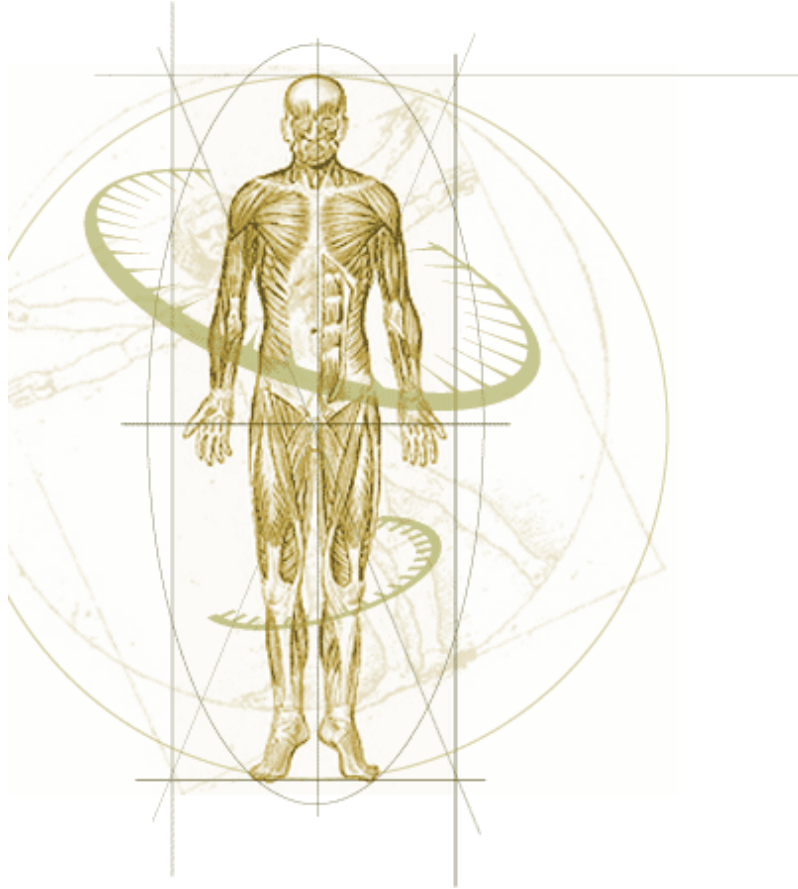
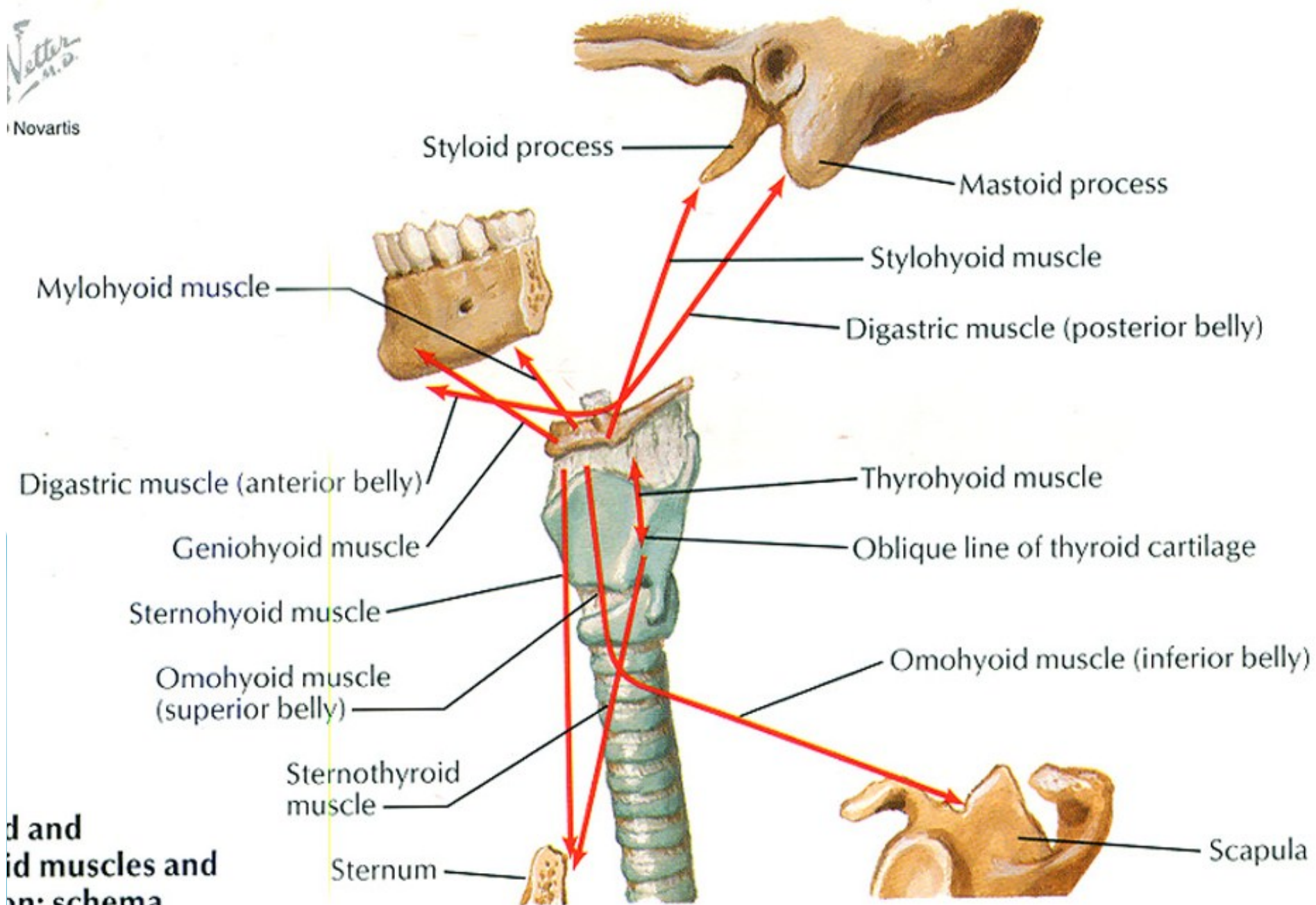


# *Toe to Head: A Collaborative Approach to Releasing Tongue and Jaw Tension*



**Martha Randall MM, Gincy Stezar PTA and Jodi Barth PT**





d and  
id muscles and  
on: schema



# Assessment Maneuvers

1. Beginning on a medium pitch, do a lip trill as high as possible. Highest note \_\_\_\_\_
2. Repeat as above and go as low as possible. Lowest note \_\_\_\_\_
3. Place the tip of your tongue on the roof of your mouth toward soft palate. Beginning on a medium pitch, sing a tone (might be an ng) as high as possible. Highest note \_\_\_\_\_
4. Repeat as above and go as low as possible. Lowest note \_\_\_\_\_
5. Hum to your highest note. \_\_\_\_\_
6. Hum to your lowest note. \_\_\_\_\_

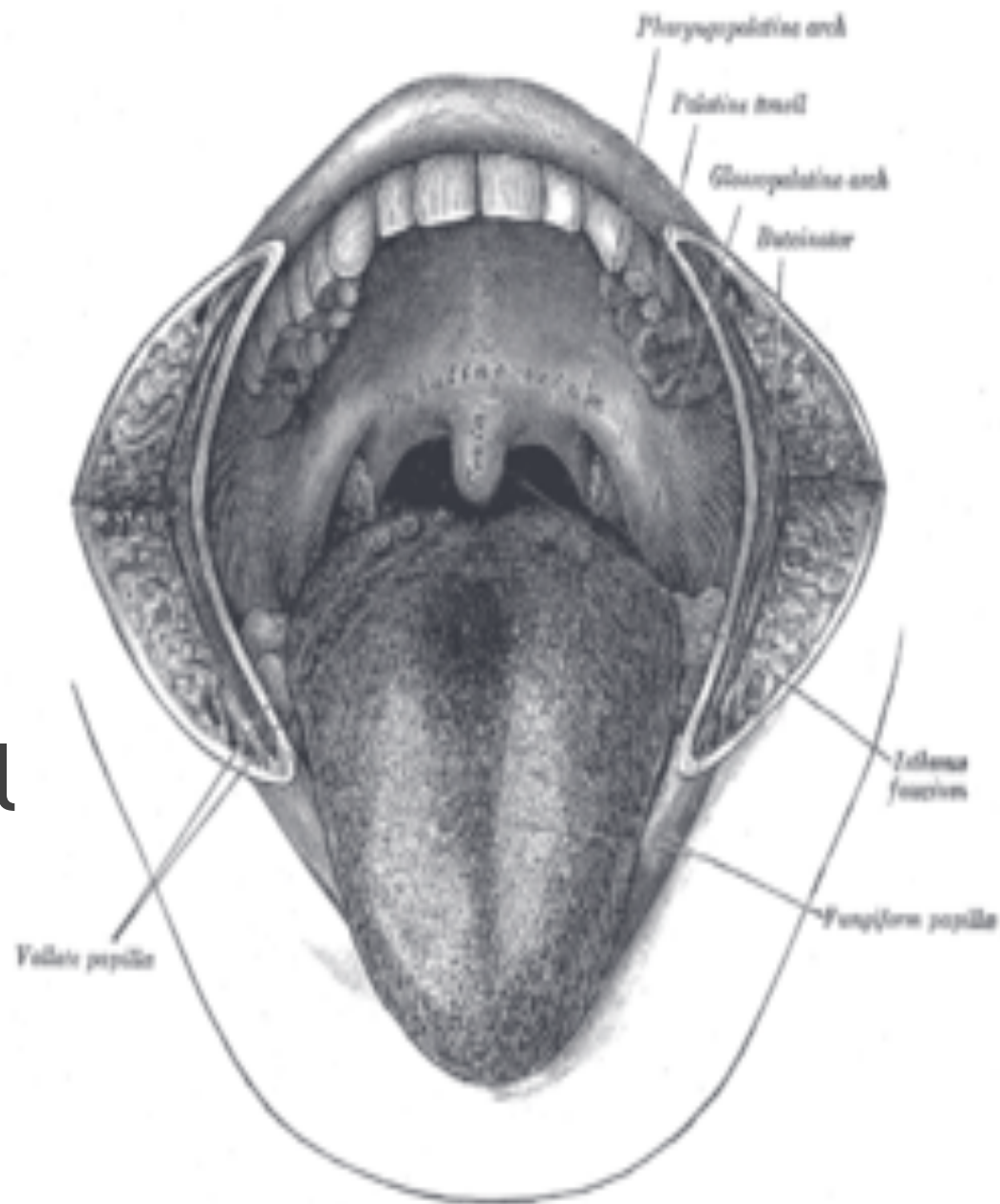


Take the gauze and gently hold the tip of your tongue and sing ah at any pitch. Does your tongue want to pull back? Y/N\_\_\_\_\_ -



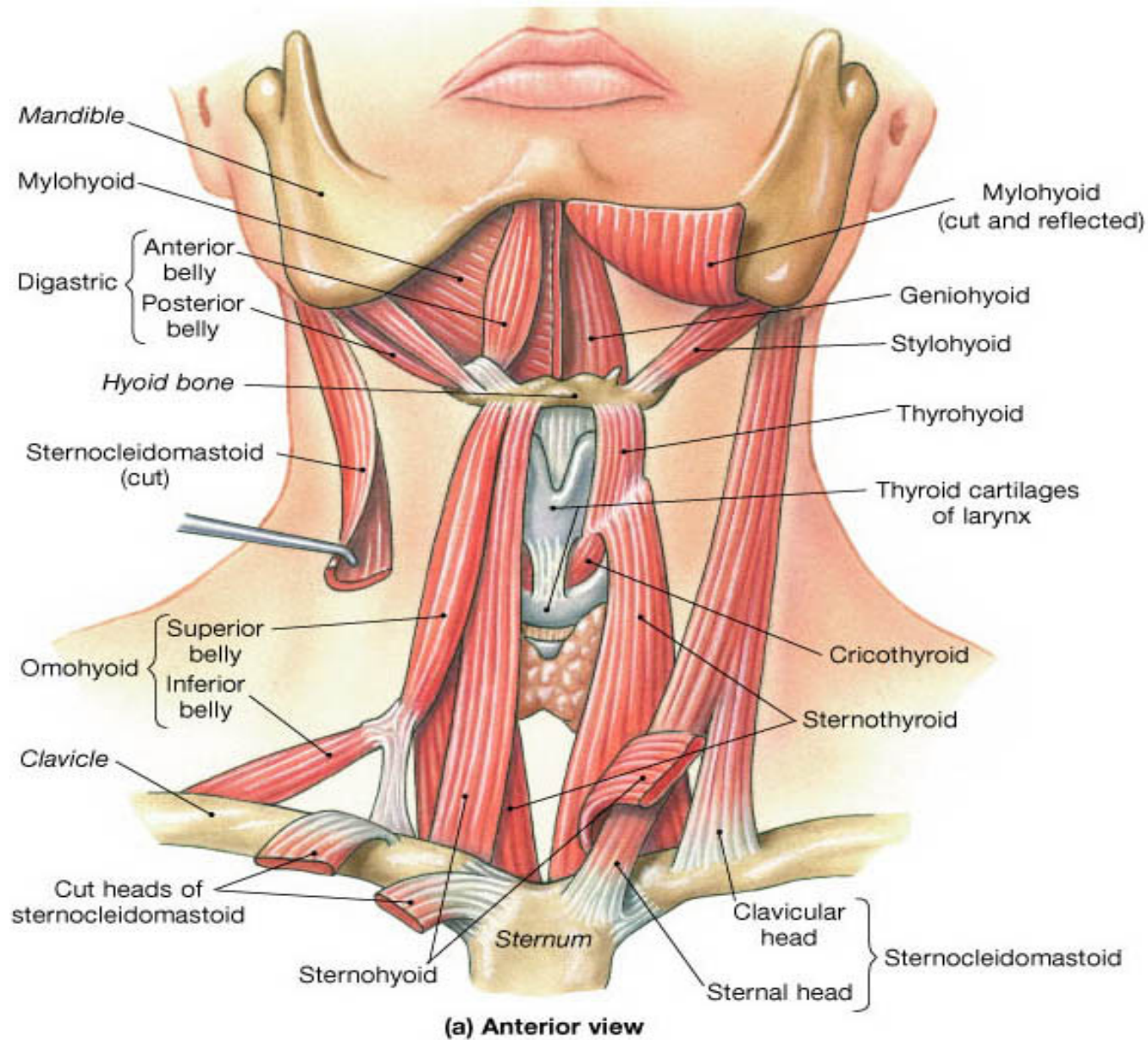


Repeat the gauze exercise but now place the gauze on both sides of the tongue and sing ah at any pitch. Does it feel that the tongue shifts to one side versus the other?





# Muscles of the Floor of the Mouth





**TABLE 9.7 Neck Muscles**

Muscle	Origin	Insertion	Action	Innervation
Sternocleido-mastoid	Sternum and clavicle	Mastoid process of temporal bone	Rotation of head; flexes neck	Accessory n.
Digastric	Inferior border of mandible and mastoid process of temporal bone	Hyoid bone	Opens mouth; elevates hyoid bone	Trigeminal n. (ant. belly); facial n. (post. belly)
Mylohyoid	Inferior border of mandible	Body of hyoid bone and median raphe	Elevates hyoid bone and floor of mouth	Trigeminal n.
Geniohyoid	Medial surface of mandible at chin	Body of hyoid bone	Elevates hyoid bone	Spinal n. (C1)
Stylohyoid	Styloid process of temporal bone	Body of hyoid bone	Elevates and retracts tongue	Facial n.
Sternohyoid	Manubrium	Body of hyoid bone	Depresses hyoid bone	Spinal nn. (C1-C3)
Sternothyroid	Manubrium	Thyroid cartilage	Depresses thyroid cartilage	Spinal nn. (C1-C3)
Thyrohyoid	Thyroid cartilage	Great cornu of hyoid bone	Depresses hyoid bone; elevates larynx	Spinal nn. (C1-C3)
Omohyoid	Superior border of scapula	Body of hyoid bone	Depresses hyoid bone	Spinal nn. (C1-C3)

digastric: L. *di*, two; Gk. *gaster*, belly

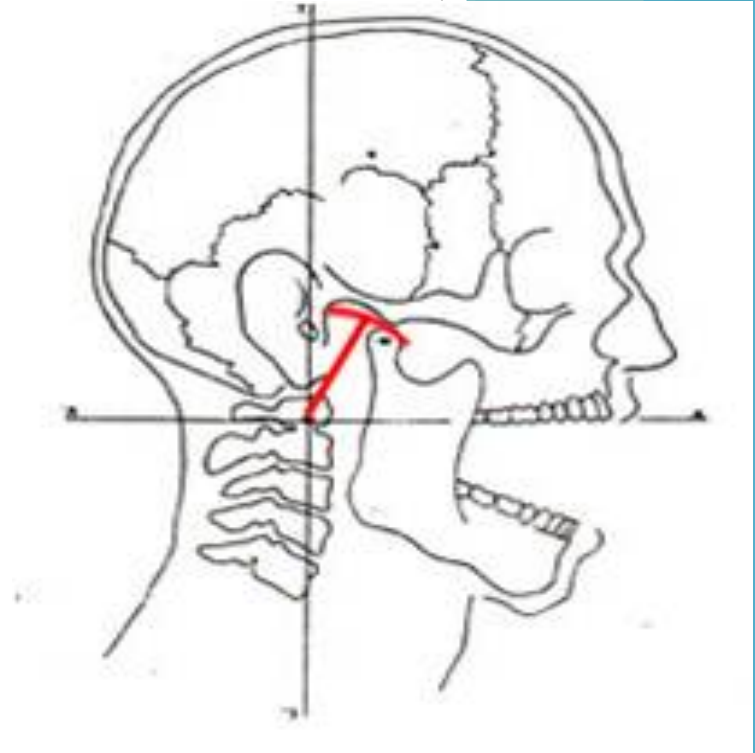
mylohyoid: Gk. *mylos*, akin to; *hyoeides*, pertaining to hyoid bone

omohyoid: Gk. *omos*, shoulder



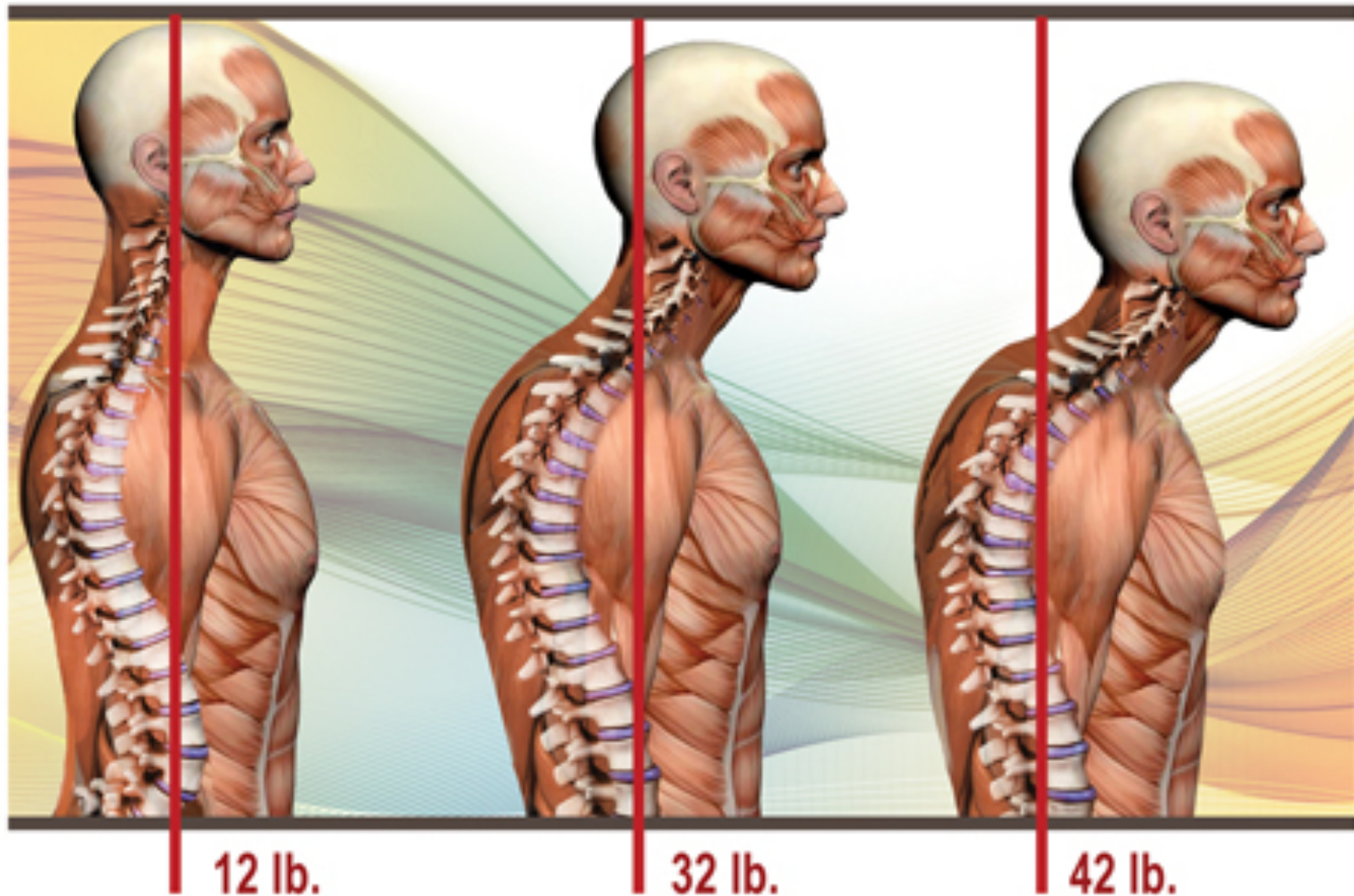
# Skeletal Relationships

- If the TMJ is malpositioned, the first two vertebrae in the neck will also undergo torsion and rotation to compensate.
- Biomechanically the first three vertebrae in the neck move in the same direction as the last three vertebrae in the lumbar (lowest) part of the spine.
- If the first two vertebrae are malpositioned, it will force a compensatory change all the way down the spine.





***“For every inch of Forward Head Posture, it can increase the weight of the head on the spine by an additional 10 pounds.” -Kapandji, Physiology of Joints, Vol. 3***



**Figure 1**



# Orthotics



- Misalignment of the feet leads to asymmetry up the chain and can cause wear and tear any where along the route.









[www.StrangeCosmos.com](http://www.StrangeCosmos.com)



# Posture Score Card

	Good - 10	Fair - 5	Poor - 0	Your Score
<b>Head:</b> The head should be centered				<input type="radio"/>
<b>Shoulders:</b> The shoulders should be level				<input type="radio"/>
<b>Hips:</b> The hips should be level				<input type="radio"/>
<b>Neck:</b> The head should be balanced on the spine				<input type="radio"/>
<b>Lower back:</b> There should be a normal curve				<input type="radio"/>
<b>Shoes:</b> The pattern of wear should be the same on each shoe	Even Wear	Uneven Wear	Very uneven Wear	<input type="radio"/>

- 0 to 9 - Extremely poor
- 10 to 19 - Very Poor
- 20 to 29 - Poor
- 30 to 39 - In Transition

- 40 to 49 - Good
- 50 to 59 - Near Optimal
- 60 - Optimal

**Your Total Posture Score** ☐

**Poor Posture can affect your entire health and well-being:**

**If your score is under 50** - we strongly suggest a complete postural evaluation by a wellness chiropractor in order to prevent unnecessary wear of your spine and joints (arthritis).

**If your score is above 50** - you posture is near optimal - we strongly suggest a neuro-spinal evaluation by a wellness chiropractor to detect any areas of interference on your nervous system related by your posture.

**A well-aligned spine is your first step toward optimal health!**



# The Variety of Symptoms Dentists Diagnose as TMJD

## Head Pain, Headache

1. Forehead
2. Temples
3. "Migraine" type
4. Sinus type
5. Shooting pain up back of head
6. Scalp too painful to touch

## Ear Problems

1. Hissing, buzzing, or ringing
2. Decreasing hearing
3. Ear pain or ear ache w/o infection
4. Clogged, "itchy" ears
5. Vertigo, dizziness

## Eyes

1. Pain behind eyes
2. Bloodshot eyes
3. May bulge out
4. Sensitive to sunlight

## Jaw Problems

1. Clicking, popping jaw joints
2. Grating sounds
3. Pain in cheek muscles
4. Uncontrollable jaw and/or tongue movements

## Mouth

1. Discomfort
2. Limited opening of mouth
3. Inability to open smoothly
4. Jaw deviates to one side when opening
5. Locks shut or open
6. Can't find bite

## Neck Problems

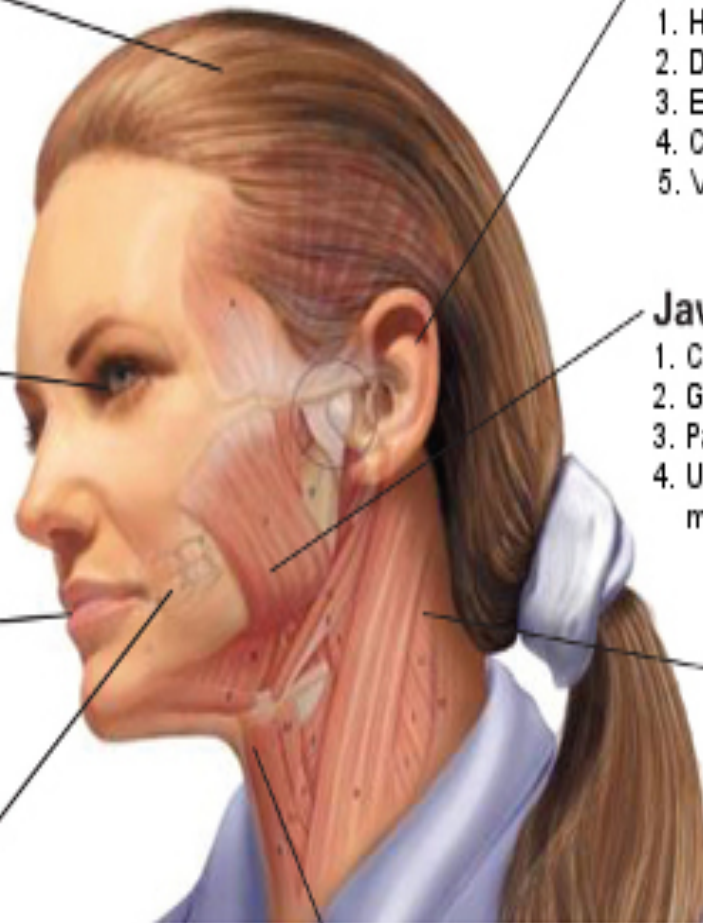
1. Lack of mobility, stiffness
2. Neck pain
3. Tired, sore muscles
4. Shoulder aches and backaches
5. Arm and finger numbness and/or pain

## Teeth

1. Clenching and/or grinding at night
2. Looseness and soreness of back teeth

## Throat

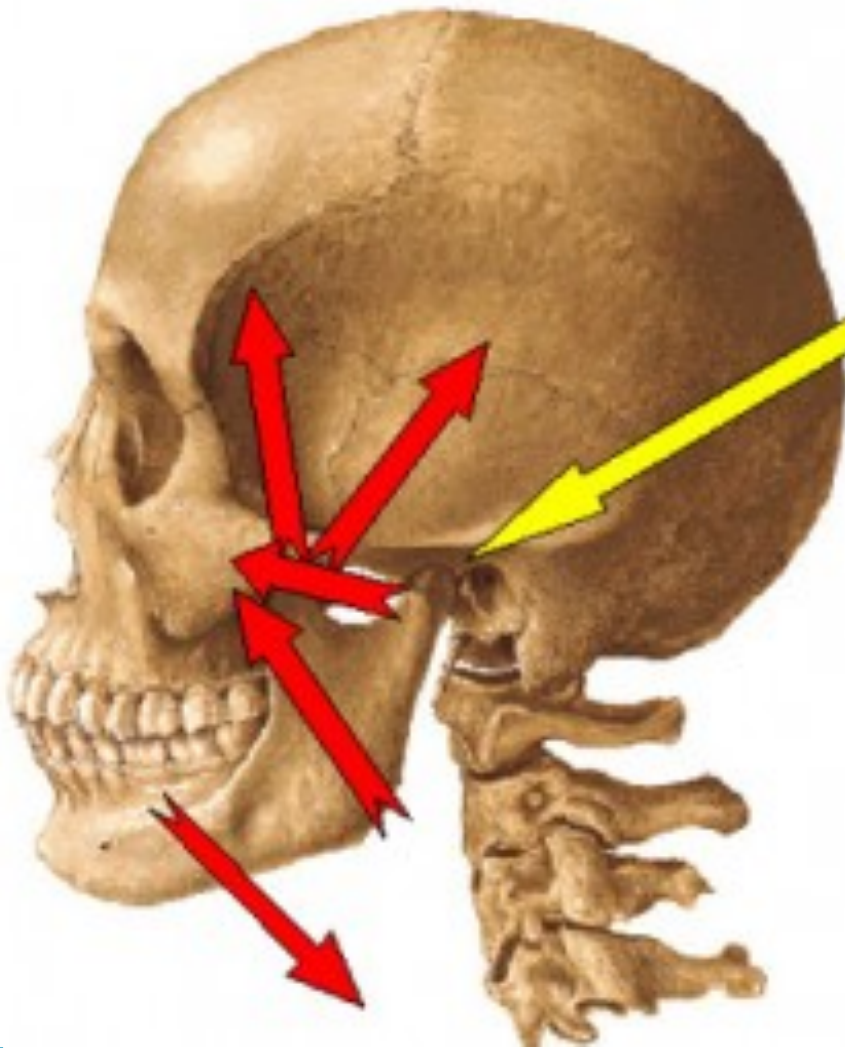
1. Swallowing difficulties
2. Laryngitis
3. Sore throat with no infection
4. Voice irregularities or changes
5. Frequent coughing or constant clearing of throat
6. Feeling of foreign object in throat constantly





# Temporomandibular Joint

One of the most complex and used joints in the body.



...but subject to the most complex vector forces (red arrows) due to masticatory muscular parafunction







# TMJ musculature

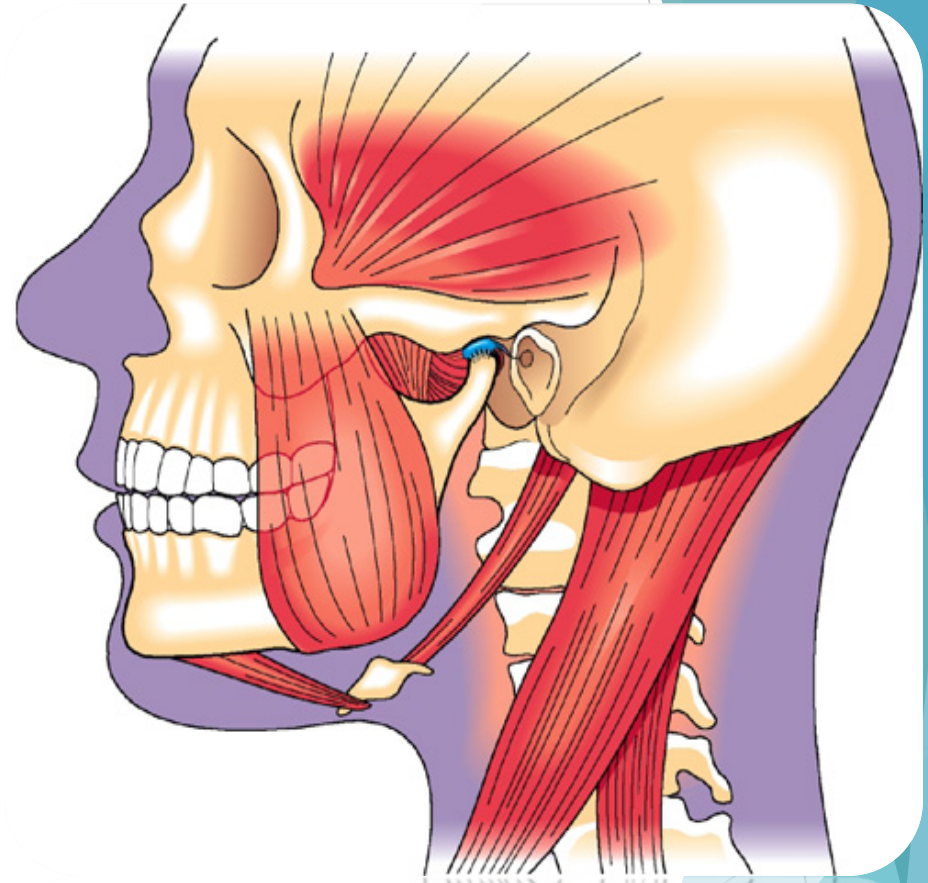
masseter

temporalis

lateral pterygoid

medial pterygoid

digastric





# JAW/NECK MUSCLES

## Muscles of Mastication

## Supporting Muscles of Mastication

Trapezius  
Muscle

Sternocleido-  
mastoid  
Muscle

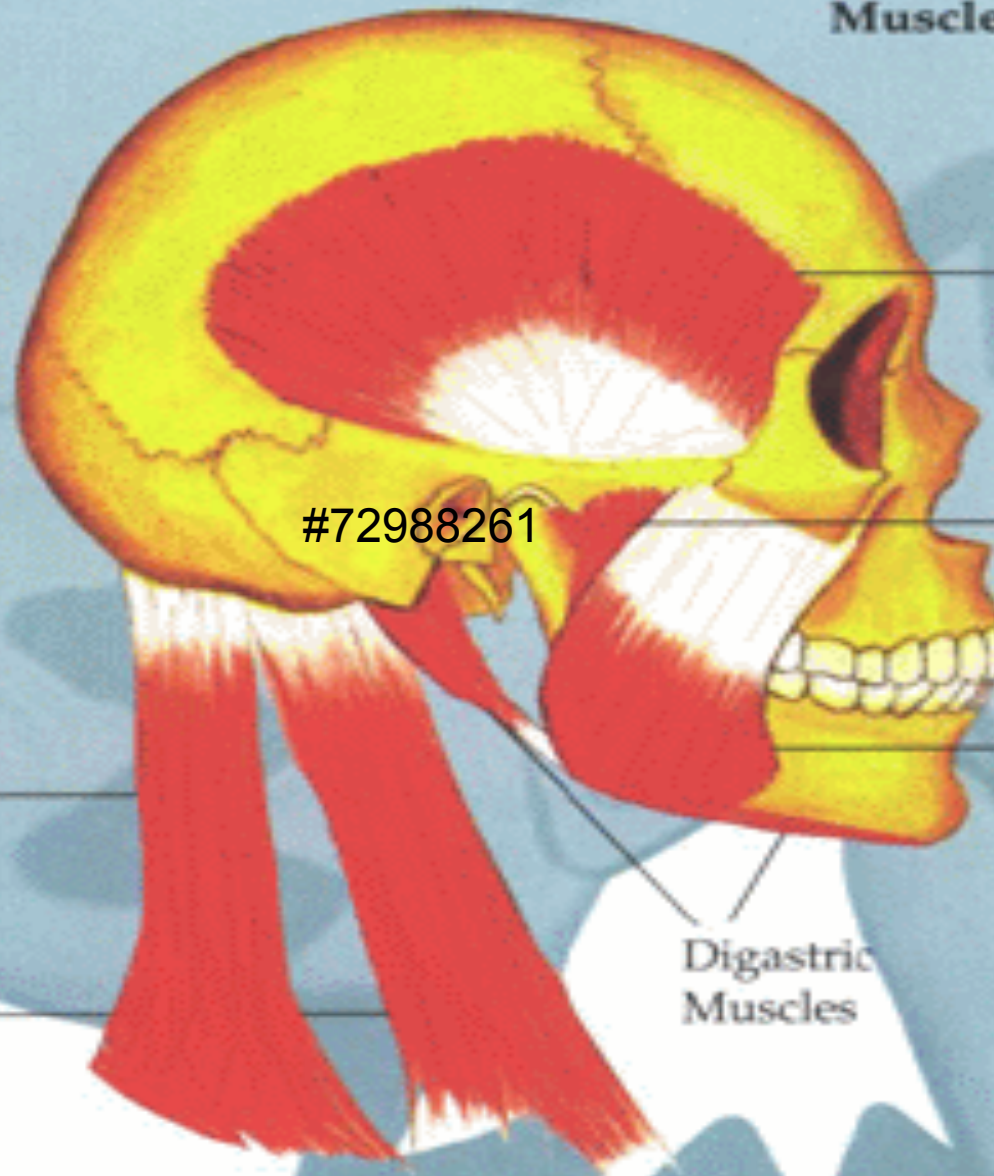
Temporalis  
Muscle

Lateral  
Pterygoid  
Muscle

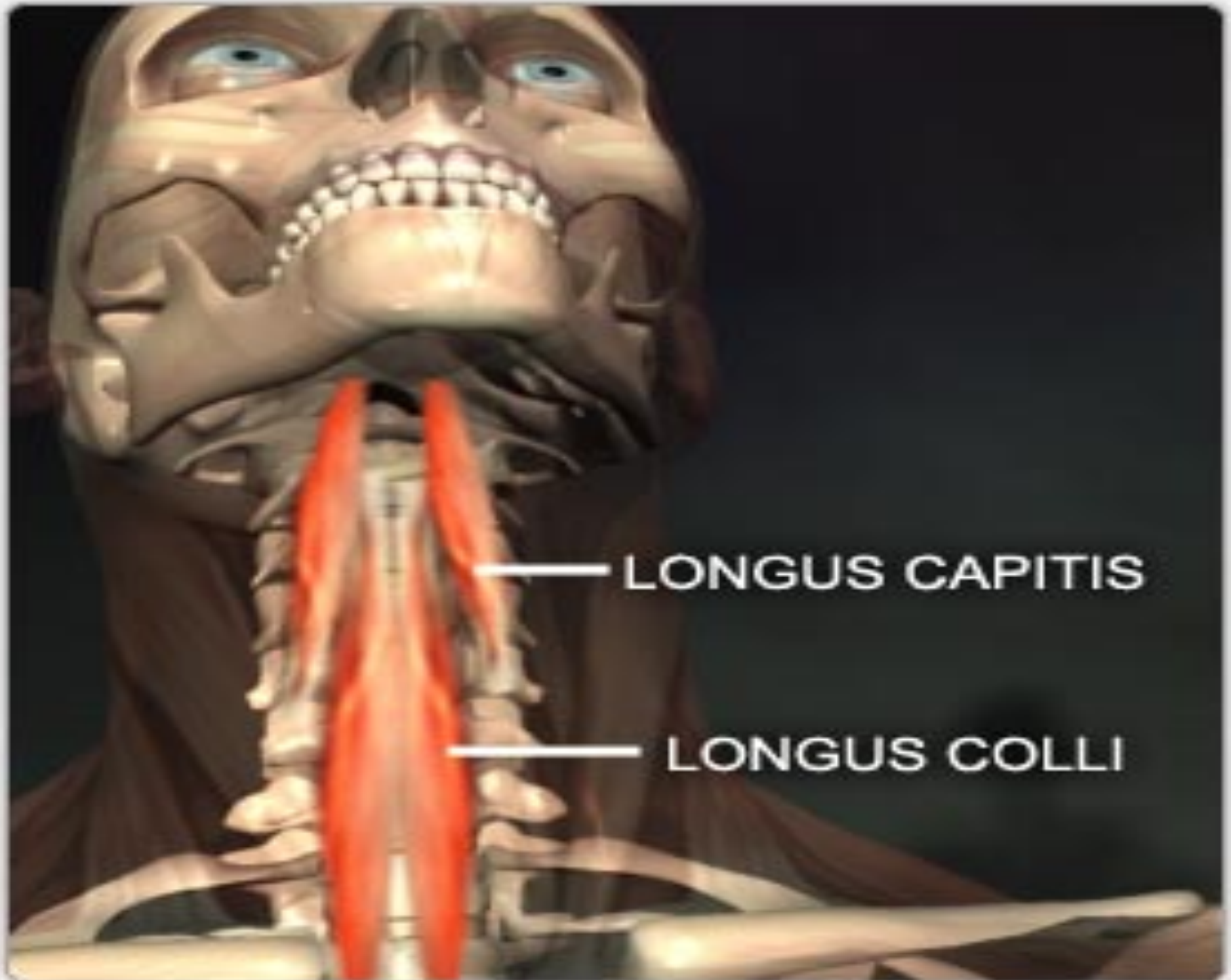
Masseter  
Muscle

Digastric  
Muscles

#72988261



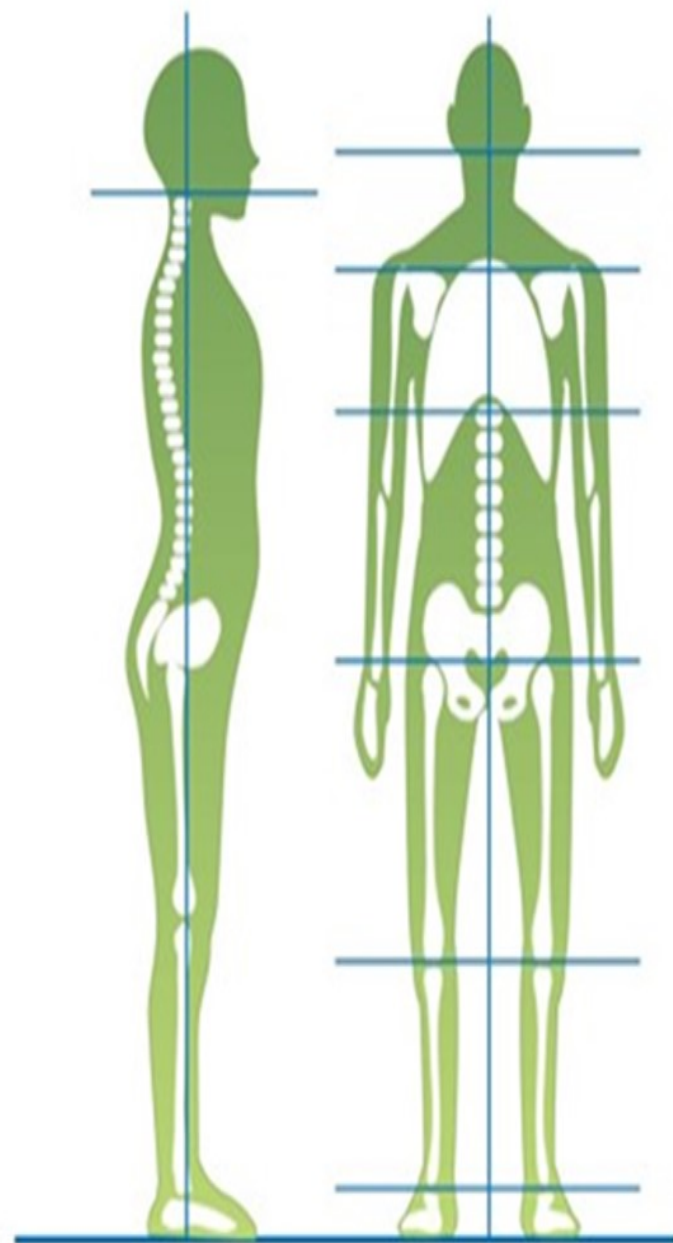




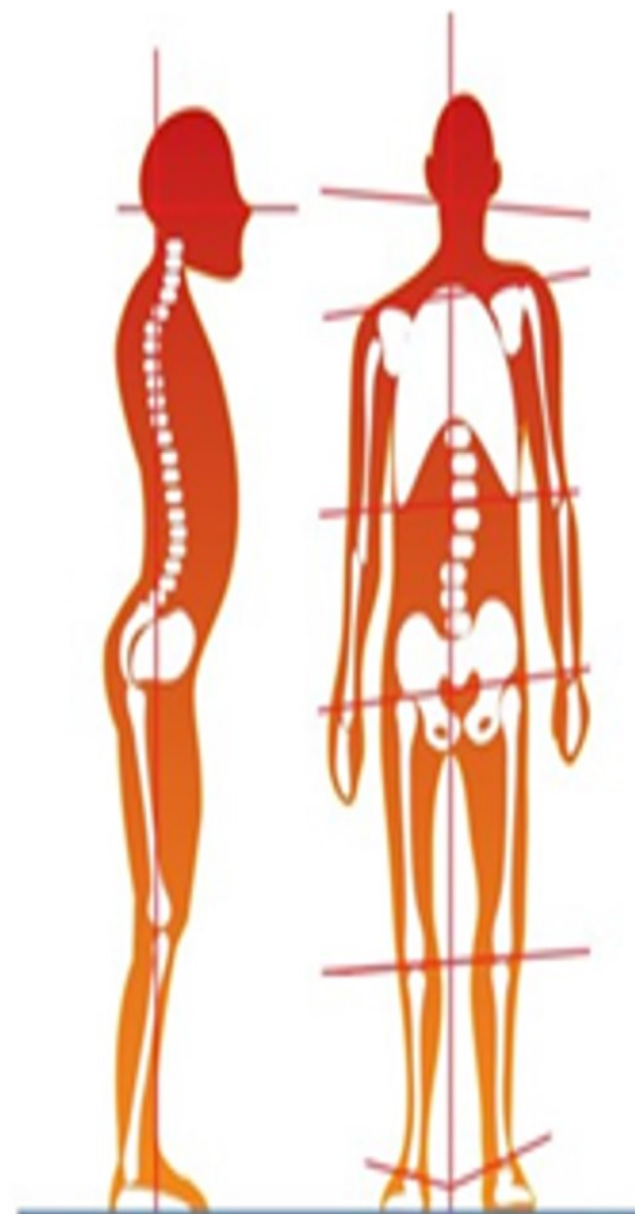
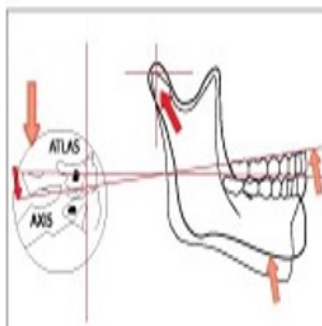
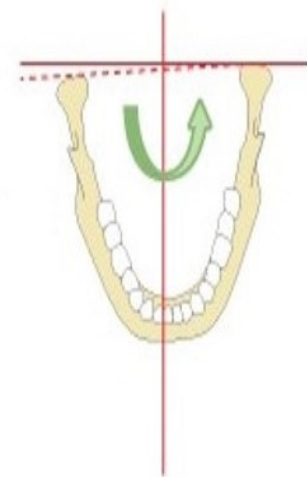
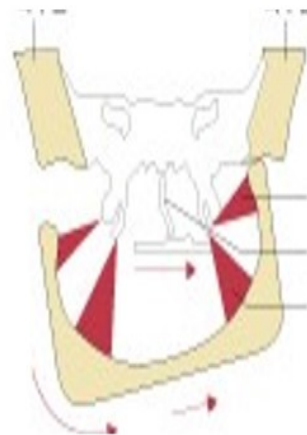
LONGUS CAPITIS

LONGUS COLLI





Normal Structure



Collapsed Structure



# Rate Your Pain Level

- Pressing my temples ..... [0] [1] [2] [3] [4]
- Pressing my jaw joints ..... [0] [1] [2] [3] [4]
- Pressing my jaw muscles ..... [0] [1] [2] [3] [4]
- Pressing the muscles under the sides of my jaw ..... [0] [1] [2] [3] [4]
- Pressing in my ears ..... [0] [1] [2] [3] [4]
- Pressing the back of my neck..... [0] [1] [2] [3] [4]
- Pressing the sides of my neck..... [0] [1] [2] [3] [4]
- S.R. Levitt M.D., Ph.D., T.F. Lundeen, D.M.D., M.W. McKinney, Ph.D.
- Copyright ©1984, 1987 Pain Resource Center, Inc. All Rights Reserved.Ci





"Can you describe your symptoms."

Copyright © 2008  
Nursing911.com

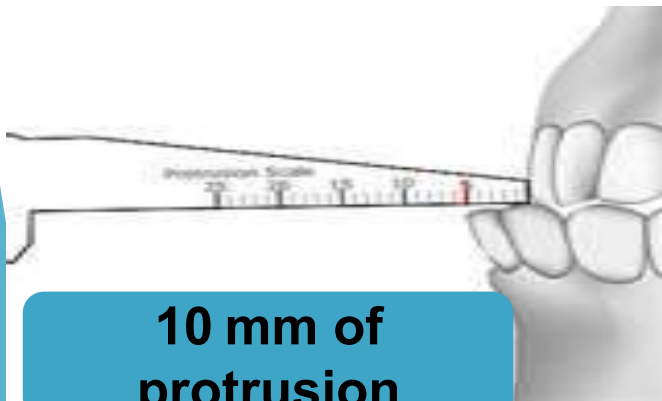


# TMJ MOBILITY

**40 mm of  
opening**



**10 mm of  
protrusion**



**10 mm of lateral  
excursion**



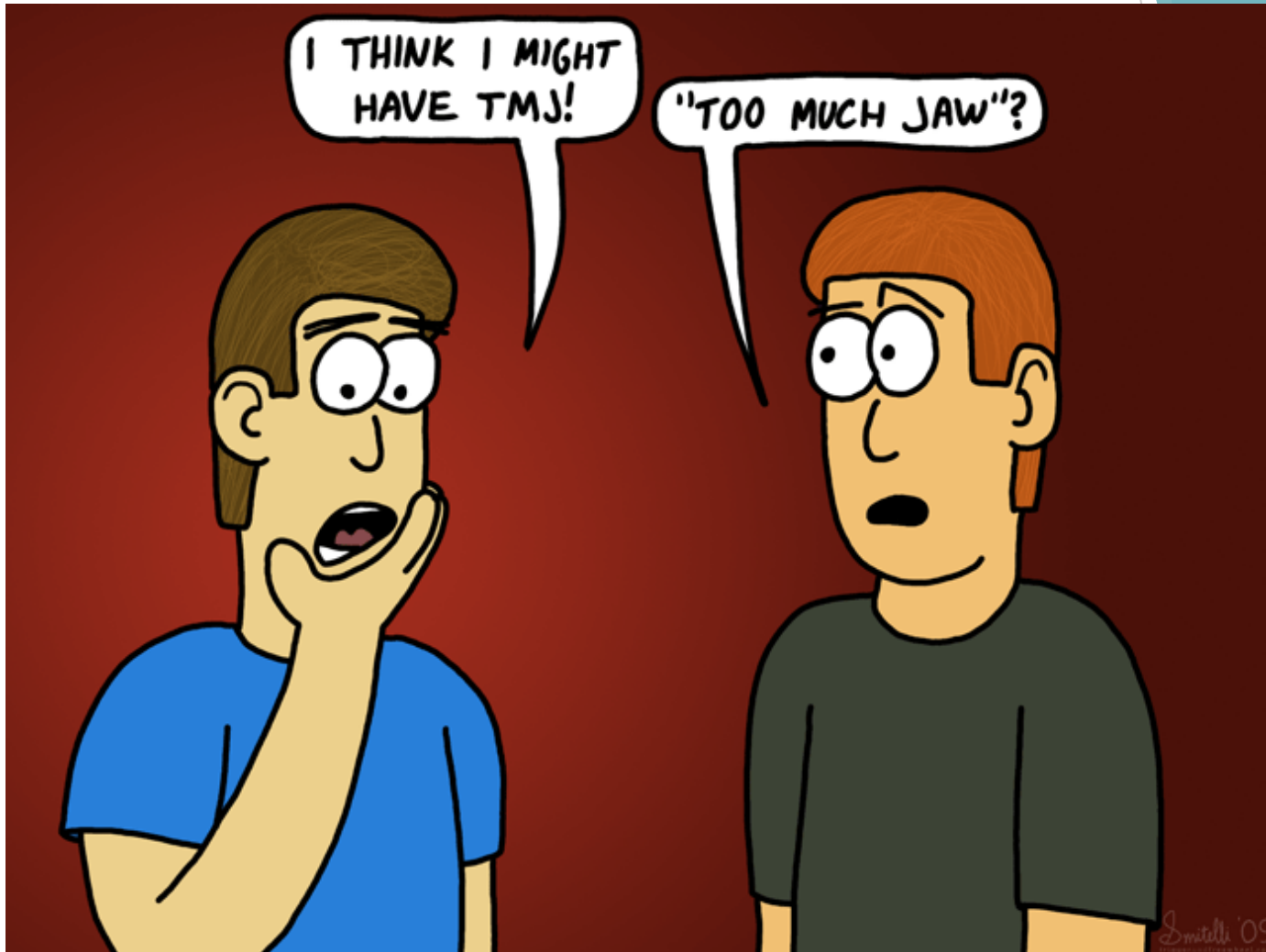


# TMJ MOBILITY



There is a 4:1 ratio opening: lateral excursion and protrusion. Normal/Functional opening is 36-42 mm



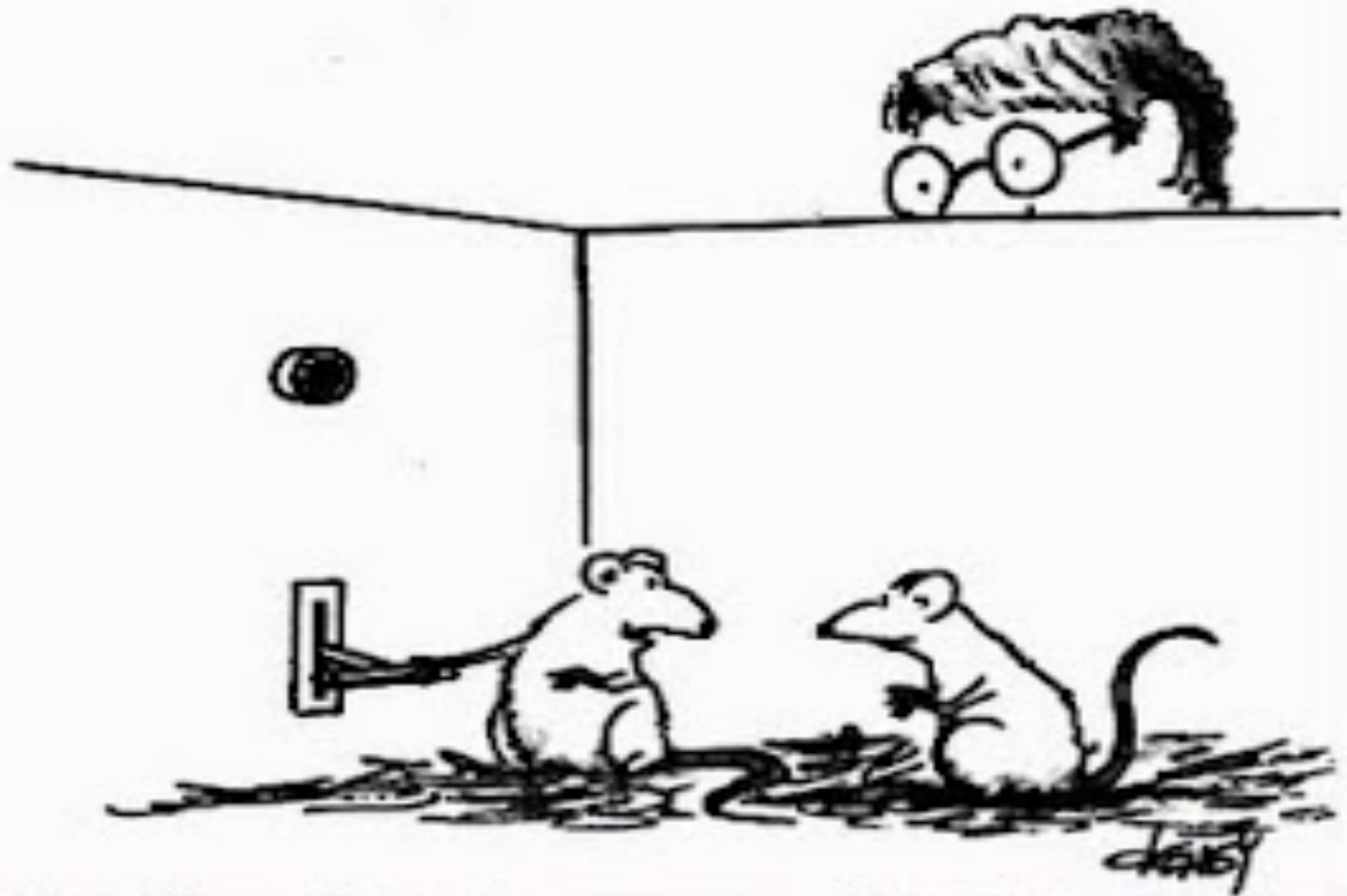




# Self Evaluation of TMJ

- ▶ Look at alignment at rest
- ▶ Look for deviation with opening
- ▶ Look for deviation with protrusion
- ▶ Look for mobility difference between right and left
- ▶ Feel for even bite

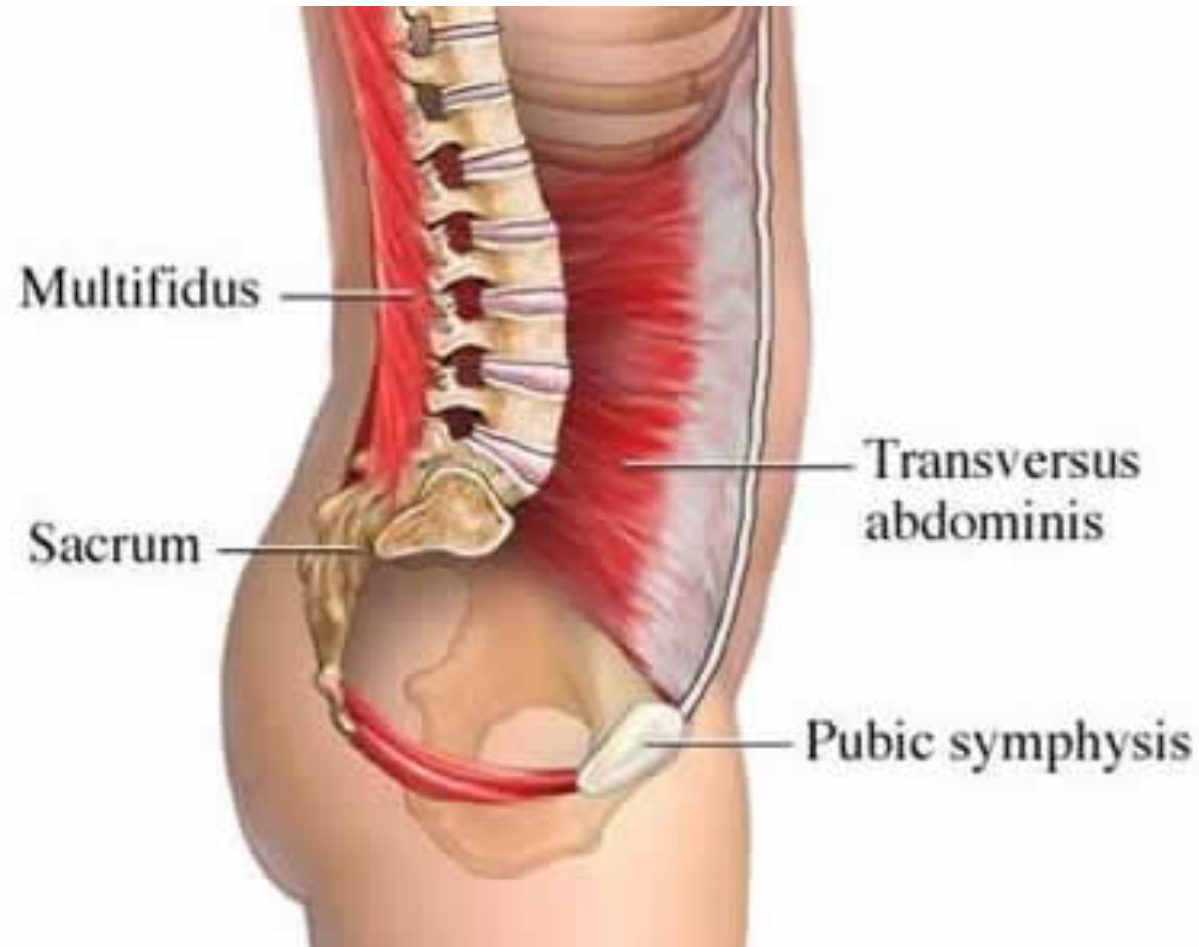




It's a rather interesting phenomenon. Every time I press this lever, that post-graduate student breathes a sigh of relief.

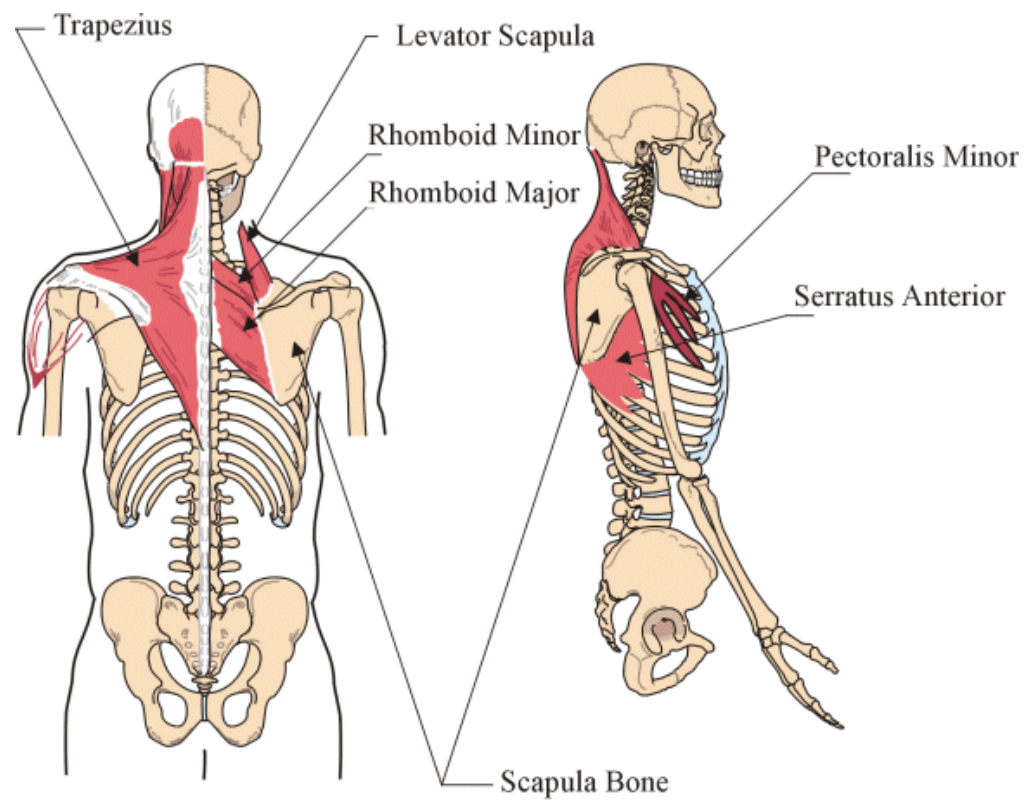


# Core Stabilizers





# Scapular Stabilization





# Dangers of Forward Head Posture

## The Domino Effect



Normal



Forward Head Posture

1. The head moves forward shifting the Center of Gravity.

2. To compensate, the upper body drifts backward.

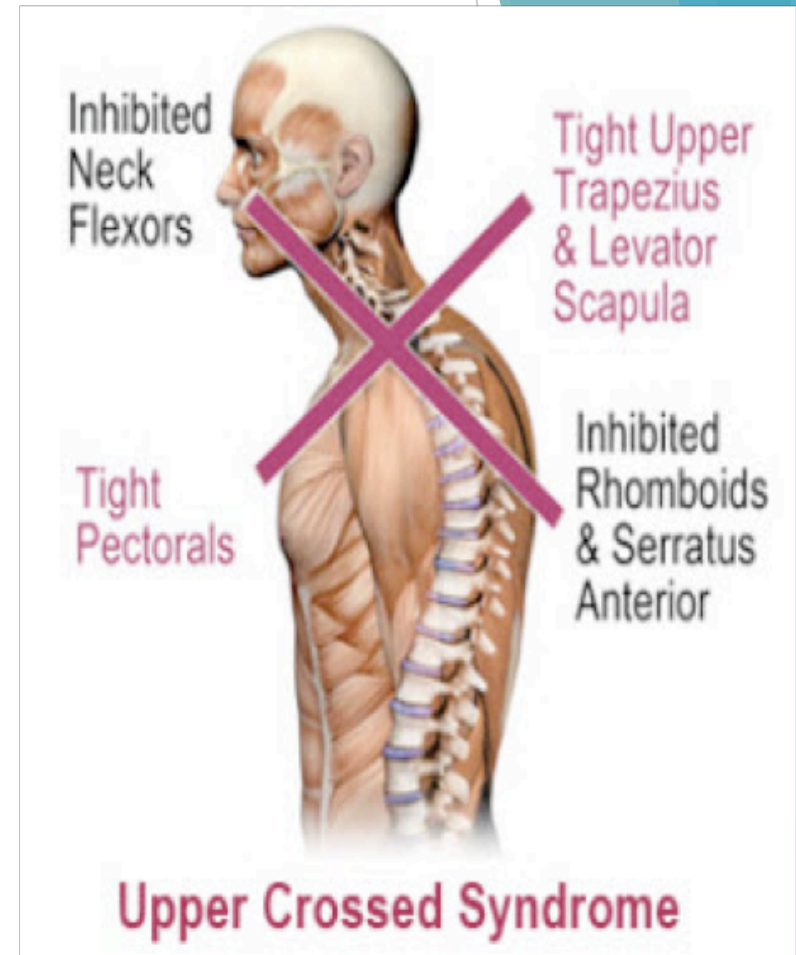
3. To compensate for the upper body shift, the hips tilt forward.

So, the forward head position can be the cause of not only head/neck problems, but also mid-back and low back problems.



# Upper Crossed Syndrome

When our head is allowed to come forward and our shoulders protract (droop forward), we put a great deal of stress on the musculature at the back of the neck. As the head drops forward, we do not look at the ground, we look out in front of us and the skull extends where it meets the neck. This engages the muscles just below the skull (the suboccipital musculature), which become overactive. The deep neck flexors weaken and destabilize the neck.





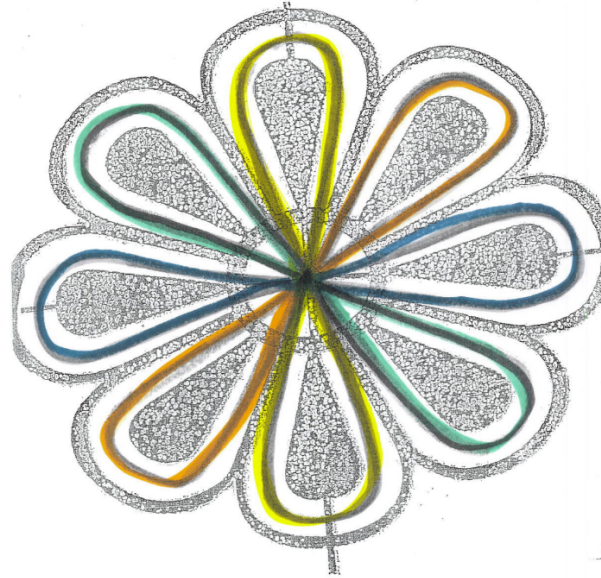
# Therapeutic Exercises

- Improve muscular coordination
- Increase muscular strength
- Postural exercises
- Active Range of Motion exercises
- Muscles of mastication
- Cervical spine muscle
- General mobility

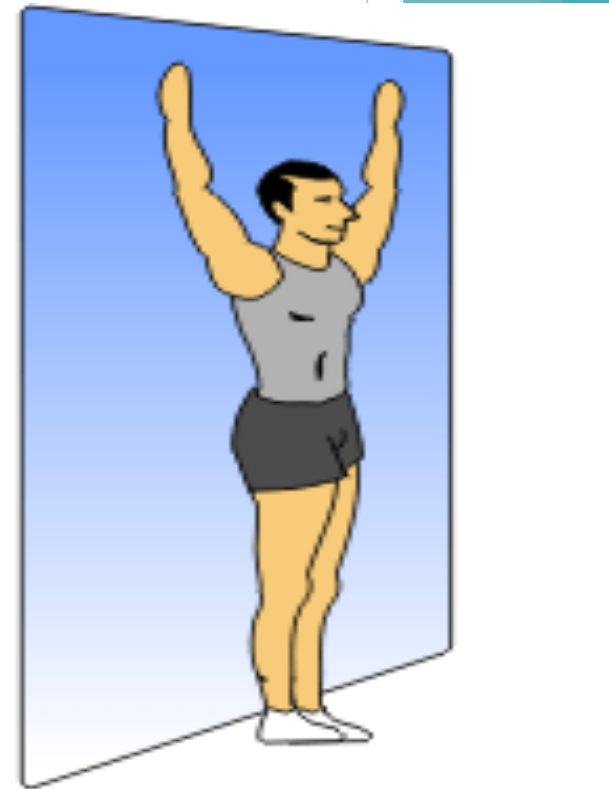




# HIGH CERVICAL MOBILITY







<http://www.strengthcoach.com/members/images/1174a.gif>



## Upper Lip Stretch

- ▶ **\*\*\*Slow and Controlled Movements\*\*\***
- ▶ Put tongue up in between the teeth and upper lip
- ▶ Roll upper lip down over tongue
- ▶ Protrude jaw forward to meet the upper lip so lips touch
- ▶ Hold for 6 seconds, 6 repetitions, 2-3x a day

## Peacock as an Activity

- ▶ Place both hands on the chest (sternum) Bring chest forward into hands
- ▶ **\*\* Do not push hands into chest\*\***
- ▶ Hold for 6 seconds. Relax; 6 repetitions, several times a day

## Peacock as a Resistance

- ▶ Place both hands on the chest (sternum) . Bring chest forward into hands. Push hands down into chest creating resistance
- ▶ Hold for 6 seconds. Relax; 6 repetitions, several times a day





# Internal Mouth Stretches

- Putty
- Ping Pong Ball
- Manually





# Resisted stretching

## **Mandibular Opening**

1. Open to widest point
2. Place both thumbs inside mouth on molar surface
3. Resist light closure for 6 seconds
4. Relax 6 seconds
5. Open further, repeat 5 times

## **Lateral Mandibular movement**

1. Mouth slightly open
2. Move mandible laterally
3. Resist medial movement for 6 seconds
4. Relax for 6 seconds
5. Laterally deviate further, repeat for 3 to 5 times



## HOME EXERCISES FOR TONGUE AND JAW MOBILITY

- ▶ **Exercise 1:** Place Nuk Brush between the center of teeth, and move:

Up&Down- 6 repetitions, 2-3x a day

Side to Side- 6 repetitions, 2-3x/day

- ▶ **Exercise 2 :** Place Nuk Brush on tongue

Move brush side to side using tongue

6 repetitions, 2-3x a day

- ▶ **Exercise 3:** Place Nuk Brush in between the teeth and bite down

Turn head to the (RIGHT/LEFT) side

Hold for 6 seconds, 6 repetitions, 2-3x a day





# Manual Therapy

- Massage
- Joint Mobilization
- Muscle stretching (passive and active)
- Myofascial release
- Manual traction
- Trigger points
- Relaxation techniques





# **Techniques: Control of Jaw Muscles**

Begin with proper resting position of the Jaw placing tongue on roof of the mouth. Practice control while elevating and depressing the mandible throughout the first half of the ROM.

Keeping the tongue on the roof of the mouth, open the mouth while trying to keep the chin in the midline. Use a mirror for visual reinforcement.

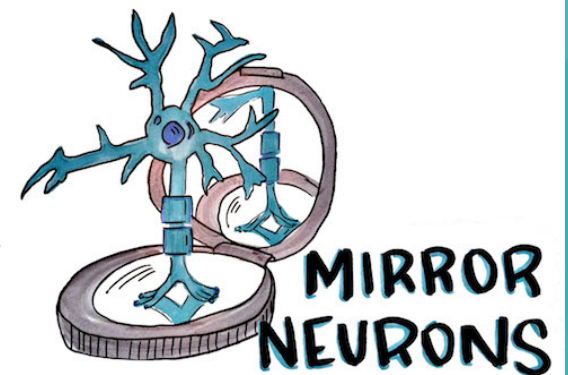
If the jaw deviates to one side, practice lateral deviation to the opposite side without creating pain or excessive motion.





# Mirror Neurons

**You see a stranger stub her toe and you immediately flinch in sympathy, or you notice a friend wrinkle up his face in disgust while tasting some food and suddenly your own stomach recoils at the thought of eating. This ability to instinctively and immediately understand what other people are experiencing has long baffled neuroscientists, but recent research now suggests a fascinating explanation: brain cells called mirror neurons.**





# What is Neuroplasticity?

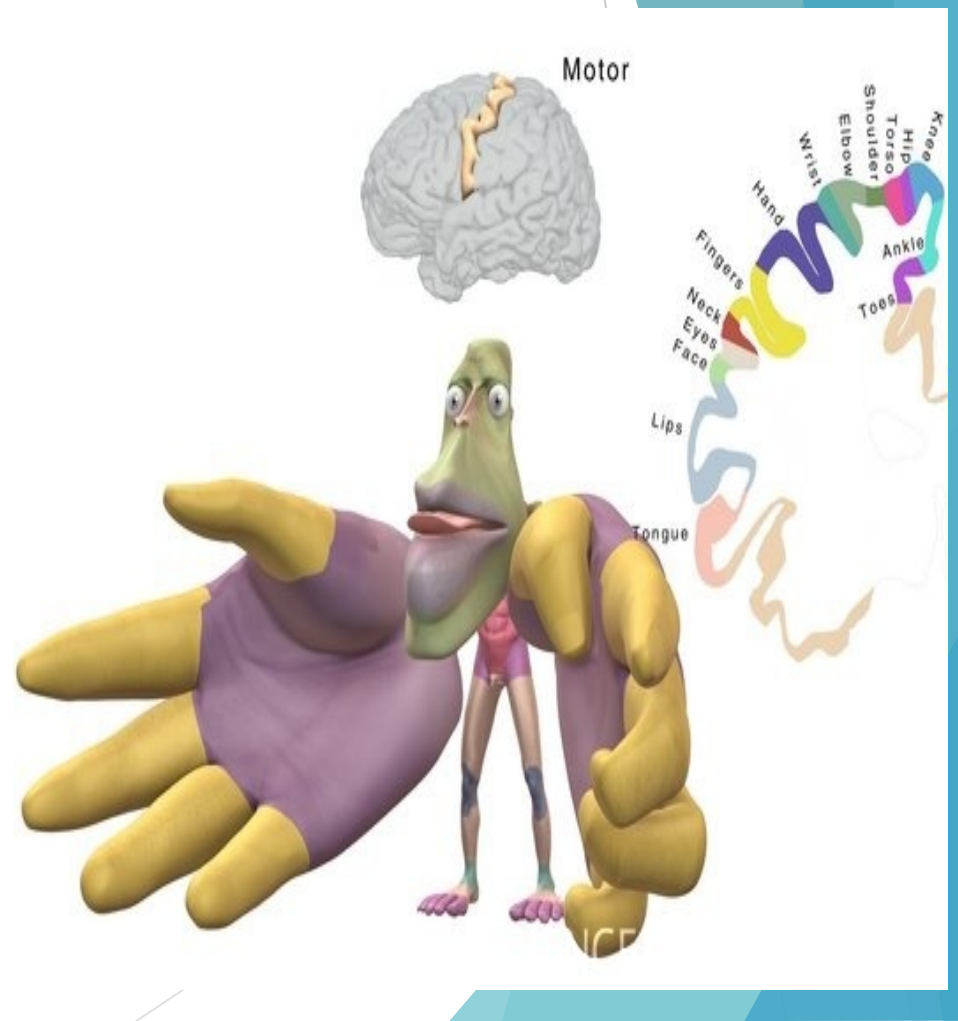
- The capability of the brain (or the CNS) to reorganize by forming new neural connections throughout life
- The ability for the brain to reorganize itself to compensate for injury and disease
- Allows for adjustment of activities in response to new situations or to changes in the environment
- Creating new pathways that allow it to adapt; in effect, a rewiring of the brain
- 70% of synaptic connections change every day





## **Body Parts Compete for Brain Representation**

- There is a need for the brain to use experience to initiate a new synaptic connection between neurons.
- The more a body part is used, the bigger its area of representation in the brain which correlates with improved function.
- The opposite effect also occurs. The more a body part is not used, the more the learned behavior of non-function occurs.
- Developing muscle memory in vocal exercises is imperative for developing healthy posture while singing and with time you will not have to really 'think' about what you are doing.



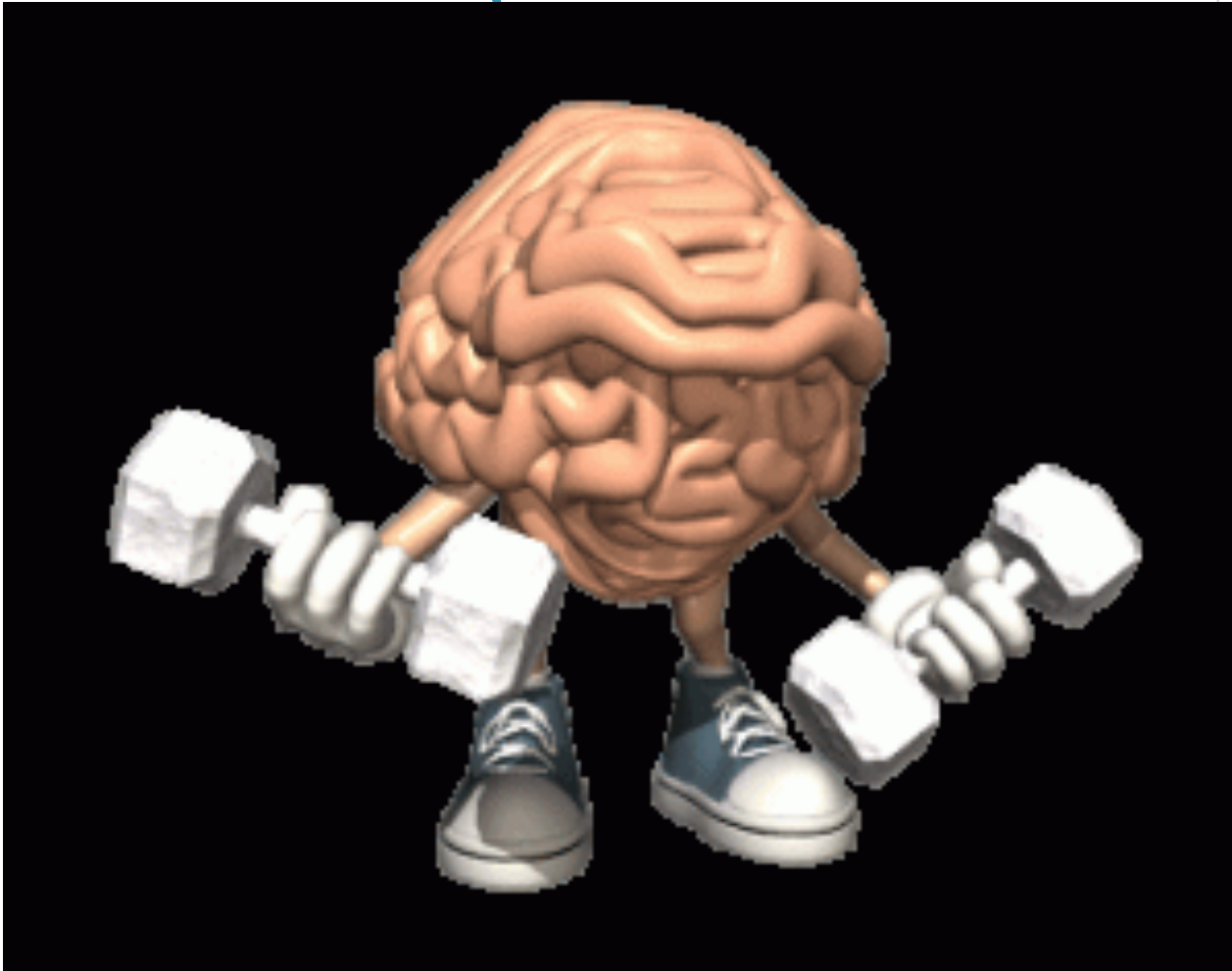


# Changing Faulty Patterns





# Mirror Exercises: Home Program







Mirror book therapy is a technique adapted by Barth and Stezar to enhance the recruitment of mirror neurons. In mirror book therapy, a bi-fold mirror is used to twice reflect the unaffected half of a patient's face, such that the patient sees a full face. The patient then proceeds to perform jaw and cervical exercises. By seeing the exercises in a symmetric manner, increased activity of motor command pathways and pathways from the stronger region are utilized to supplement the weaker region.





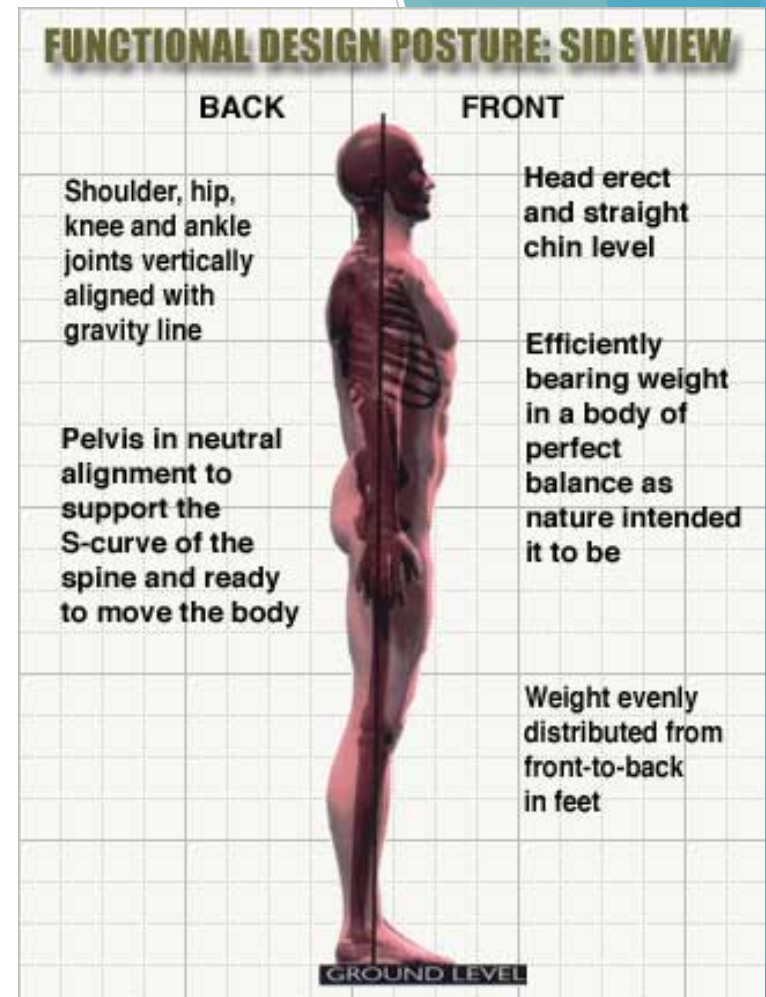
# Preventing TMD

## Avoid

- Large bites
- Excessive chewing
- Removing food from teeth with tongue
- Chewy food

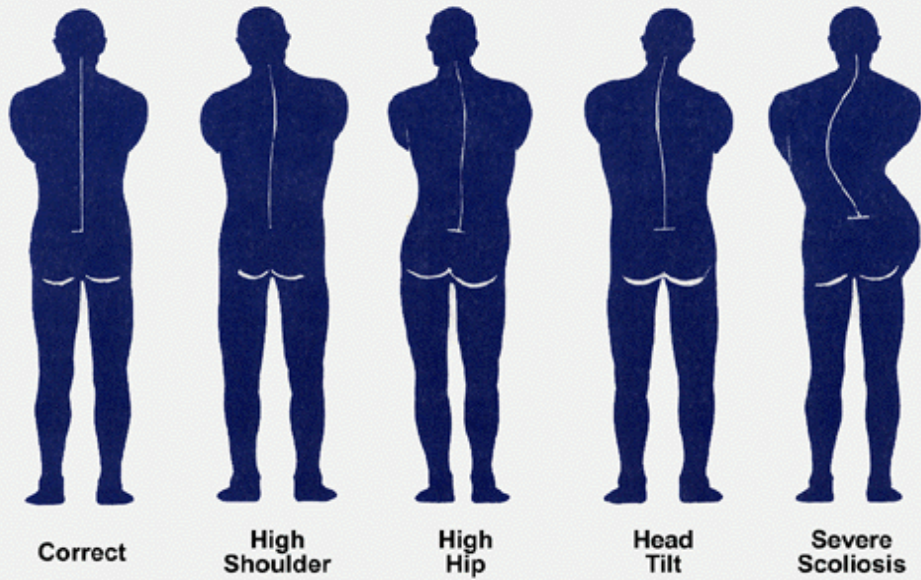
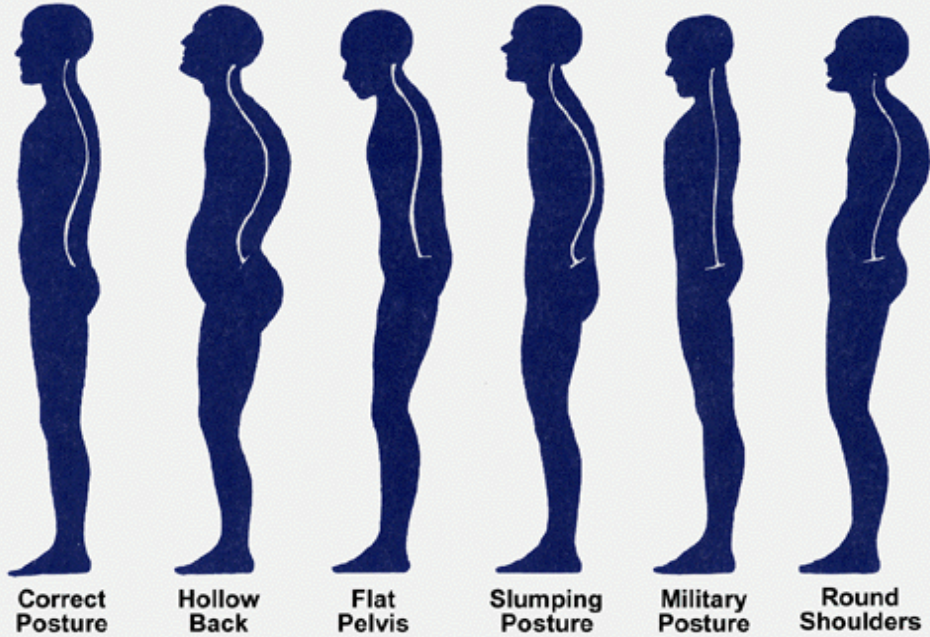
## Do

- Relaxation techniques
- Reduce tension
- Maintain good posture



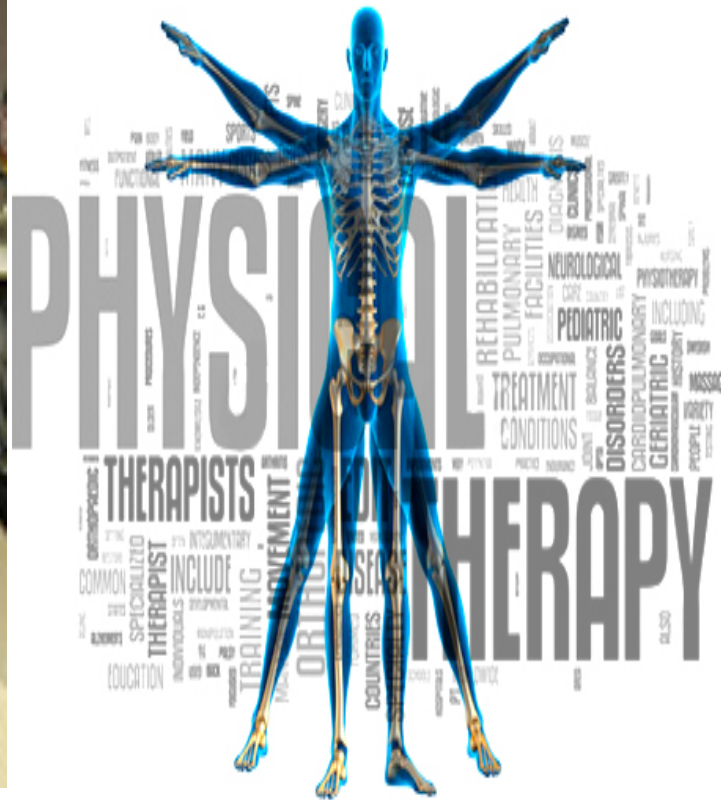


## LOOK AT YOUR POSTURE... OTHERS DO



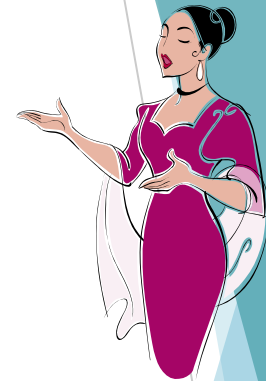


# Putting It All Together





# Questions???





# Relevant studies and research

## Dental Occlusion and Body Posture: a surface EMG study

Properly aligning the malocclusion of the mouth using acrylic wafer, there was a reduction of sEMG values in all the muscles that was tested. The reduction of neuromuscular firing indicates that the muscles are more or less in a relaxed non stress state in continuously realigning paired muscles (SCM, erector spinae and soleous)

Cranio. 2008 Jan;26(1):25-32.

Bergamini M<sup>1</sup>, Pierleoni F, Gizdulich A, Bergamini C.



## Changes in head position due to occlusal supporting zone loss during clenching

When the occlusal supporting zones are lost or inadequate the head equilibrium is lost due to lost proprioceptive feedback from the masticatory muscles and periodontal membrane.

When these supporting zones are either lost or inadequate, there is a likely possibility for the neck musculature to compensate, thereby affecting the posture in increment and in increasing manner.

Cranio. 2003 Apr;21(2):89-98.

Yoshino G<sup>1</sup>, Higashi K, Nakamura T.



# Correlation between occlusion and cervical posture in patients with bruxism

There was a higher malocclusion in subjects who also suffer from temporomandibular disorder. There was also a prevalence of in the anteriorazation of the head with subjects who has malocclusion. Malocclusion is predominant with subjects with bruxism.

Compend Contin Educ Dent. 2006 Aug;27(8):  
463-6; quiz 467-8.

▪  
Cesar GM<sup>1</sup>, Tosato Jde P,  
Biasotto-Gonzalez DA.



## ► Event-related functional MRI investigation of vocal pitch variation☆

► Kyung K. Peck a,b,\*, Jessica F. Galgano c,d, Ryan C. Branski d, Dmitry Bogomolny d, Margaret Ho d, Andrei I. Holodny a, Dennis H. Kraus d

► a Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

► b Department of Medical Physics, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

► c Department of Speech-Language Pathology, Teacher's College, Columbia University, New York, NY, USA

► d Department of Head and Neck Surgery, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

► Voice production involves precise, coordinated movements of the intrinsic and extrinsic laryngeal musculature. A component of normal voice production is the modification of pitch. The underlying neural networks associated with these complex processes remains poorly characterized. However, several investigators are currently utilizing neuroimaging techniques to more clearly delineate these networks associated with phonation. The current study sought to identify the central cortical mechanism(s) associated with pitch variation during voice production using event-related functional MRI (fMRI). A single-trial design was employed consisting of three voice production tasks (low, comfortable, and high pitch) to contrast brain activity during the generation of varying frequencies. For whole brain analysis, volumes of activation within regions activated during each task were measured. Bilateral activations were shown in the cerebellum, superior temporal gyrus, insula, precentral gyrus, postcentral gyrus, inferior parietal lobe, and post-cingulate gyrus. In the left hemisphere, activations in the medial and middle frontal gyri were also observed. Regions active during high pitch production when compared to comfortable pitch were evident in the bilateral cerebellum, left inferior frontal gyrus, left cingulate gyrus, and left posterior cingulate. During low pitch generation, activations were present in the inferior frontal gyrus, insula, putamen, and cingulate gyrus in the left hemisphere. The inferior frontal gyrus in the right hemisphere produced greater activity than the area of the left hemisphere during high and low pitch generation. These results suggest that a single-trial design is sensitive enough to begin to delineate a widespread network of activations in both hemispheres associated with vocal pitch variation.



**Cranio. 2009 Oct;27(4):221-30.**

**Professional musicians with craniomandibular dysfunctions treated with oral splints.**

**Steinmetz A1, Ridder PH, Methfessel G, Muche B.**

Craniomandibular dysfunction (CMD) symptoms occur frequently in violin/viola and wind players and can be associated with pain in the neck, shoulders and arm. In the current study, the effect of oral splint treatment of CMD on reducing pain and symptoms especially in these areas was investigated. Thirty (30) musicians undergoing CMD treatment with oral splints participated in this study. They completed a questionnaire that addressed CMD symptoms, localization of pain, and subjective changes in symptoms. Pain in the shoulder and/or upper extremity was the most frequent symptom reported by 83% of subjects, followed by neck pain (80%) and pain in the teeth/TMJ regions (63%). Treatment with oral splints contributed to a significant decrease in neck pain in 91%, teeth/TMJ pain in 83%, and shoulder and upper extremity pain in 76% of the musicians. Eighty percent (80%) of the patients reported improvement of their predominant symptoms. CMD can be a potential cause for pain in the neck, shoulders, and upper extremities of musicians. It is paramount that musicians with musculoskeletal problems be examined for CMD symptoms. Treatment with oral splints seems to be valuable. Further prospective, randomized controlled studies are necessary to confirm efficacy of oral splint treatment in CMD-associated pain and problems in the neck, shoulder, and the upper extremities in musicians.



# The relationship between forward head posture and temporomandibular disorders.

The statistical measurements of shoulder, ear and C7 revealed the subjects who were suffering TMD shows that their head is positioned more forward compared with the control group.

J Orofac Pain. 1995 Spring;9(2):161-7.  
Lee WY<sup>1</sup>, Okeson JP, Lindroth J.



## **Body posture evaluations in subjects with internal temporomandibular joint derangement**

researchers came up with the following results:

TMD have more frequency of lifter shoulders than healthy individual  
TMD presented more deviations in the antero internal hip chain

Previous history suggest that any alterations in one joint, cascades to alteration on the next joint. The posture analysis shows muscle chain change, thus affecting the global posture.

Cranio. 2009 Oct;27(4):231-42.

Munhoz WC<sup>1</sup>, Marques AP.



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When the occlusal supporting zones are lost or inadequate the head equilibrium is lost due to lost proprioceptive feedback from the masticatory muscles and periodontal membrane.

When these supporting zones are either lost or inadequate, there is a likely possibility for the neck musculature to compensate, thereby affecting the posture in increment and in increasing manner.

Cranio. 2003 Apr;21(2):89-98. Yoshino G<sup>1</sup>, Higashi K, Nakamura T.



## Professional musician with craniomandibular dysfunction treated with oral splints

CMD is a potential cause for pain in the neck, shoulder and UE in professional musicians. The current study shows that in treating the CMD, there is a significant decrease in pain in all the areas previously mentioned. A noted decrease of neck pain in 91% of the subjects and issues on TMJ and teeth also decreased in 83% of the subjects.

Cranio. 2009 Oct;27(4):221-30.

Steinmetz A<sup>1</sup>, Ridder PH, Methfessel G, Muche B.





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