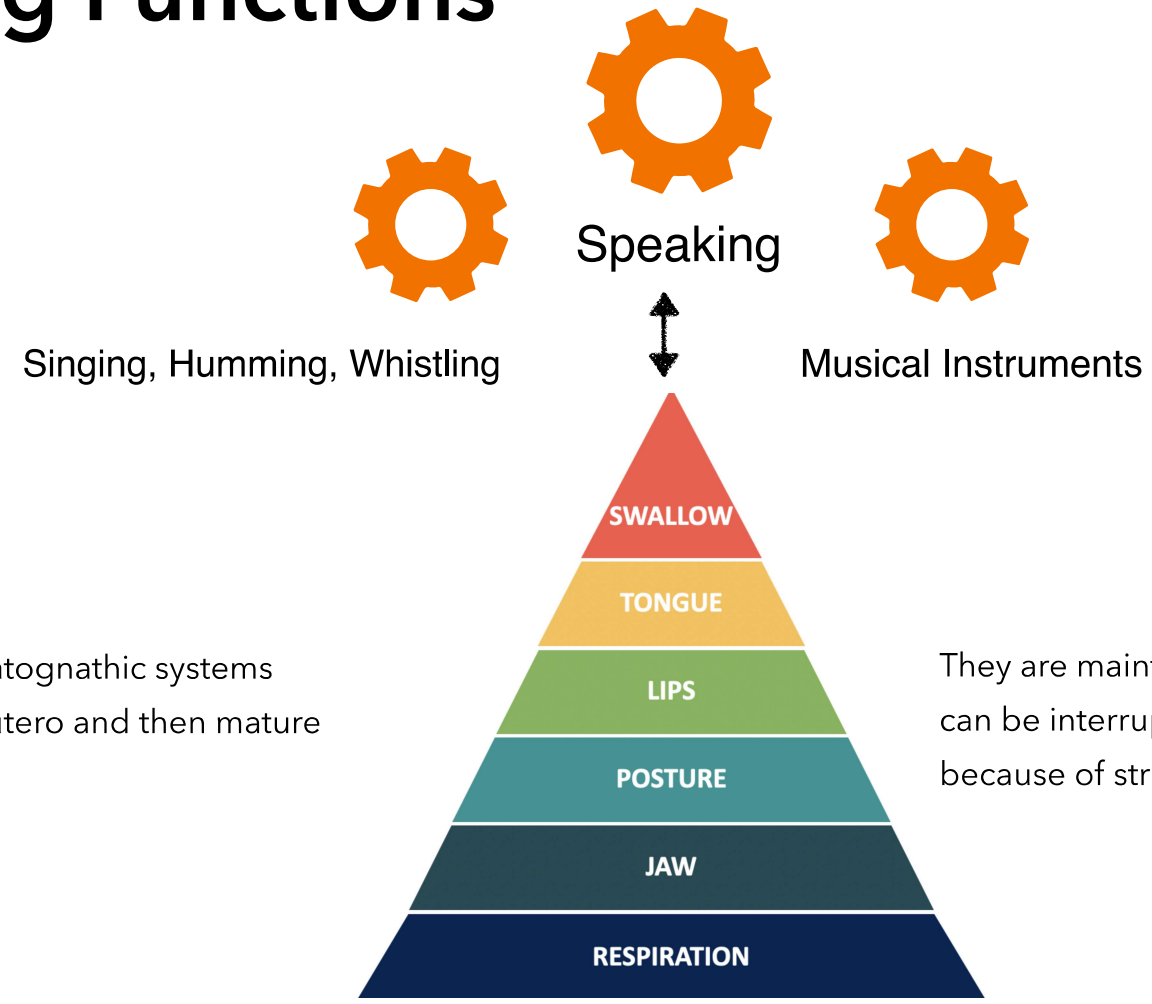
Overlaying Functions



These stomatognathic systems develop in-utero and then mature

They are maintained through life but can be interrupted, injured, or change because of structural impairment

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Think Functionally

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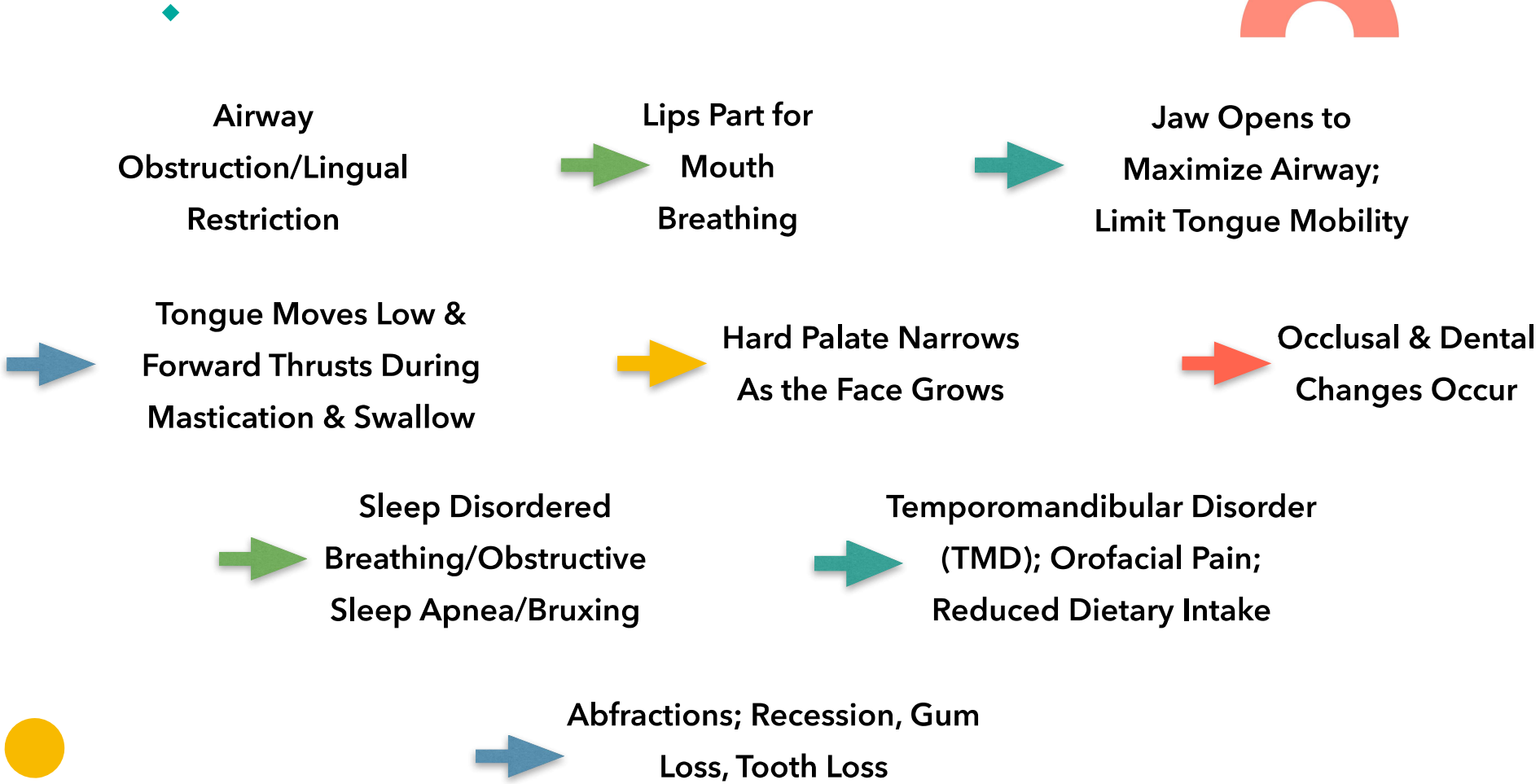
Casade of Dysfunction: Explained



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Respiration System

RESPIRATION

- obstructive airway
- posture
- noxious oral habits
- velopharyngeal insufficiency or inadequacy
- tonsils and adenoids inflammation
- nasality concerns
- other structural deficiencies
- Sleep disordered breathing

RESPIRATION is the foundation of the orofacial complex

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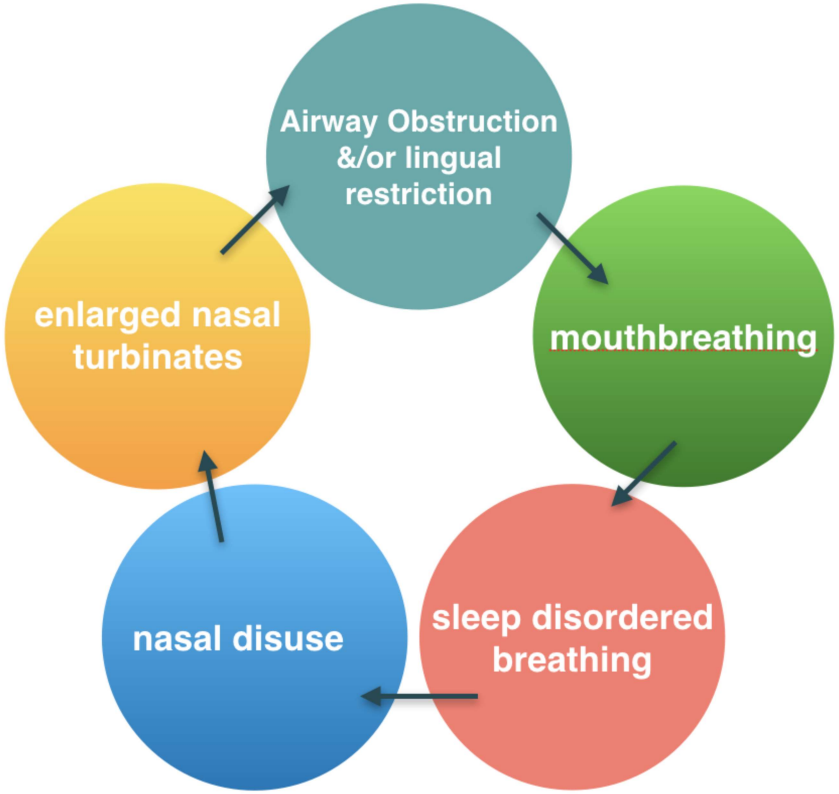
Airway Dysfunction Cycle



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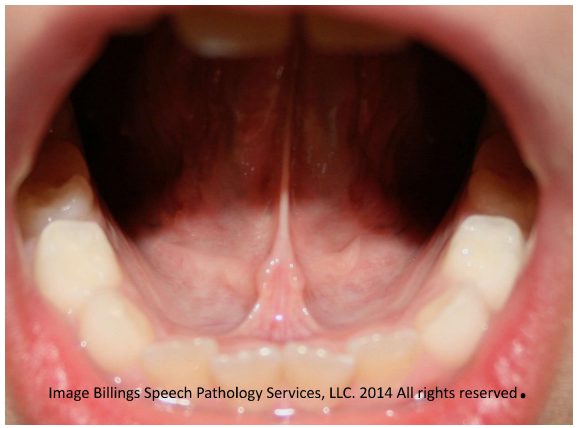
Respiration Variables:



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HISTORICAL FOCUS ON **MOUTH BREATHING**

The research

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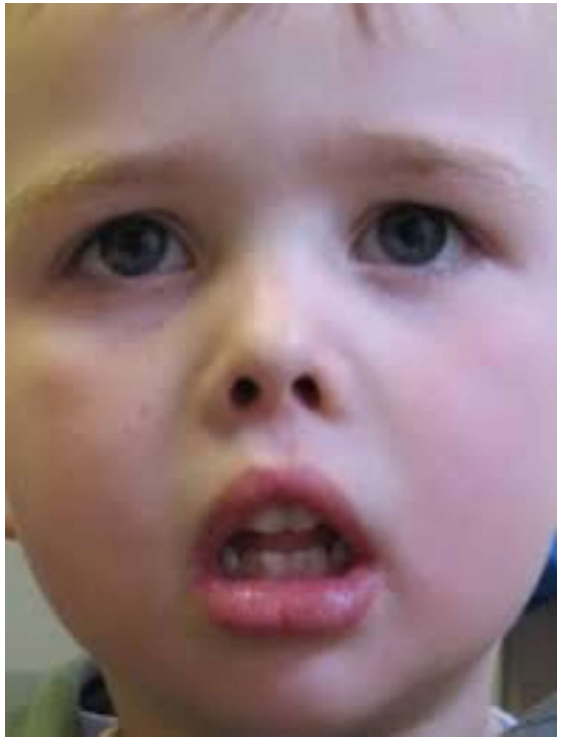
An Open Mouth is Never Okay



http//www.googleimages.com/adenoidface

01. Open mouth breathing is related to the growth and development of the orofacial structures, including narrowing of the maxilla, reduced development of the mandible, malocclusion and dry mouth (Bresolin., et.al., 1983)

02. Open mouth breathing significantly narrows the redropalatal and retroglossal areas, lengthens the pharynx, and shortens the mandibular plane height. Knowledge of these changes associated with opening the mouth adds to understanding of the increase of OSA security and low adherence to nasal CPAP therapy in mouth breathers (Lee, et al. 2007)

03. Open mouth The dental arched narrower in children snoring routinely at age 4, 6 and 12 compared to non-snoring children. Crossbites more common among snoring children than non-snoring children at 4, 6 and 12 (Hulcrantz & Tidestrom, 2009)

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An Open Mouth is Never Okay

(Souki, et.al, 2009)

04.

Prevalence of posterior ***cross bite*** is higher in MB children than general population. During mixed and permanent dentition, anterior open bite and Class II malocclusion more likely to be present in mouth breathers.

Although more children showed this malocclusion, most mouth breathing children evaluated did not match the expected "mouth breathing dental stereotype

Open In this population of mouth breathing children, the obstructive size of the adenoids and/or tonsils and presence of rhinitis were not risk factors to development of Class II malocclusion, AOB or posterior cross bite

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An Open Mouth is Never Okay

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(Guilleminault & Ahktar, 2015)

05.

Sleep -disordered breathing (SDB) in children could be resolved by adenotonsillectomy (T&A). However, incomplete results are often noted post-surgery. Because of this partial resolution, l***ong-term followup is needed*** to monitor SDB recurrence, which may be diagnosed years later through recurrence or systematic investigation of complaints.

Children undergoing T&A often have small upper airways. Genetics play a role in fetal development of the skull and skull base, size of the upper airway. ***In non-syndromic children, specific mutation are often unrecognized early in life and affect the craniofacial growth, altering functions such as suction, mastication, swallowing and nasal breathing.***

Because These developmental and functional changes are associated with development of SDB. Children without specific mutations but with impairment of the above said functions also development SDB.

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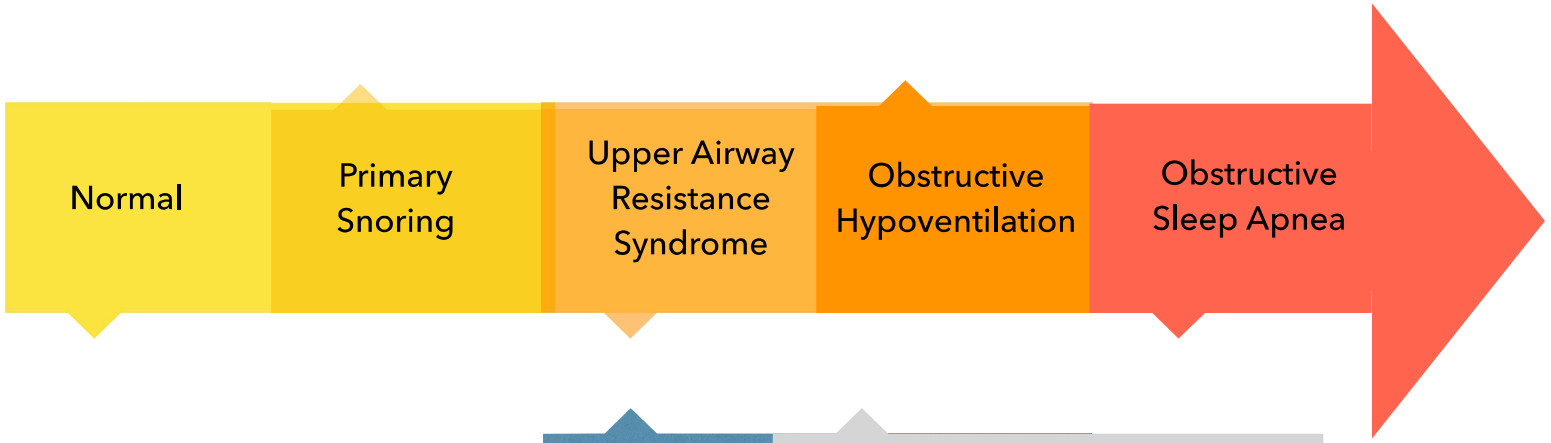
Sleep Disordered Breathing



AHI - Apnea Hypopnea Index
Apneas-Hypopneas/Hour

Children	1 -5	6 -9	>10
Adults	5 -15	16 -29	>30

Consequences of Sleep Disorders Breathing

(Jefferson, 2010)

06. Vast majority of healthcare professionals are unaware of the negative impact of upper airway obstruction (mouth breathing) on normal facial growth and physiologic health. Children whose mouth breathing is untreated may develop long, narrow faces, narrow mouth, high palatal vault, dental malocclusion, gummy smiles, and many other unattractive facial features such as Class II or Class II facial profiles.

These children do not sleep well at night due to obstructer airways. The lack of sleep can adverse affect their growth and academic performance. Many of these children are **misdiagnosed** with attention deficit disorder (ADD/ADHD).

It is important for the entire health community (including general and pediatric dentists) to screen and diagnose for mouth breathing in adults and children as young as 5 years of age. If mouth breathing is treated early, its negative effects on facial and dental development and the the medical/social problems associated with it can be reduced or averted.

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THE JAW

The Unrecognized Component

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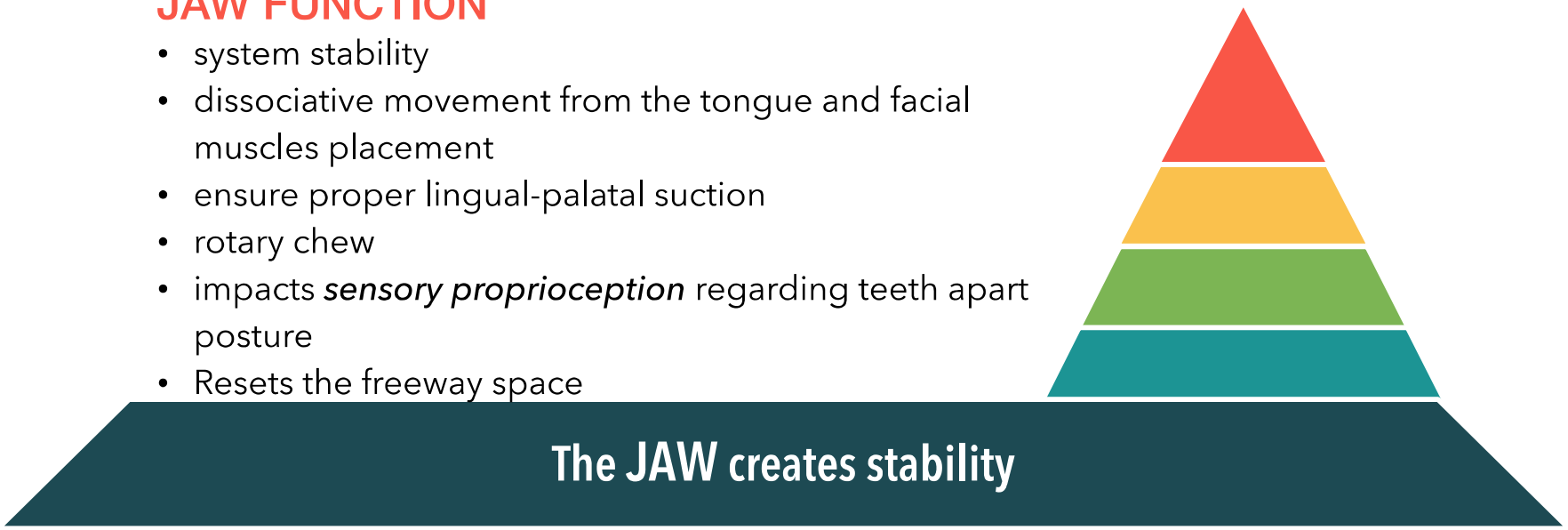
Jaw System

JAW FUNCTION

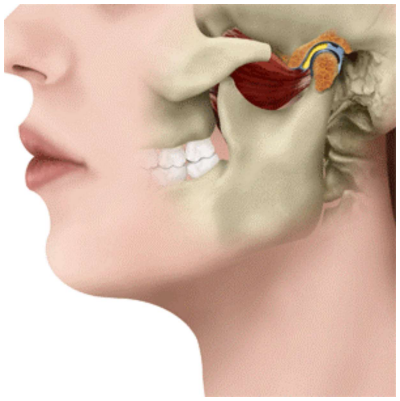
- system stability
- dissociative movement from the tongue and facial muscles placement
- ensure proper lingual-palatal suction
- rotary chew
- impacts ***sensory proprioception*** regarding teeth apart posture
- Resets the freeway space

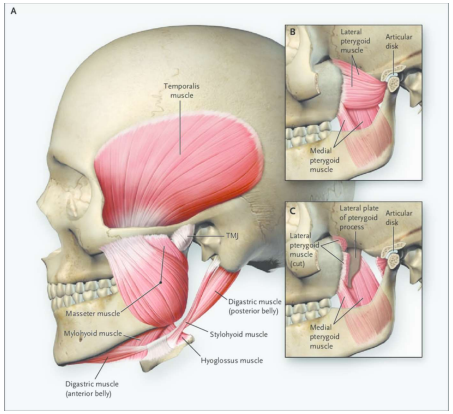


"If jaw stabilization is not acquired and well-habituated, long term benefits of behavioral treatment fail." (Fletcher, S., 1974)

Jaw System

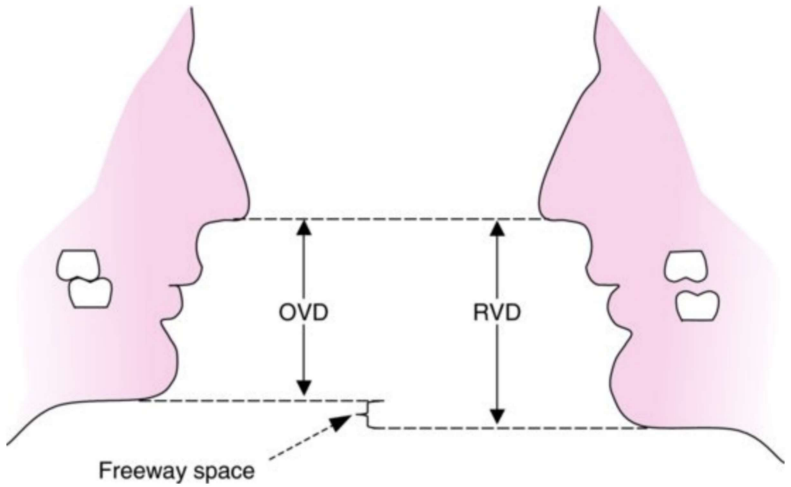
The jaw itself does not work without the function of the accompanying muscles: *pterygoids, temporals, digastric*





.http://www.kennethmooredds.com/tmj/

Vertical Rest Position



Not to be confused with Occlusal Vertical Dimension

Jaw Strength and mobility establish Rest Vertical Dimension

The Jaw supports lip seal and nasal breathing

Vertical Rest Position

(Seeman, Kundt, Stahl De Castrillion, 2011)

01. Relationship between occlusal finding and orofacial myofunctional status in primary and mixed dention: part IV: interrelation between space conditions and orofacial dysfunctions

Static and dynamic orofacial dysfunctions were documented in primary and mixed dentition stages

Conclusions: deviations from regular arch form become notable during very early development of dentition and coexist with specific orofacial dysfunctions.

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Vertical Rest Position

(Germa, Clement, et.al., Angle Orthodontist, 2016)

02. Early risk factors for posterior cross bite and anterior open bite in the primary dentition.

Investigated risk factors specific to development of posterior cross bite and anterior open bite by 3 years of age

Conclusions: pre-term birth is a risk factor for cross bite and associated oral dysfunctions

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Jaw Stability

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Airway Or Posture…?

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Temporomandibular Dysfunction

Arthrogenous vs. Myogenous

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TMD: Arthrogenous

ORIGINATES IN THE JOINT

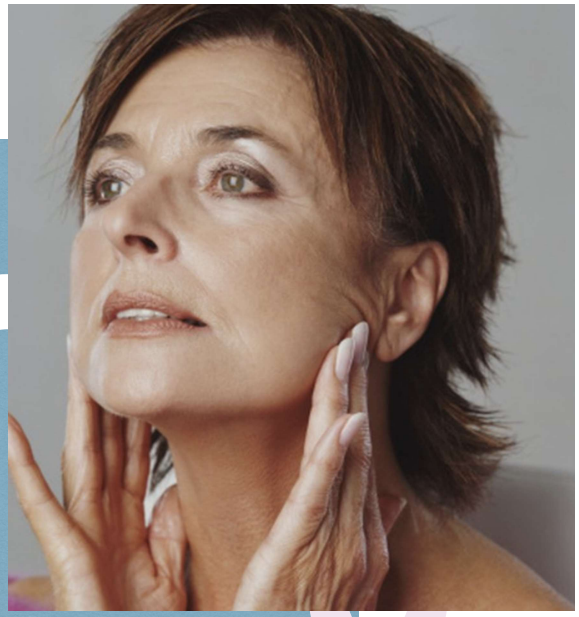
01. Disc Displacement

Joint related
Clicking
Popping
Locked Jaw
Develops on one side initially

02. Arthritis

Degenerative
Most painful
Can be associated with other medical conditions

TMD: Myogenous



ORIGINATES FROM MUSCLE DYSFUNCTION

01.

Bruxism and Clenching

Controlled by Sympathetic CNs
Spastic Muscles
Limited Jaw Movement
Morning Headaches
Broken Teeth
Broken Dental Guards

02.

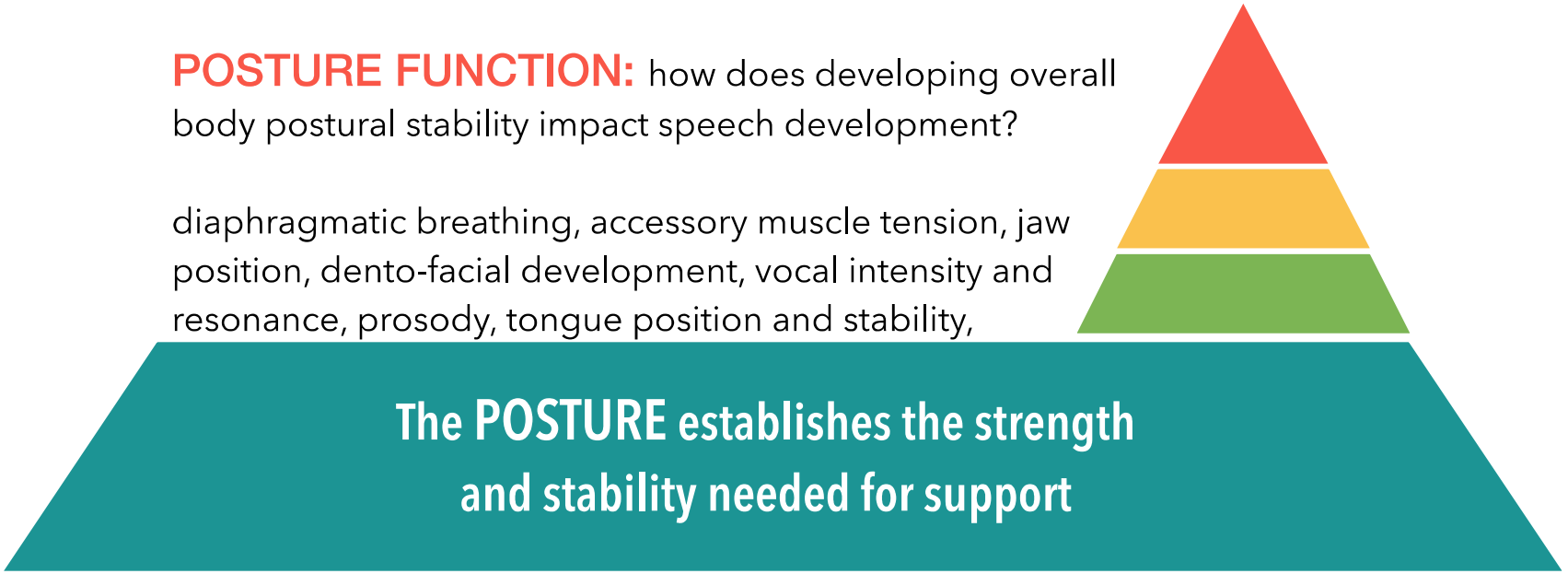
Muscle Dysfunction and Imbalance

Chewing Patterns
Sleep Positions
Leaning Habits
Tech Neck
Usually Unilateral
Musical Instruments

Posture System

POSTURE FUNCTION: how does developing overall body postural stability impact speech development?

diaphragmatic breathing, accessory muscle tension, jaw position, dento-facial development, vocal intensity and resonance, prosody, tongue position and stability,



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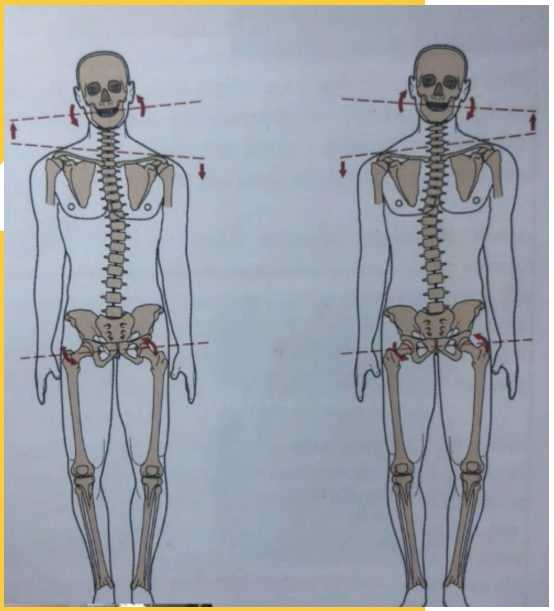
Body Posture Changes



IMPACT ON OCCLUSION

01. **Body Adjustments**

The tongue establishes stability for the whole body
Absence of tongue to palate at birth creates compensation

Feeding issues
Delayed development of shoulder girdle
Decreased trunk and core strength
Decreased coordination

Postural Adjustment

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01.

Compensations:

Right hip higher
Right hip anterior to left
Right shoulder higher
Arms uneven
Neck tension

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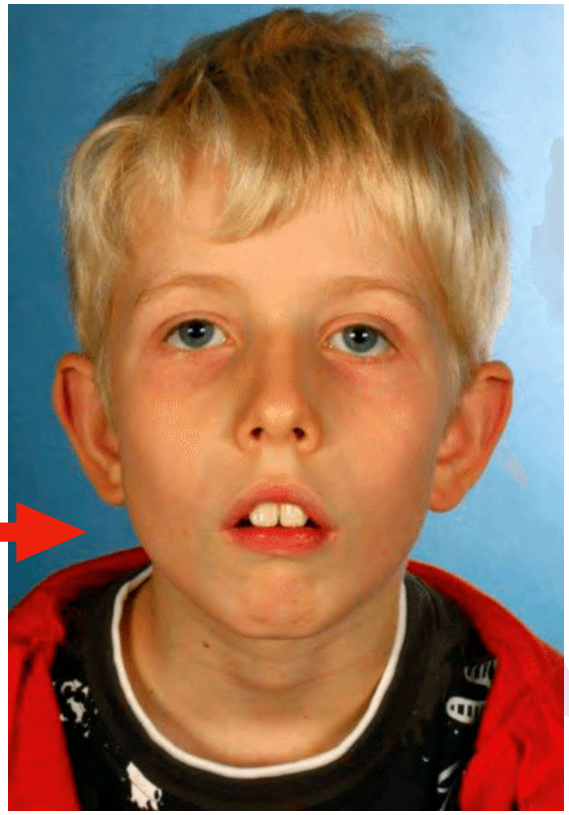
Look Inside. . .

Postural Adjustment



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02.

Compensations:

Neck extended (airway)
Open mouth
Shoulders rolled
Toe walking
Torso leaning forward
Chronic jaw shift to establish occlusion
Generalized lack of coordination

Generally looks unhealthy

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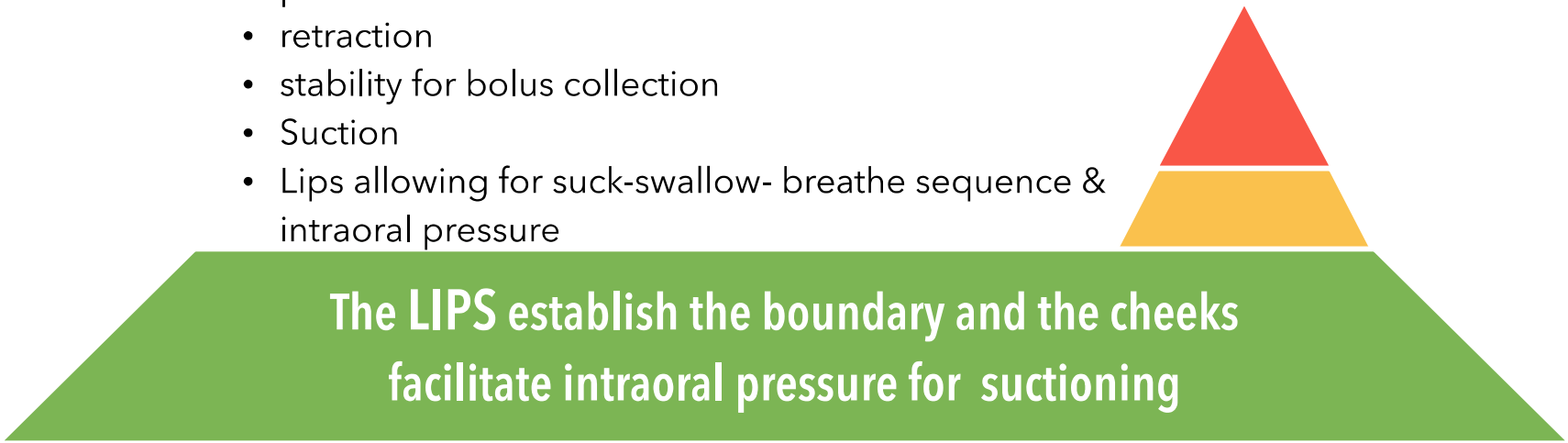
Lips/Cheeks System

LIPS AND CHEEKS FUNCTION

- seal
- protrusion
- retraction
- stability for bolus collection
- Suction
- Lips allowing for suck-swallow- breathe sequence & intraoral pressure



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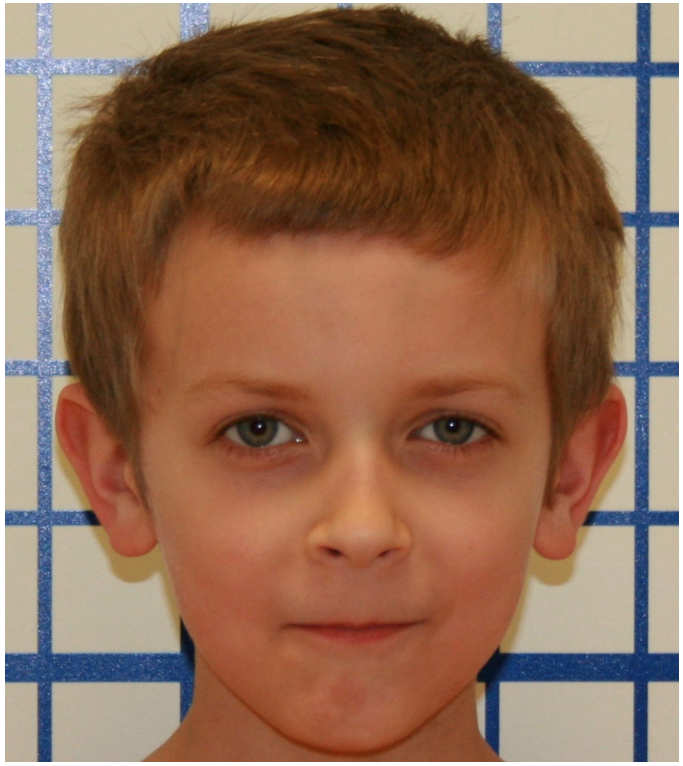
Postural Adjustment



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01.

Compensations:

Rest Vertical Dimension
Lip tension
Lower lip rolls
Tension in mentalis
Developing mid-face deficiency
Lack of buccinator

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Look Inside . . .

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01.

Compensations:

High narrow palate
Developing malocclusion
Extremely pronounced rugae
No room for tongue accommodation

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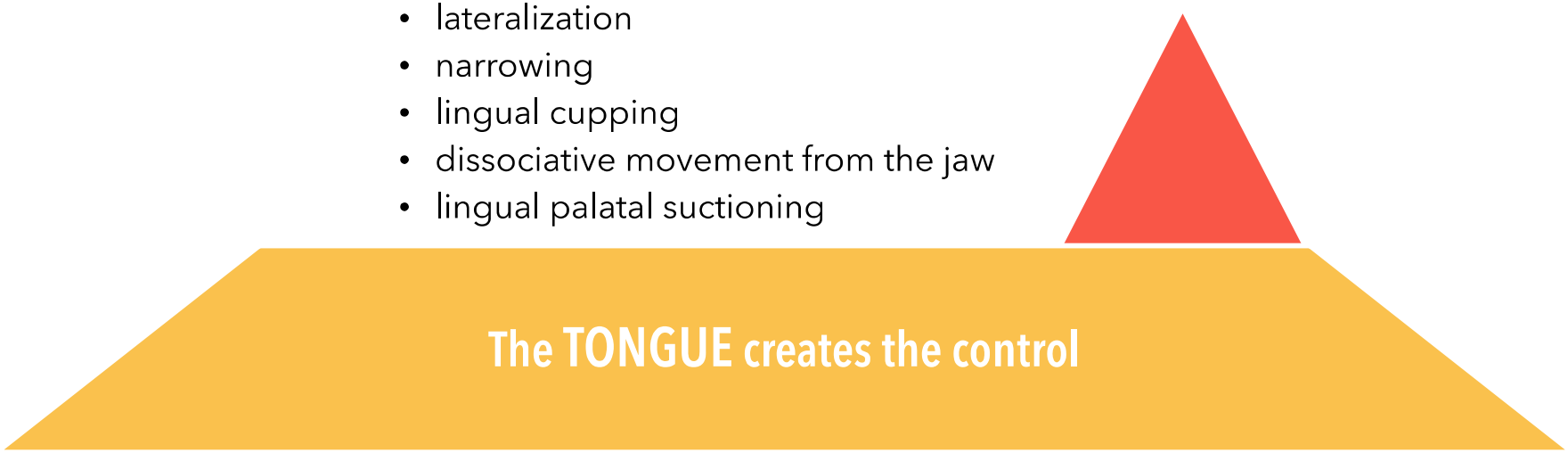
Tongue System

TONGUE FUNCTION:

- elevation
- depression
- lateralization
- narrowing
- lingual cupping
- dissociative movement from the jaw
- lingual palatal suctioning



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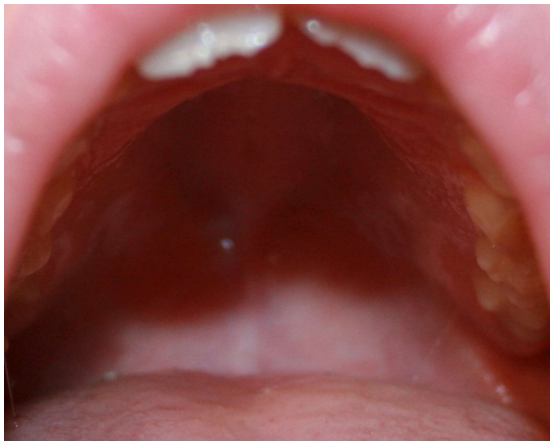
Establishes Oral Rest Posture



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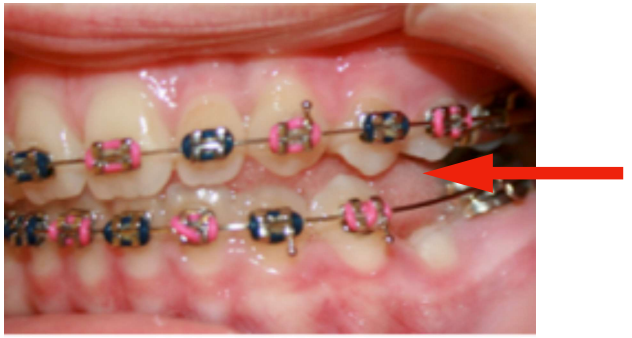
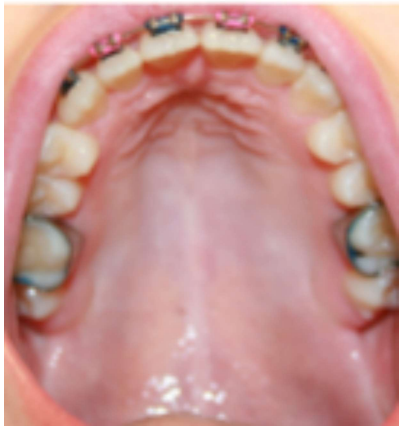
14 Year Old Nasal Breather





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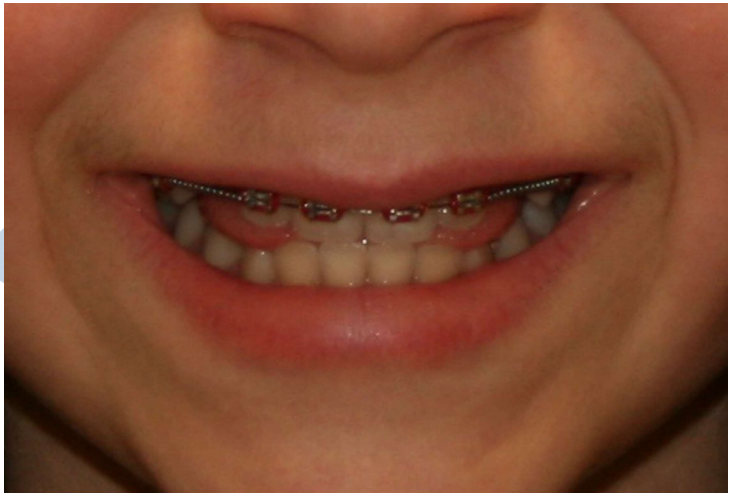
7 Year Old Nasal Breather - Class III

What happened here….Tongue tie

Close up…



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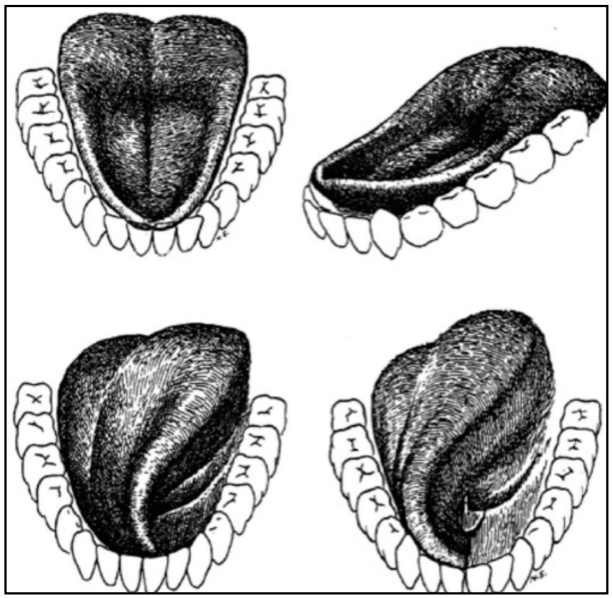
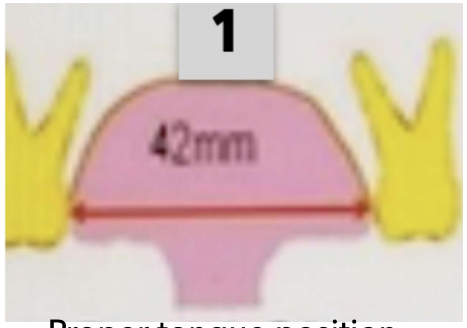
Lingual Movement

NEEDED FOR CHEWING/SWALLOWING

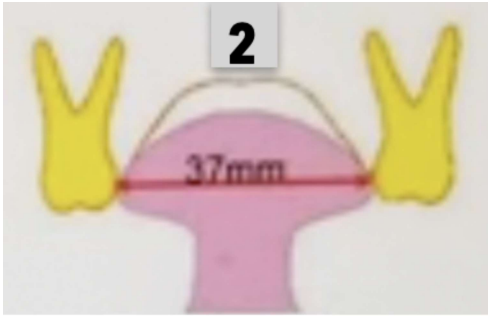


Elevation
Depression
Lateralization
Narrowing
Cupping
Dissociated movement
Suction

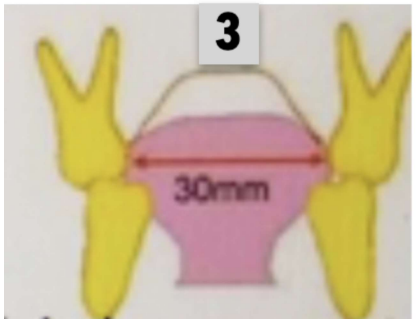
Growing the Palate



Proper tongue position –
Tongue to palate during swallow expands the naso-maxillary complex

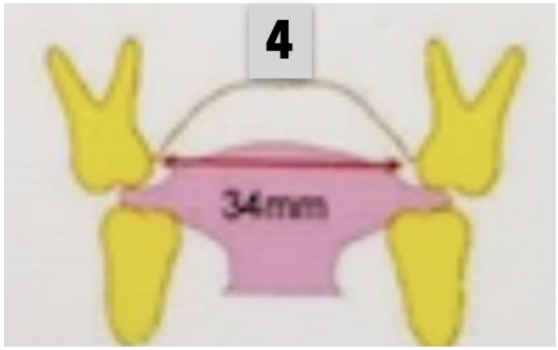


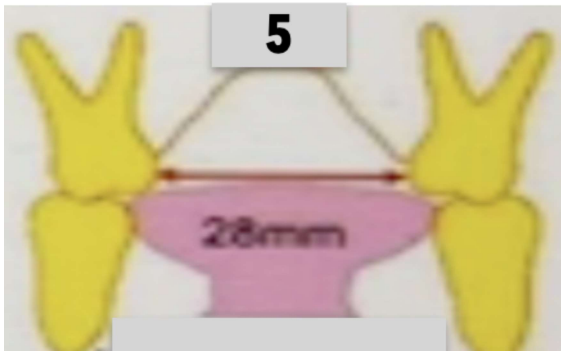
Tongue not fully contact palate; causes narrowing of maxilla and the naso-maxillary complex



Tongue not freaching palate; narrowing of maxilla , mandible and the naso-maxillary complex

Tongue position over occlusal surface: AOB or POB, or deep bite develops with narrowing of the naso-maxillary complex with reduced tongue accommodation





Low tongue posture can lead to crossbite; very narrow naso-maxillary complex; high vaulted palate; no tongue accommodation

www.facebook.com/Ronco, Apneia do Sono e Bruxismo

Its not just Structural Appearance

Varies by Mouth

Varies by functional adaptations

Varies by symptomology

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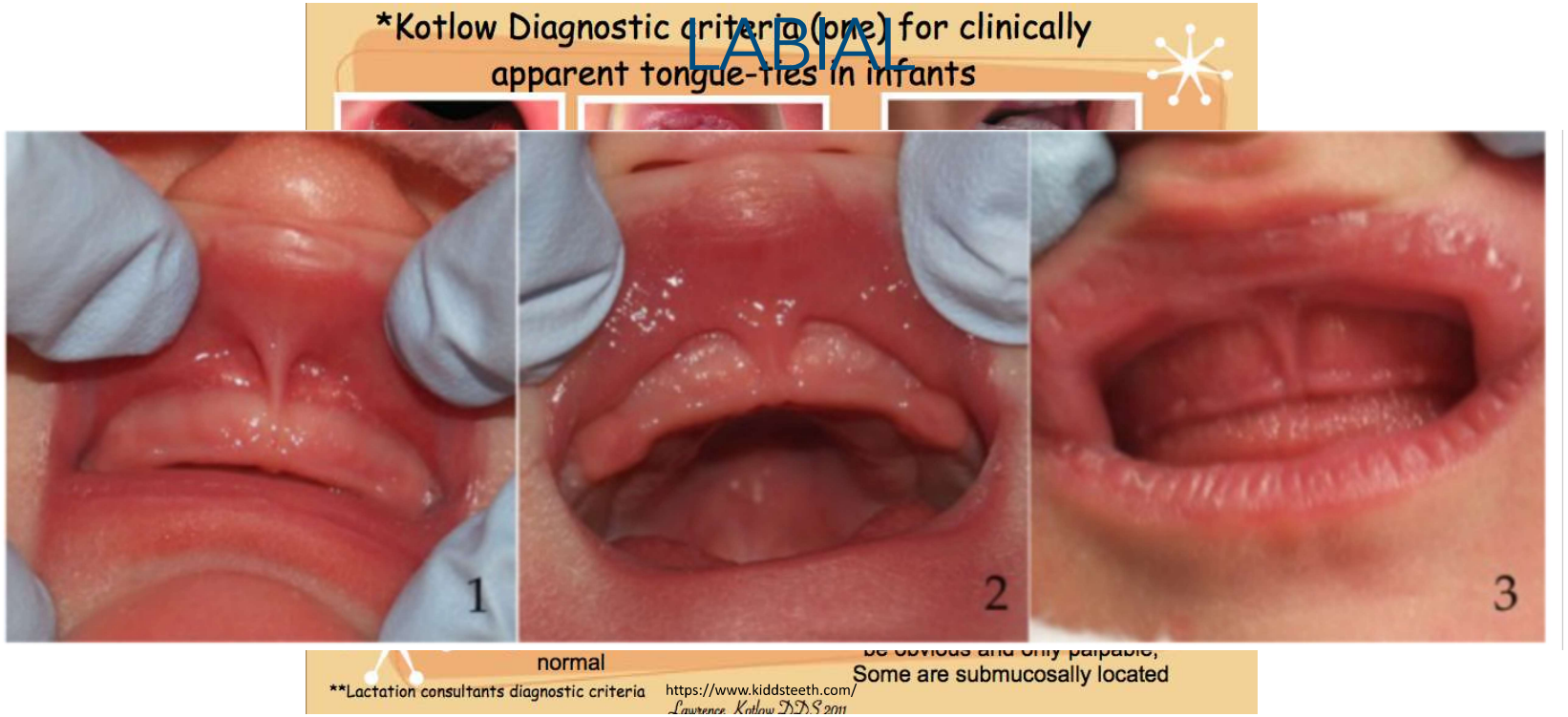
Lingual Frenulum - Infant



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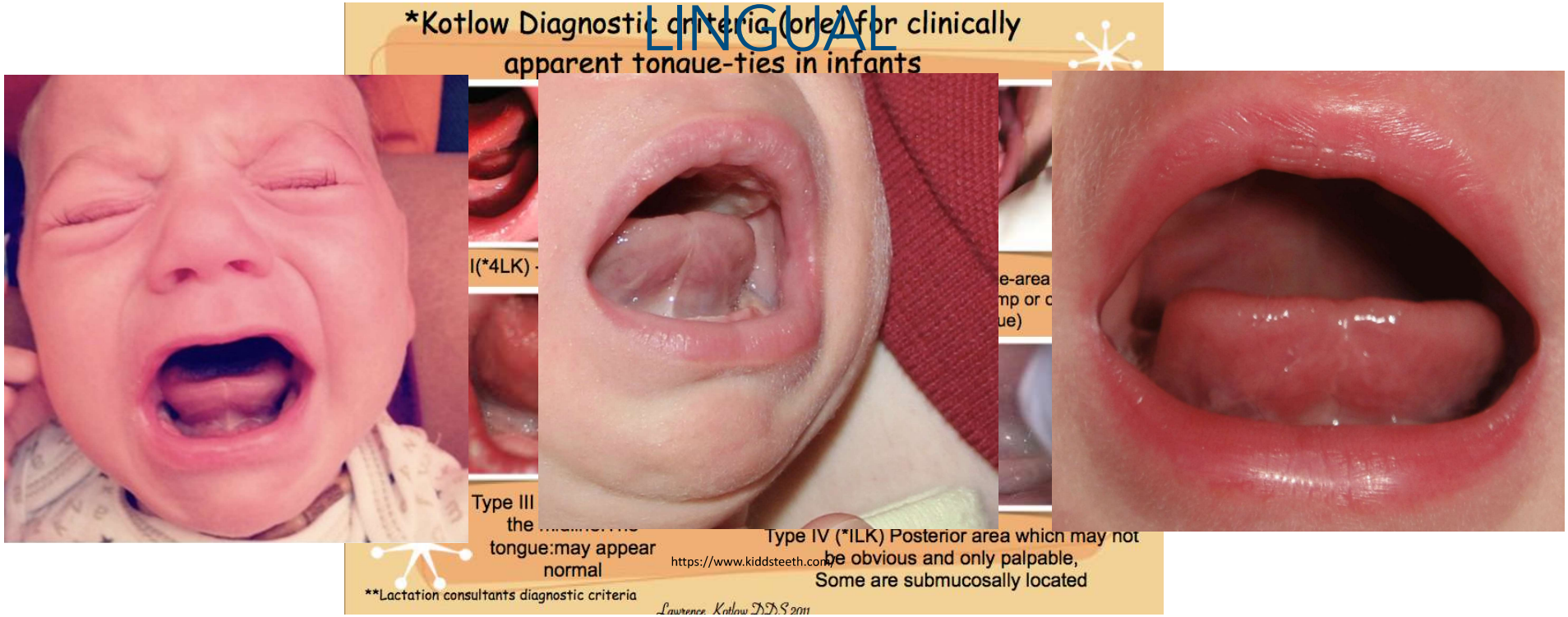
Lingual Frenulum - Infant



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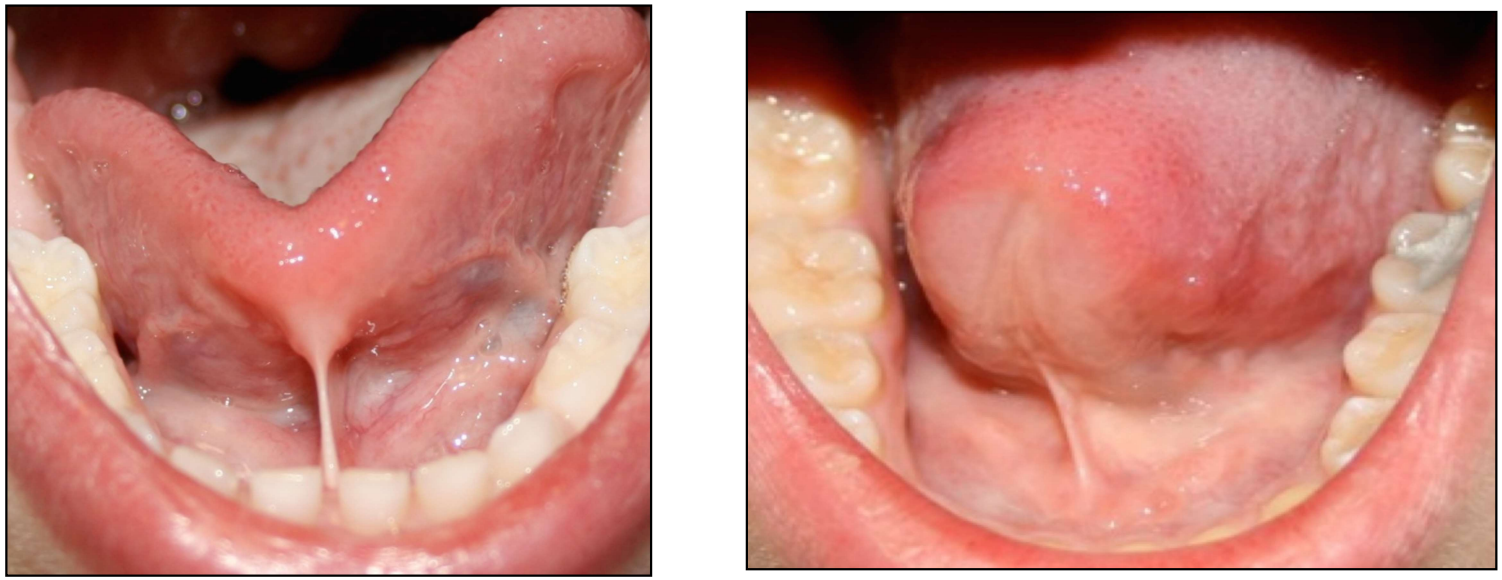
Lingual Frenulum

ATTACHMENT



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Lingual Frenulum

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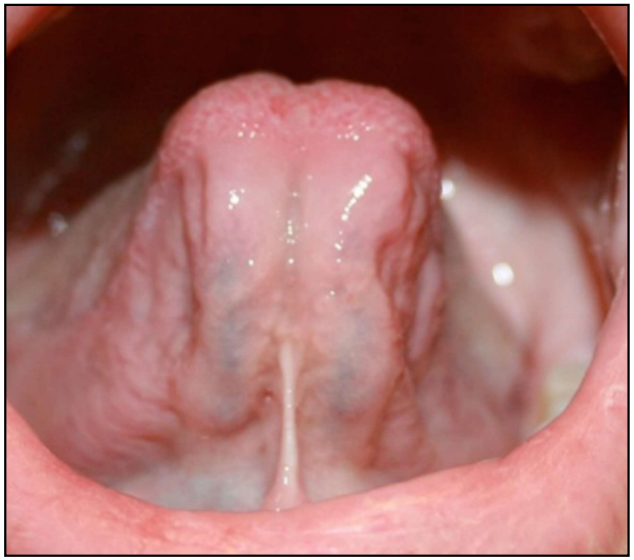

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Lingual Frenulum

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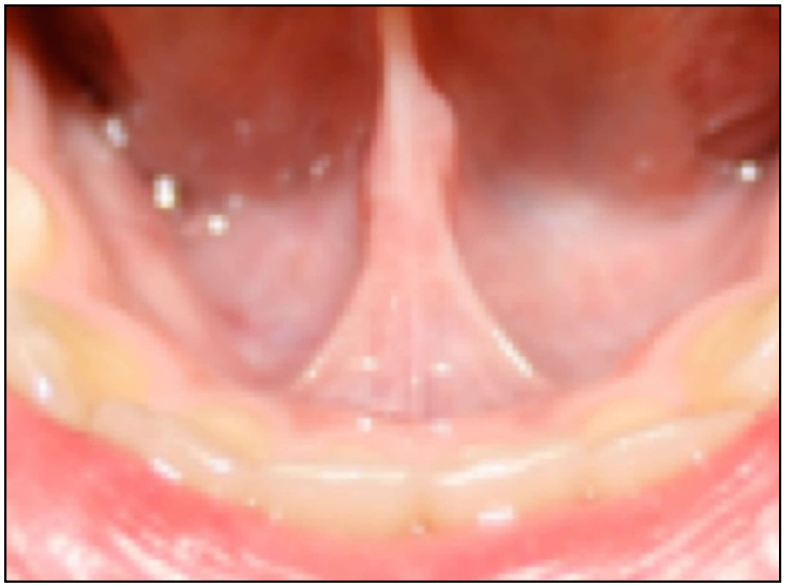
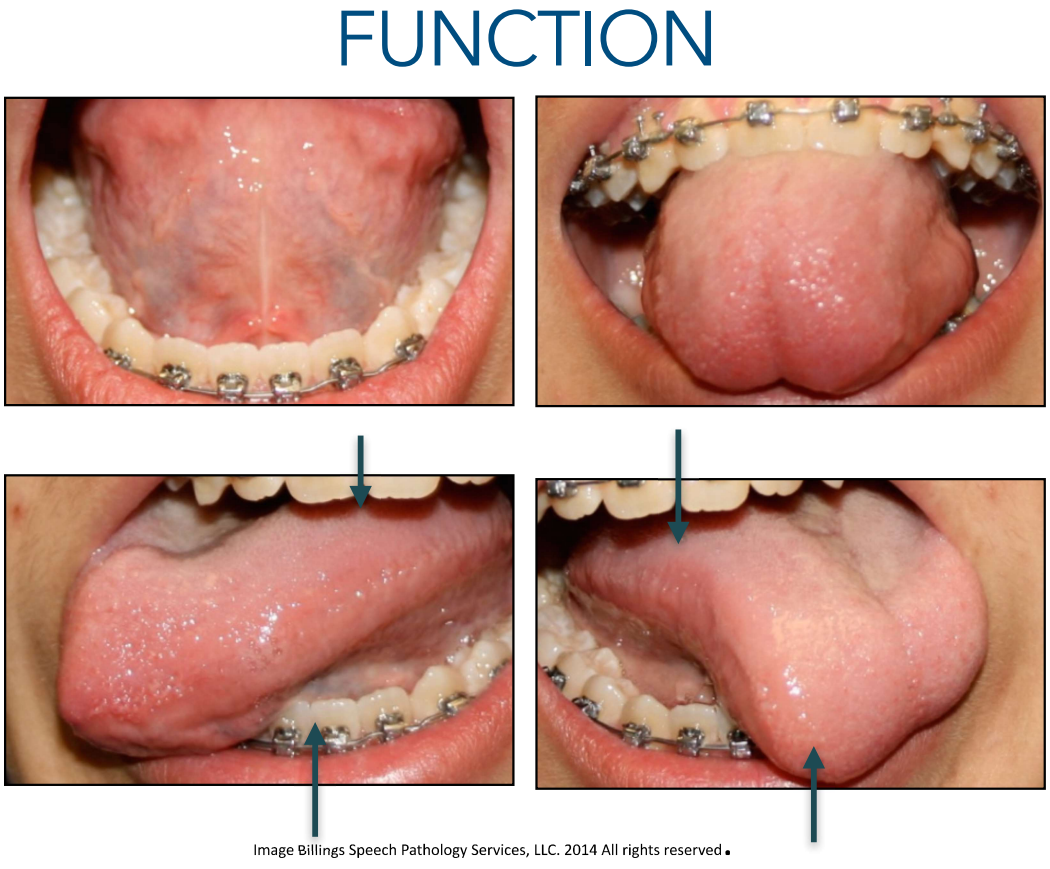


Lingual Frenulum

- Elevation
- Protrusion
- Lateralization
  - Jaw instability



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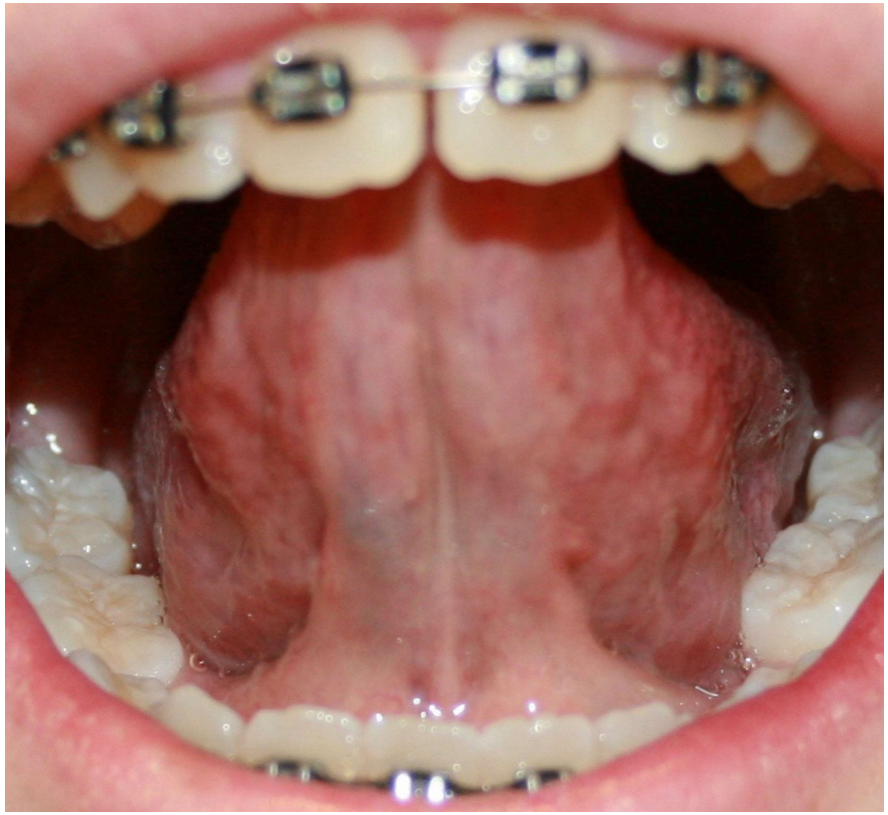
Closer…



What?????...

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LINGUAL FRENULUM

The research

Lingual Restriction Impacts Facial Growth

Huang, et.al, 2015)

01. Retrospective study of pre-pubescent children referred for suspicion of OSA, found 27 subjects with non-syndromic short lingual frenulum. The children had findings associated with enlarged adeno-tonsils and/or orofacial growth changes.

Children with untreated short lingual frenulum developed abnormal tongue function early in life with secondary impact on orofacial growth and sleep disordered breathing (SDB). After presence o SDB, analysis of treatment revealed:

Apnea-hypopnea index (AHI) of children with T&A performed without frenectomy improved but surgery did not full resolve the abnormal breathing. Similar results were noted when frenectomy was provided at same time. Finally, frenectomy on children 2 or older without enlarged adeno/tonsils also did not lead to normalization of AHI. **The changes in orofacial growth related to factors including short lingual frenulum lead to SDB and mouth-breathing early in life.**

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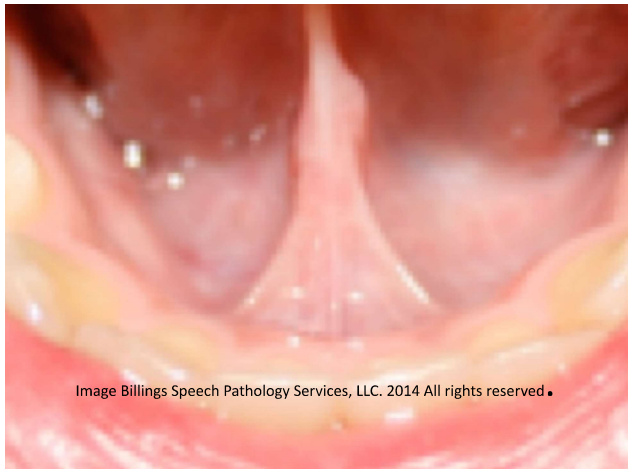
Lingual Restriction Impacts Facial Growth

(Guilleminault & Akhtar, 2015)



02.

All children with short lingual frenulum had an association with SDB when seen untreated between ages 2 and 6 years. **They had a narrow and high hard palate.**

Children Example of a short lingual frenulum in a child that presented with speech difficulties early in life and developed SDB associated with narrow hard palate. The abnormally short structure limits normal movements of the tongue and keeps it in an abnormally low position when at rest.

While the child had orthodontic treatment for abnormal maxillary growth, the presence of short lingual frenulum was not recognized. It impaired successful results of orthodontia due to its continued restriction of tongue movements as indicated by persistence of high apnea-hypopnea index (AHI) during polysomonogram (PSG).

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Lingual Restriction Impacts Facial Growth

(Huang, et.al,2015)

03. A retrospective study of prepubertal children referred for suspicion of OSA, found 27 subjects with non-syndromic short lingual frenulum. The children demonstrated findings commensurate with enlarged adeno-tonsils and/or orofacial growth changes.

- Children with untreated short frenulum developed abnormal tongue function early in life with secondary impact on orofacial growth and sleep disordered breathing (SDB).
- Analysis of SDB revealed that AHI of children adenostonsillectomy (T&A) without frenectomy improved but surgery did not fully resolve the abnormal breathing.
- Frenectomy on children 2 years or older without enlarged adeno tonsils also did not lead to normalization of AHI.

The changes in orofacial growth related to factors including short lingual frenulum lead to SDB and mouthbreathing very early in life.

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Swallow System

SWALLOW - ORAL PHASE

- mastication
- control
- bolus formation
- bolus collection
- transfer

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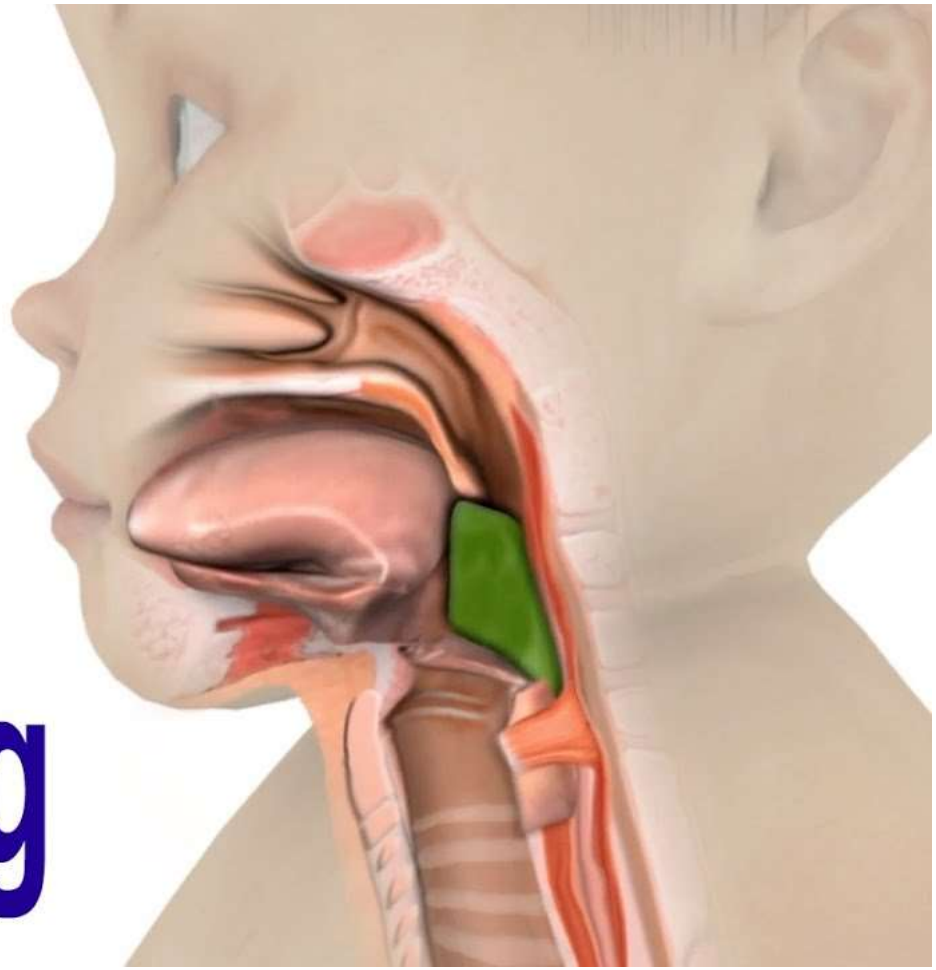
4 Stages of Normal Swallowing



https://www.FauquierENT.net

WHAT ABOUT THE SWALLOW

The Importance of Suck-Swallow-Breathe

Suck-
Swallow-
Breathe

Synchrony

Reaching, standing upright, and nearly all other reflexive movement patterns rely on the ***suck-swallow-breathe*** musculature.

SSB is the ***first motor (axion) coordination*** benchmark of development. We have a downloaded code for suck-swallow-breathe, just as we have central pattern generators for other movements like reaching, walking, squatting, and many others.

Suck-Swallow Breathe Synchrony

SUCKING BEGINS IN UTERO

- Tongue bud emerges at 4 weeks gestation
- Begins moving by 8 weeks gestation
- At 12 weeks there is enough sucking to swallow the equivalent of 12 ounces of fluid daily
- At 16 weeks active "sucking" begins (thumb, finger, toe sucking present)
- The lingual frenulum gradually resorbs (around 20 weeks) to allow the tongue to move more posteriorly and improve SSB sequencing
- Coordination of the suck-swallow-breathe sequence is present at 32 weeks with greater mastery by 37 weeks
- Recent research suggests the swallow doesn't fully mature until the 40th week of gestation.
- Newborn will swallow approximately 50% of the fluid in amniotic sac by birth.

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Suck-Swallow Breathe Synchrony

SSB

- Failure to achieve mastery of certain milestones will have consequences at various levels, from serious neuromuscular disorders to motor control limitations in high level skill acquisition.
- Addressing suck-swallow-breathe can improve other dysfunctions.

OF NOTE:

- Inadequate development of suck-swallow-breathe synchrony is not commonly discussed in adults but is one possible theory behind sleep apnea, poor stability, and overall poor motor control.

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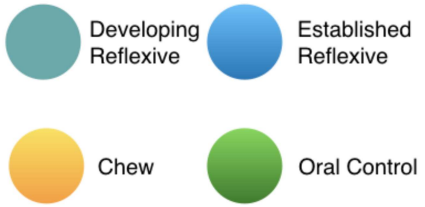
Swallow Milestones & Reflexes

0-3 MONTHS



Chastain, A. GoMap Infant & Toddler Feeding, 2018. Reproduced

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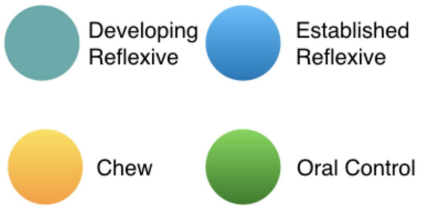
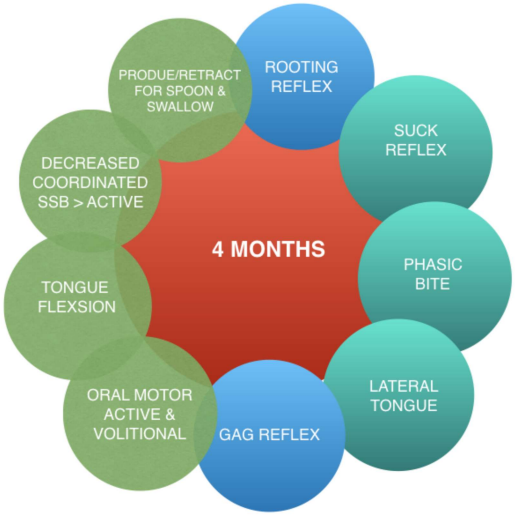
Swallow Milestones

4-6 MONTHS





Chastain, A. GoMap Infant & Toddler Feeding, 2018. Reproduced

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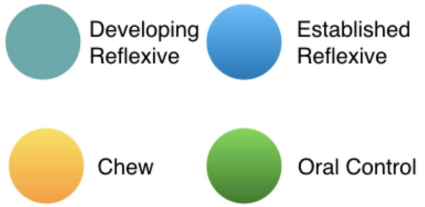
Swallow Milestones

7-9 MONTHS



Chastain, A. GoMap Infant & Toddler Feeding, 2018. Reproduced

Early Feeding Patterns

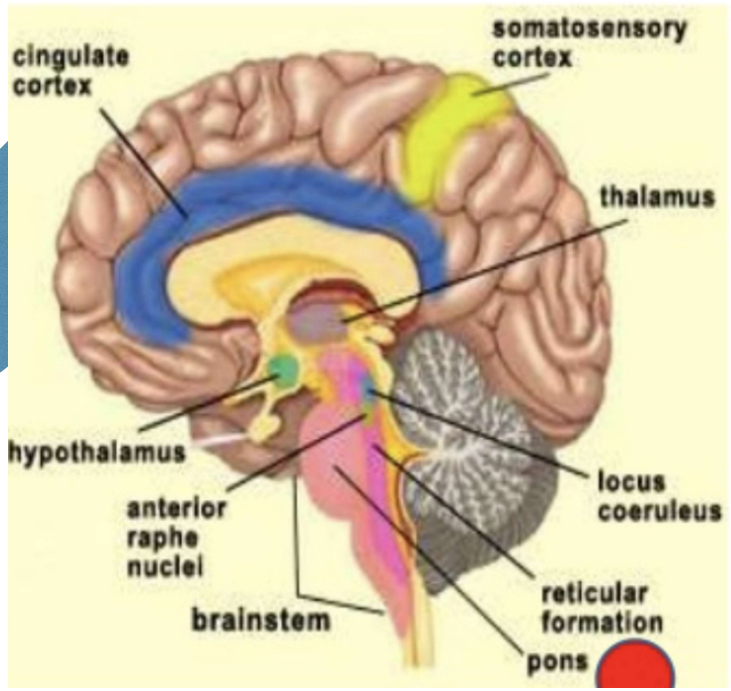
IMPORTANCE

- The tongue is leading muscle in oral-facial development
- Long term breast-fedf children are much less likely to need orthodontia. (***Palmer, B.1998)***
- Even 3 months of breastfeeding makes orthodontic difference. (***Pottenger & Krohn & Montagu, 1977)***
- Frequent peristaltic pressure of tongue to palate helps to widen & mold palate to fullest genetic potential. (***Straub W., & Garliner D., 1971***)
- Short lingual and labial frenums impact ability to breastfeed successfully

"THRUST" PATTERNS

A REVIEW

The Chew



Kheite, A. J of Neuroscience, Oct. 1991

Mastication is a programmed event residing in a “chewing center” located within the brain stem, likely in the reticular formation of the pons

The Chew & Collection

TONGUE THRUST PATTERNS

TYPE	OCCLUSION	PATTERNS OF MOVEMENT
1	Class I	Pressure is concentrated on the incisors in a wedging action, driving upper and lowers apart anteroposteriorly
2	Class II, Division 1	"Dispersing" action of the tongue, spread between the teeth around the dental arch from 1st molar to 1st molar
3	Class III	Apex thrust against lower incisors or symphysis of the mandible. Results in a functional Class III, a mandible of normal size displaced anteriorally
4	Bimaxillary Thrust	Tongue thrust against lingual margins of upper and lower incisal edges. May result in spacing of lower teeth
5	Open Bite	Thrust into contact with lower lip before molars occlude
6	Closed Bite	Flaccid generalized protrusion. Tongue usually engulfs the entire lower arch
7	Unilateral Thrust	Thrust at an angle toward the involved cuspid or bicuspid, somewhat like type 5
8	Bilateral Thrust	Spread bilaterally between buccal teeth. Tongue tip usually braced against lower incisors in order to execute thrust, may lead to Class III occlusion

(Hanson, M., Barrett, R., (1988). Fundamentals of Orofacial Myology. Reproduction).

Noxious Habits

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Noxious Habits

Noxious Habits

- Between 75 and 95% of all infants suck their thumb (Larsson & Dahlin, l985)
- Approximately 30 to 45% of American children engage in nonnutritive sucking habits in preschool (Traisman & Traisman, l958)
- Most common in females (Curson, l974)
- Only 5-20% have a sucking habit after 6 years of age (Gellin, l978)
- Found no evidence of sucking habits in Artic areas
  Rare in American Indian and African children (Palmer, 2008)

Suck-Suckle

There's a difference..

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Sucking Habits

freeimages.com

- Mouthing and sucking in infants is developmentally appropriate and occur 100% (or should) neonatally (Barlow, 2012)
- Incidence of oral habits: 13-100% at some time in infancy (Blum, N, 1999., Traisman & Traisman, 1958)
- Effect of habits on dento-alveolar-skeletal deformation. (AAPD, Policy on Oral Habits, 2014)
- Form vs. Function: structure and function act reciprocally on one another. (Hanson & Cohen, 1973)
- "Teeth will not go where muscle will not allow." (Dawson, 2000).

Habits: Pacifiers

www.googleimages.com/pacifiers

Nope!

Habits: Pacifiers

Thoughts on Pacifiers

- Not all babies require extra sucking or a pacifier
- Choose one that fits the oral cavity
- Reduce access by 6 months and work to eliminate before 8 months
- Long term sucking results in adaptation and poor integration of oral reflexes
- Sucking after 12 months becomes a noxious habit

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It's Personal

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Habits: Sippy Cups & More

www.googleimages.com/pacifiers

Habits: All Shapes & Sizes

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Habit Elimination: It Works

Week 1

Week 4

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Habit Elimination: It Works

4 months of therapy

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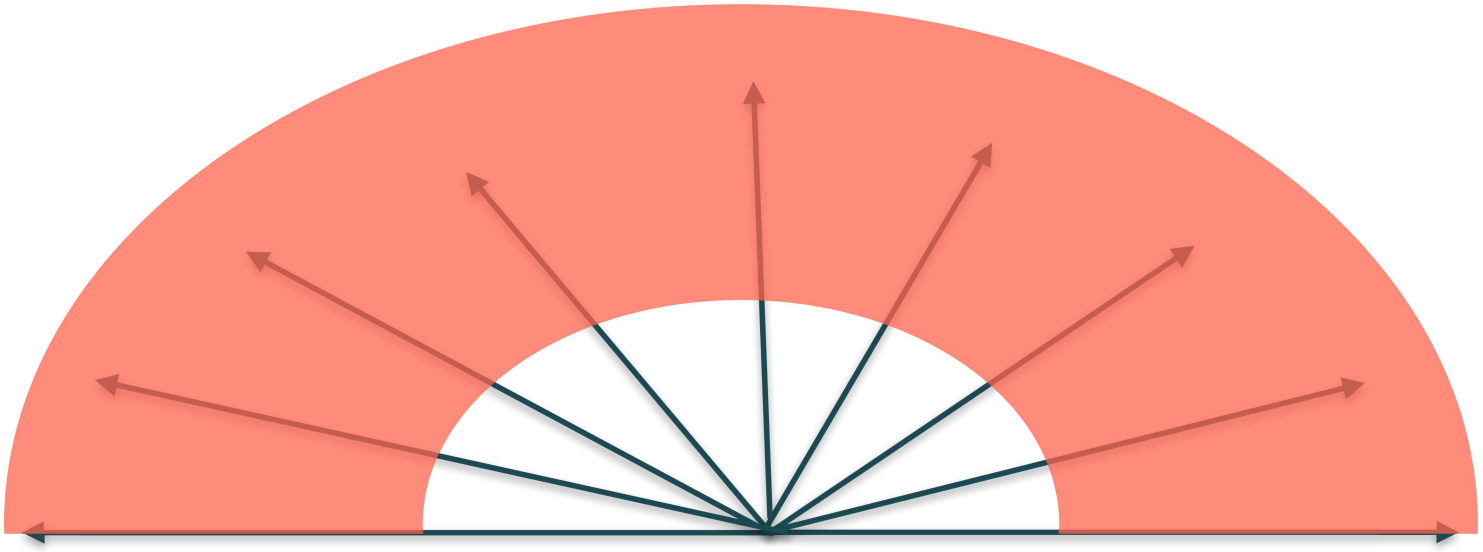
So How Do We Get There?

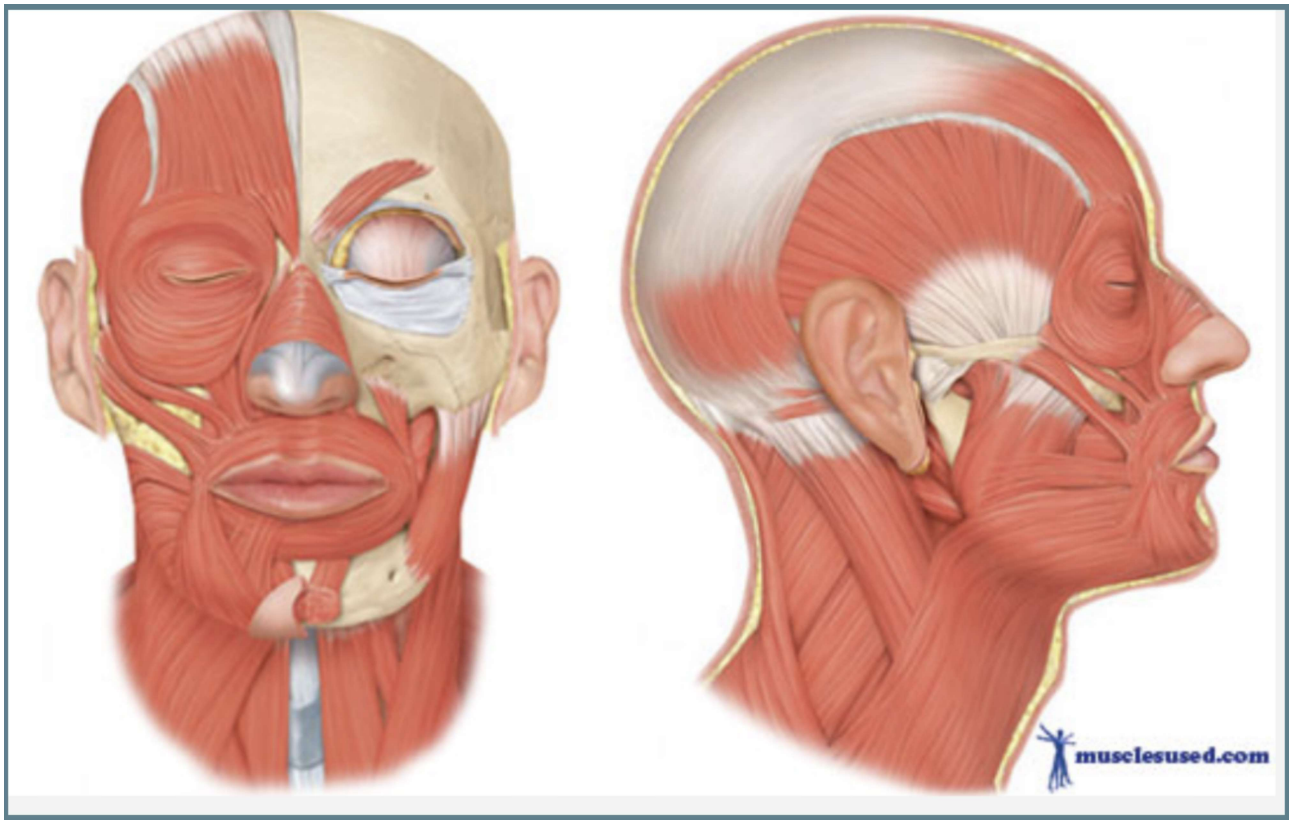


HOW A FUNCTIONALIST THINKS

GLOBALLY

“In a battle between muscle and bone, muscle will always win.”

- Peter Dawson, DDS



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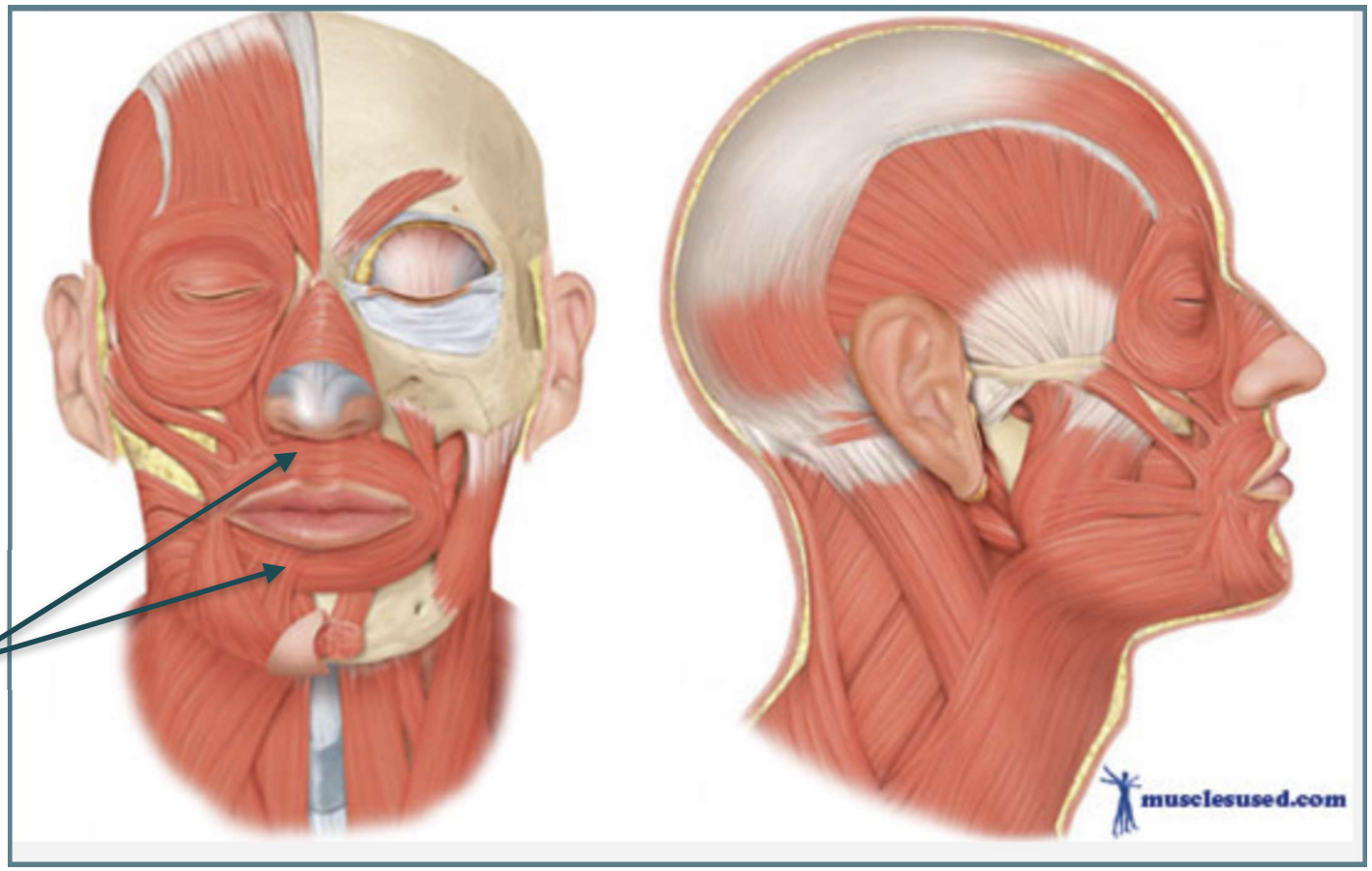
Facial Muscles

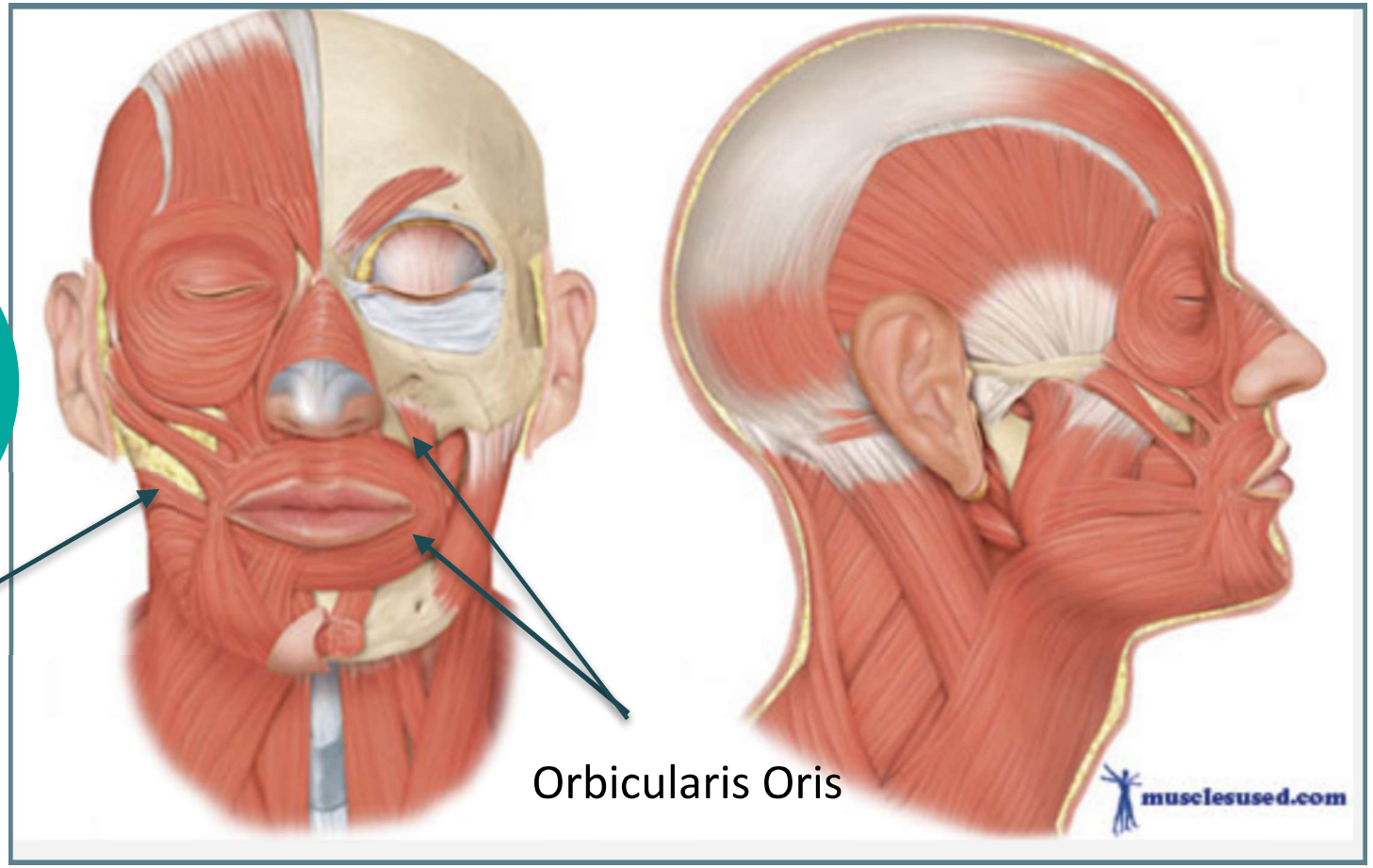
<u>Orbicularis Oris</u>
Brings lips together; seals the lips



Orbicularis Oris

Facial Muscles

<u>Risorius</u>
Retracts
Orbicularis Oris



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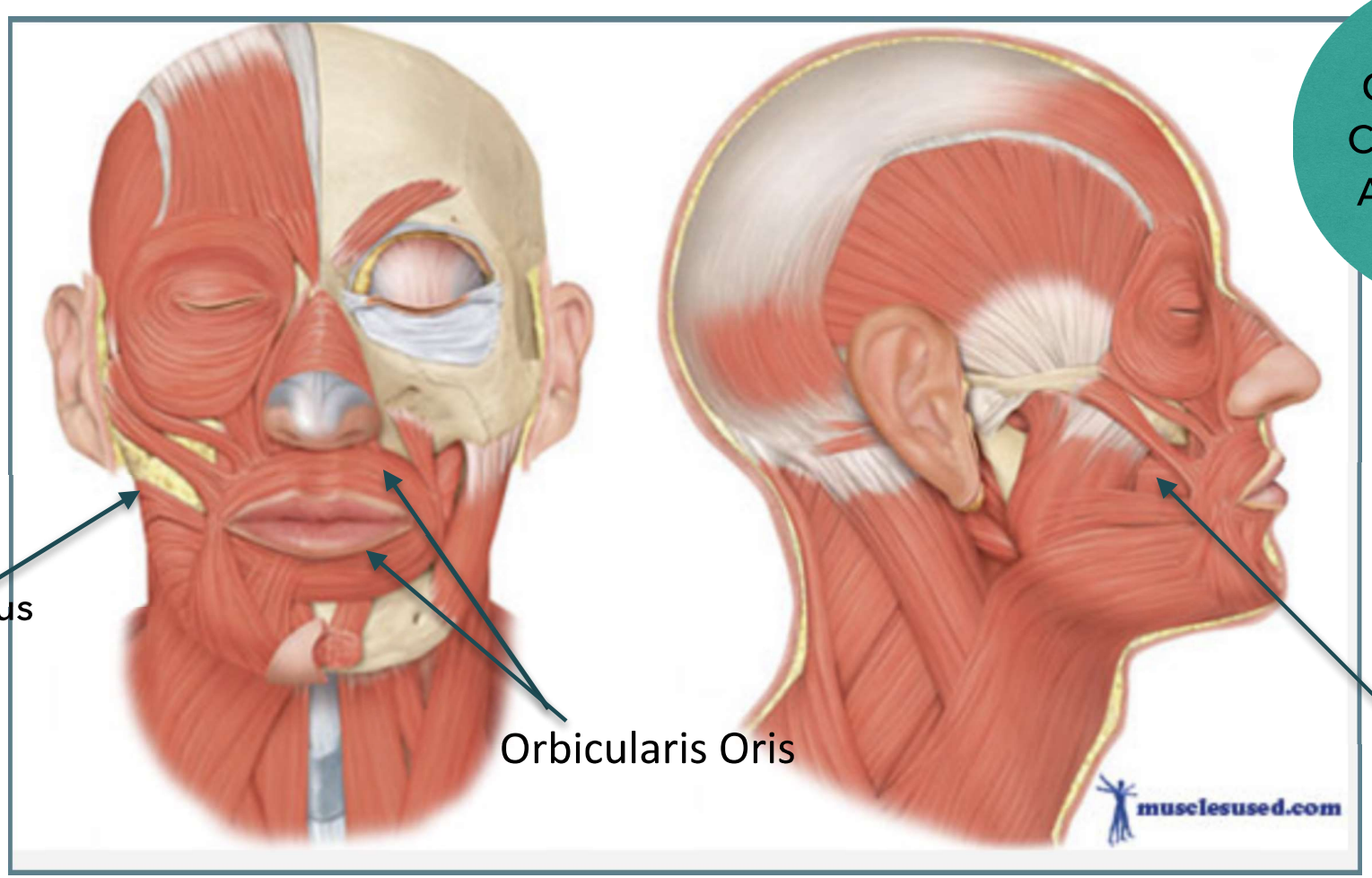
Facial Muscles



Risorius

Orbicularis Oris

Buccinator

Buccinator
Coordinates
Chew Process
Assists Bolus
Collection

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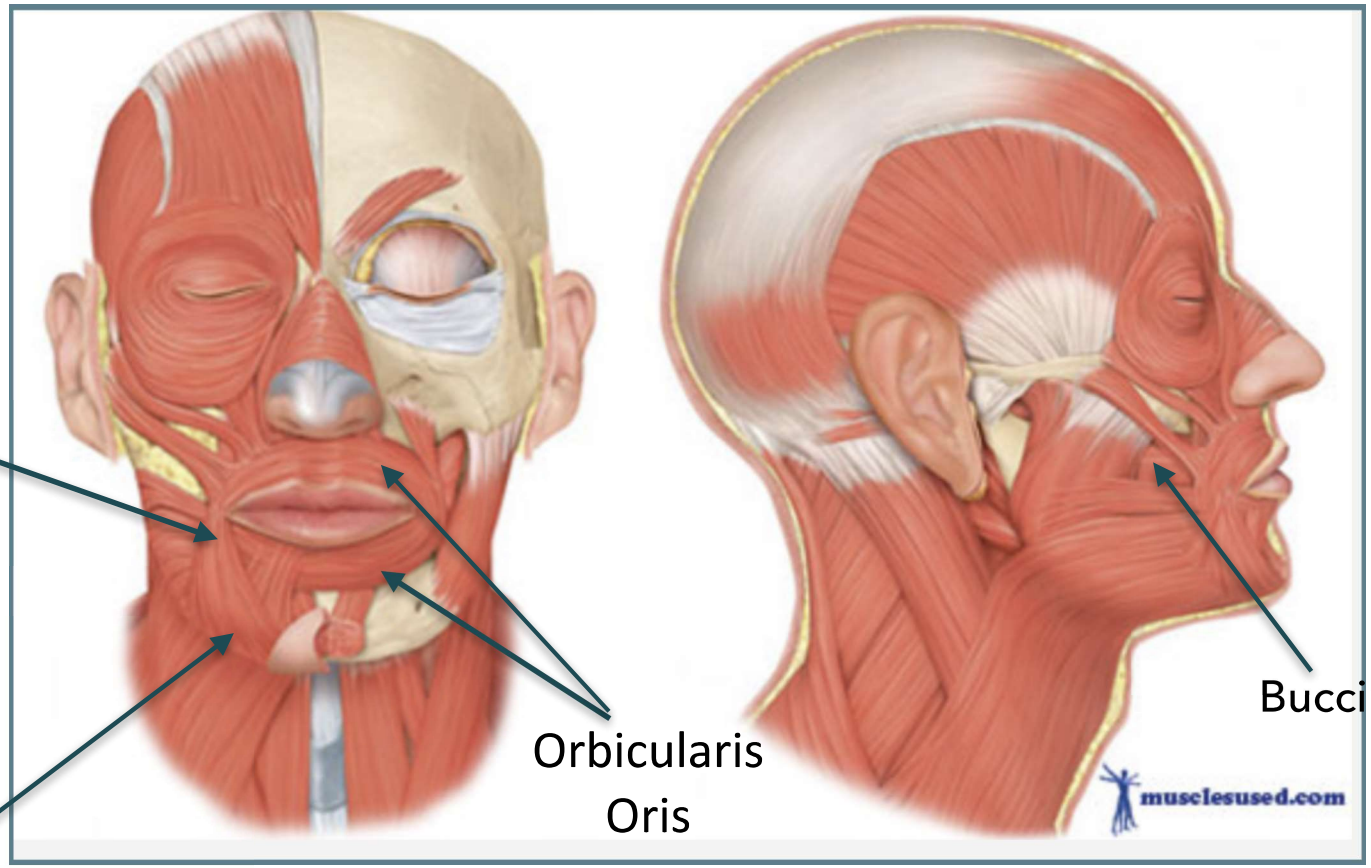
Facial Muscles

Depressor Anguli Oris
Draws the Corners of the mouth downward



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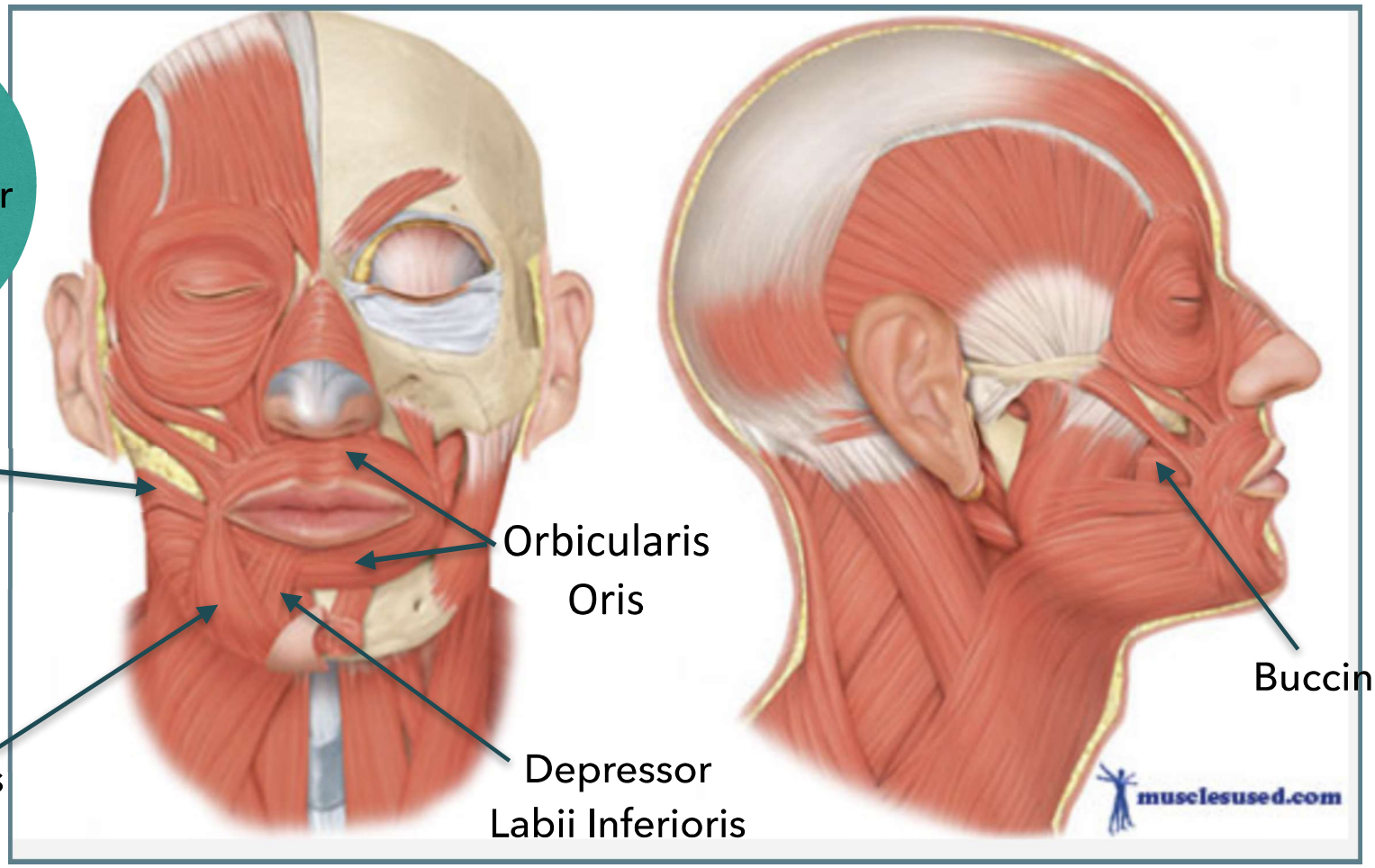
Facial Muscles

Depressor Labii Inferioris
Draws the lower lip downward



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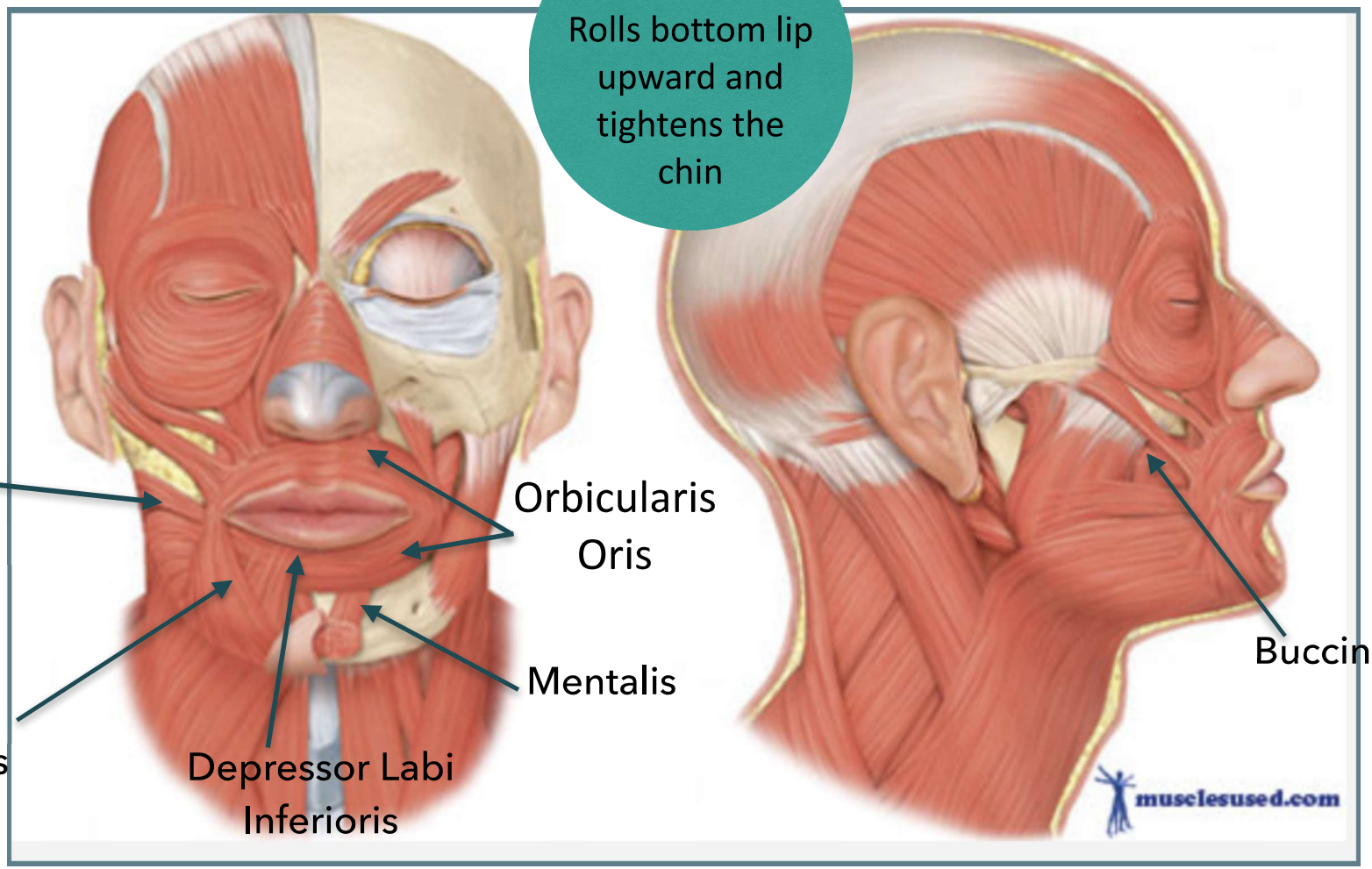
Facial Muscles



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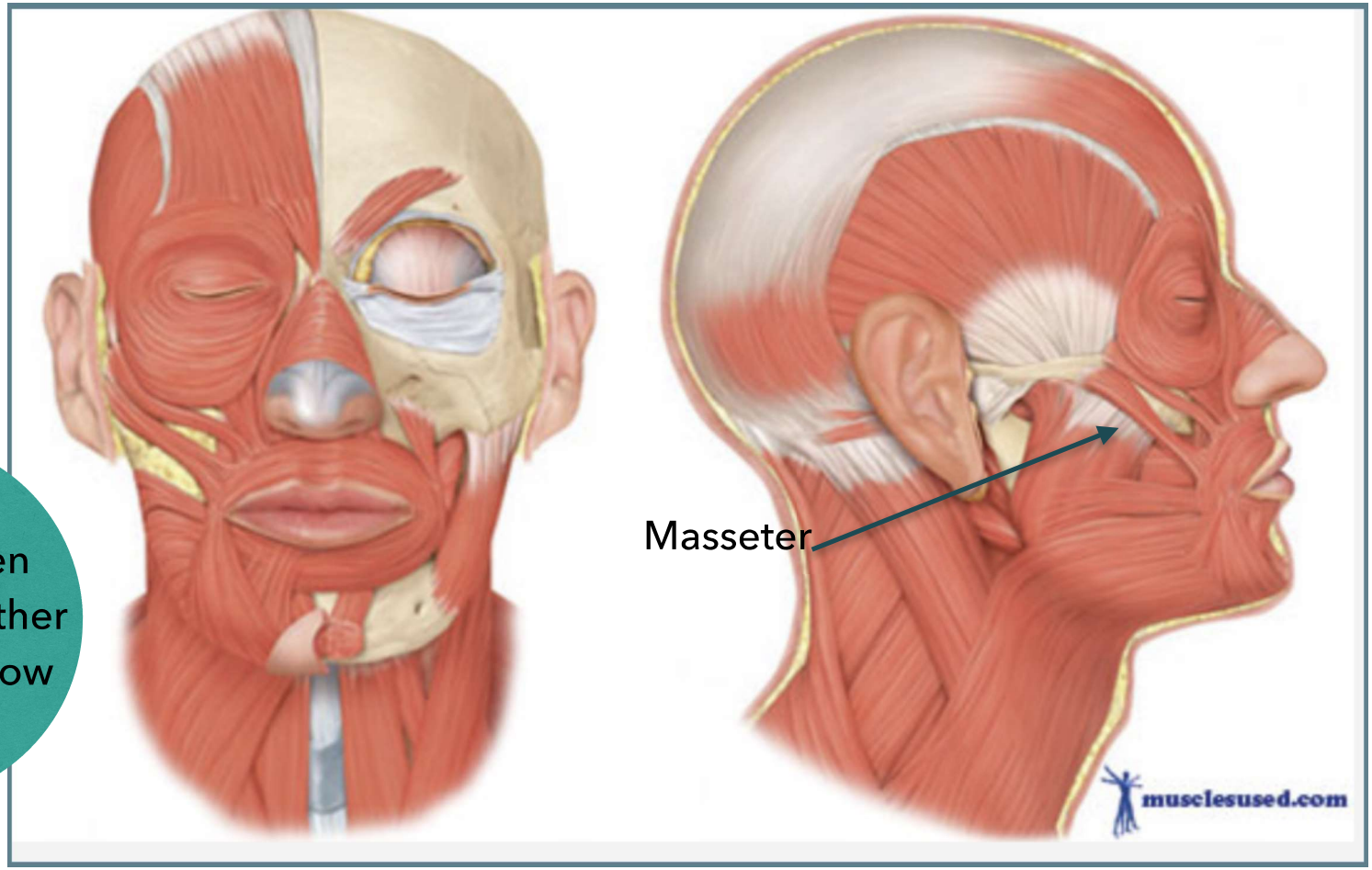
Masticatory Muscles

<u>Masseters</u>
Activate when teeth are together
Activate swallow onset



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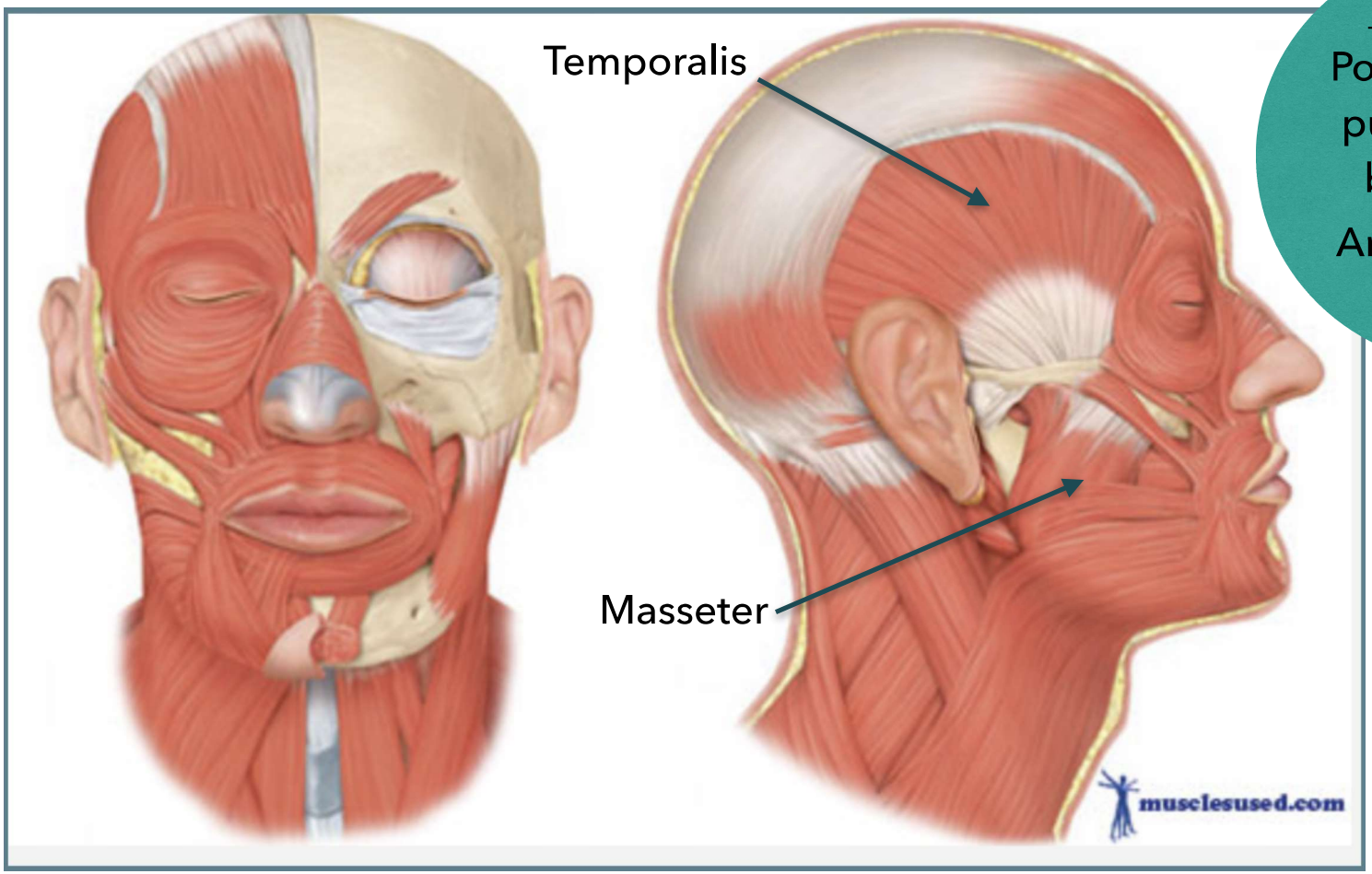
Masticatory Muscles

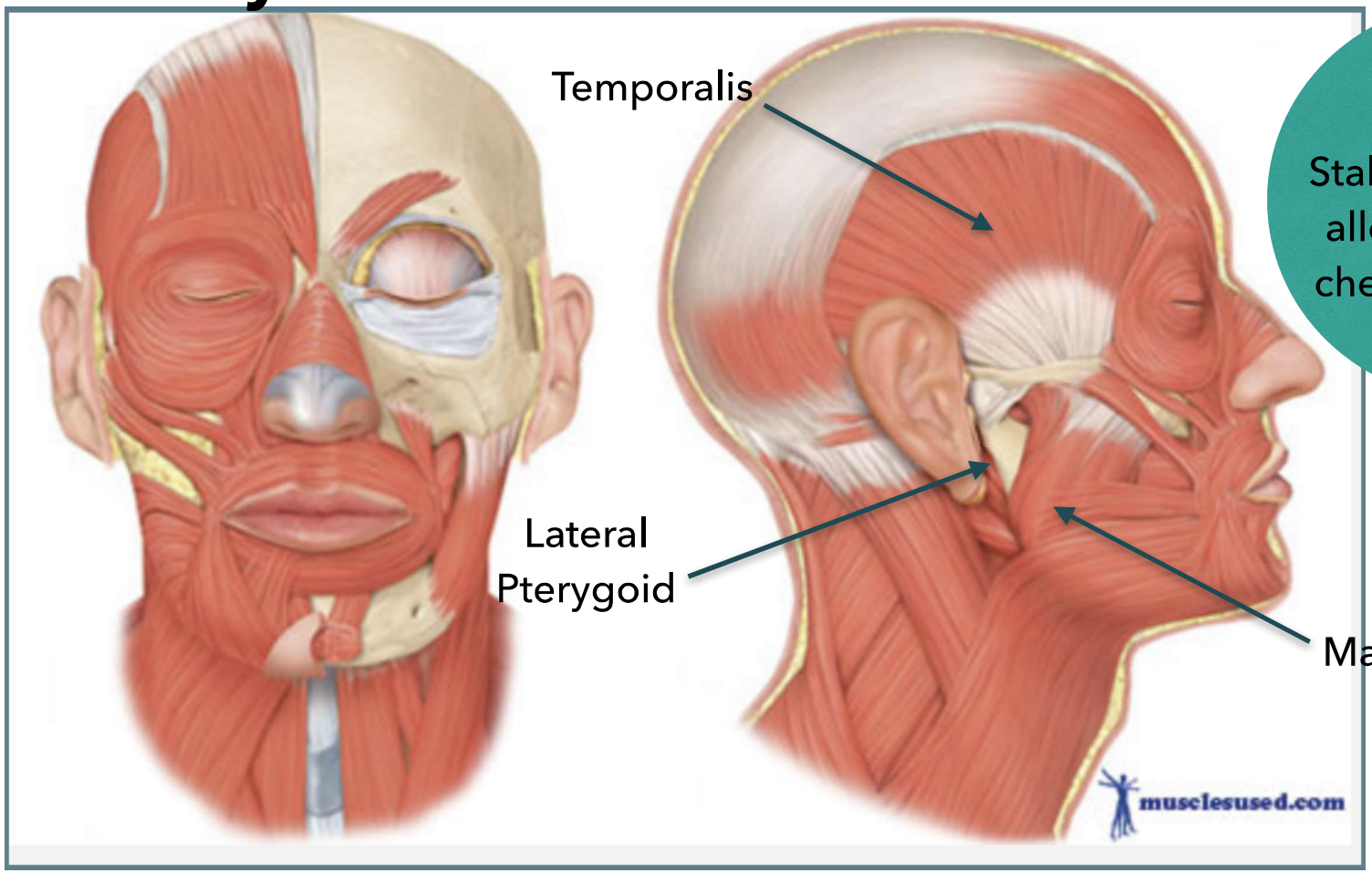


Temporalis

Posterior fibers pull mandible backwards;

Anterior fibers move

Masticatory Muscles



Lateral Pterygoid
Stabilizes the jaw; allows for rotary chew movement; jaw

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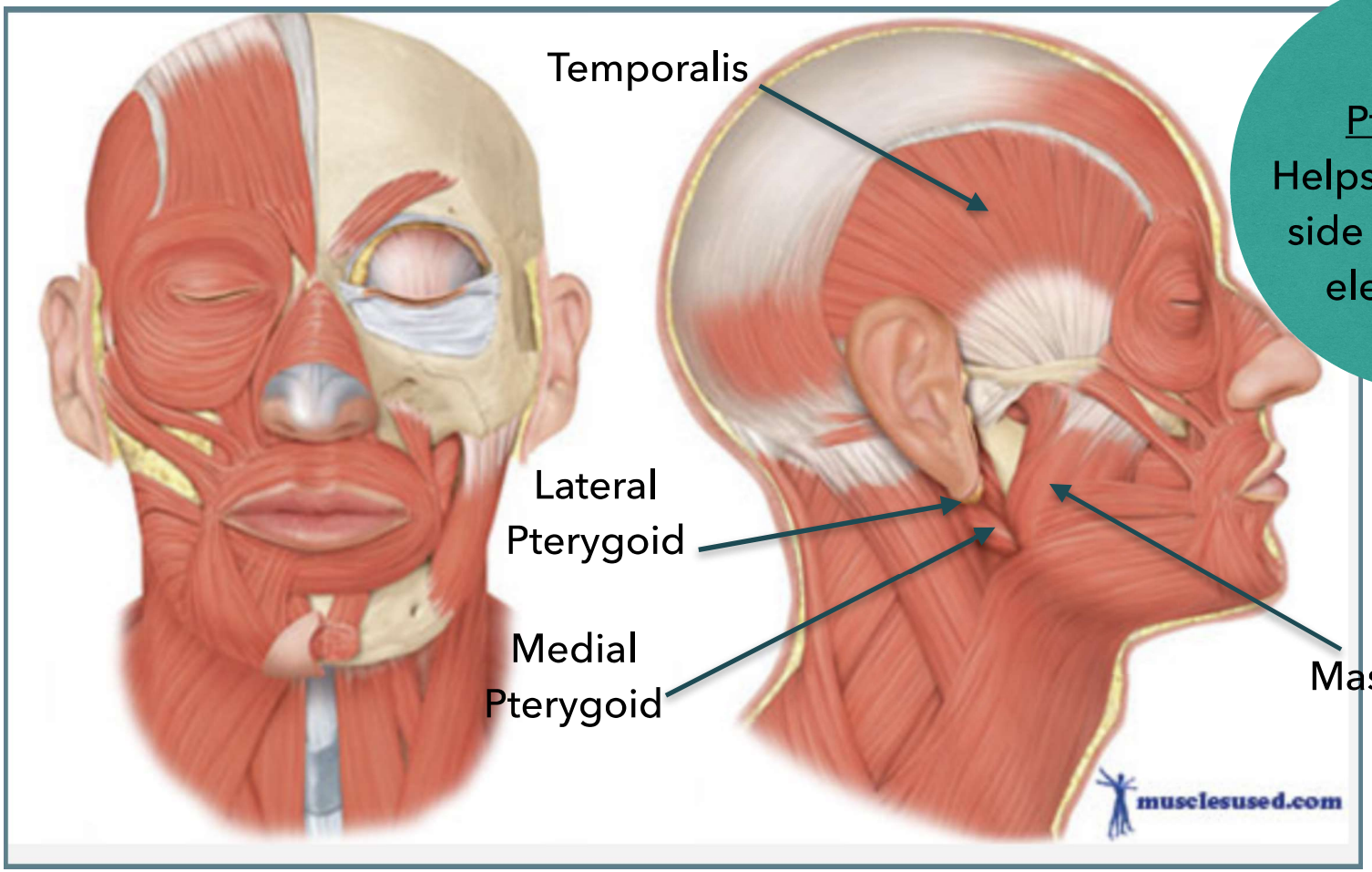
Masticatory Muscles



Medial Pterygoid
Helps with side to side movement; elevates the jaw

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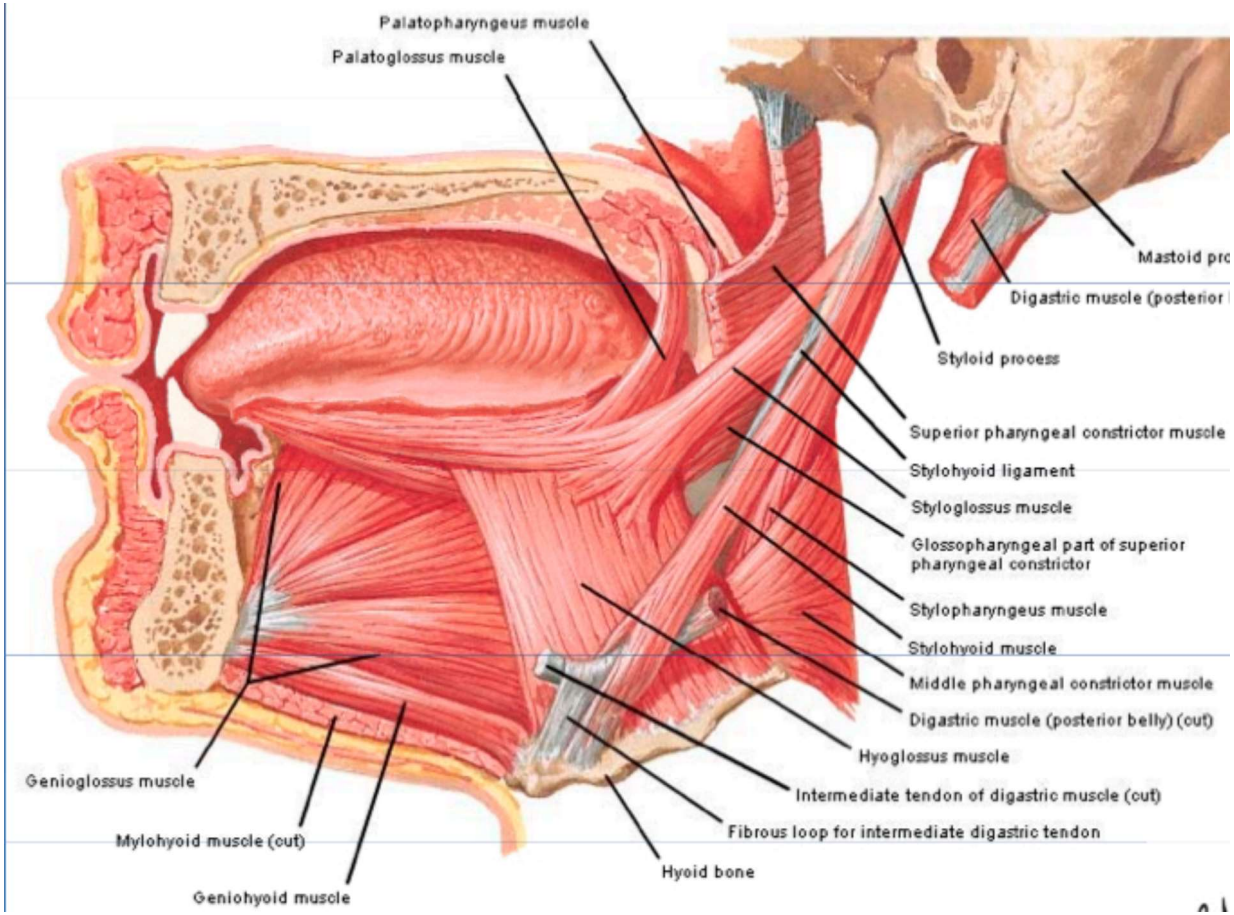
The Tongue: A Complex and Dynamic System



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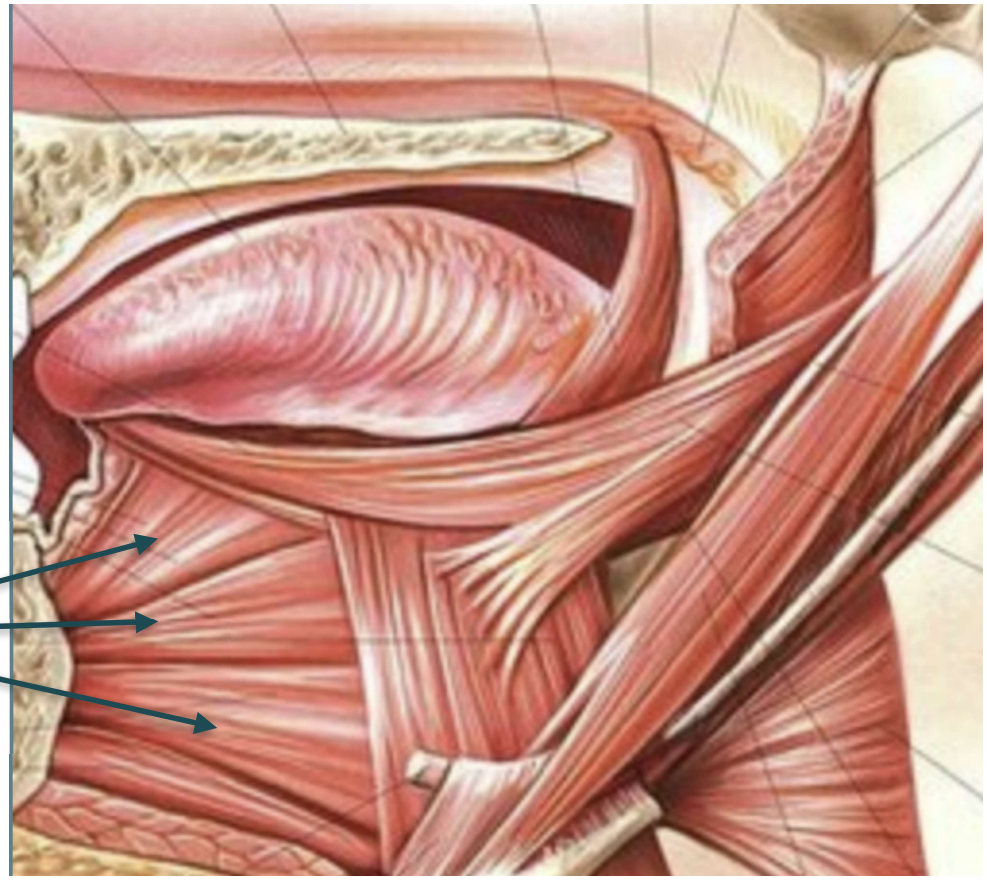
The Tongue: Extrinsic Muscles



<u>Genioglossus</u>
Raises the tip; aids in grooving, moves bolus posteriorly

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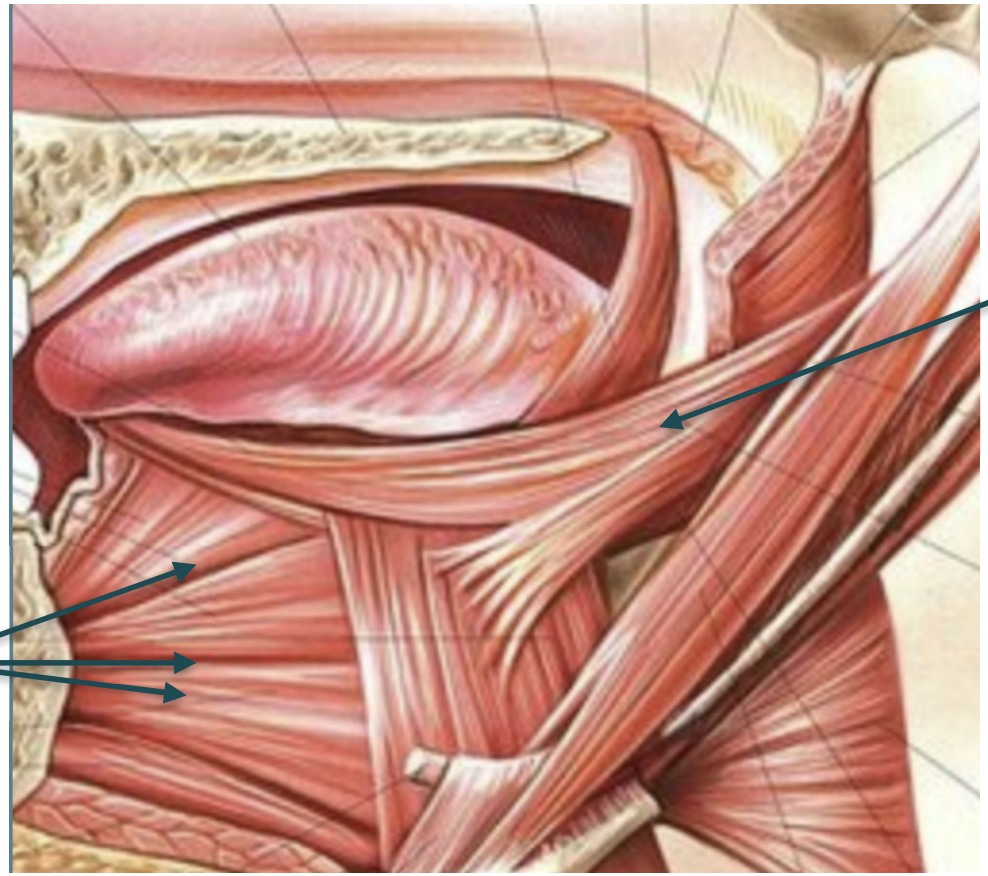
The Tongue: Extrinsic Muscles



Styloglossus

Genioglossus

Styloglossus
Raises the sides of the tongue for collection. Pulls the tongue up and back

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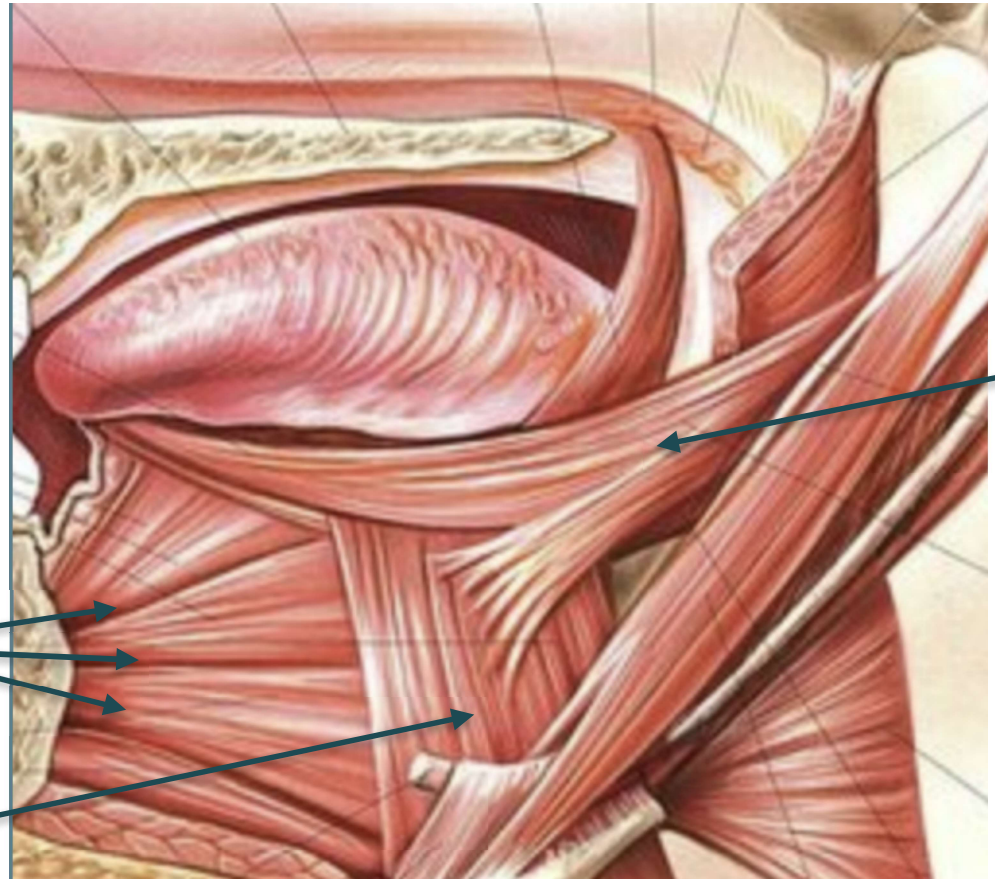
The Tongue: Extrinsic Muscles



Hyoglossus
Depresses the body of the tongue; assists in grooving and bolus collection

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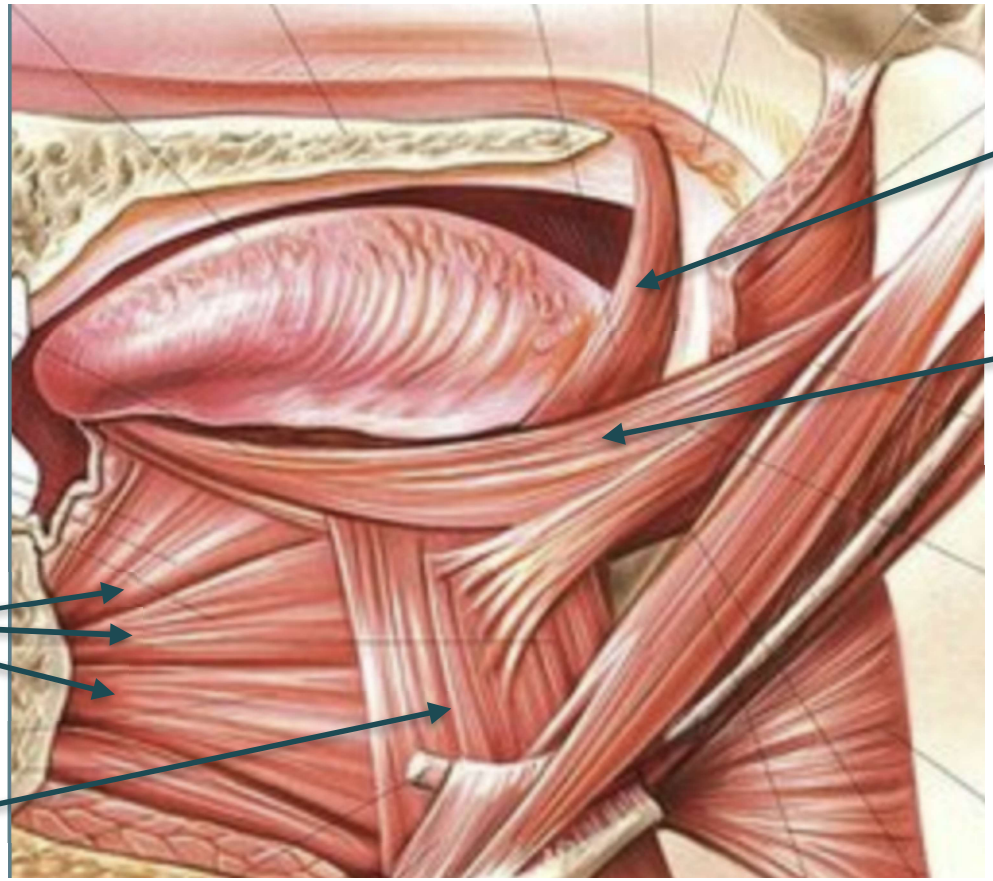
The Tongue: Extrinsic Muscles



<u>Palatoglossus</u>
Elevates the posterior tongue; closes oropharynx; helps initiate swallow

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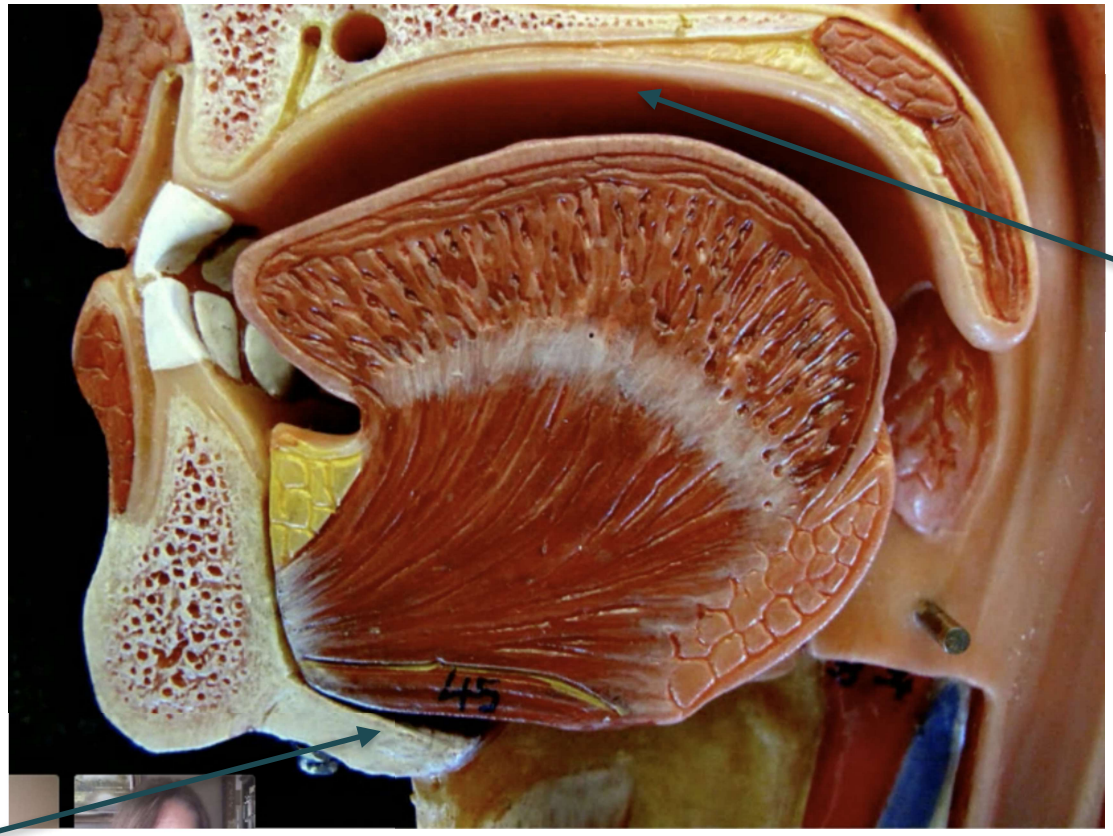
The Tongue: Intrinsic Muscles



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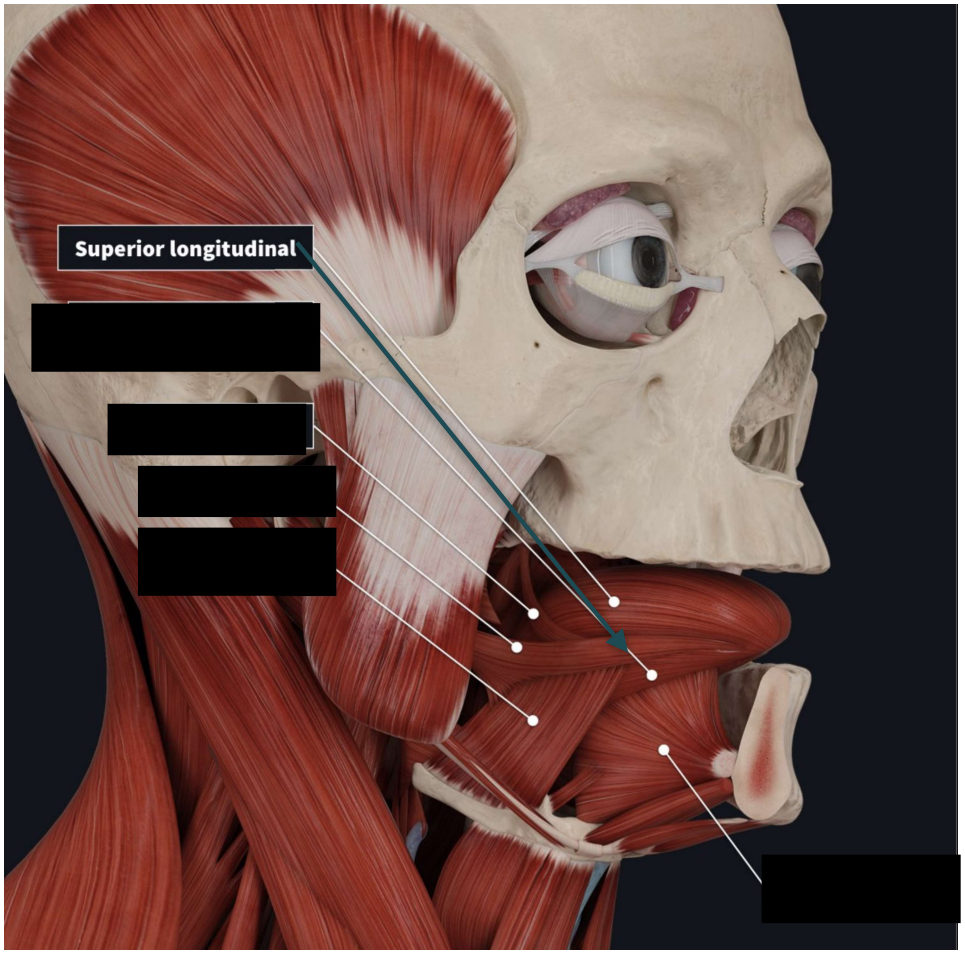
The Tongue: Intrinsic Muscles



Superior Longtitudinal
Elevates side of the tongue for bolus collection;

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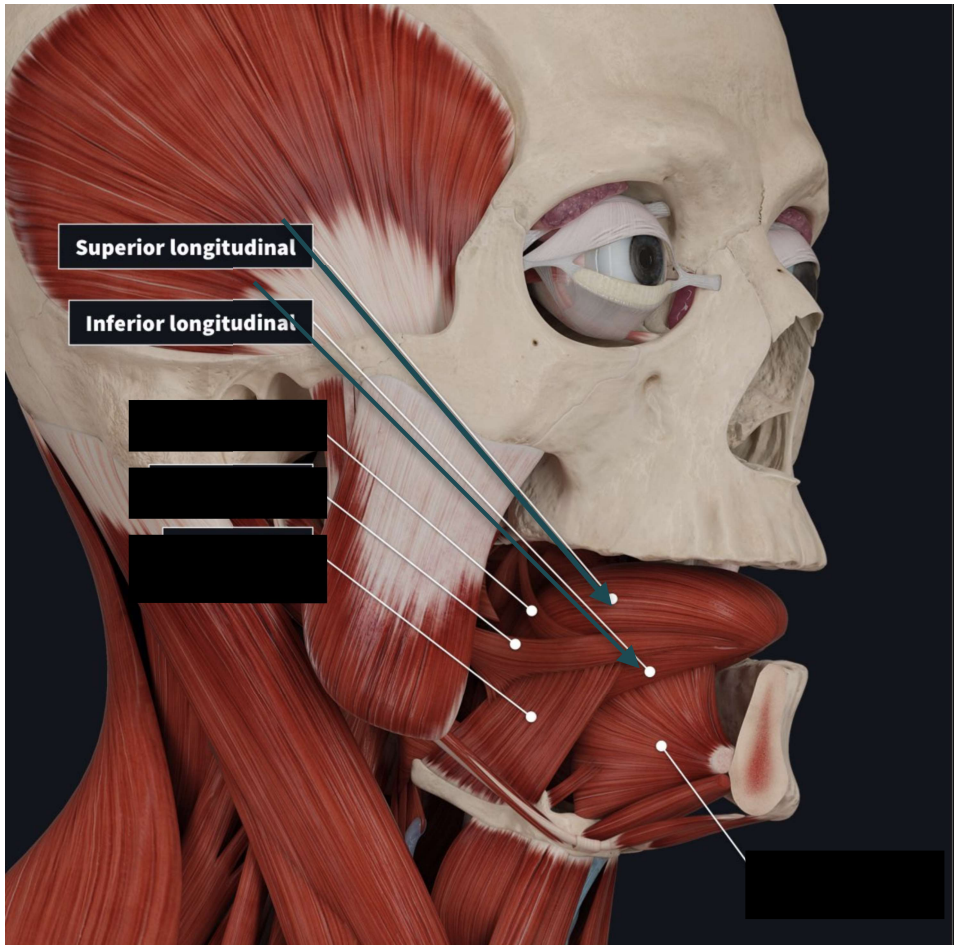
The Tongue: Intrinsic Muscles



Inferior Longitudinal
Lowers sides of the tongue; allows for tongue grooving collection;

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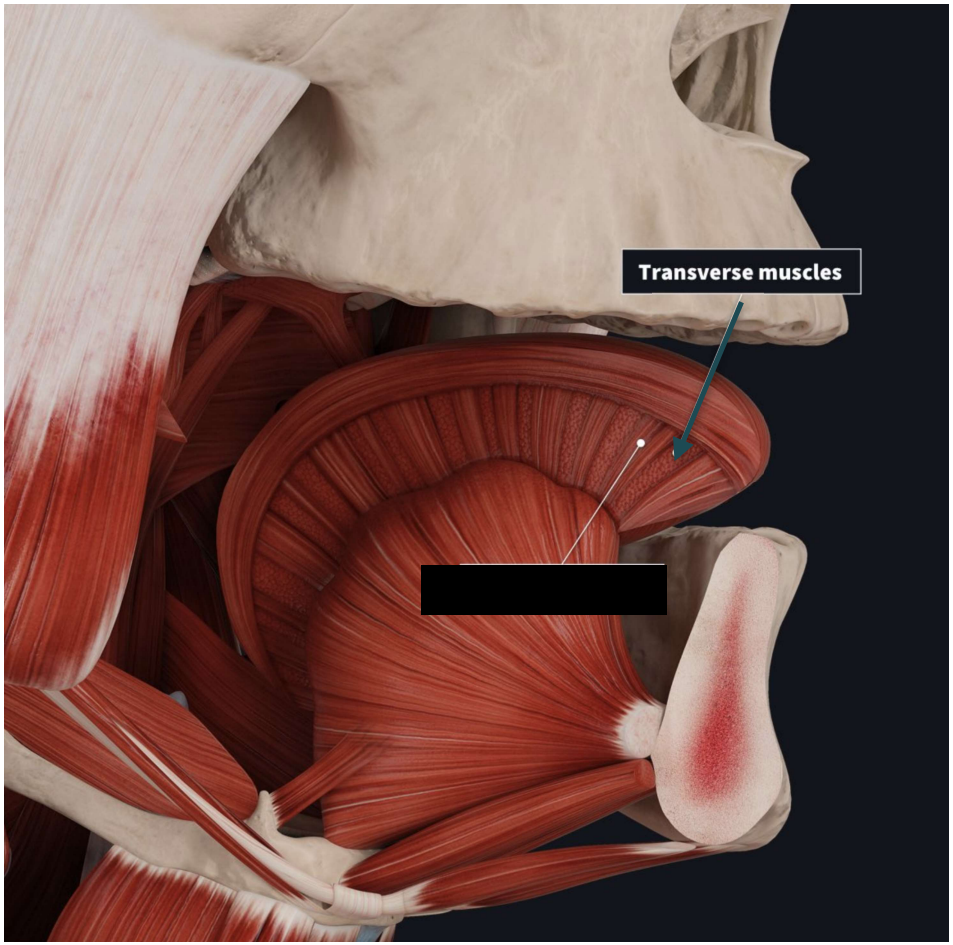
The Tongue: Intrinsic Muscles



<u>Transverse</u>
Helps pull tongue downward to form the bowl; assists in tongue grooving collection;

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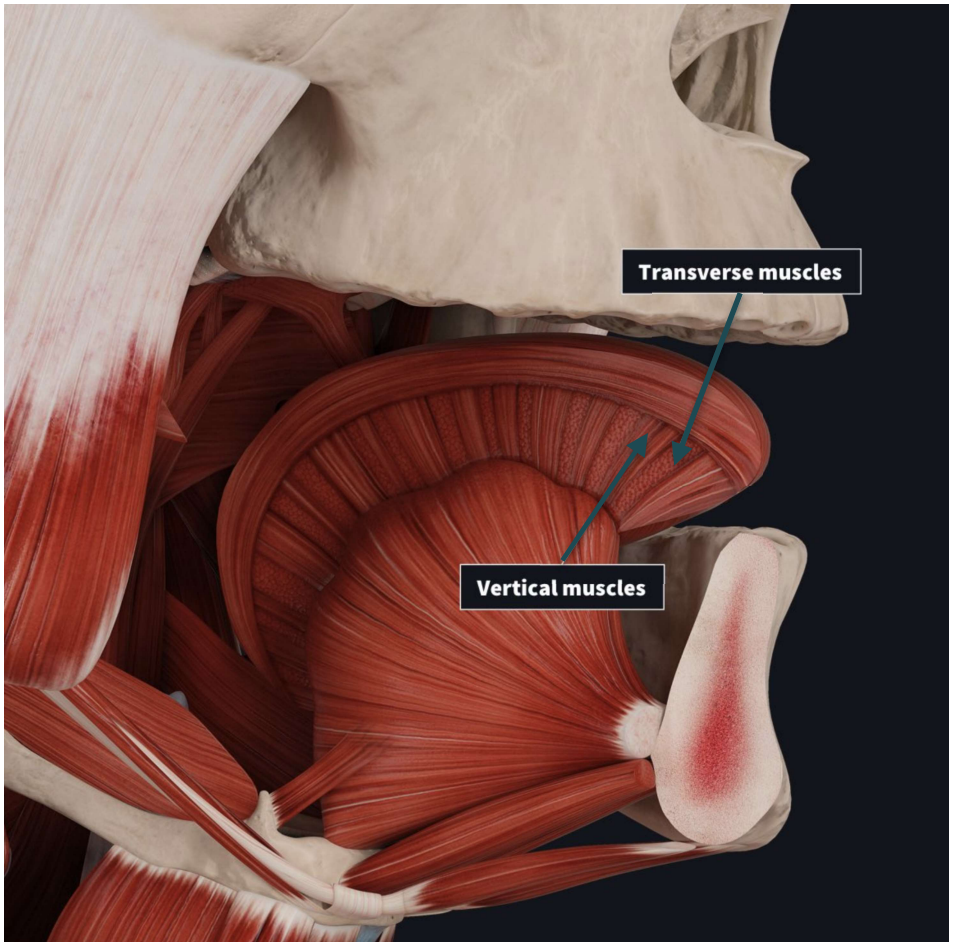
The Tongue: Intrinsic Muscles



<u>Vertical</u>
Flattens the tongue

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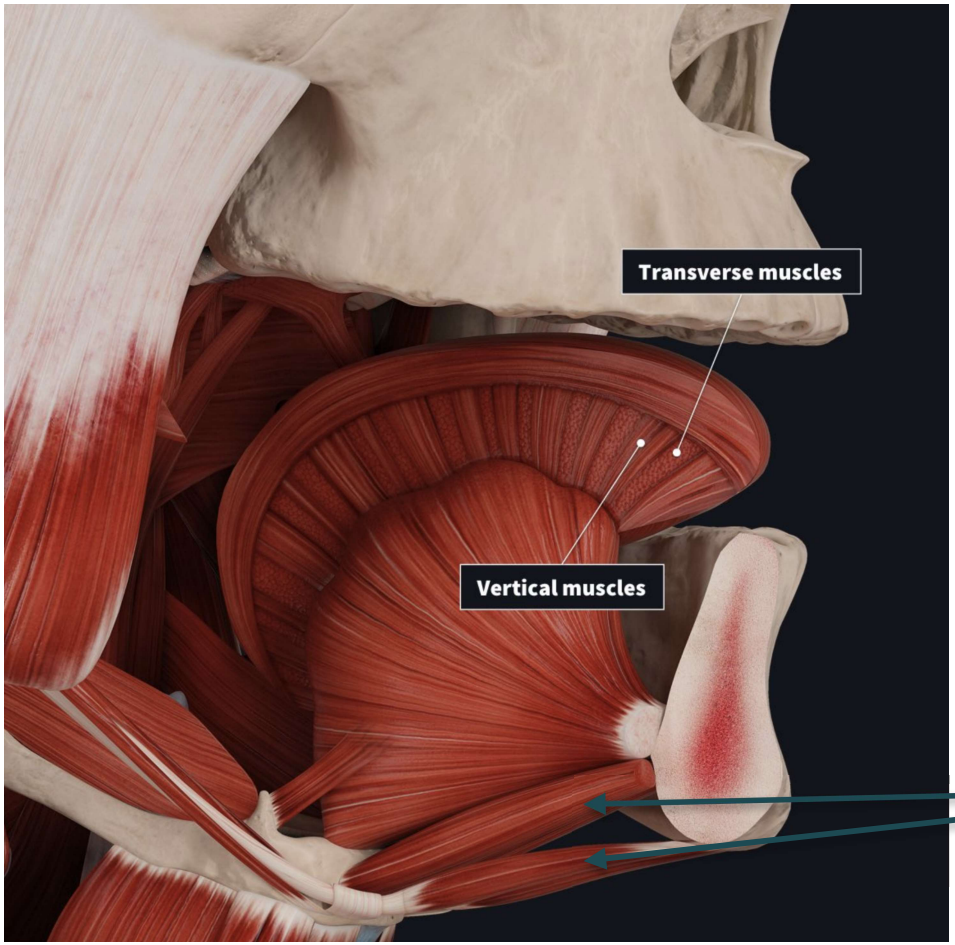
Suprahyoid System: Digastric

A poorly understood element In Swallowing



Digastric
Muscle works in a pulley action on the jaw; protrudes/ depresses tongue; opens the jaw

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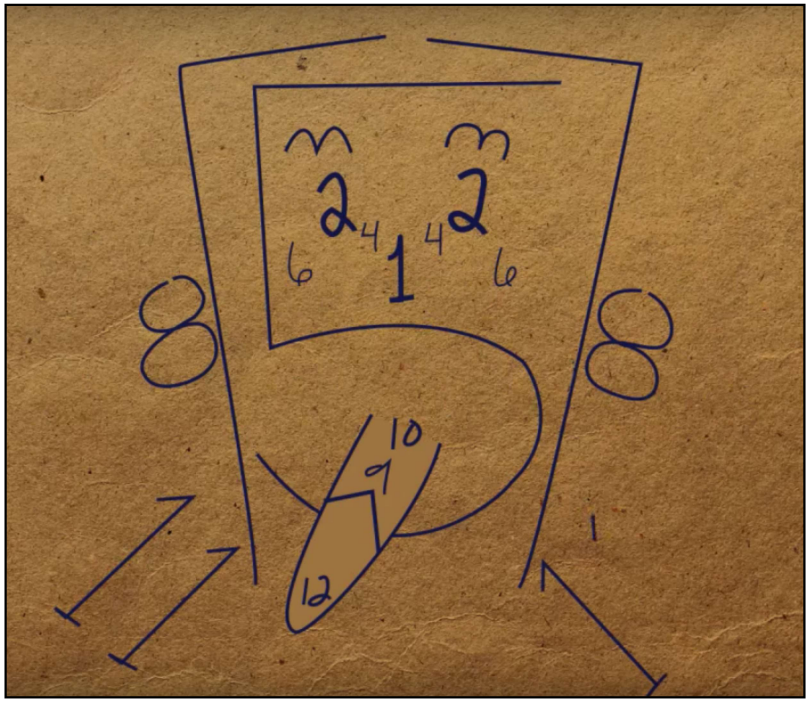
Cranial Nerves



CRANIAL NERVE ASSEMENT

Cranial Nerve	Name	Sensory, Motor, or both	Function / Location	Testing
I	Olfactory	Sensory	• Sense of Smell • Does not pass through thalamus but goes directly to the temporal lobe of the cerebrum	Smell
II	Optic	Sensory	• Vision/sight • Impulse from retina (rods & cones) to thalamus (diencephalon) to occipital lobe of cerebrum	Visual acuity Visual fields
III	Oculomotor	Motor (primary)	• Eye movement (extrinsic muscles of the eye, 5 of them) • Parasympathetic – intrinsic eye muscles (ciliary muscles move the lends and circular muscles move the iris – constrict pupil • CN of midbrain	Pupil reaction Eye movement
IV	Trochlear	Motor (primary)	• Eye movements • CN of midbrain	Eye movement
V	Trigeminal	BOTH	• Sensory – face, teeth, nose, lips, tongue (not taste) • Motor – Chewing (innervates the muscles of mastication, digastric) • CN of Pons	Clench teeth Open jaw Sensation of forehead, cheek, chin
VI	Abducens	Motor	• Eye movement (last 6 extrinsic eye muscles) – abduction of the eye • CN of Pons	Eye movement
VII	Facial	BOTH	• Sensory – taste • Motor – muscles of facial expression • Parasympathetic – glands/secretions (sublingual, lacrimal, nasal, palatine) • CN of Pons	Raise eyebrows, Frown Close eyes tight Smile, show teeth Taste
VIII	Vestibulocochlear (Acoustic)	Sensory	• Sense of hearing and equilibrium (balance) • CN of medulla oblongata and Pons	Hearing
IX	Glossopharyngeal	BOTH	• Sensory – pharynx and posterior tongue (gag reflex and taste) • Motor – swallowing – muscles of the pharynx • Parasympathetic – parotid gland, major salivary gland • CN of the medulla oblongata	Movement of the uvula and palate when saying "ah"
X	Vagus	BOTH	• Sensory – larynx and pharynx • Motor – swallowing and speech (muscles larynx and pharynx) • Parasympathetic – viscera/organs of thoracic and abdominal cavities (lunges, heart, vessels, respiratory, GI tract) • CN of medulla oblongata	Gag reflex Hoarseness
XI	Spinal Accessory	Motor	• Coordinates head/neck movements, swallowing	Shrug shoulders against resistance Turn head against resistance
XII	Hypoglossal	Motor	• Tongue muscles (swallowing and speech)	Stick out tongue Tongue in cheek against resistance

Primitive Reflexes

Primitive Reflexes

Primitive Reflex	Purpose	What the Reflex Looks Like in a Baby:	When It Appears	Should Integrate by:	Signs of Retention
FPR Fear Parlysis Reflex	protective mechanism, response to perceived threat	Freezing reaction - similar to deer in headlights	5th to 8th week in Utero	before birth	anxiety, poor self esteem, sleep/eating disorders, agression, fear of failure or embarassment, phobias
Moro	Insant arousal of survival systems	Automatic reaction to a sudden change in sensory stimuli. Startle response. Primitive fight or flight reaction	birth	2 to 4 months	hyper sensitivity, hyper reactivity, poor impulse control, sensory overload, social and emotional immaturity
Rooting Reflex	to assist baby to find food, breastfeeding	Baby automatically turns head towards touch on their cheek	birth	3 to 4 months	picky eater, thumb sucking, dribbling, speech and articulation problems
Palmar Reflex	to assist baby's grasp development	Hand closes when object is places in the palm	birth	5 to 6 months	poor fine motor skills, poor manual dexterity, poor handwriting
ATNR Asymmetrical Tonic Neck Reflex	To assist baby through birth canal and to develop cross pattern movements	Activated by turning the head to the left or right side. As the head is turned, the arm and leg on the same side will extend while the opposite limbs bend.	birth	6 months	Difficulty with: eye-hand coordination, handwriting, crossing vertical midline, visual tracking
STNR Symmetrical Tonic Neck Reflex	preparation for crawling	Arms bend and legs extend when the head is bent down. Arms straighten, legs bend when the head is bent backwards.	6 to 9 months	9 to 11 months	tendency to slump while sitting, poor muscle tone, W-sitting, poor eye-hand coordination, inability to sit still and concentrate
TLR Tonic Labrynthine Reflex	head management and postural stability	Forward TLR: Head bendt forwards causes body and limbs flexion. Backwards TLR: Head bent backwards causes body and limb extension	in utero	3 1/2 years	poor muscle tone, W-sitting, toe-walking, poor balance, motion sickness, spatial orientation issues, gravitational insecurity
Spinal Galant Reflex	assists baby with birth process, crawling and creeping	Hip rotation when back is touched on either side of the spine	birth	3 to 9 months	unilateral or bilateral posture issues, fidgeting, bedwetting, clothing issues, poor concentration, poor short term memory

Billings, M., GKCDS, Looking Beyond Structure, 2021

Neurotransmitters

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TREATMENT

Orofacial Myofunctional Disorders

Dental Paradigm Shift

Growth of the Maxilla:

- Malocclusion is a Symptom
- Soft Tissue is the Etiology
- Facial Collapse is a risk factor
- The Child is attached to the teeth

Scott's Theory

The nasomaxillary complex grows as a unit	The cartilage nature of the nasal septum serves as a pacemaker for maxillary growth
That cartilage growth leads to forward and downward growth of maxilla	Sutures become the reactive area which responds to new bone formation leading to growth

Raphael, B., AAPMD.pppt, 2017

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Goals of Treatment

Teach, maximize and generalize nasal breathing	Increase jaw stability and jaw grading	Increase lingual coordination, stability and symmetrical movement
Develop lip and cheek functional muscle activation	Strengthen, coordinate, and stabilize fascial muscles	Teach lingual stabilization and accurate rest posture
Lingual tissue preparation for maximizing normal range of motion pre-frenectomy	Improve soft palate and oropharyngeal muscle to maximize airway and improve swallow skills	Teach appropriate chew and swallow patterns

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Respiratory System

RESPIRATION

- obstructive airway
- posture
- noxious oral habits
- velopharyngeal insufficiency or inadequacy
- tonsils and adenoids inflammation
- nasality concerns
- other structural deficiencies

RESPIRATION is the foundation of the orofacial complex

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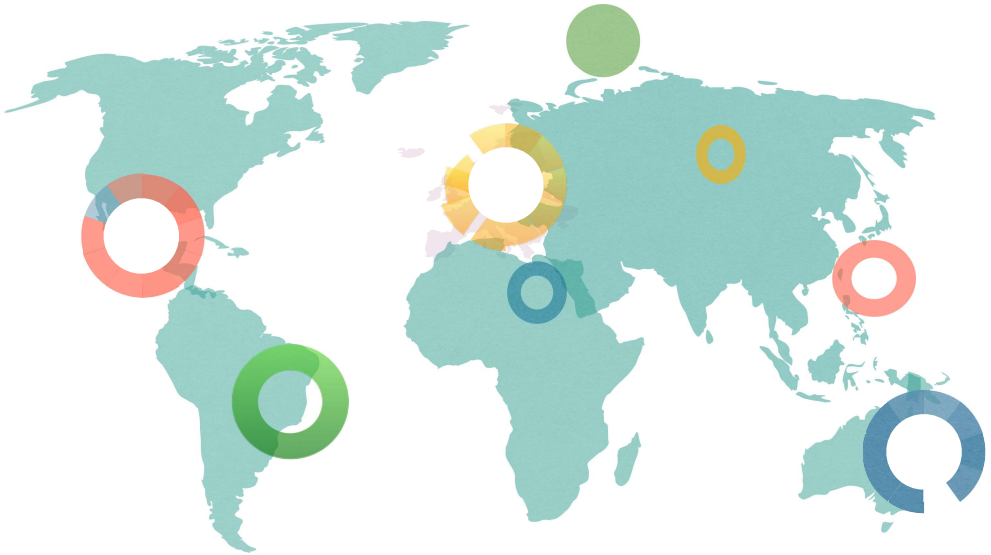
A Structuralist sees…



STRUCTURALISTS

Argue that since the soft tissues of the mouth are adaptable to anatomical configurations and mechanical devices (braces, dentures) that organization of oral patterns like tongue thrust can be ignored… because they will adapt to a new environment

● ● ● ● ● (?)

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Structuralists See….

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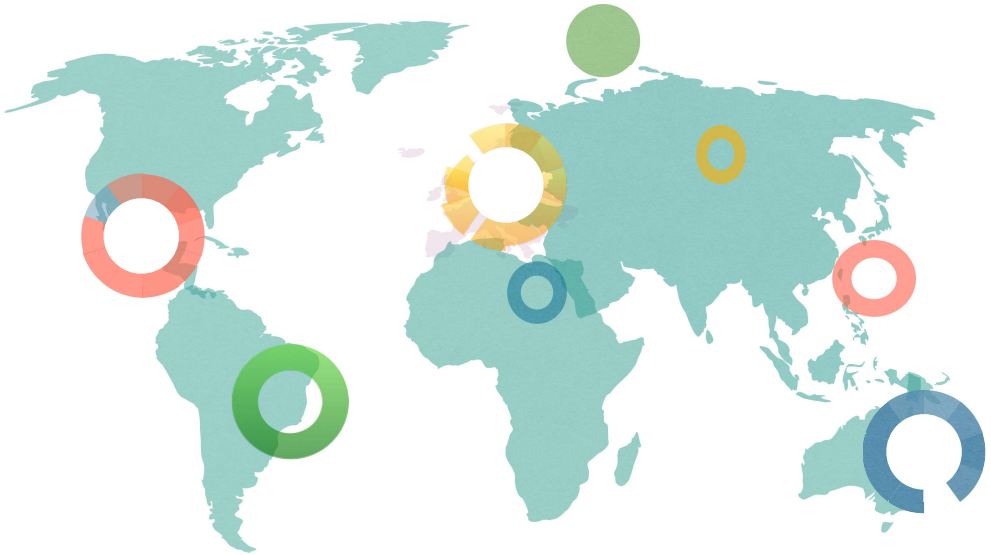
A Functionalist sees…



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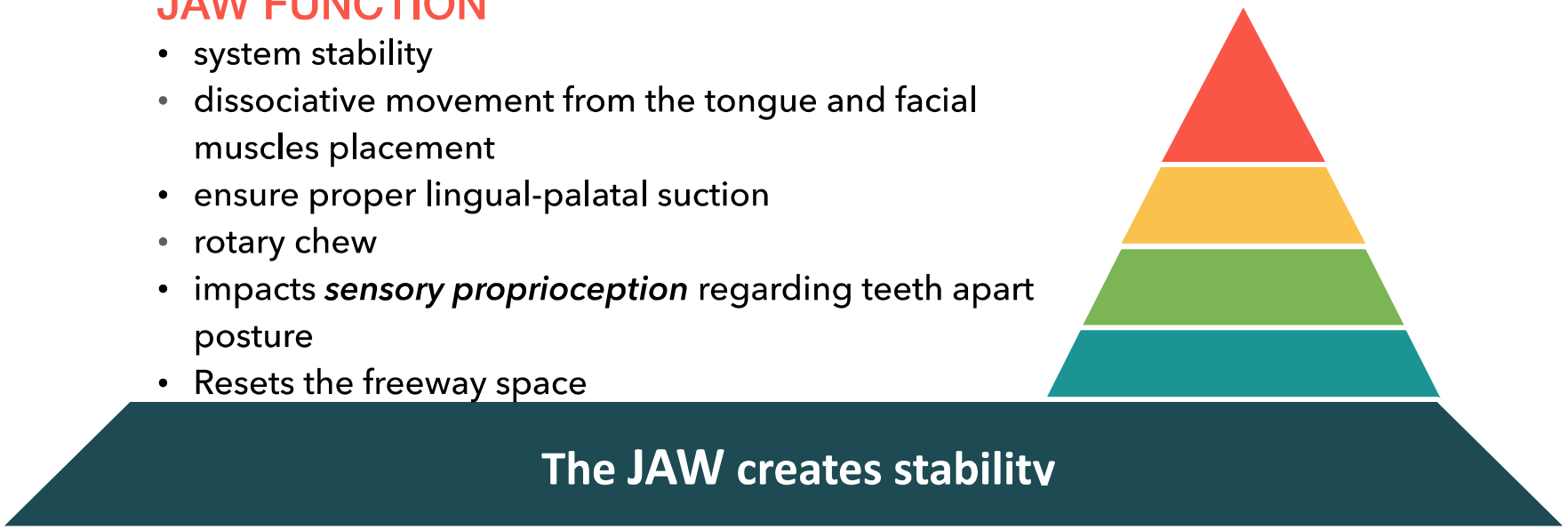
Jaw System

JAW FUNCTION

- system stability
- dissociative movement from the tongue and facial muscles placement
- ensure proper lingual-palatal suction
- rotary chew
- impacts ***sensory proprioception*** regarding teeth apart posture
- Resets the freeway space



"If jaw stabilization is not acquired and well-habituated, long term benefits of behavioral treatment fail." (Fletcher, S., 19

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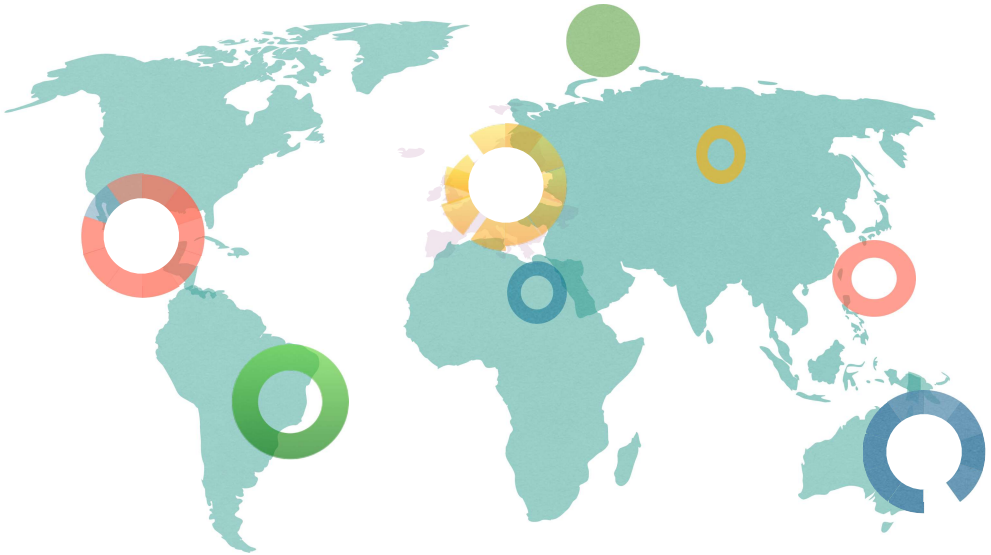

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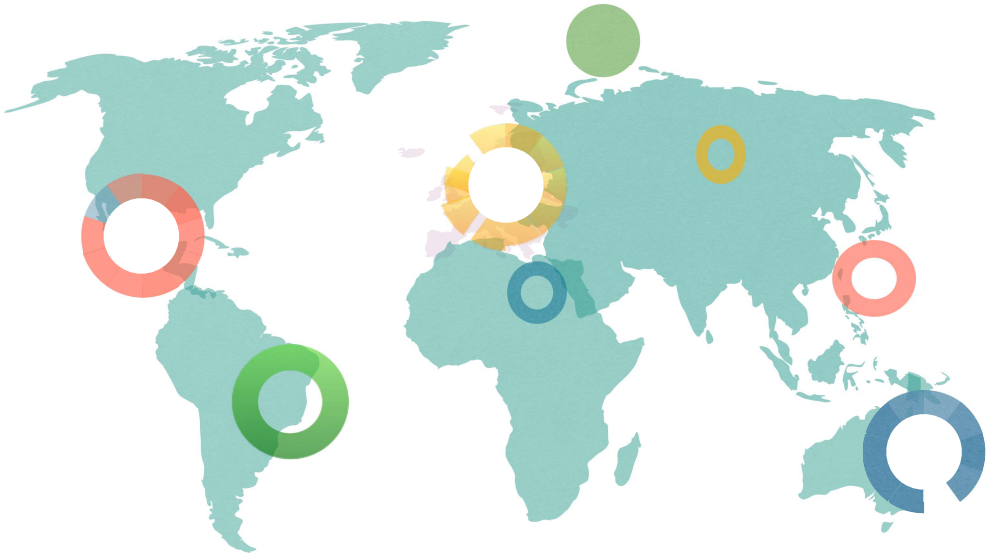

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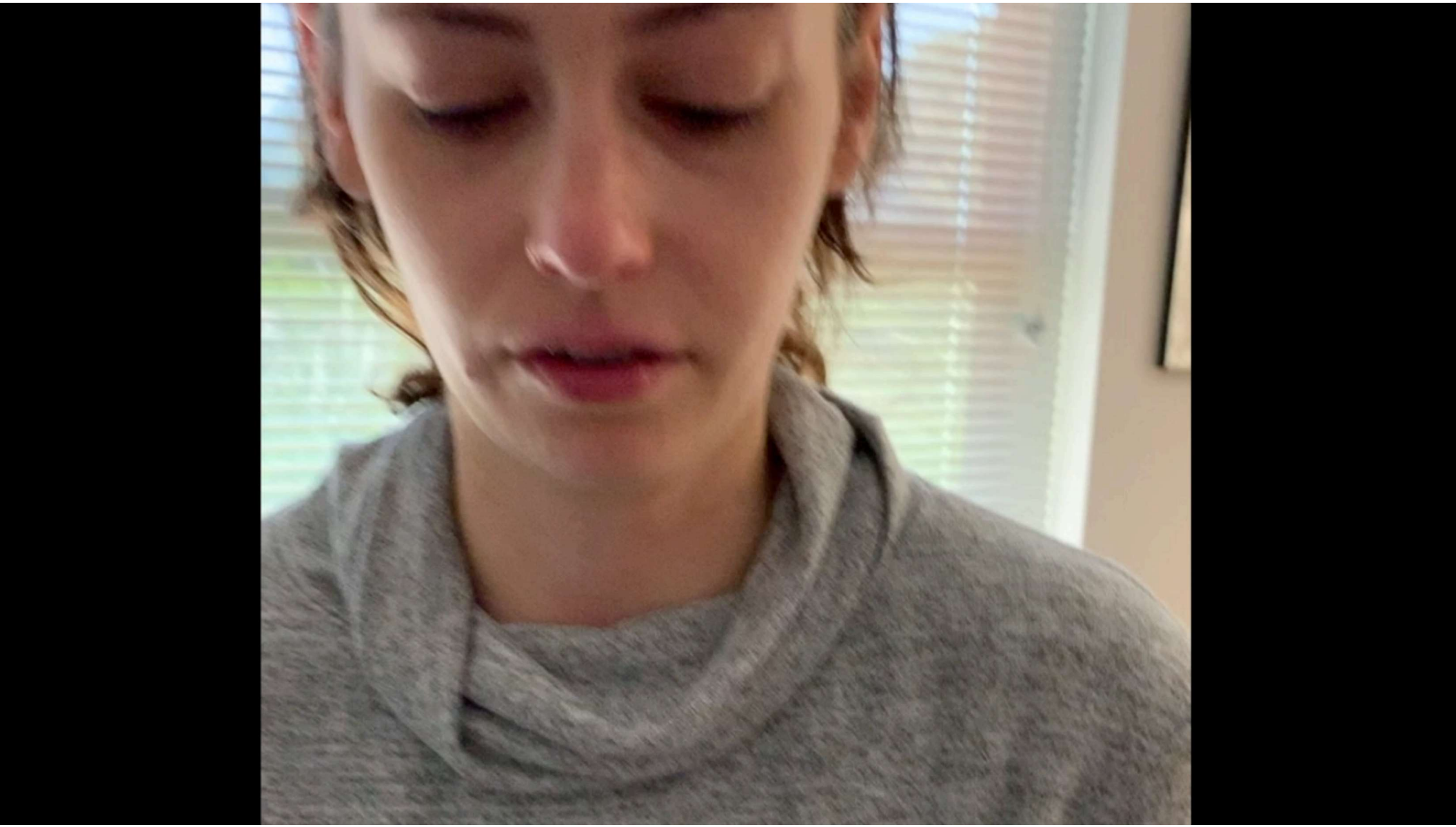

Postural System

POSTURE: how does developing overall body postural stability impact speech development?

diaphragmatic breathing, accessory muscle tension, jaw position, dento-facial development, vocal intensity and resonance, prosody, tongue position and stability,

The POSTURE establishes the strength and stability needed for support

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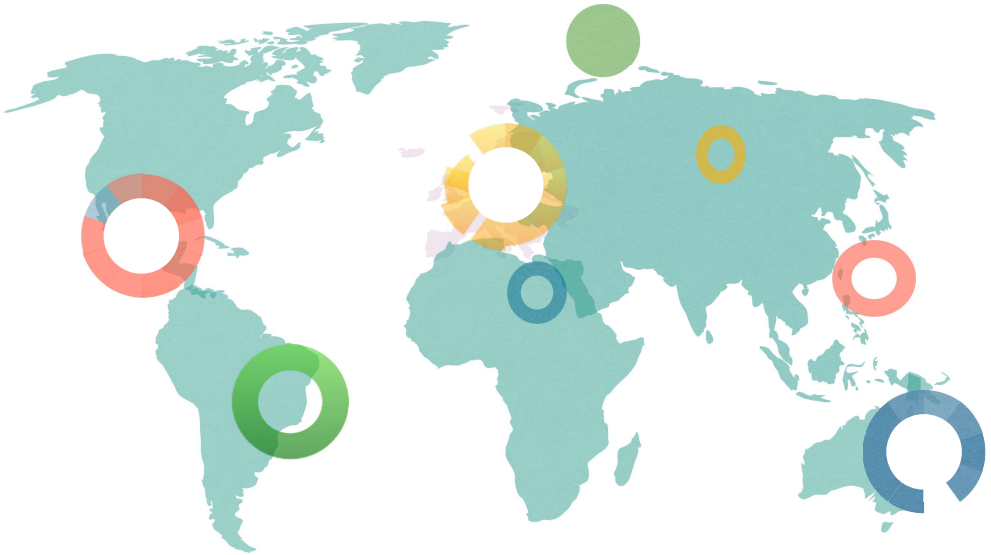
A Structuralist sees…



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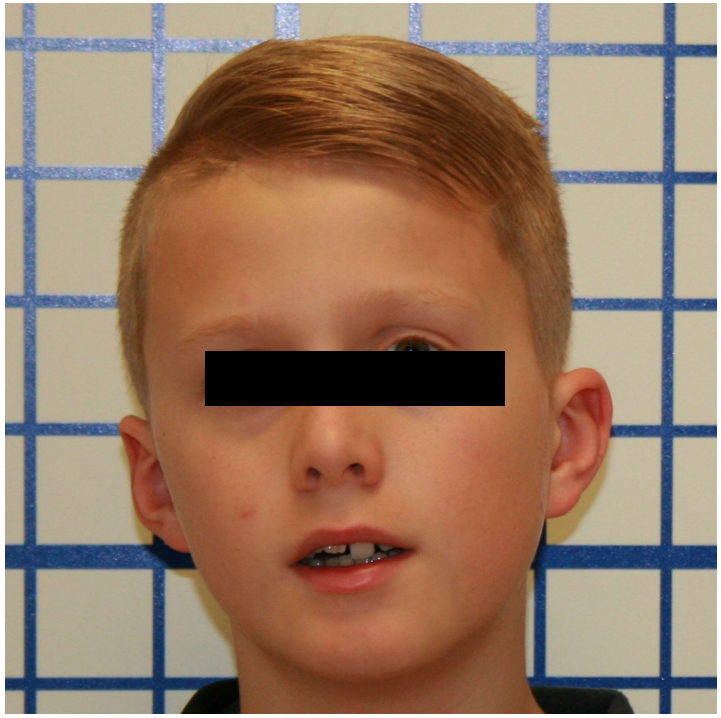

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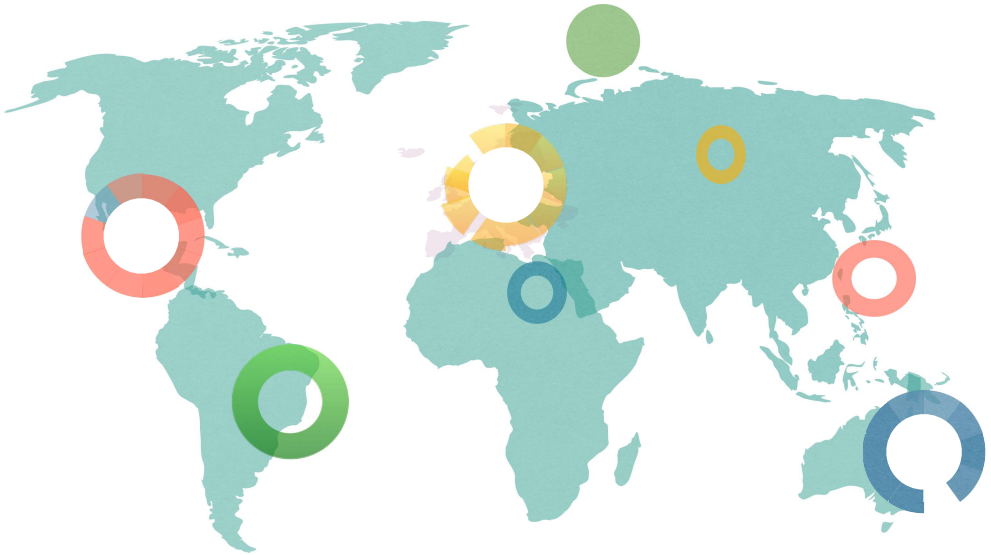

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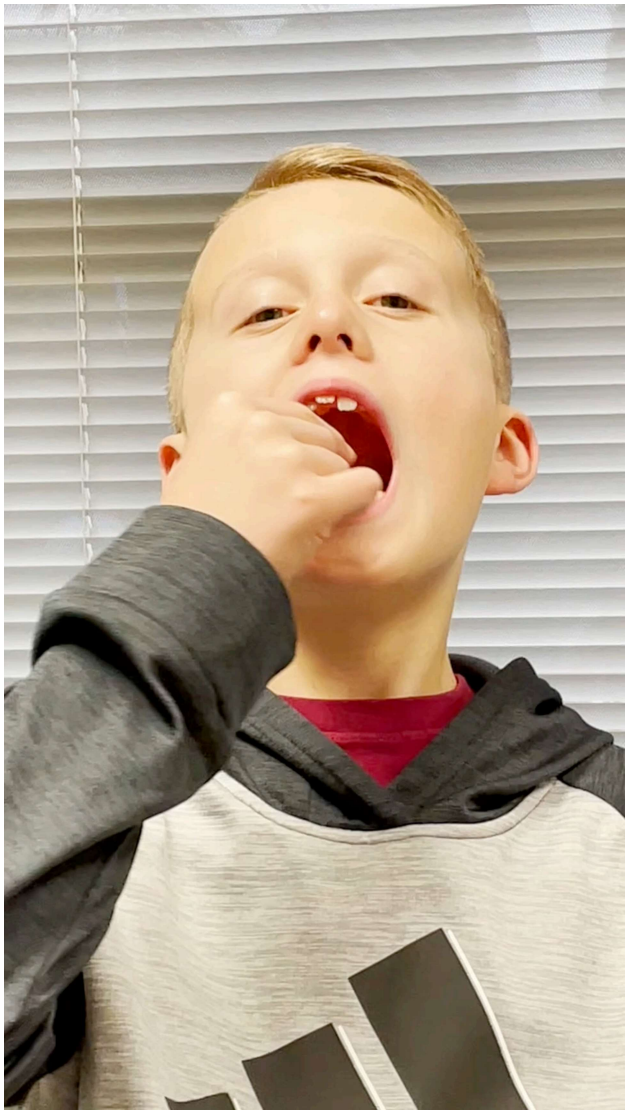

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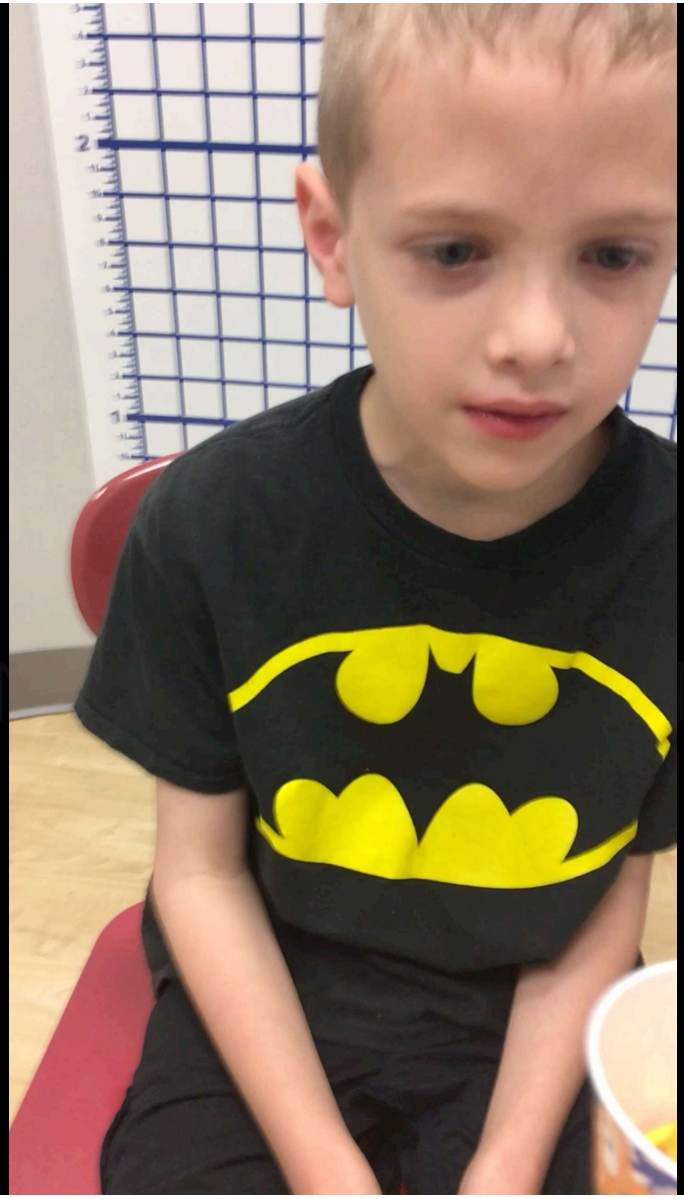
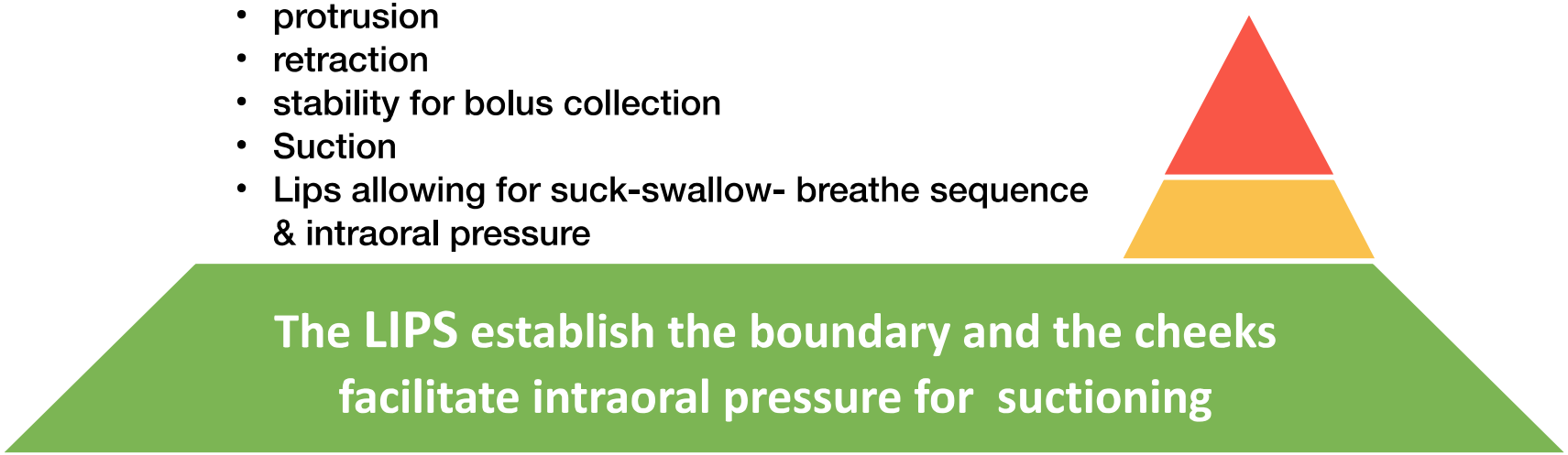


Lip and Cheek System

LIPS AND CHEEKS

- seal
- protrusion
- retraction
- stability for bolus collection
- Suction
- Lips allowing for suck-swallow- breathe sequence & intraoral pressure



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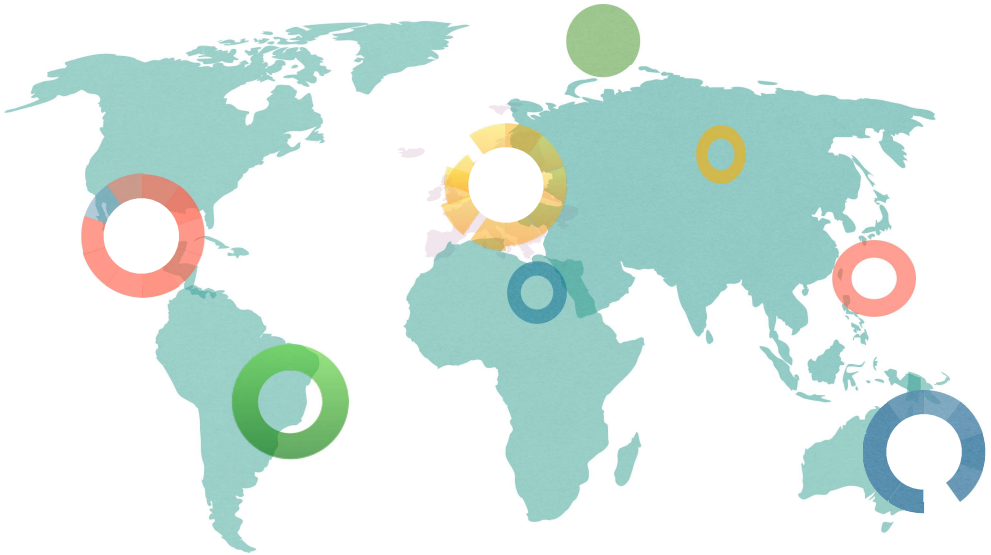

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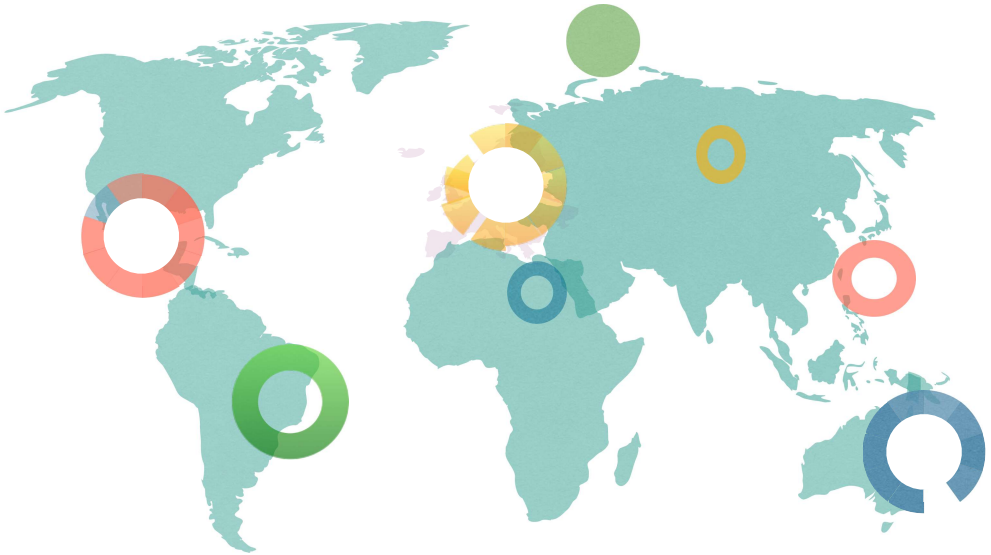

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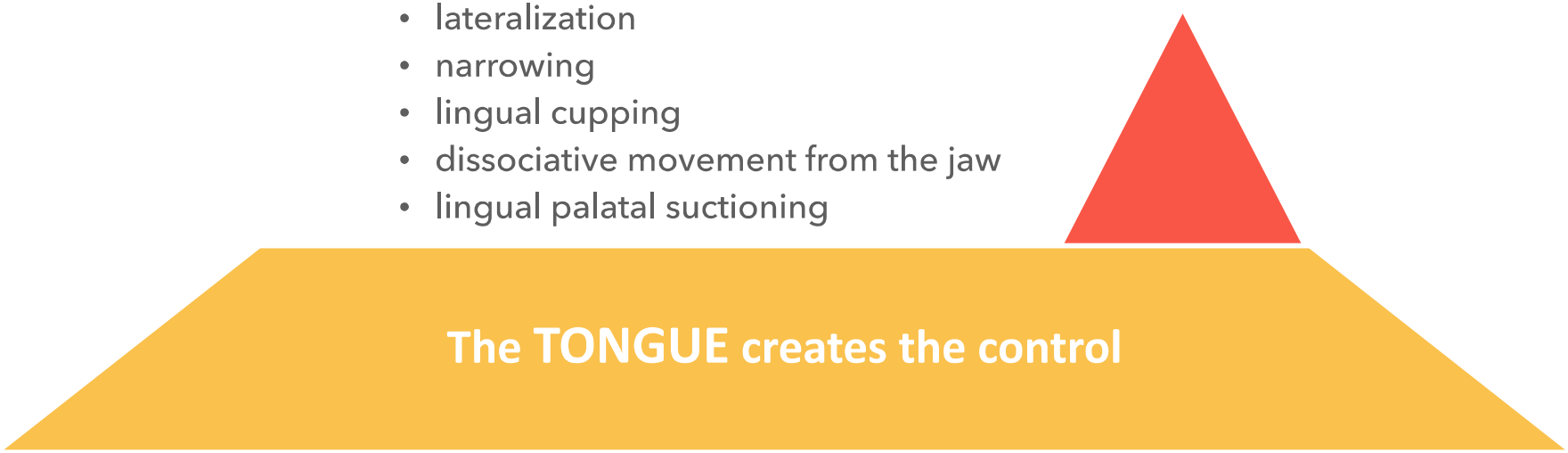
Lingual System

TONGUE MOVEMENTS

- elevation
- depression
- lateralization
- narrowing
- lingual cupping
- dissociative movement from the jaw
- lingual palatal suctioning



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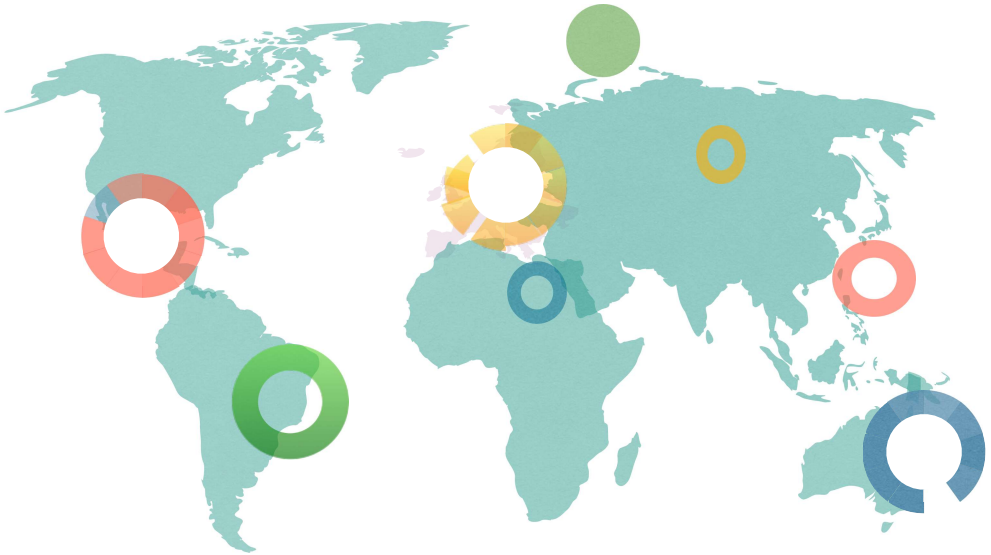

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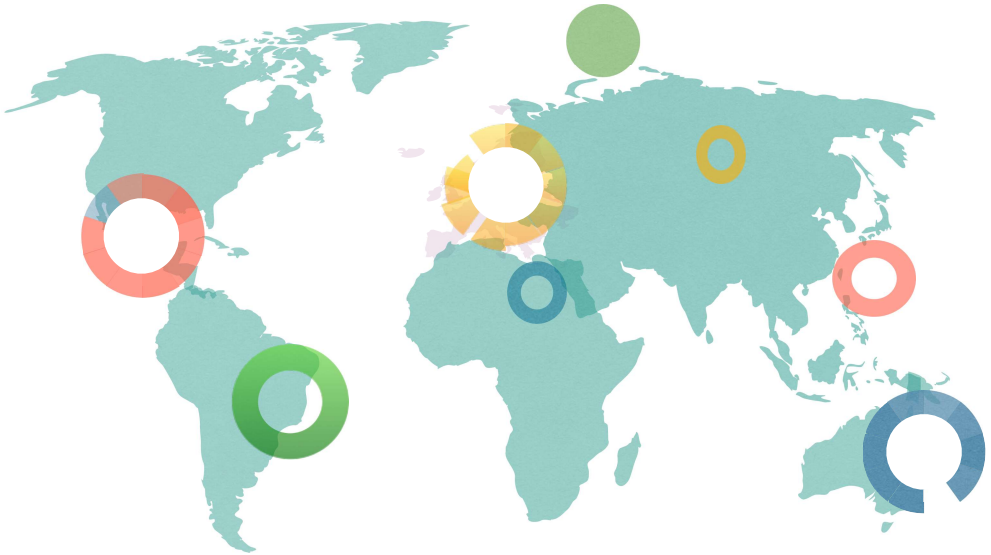
A Structuralist sees…

Orofacial Myofunctional Disorders

Perspectives



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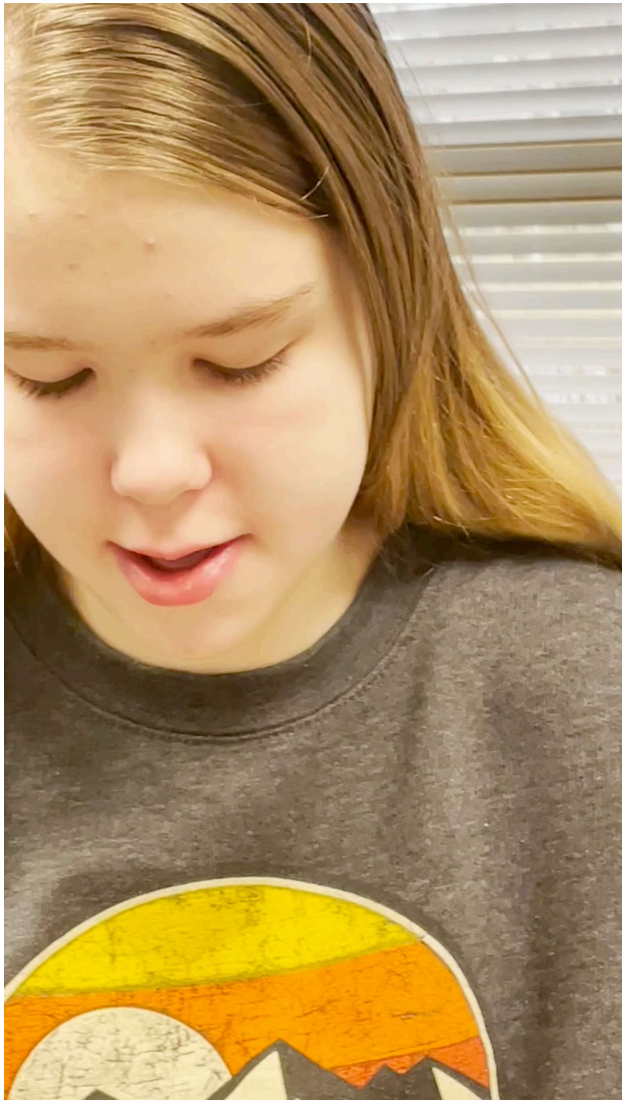

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Swallow System

SWALLOW - ORAL PHASE

- mastication
- control
- bolus formation
- bolus collection
- transfer

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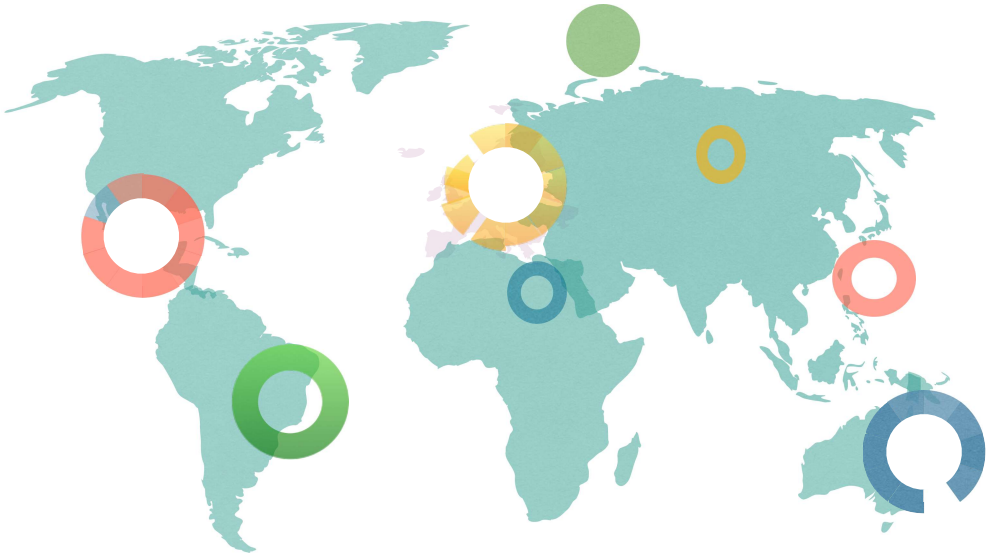

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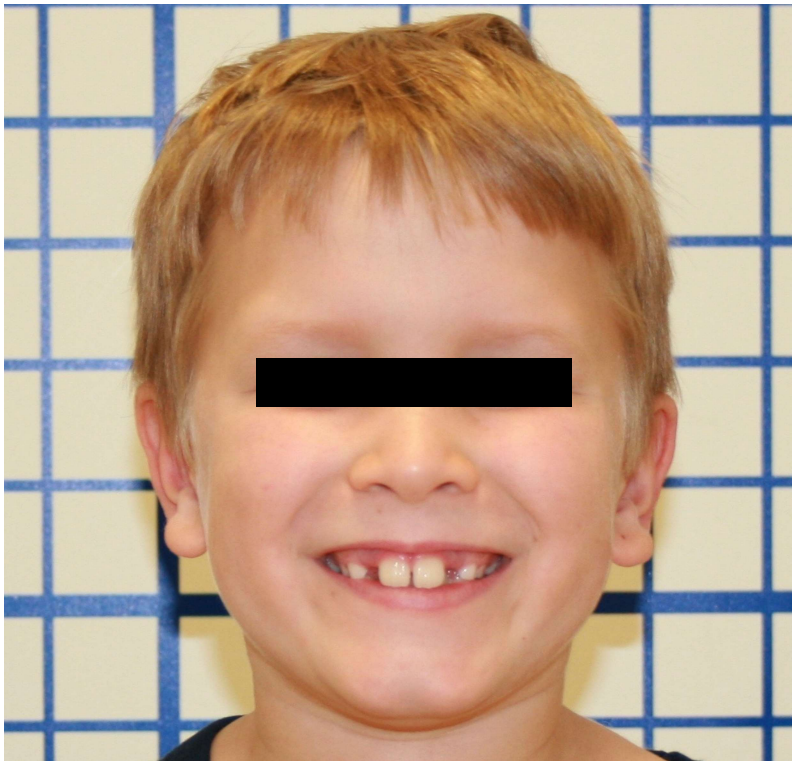

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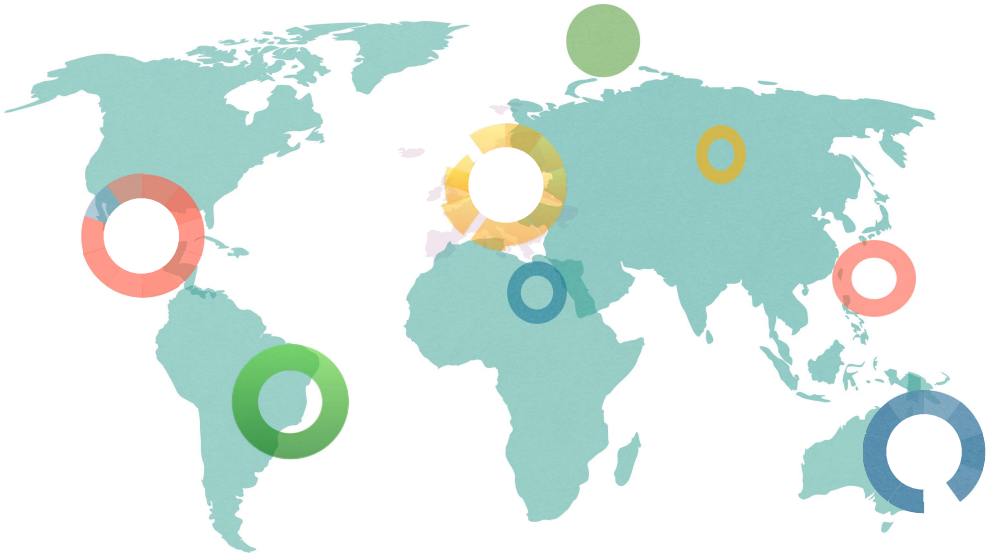

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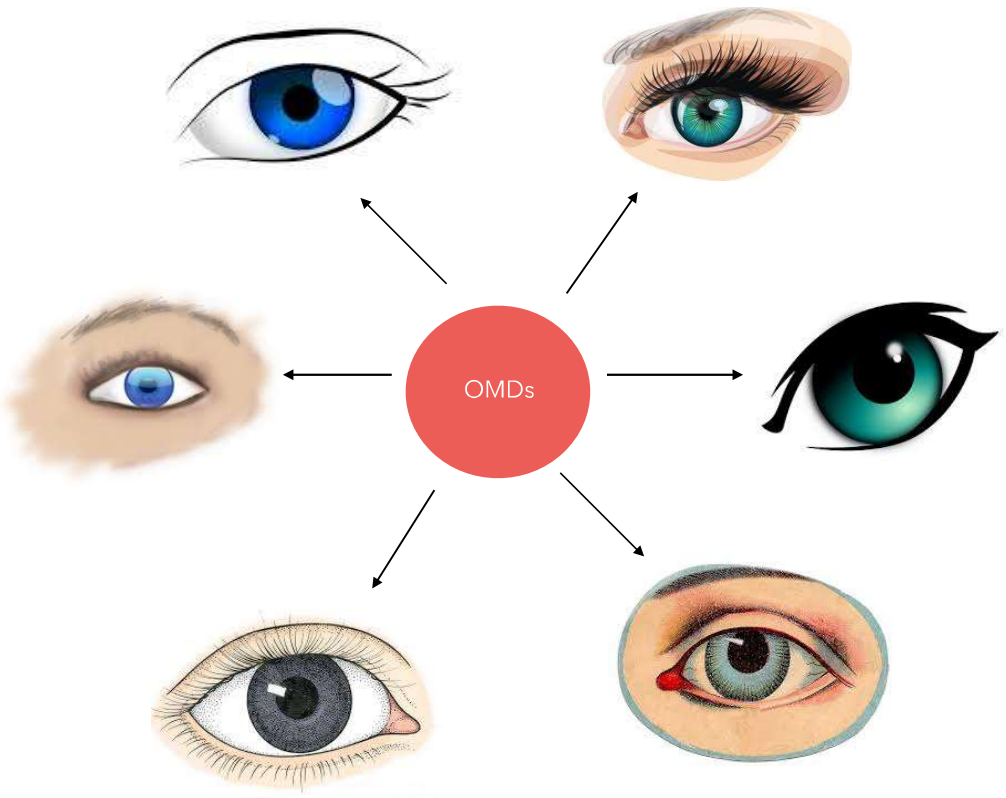
Talk Tools: OMD's Deconstructed

ymptom, Not A Diagnosis, 2021

Think Beyond….

https://www.ebay.com/itm/Kids-Dental-Poster-Fun-Dentist-Cartoon-20x-30-/161827648618

A Different Lens



- Look differently
- Think differently
- Diagnose differently

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Lessons from History

Peter Dawson
"In a battle between muscle and bone, muscle always wins"

New advances in dentistry, neurology and sleep medicine exists and is changing patient care

Learn how to assess for lingual restrictions. Avoid a "wait and see" approach

Bruxism can be a sign of sleep disordered breathing and poor jaw stability

Sensory integration deficits are real and spur avoidance of dental care. Careful treatment planning is needed.

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Prevention of OMD's & Malocclusion

01.

Screen for airway obstruction and night time breathing disorder early in life

02.

Screen & refer for restricted oral frenula in all patients of all ages

03.

Screen for and refer for feeding and other oral function difficulties early in life

04.

Encourage breastfeeding for as long as possible

05.

Take note of and encourage closed mouth nasal breathing as part of oral hygiene during routine examinations

06.

Participate in multidisciplinary team care for long term effectiveness

Red Flags By the Ages

AGES 1-5

Open mouth resting posture

Audible breathing

Restricted lingual, labial, buccal frenula

Poor saliva control after 2 years age

Sucking habits (digits, cheeks, tongue, pacifier)

Poorly developed swallow

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Recommendations

AGES 1-5

- Habit elimination
- Airway Consult - tonsils, adenoids, frenulum
- Physical Therapy: body posture; coordination
- Early oral appliance intervention
- OMD Consult/Therapy
- Speech Pathology (feeding, speaking)

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Red Flags By the Ages

AGES 1-5

- Poor palate development; malocclusion
- Sucking habits; poor saliva control/drooling
- Restricted oral frenula
- Oral aversion: touch, eating,
- Speech delays: coordination; sound development

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Recommendations:

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Red Flags By the Ages

PERMANENT DENTITION

01. Open mouth rest posture

02. Audible breathing

03. Atypical tongue position and movement

04. Restricted oral frenula: lingual buccal, labial

05. Persistent open bite

06. Speech distortions

Recommendations

PERMANENT DENTITION

- ENT Consult for upper airway, sleep, oral frenulum
- Orthodontic intervention
- Physical Therapy: core stability, head-neck posture
- OMD Consult: posture; tongue coordination; thrust
- Speech distortions

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MultiDisciplinary Team

https://pxhere.com/en/photo/1573021

Speech-Language Pathologists	Sleep Medicine Physicians
Dental Hygienists (COM®)	TMJ Specialists
Physical Therapists	Osteopathic Physicians
Chiropractors	Orthodontists

Licensed practitioners with education and clinical background in health sciences

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Think Consequences

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Think Development

Think Arch

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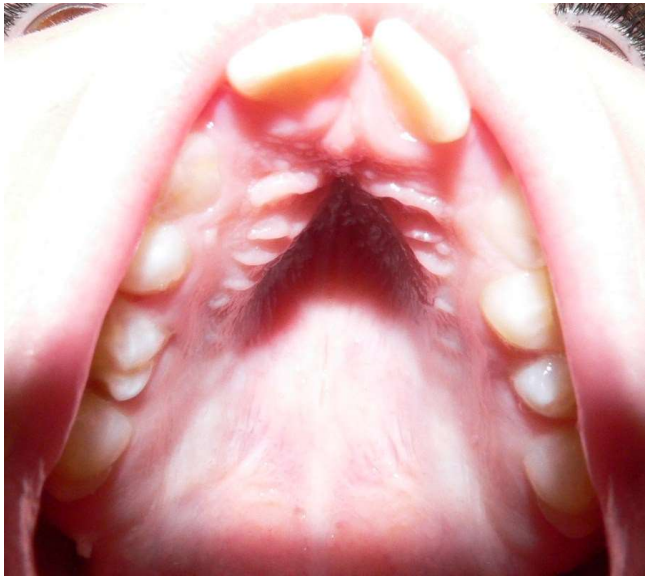
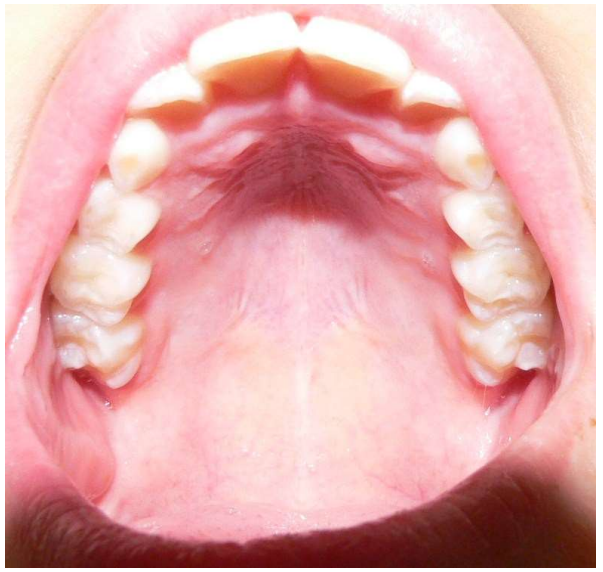
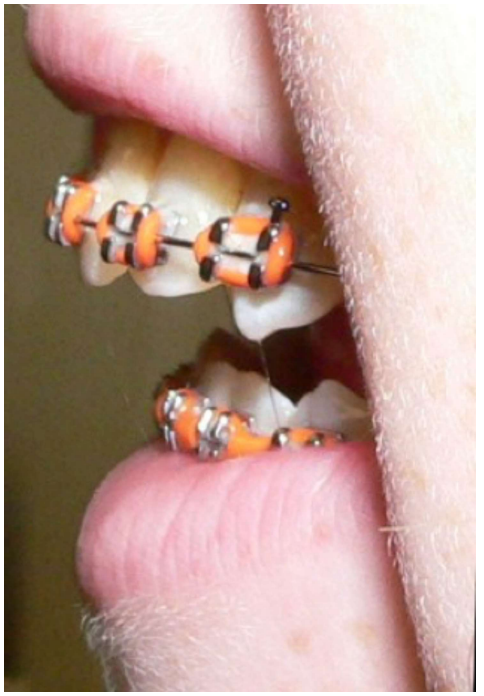
Think Facial Development





Think Stability



Think Rest Posture

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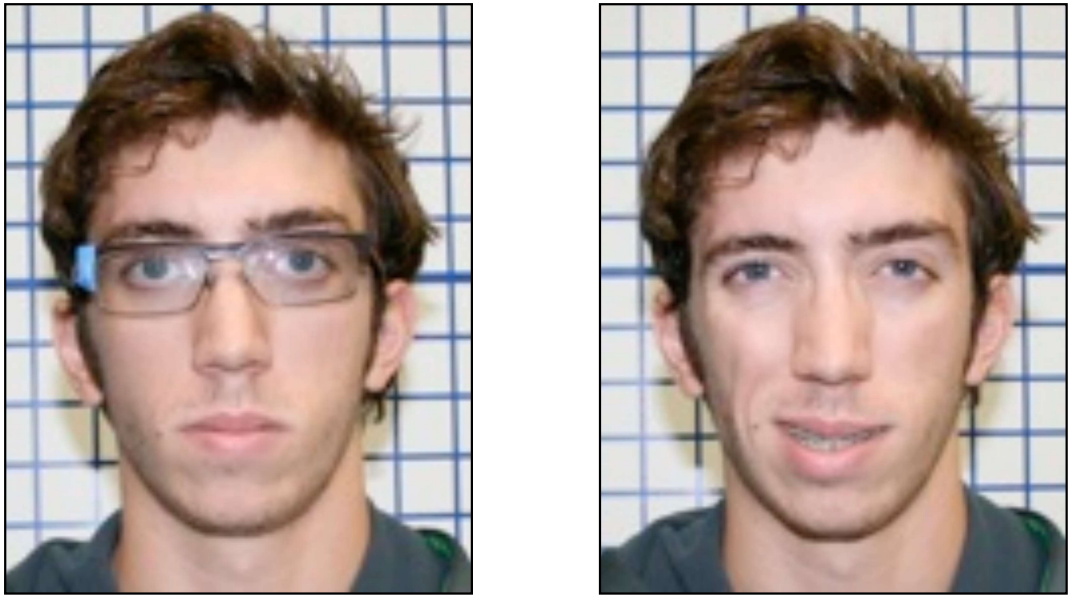
Think Symmetry

SOME OBVIOUS



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Think Symmetry

SOME OBVIOUS

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Think Consequences: Symmetry

SOME NOT

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Think Healthy

“Children are the Priority. Change is the Reality. Collaboration is the Strategy.”

- Judith Billings,
Washington State Superintendent

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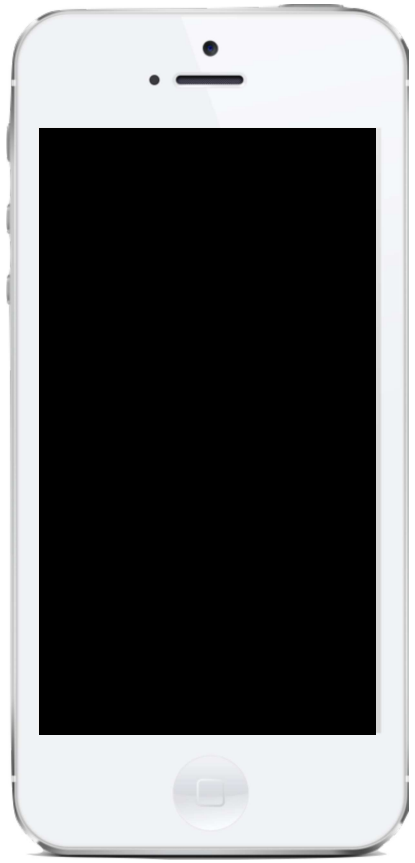
www.google.com/images/collaboraation



I am here for you.

Thanks:) I'm going through a tough time right now so this means a lot

So sorry…I lost all my contacts. Who is this?

This is your Uber driver.

I am here to pick you up.

Oh..

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Q & A

“Have a great weekend!”

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