PRESENTATION

Breathing, Sleeping, and Posture

SPEAKER

Leslie Russek, PT, DPT, PhD, OCS
Professor Emeritus, Clarkson University
Physical Therapist, St. Lawrence Health System

Who Am I?

- Professor Emeritus, Physical Therapy Department, Clarkson University
- Staff PT, St. Lawrence Health System, Potsdam NY
  - Clinical specialties: hypermobility, fibromyalgia, headaches, temporomandibular disorders
- Frequent presenter to professional and patient groups at national conferences
- Author of multiple review and research articles on hypermobility
- Author of ”Chronic Pain” chapter in *Physical Rehabilitation* textbook for PT students
- Lrussek@Clarkson.edu
- https://webspace.clarkson.edu/~lrussek/

I do not have any conflicts of interest to report

Objectives

At the end of this presentation, participants will better understand:

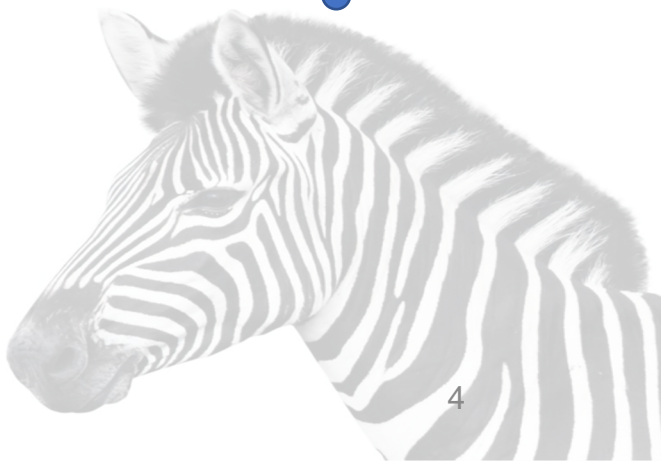
- How daily activities can contribute to pain and other symptoms:
    1. Breathe correctly
    2. Sleep better
    3. Sit and stand with less stress to your body
- How physical therapy can help you achieve these goals

Clarkson UNIVERSITY

Breathing

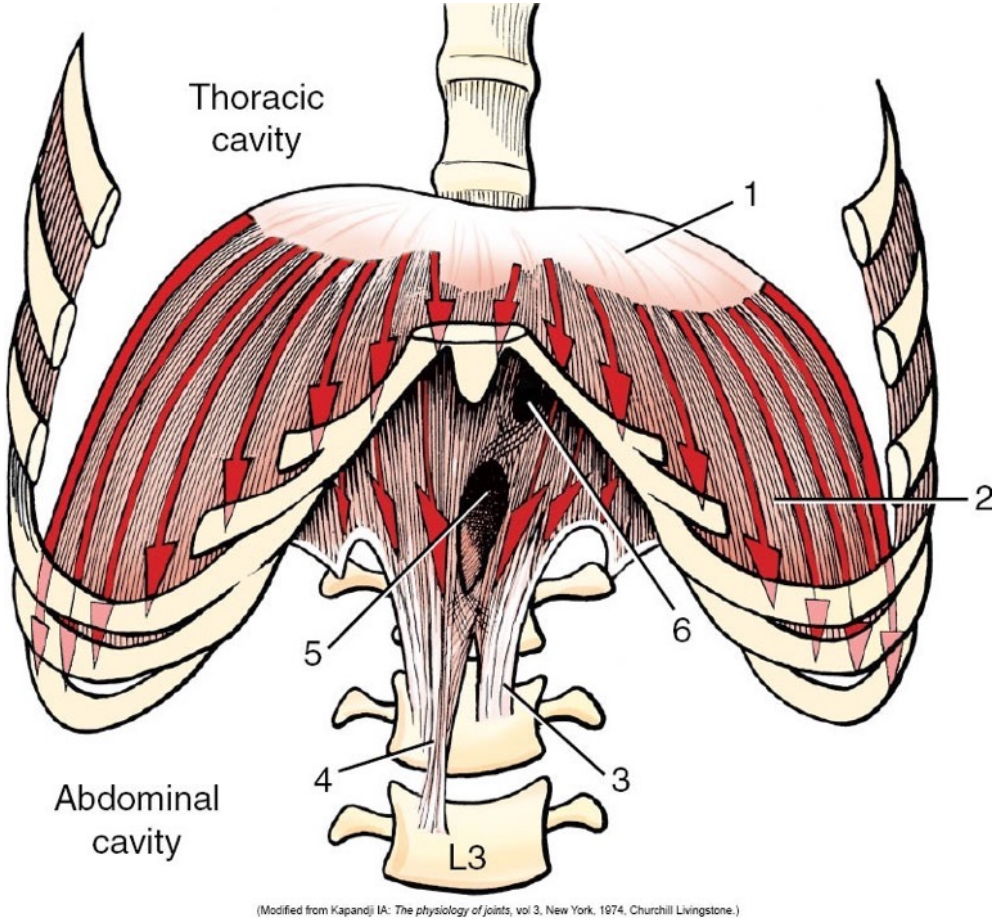
You mean, there is a WRONG way to breathe?

- Why breathing correctly is important
- Diaphragmatic breathing and problems due to the diaphragm not functioning properly
- Benefits of slow breathing
- Nose breathing vs. mouth breathing
- How physical therapy can help



Clarkson UNIVERSITY

The Diaphragm

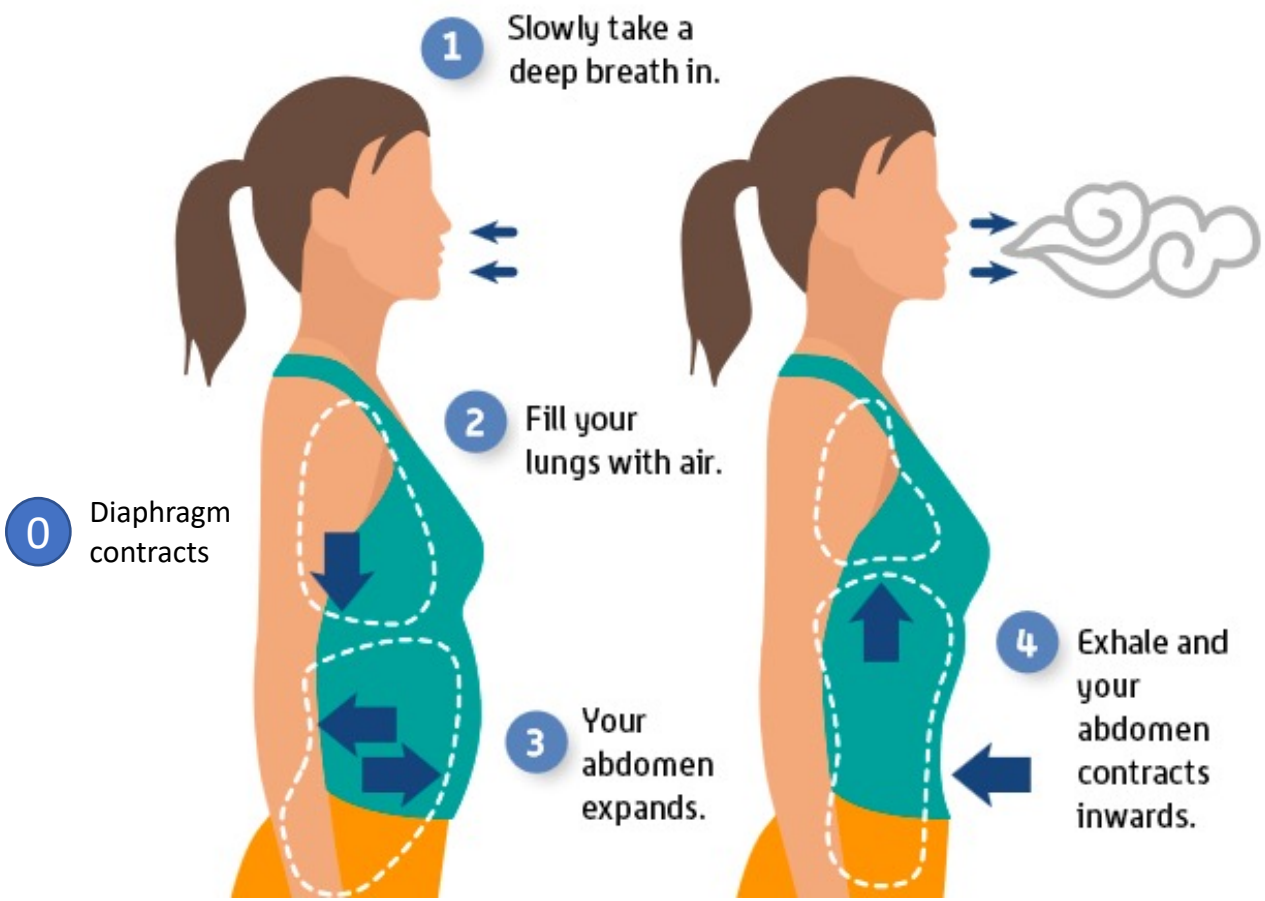


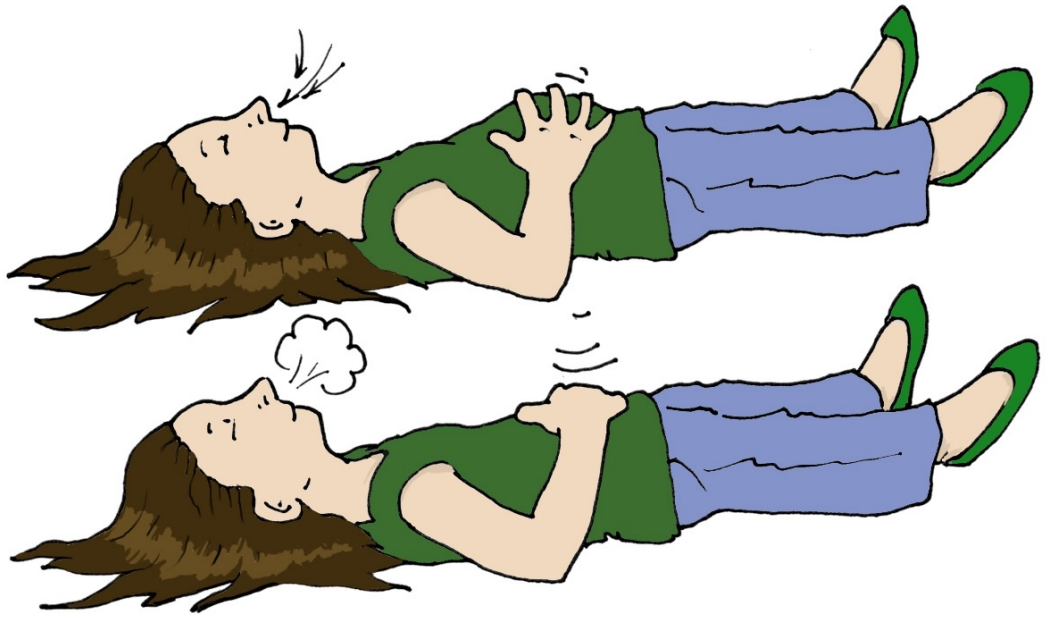
(Modified from Kapandji IA: *The physiology of joints*, vol 3, New York, 1974, Churchill Livingstone.)

- The primary muscle for relaxed breathing
- Coordinates with abdominal and pelvic floor muscles
- Stabilizes the lumbar spine
- Irritation of the diaphragm refers pain to the shoulders
- 14+ accessory breathing muscles are normally active only in strenuous breathing

(Kocjan, 2017)

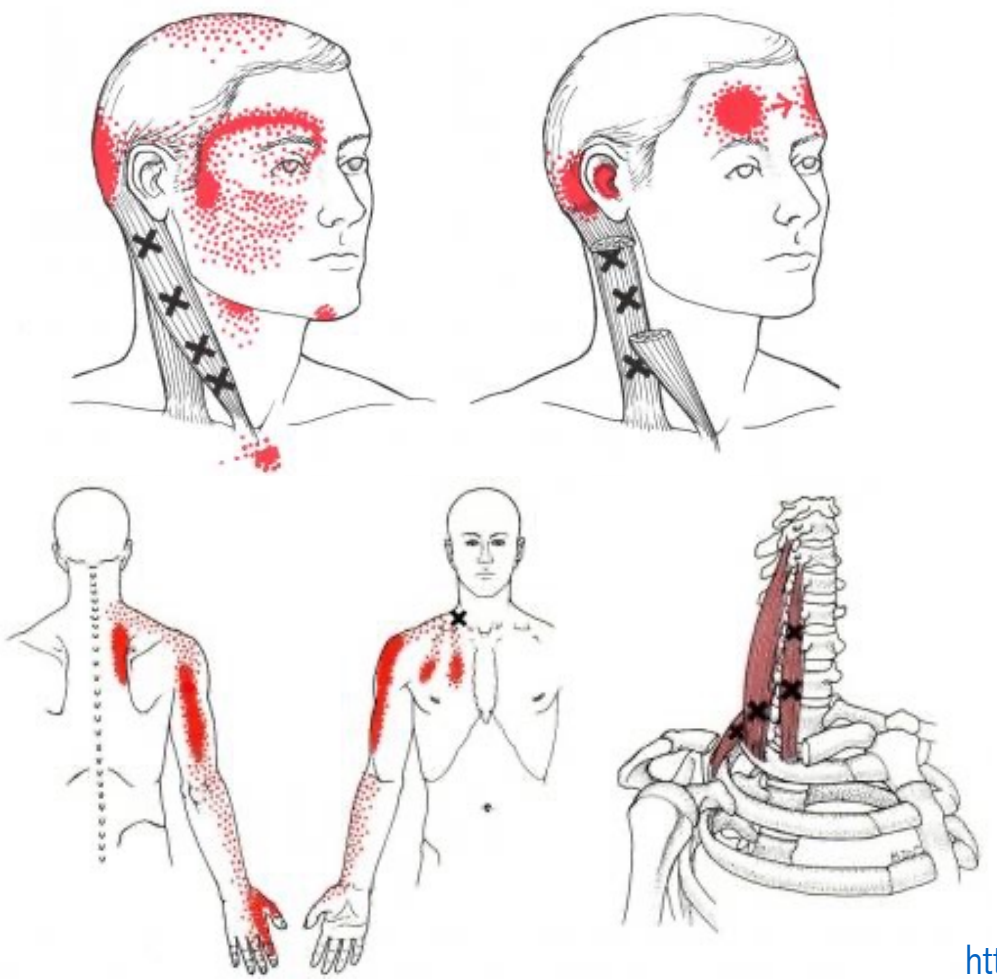
Diaphragmatic Breathing Practice





https://onepointhealth.com.au/physiotherapy/the-what-why-how-of-diaphragm-breathing/
https://webstockreview.net/image/breath-clipart-relaxing/300073.html

Accessory Breathing Muscles



- Overuse of sternocleidomastoid (SCM) muscle causes headaches, ringing/fullness in the ear, sinus congestion, nausea, dizziness
- Overuse of scalene muscles causes chest and upper back pain, and pain and numbness radiating into the arms and hands

http://www.triggerpoints.net/muscle/sternocleidomastoid
http://www.triggerpoints.net/muscle/scalene

Problems of Diaphragm Dysfunction

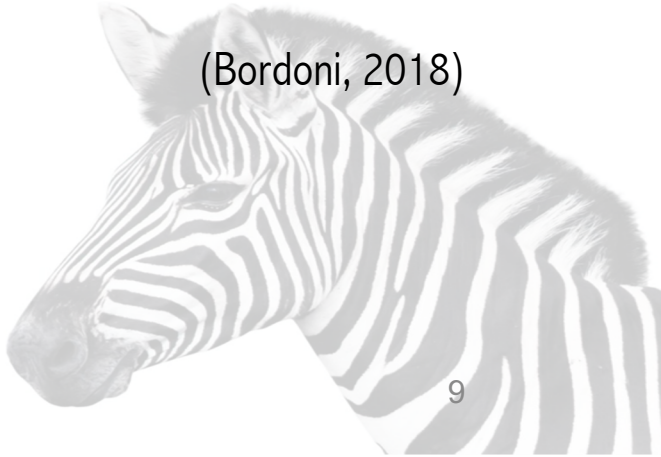
- Overuse of accessory muscles of breathing in the neck
  - Causing neck pain, headaches, and nerve pain and numbness into the arms
- Problems with swallowing and sleep apnea
- Asthma, shortness of breath, decreased exercise/activity tolerance
- Increased arch in the low back (lordosis), lumbar and pelvic instability
- Low back muscle spasm; low back and sacroiliac joint pain
- Weak hamstring and abdominal muscles
- Decreased heart function
- Decreased lymphatic fluid movement through the body, increased fluid build-up
- Increased psychological stress and sympathetic nervous system activity (bad)

(Kocjan, 2017, Bordoni, 2018)

Diaphragm and Gut Function

- Dysfunction in the diaphragm increases gastroesophageal reflux
  - Diaphragm exercise is an effective treatment for GERD
- Lack of coordination between diaphragm and abdominal muscles is associated with irritable bowel syndrome (IBS)
- Decreased diaphragm function increases pain sensitivity in the gut
  - Diaphragmatic motion “massages” the vagus nerve, decreasing inflammation and gut-related pain

(Bordoni, 2018)



Benefits of Slow Breathing

- Optimal function at 6 breaths/minute (5 seconds in, 5 seconds out)
- Improved diaphragm mobility and function
- Improved efficiency of breathing
- Increased heart function
- Improved heart rate variability (HRV), a measure of autonomic function, and improved parasympathetic function
- Improved vagus nerve function (improves gut function)
- Improved response to position changes (e.g. standing)
- Can decrease blood pressure

(Russo, 2017)

Nose Breathing is Better

- Improves function of the diaphragm
- Helps prevent colds, flues, allergies by filtering air
- Improves oxygen absorption, air flow and blood flow in the lungs
- Improves parasympathetic nervous system activity (good), which calms and relaxes the body, slows heart rate and improves digestion
- Improves position of the tongue, which improves alignment of teeth
- Decreases likelihood of snoring and sleep apnea
- Decreases temporomandibular problems (compared to mouth breathing)

Ruth, 2015

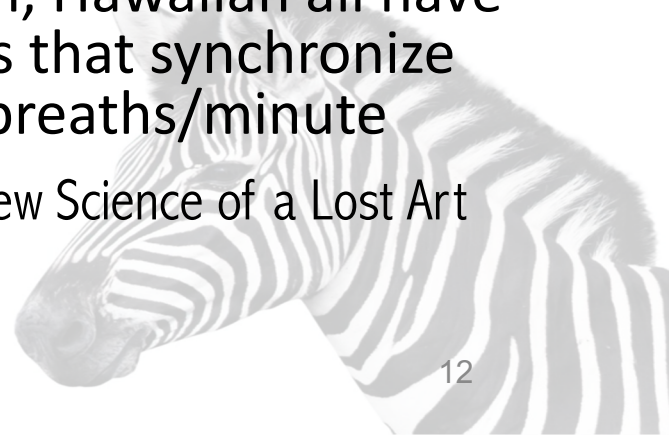
"365 Breathing" Practice

- **3** times per day
- Breath **6** times/minute
  - = 5 seconds in, 5 seconds out
- For **5** minutes

- It may take several weeks for the nervous system to reset

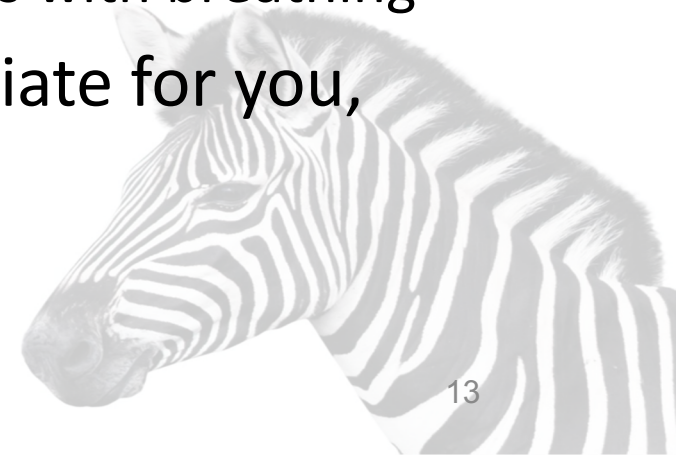
- Almost every culture has a chant or prayer that slows breathing to ~ 6 breaths/min
  - Catholic: Ave Maria and rosary prayers
  - Buddhist: Om Mani Padme Hum
  - Kundalini yoga: sa ta na ma
  - Hindu, Taoist, Native American, Japanese, African, Hawaiian all have chants or prayers that synchronize breathing to ~6 breaths/minute

James Nestor: Breath, The New Science of a Lost Art



How Physical Therapy Can Help

- PTs are movement experts – sometimes *how* you do things matters!
- People with HSD have decreased body awareness, and might not realize they are breathing incorrectly, or not know what correct is
- There are at least 14 muscles involved in breathing, and a PT can help you figure out which are working properly, and which are not
  - Some abnormal patterns of breathing are associated with specific pain complaints – a PT can help link pain or functional complaints with breathing
- PTs can identify which breathing exercises are appropriate for you, and make sure you are doing them correctly.



Clarkson UNIVERSITY

Resources for Breathing

- Introduction to breathing problems and pain, and instructions on breathing right:
  - https://www.painscience.com/articles/respiration-connection.php
- Andre C. Proper Breathing Brings Better Health. Scientific American. Jan, 2019.
  - Available at: https://www.scientificamerican.com/article/proper-breathing-brings-better-health/
- Alderman L. Breathe. Exhale. Repeat: The Benefits of Controlled Breathing, 2016.
  - Available at: https://www.nytimes.com/2016/11/09/well/mind/breathe-exhale-repeat-the-benefits-of-controlled-breathing.html
- Books:
  - Nestor J. Breath: The New Science of a Lost Art, 2020
    - Focused on research findings, but has practice guidelines at the end
  - Moselle V: Breathwork: A 3-Week Breathing Program to Gain Clarity, Calm, and Better Health, 2019
    - Yoga based practice

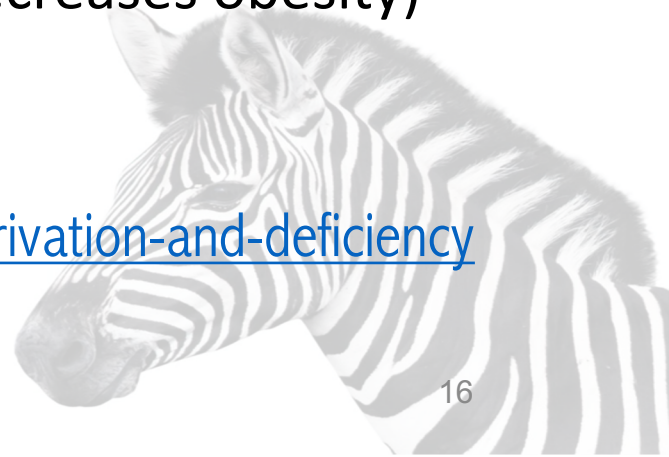
Sleeping

- Importance of sleep
- Pain management at bedtime
- Positioning in bed
- Night-time subluxations
- Sleep hygiene
- How physical therapy can help

Why Is Sleep Important?

- Sleep improves:
  - Brain function, learning, memory
  - Emotional well-being
  - Pain management (sleep deprivation increases pain sensitivity)
  - Physical health: decreased risk of heart disease, kidney disease, high blood pressure, diabetes, stroke
  - Body's ability to heal from injury or illness, and immune function
  - Weight control by regulating hunger hormones & insulin (decreases obesity)
  - Energy levels
  - Function and safety during the day

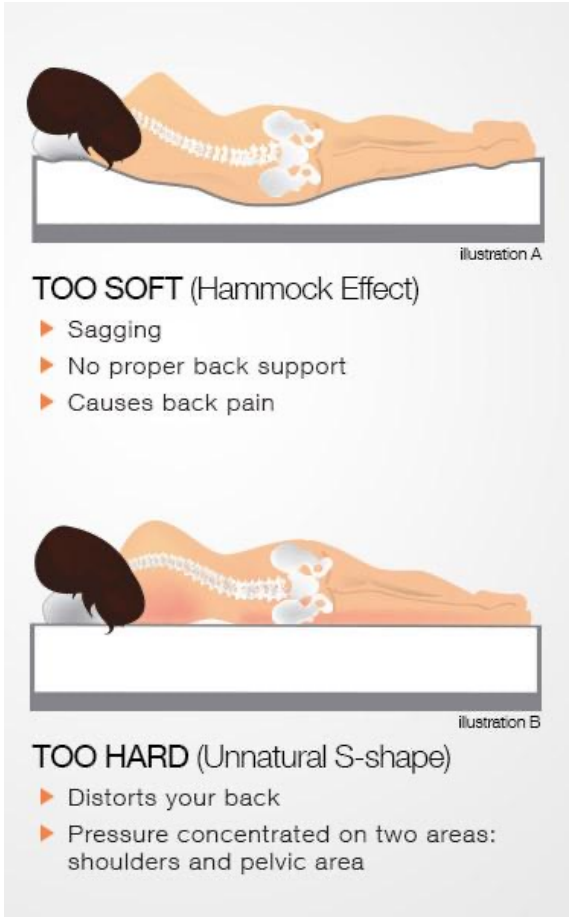
https://www.nhlbi.nih.gov/health-topics/sleep-deprivation-and-deficiency

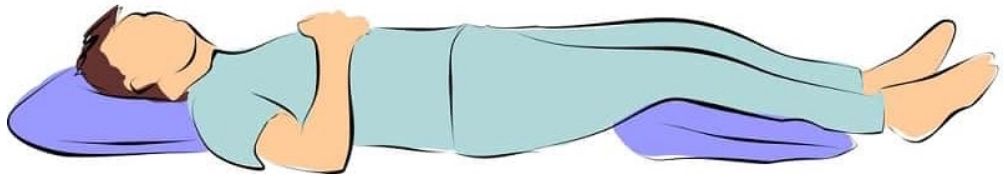


Managing Night-Time Pain

- Manage day-time pain: posture, exercises, body mechanics, etc.
- Bath, heat, ice, topical rubs, TENS (aka, electromassager) before bed
- Do relaxation exercises, such as gentle movements or muscle stretches
- Physiological quieting at bedtime, (to decrease nerve sensitization):
  - Meditation
  - Slow breathing
  - Binaural music
  - Sleep yoga, etc.
- Use optimal body positioning, support, and padding
- Weighted blankets, especially for people with anxiety or depression (Ekholm, 2020)
- *Pain medications, if necessary*

Ideal Bed Support





- Spine should be aligned
- Pressure should be distributed across whole body
- Bed too soft allows sagging → poor spinal alignment
- Bed too hard → too much pressure on shoulders and hips

https://www.europeanbedding.sg/blogs/articles/the-influence-of-sleeping-on-a-hard-or-soft-bed-why-a-firm-mattress-won-t-relieve-you-from-back-pain
https://www.terrycralle.com/best-sleeping-positions-for-lower-back-pain/

If Your Bed Is Not Ideal…

- Consider a bed "topper" or pillows to provide necessary support
  - Bed toppers can distribute body weight more evenly
  - Options: memory foam, down, fleece, egg crate, etc.
- Best topper *for you* depends on:
  - Your sleep position(s)
  - Your body size/type
  - What your complaints are due to (e.g., excessive pressure or poor alignment)
- Reviews of toppers:
  - https://buyersguide.org/mattress-topper/t/best
  - https://www.sleepadvisor.org/best-mattress-topper-for-back-pain/

Neck Pillows

https://www.comfycentre.com/best-pillow-for-neck-pain/

- There is no universal ‘best’ pillow for everyone
- The best pillow for you depends on:
  - Your body type
  - How you sleep
    - Back sleepers need soft/low pillow
    - Side sleepers need firmer/thicker pillow
    - Stomach sleepers….
- Your neck should be aligned with your spine

Supporting Your Body in Bed

- Decrease tissue compression by distributing body weight using pillows
  - Shoulder relief pillow to decrease shoulder compression side-sleeping
  - Waist pillow to decrease pressure on both shoulder and hip in side-sleeping, or to align the spine
  - Knee pillow to align hips in side sleeping
  - Body pillow for overall support, especially for belly-sleepers

Night-Time Subluxations

- It is possible for joints to slip out of place at night, when muscles relax
- Prevention before bed: strengthen stabilizing muscles, stretch tight muscles, improve posture
- Prevention in bed:
  - Use pillows to support limbs
  - Position joints in mid-range; don't stretch joints
  - Decrease the weight of blankets on joints
  - Consider sleeping with braces

Cognitive-Behavioral Therapy - Insomnia

- CBT-i (in general, not just this app) is at least as effective as medication
- CBT-i is a completely free app that teaches sleep hygiene
  - Has a self-assessment tool
  - "Sleep 101" education
  - Tools for relaxation
    - Meditations
    - Relaxation activities
    - Etc.
- Review of best insomnia apps: https://www.healthline.com/health/healthy-sleep/top-insomnia-iphone-android-apps

Sleep Hygiene

- **Do:**
  - Use bedroom only for sleep and intimacy
  - Regular sleep schedule and bedtime routine
  - Exercise on most days
  - Increase exposure to bright light during the day
  - Quiet, cool, dark room; bed supportive but soft
  - Have a wind-down routine: bath, music , breathing, meditations, etc.
- **Avoid:**
  - Caffeine, nicotine, alcohol, sweets before bedtime
  - Heavy meals or fluids 2-3 hrs before bedtime
  - Late afternoon naps
  - Computers, phones, tablets, blue light before bedtime
  - Lying in bed awake (get up, do something boring).

Managing POTS & Sleep Disturbance

- Night-time POTS episodes disrupt deep sleep… wake you up during the night
- Management ideas
  - General POTS self-management
  - Relaxation activities at bedtime, to calm sympathetic nervous system: breathing, yoga, meditation, music, etc.
  - Elevating head of bed may decrease need to toilet at night (helps to retain fluids overnight)

Sleep Disordered Breathing

- Sleep disordered breathing (obstructive & central sleep apnea)
  - 6x more common in HSD/EDS than general population (Sedky, 2019)
- Management:
  - Alter sleep position
    - 50% of sleep apnea is due to sleeping on your back https://www.sleepassociation.org/sleep-apnea/positional-sleep-apnea/
  - Improve breathing overall
    - Slow, diaphragmatic breathing
    - Nose breathing (nose strips may help)
  - CPAP (Continuous Positive Airway Pressure)

How Physical Therapy Can Help

- PTs are experts in body alignment, and can help determine optimal sleep positioning to minimize stress to your body
- Pain management
  - Posture, body mechanics, joint alignment
  - Pain education and self-management of pain
- POTS management, so it is less likely to wake you up
- Effective breathing, decrease sleep apnea
- Facilitate daily exercise/activity improves quality of sleep

Clarkson UNIVERSITY

Resources for Sleep Management

- CBT-i app, created by Veteran's Administration and Stanford Univ.
- Overall information: https://www.sleepfoundation.org
- Review of best insomnia apps: https://www.healthline.com/health/healthy-sleep/top-insomnia-iphone-android-apps
- Newcastle Sleeping Problems guide: https://www.newcastle-hospitals.org.uk/downloads/Therapy%20Services/Sleeping_Problems_2016.pdf
- Good information at https://sleep.org
- Best Guided Meditations for Sleep: https://www.nestmaven.com/sleep/aids/best-guided-sleep-meditation/
- Walker, M. Why We Sleep. *Scribner*, 2018. How to sleep effectively.

Sitting

- Posture
  - Forward head
  - Text neck
- Common causes of pain from sitting posture
  - Common trigger points
  - *(Compression of nerves or neural tissues)*
- Role of being sedentary on pain sensitivity

But I wasn't DOING anything when the pain started

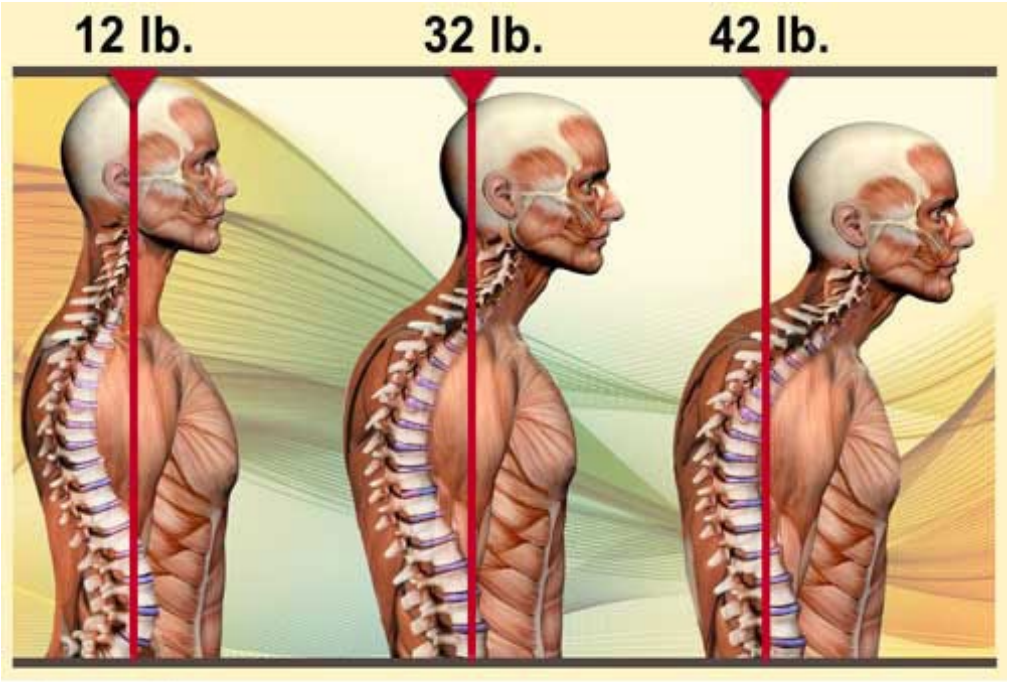
Why Is Sitting Posture Important?

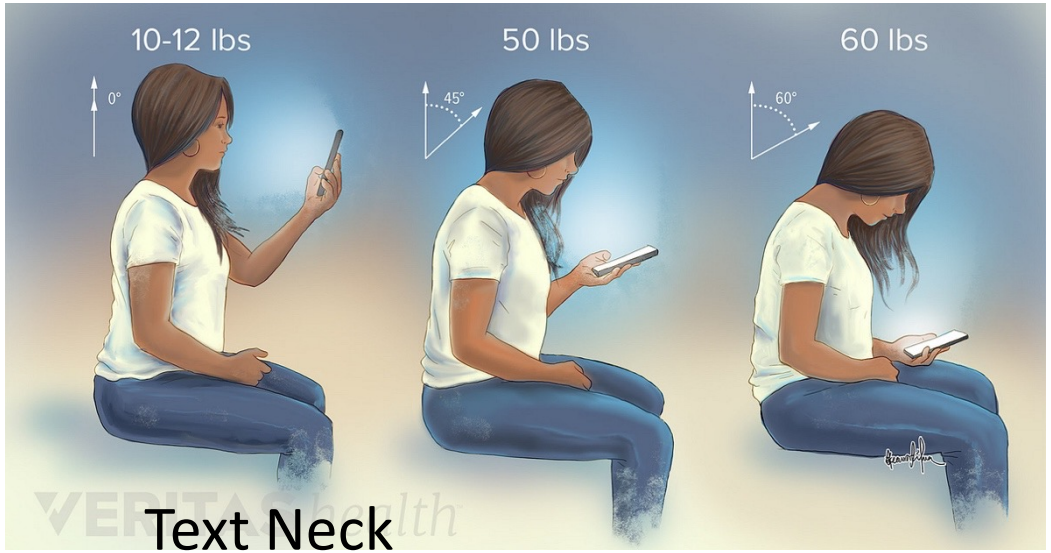
- Static positions can place a lot of stress on the joints and muscles
- Prolonged stretch can cause more damage than short term stretch
  - Tissue 'creep'
  - Compromised blood flow
- Poor sitting posture can cause:
  - Headaches, neck pain, upper and lower back pain
  - Decreased energy and mood
  - Poor breathing patterns
- (Szczygiel, 2017)

- https://www.usa.edu/blog/how-to-improve-posture/
- https://www.genesischiroclinic.com/blog/bad-sitting-posture-and-back-pain/

Forward Head and Text Neck

- Excessive forces on joints and muscles
- Muscle spasm & trigger points (TrP)
- Compression of nerves in the neck
- Compression of spinal cord structures



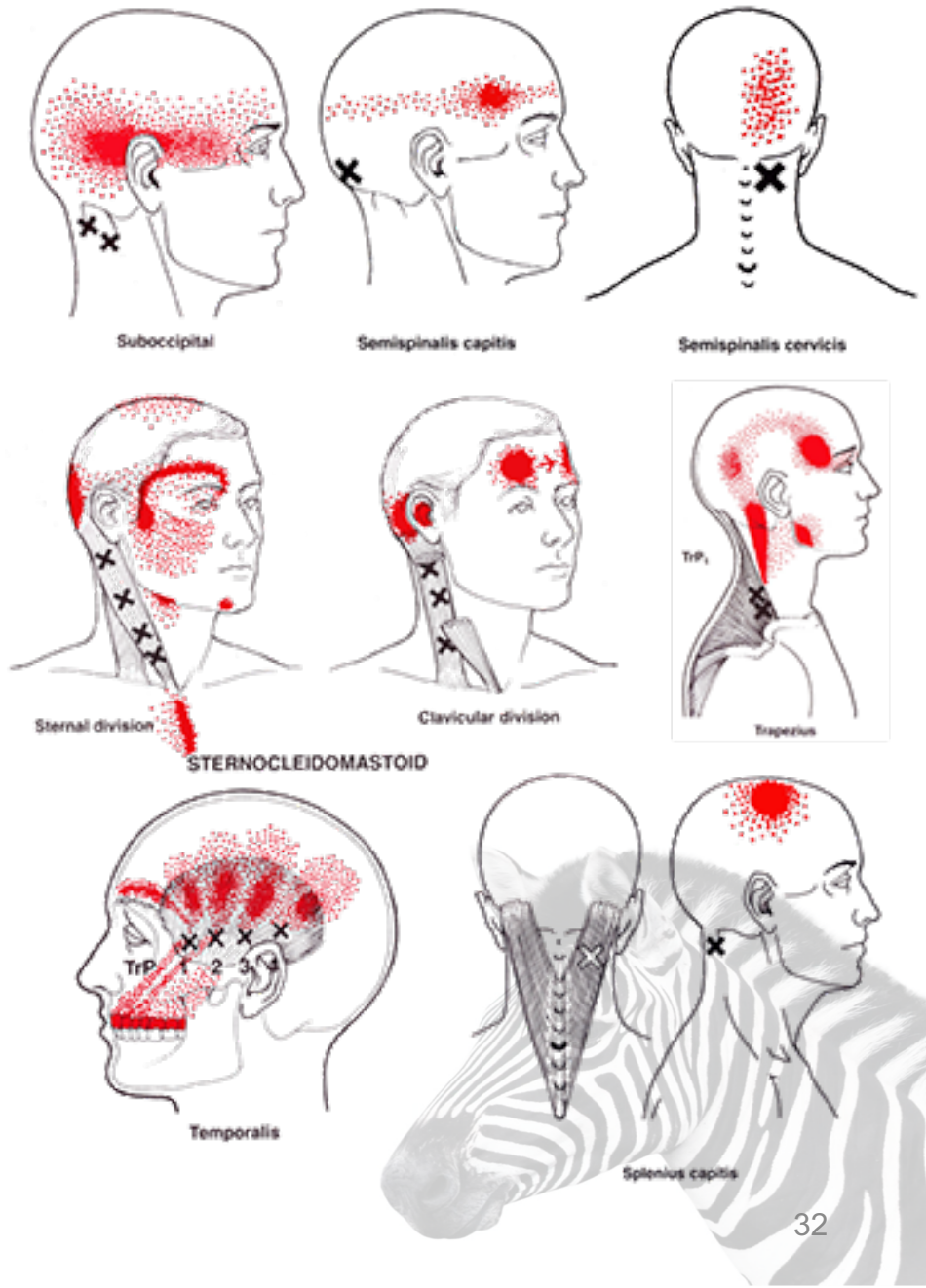


Text Neck

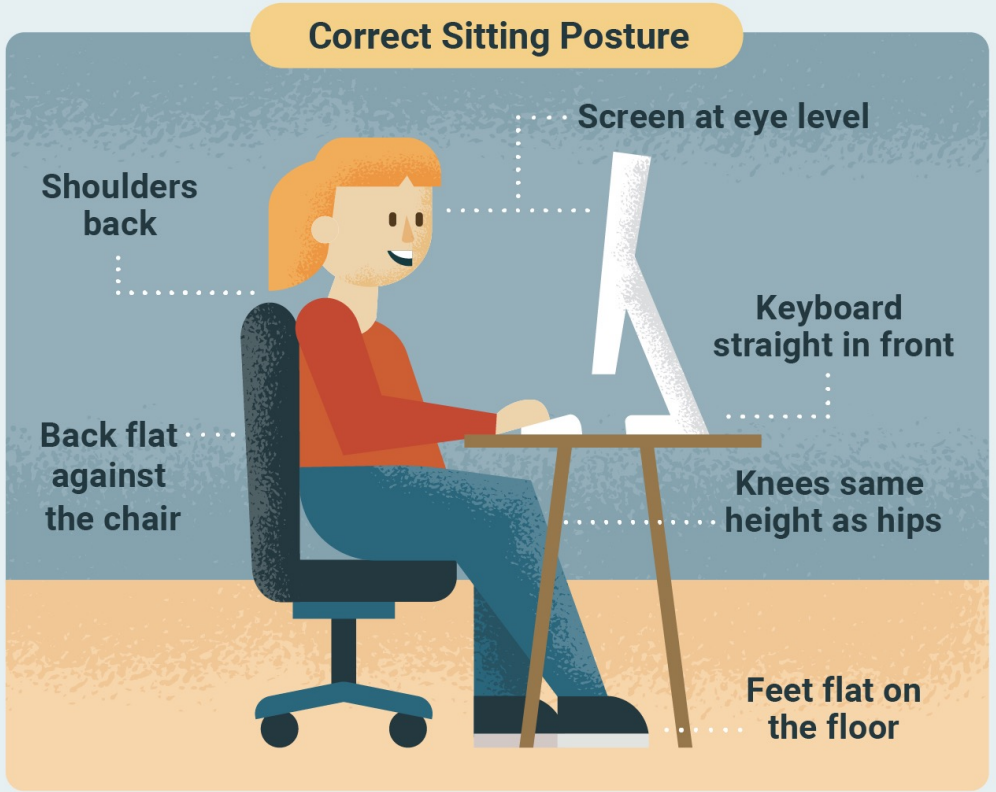
https://www.spine-health.com/conditions/neck-pain/text-neck-treatment-and-prevention

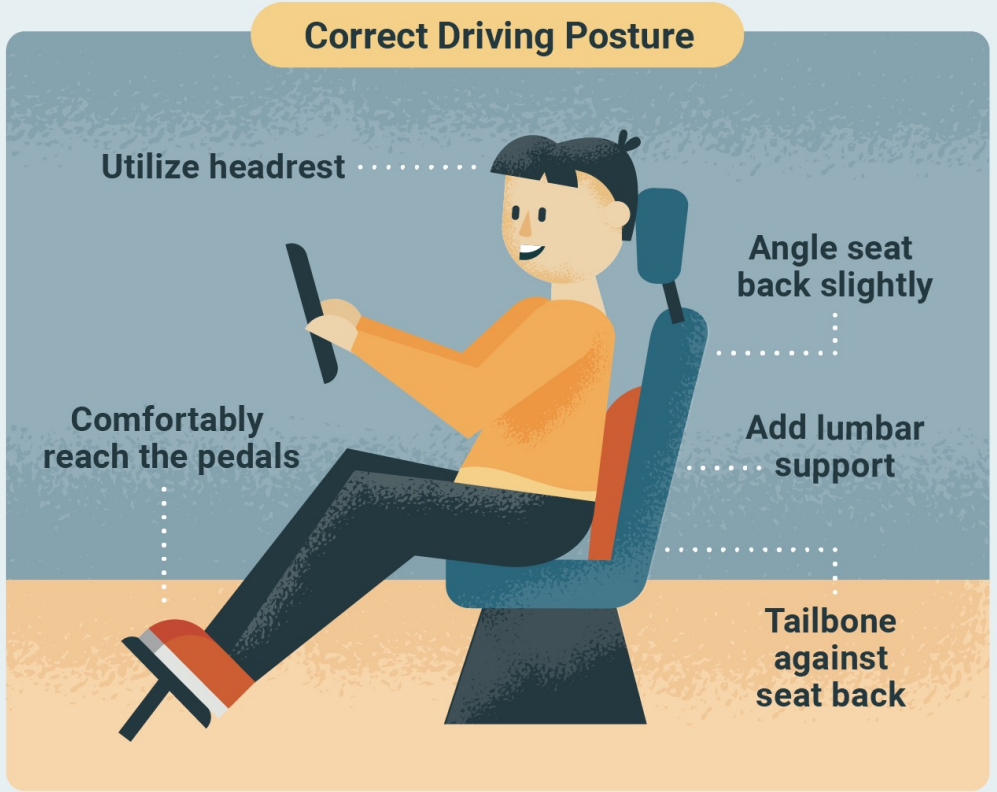
Neck Trigger Points

- Pain may be due to trigger points (TrP)
- TrP due to poor posture, tensing all the muscles, or stress,
- Poor posture due to weak stabilizing muscles (deep neck flexors)
- Weak stabilizing muscles and overuse of superficial muscles due to poor motor control (coordination of muscles)
- Poor motor control due to decreased body awareness (proprioception)



Good Sitting Posture





https://www.usa.edu/blog/how-to-improve-posture/

Avoid Prolonged Sitting

- Being sedentary:
  - Decreases muscle strength that you need for joint stability and function
  - Decreases energy and contributes to fatigue and sleep problems
  - Increases risks of heart disease, cancer, diabetes, varicose veins
  - Increases sensitivity to pain and likelihood of developing chronic pain
- Prolonged sitting aggravates POTS
- What you can do:
  - Get up and move for a few minutes every hour – walk around, dance!
  - Do chair exercises – wiggle, sitting yoga, dance, Tai chi!
- https://www.betterhealth.vic.gov.au/health/healthyliving/the-dangers-of-sitting

(Hakim, 2017)

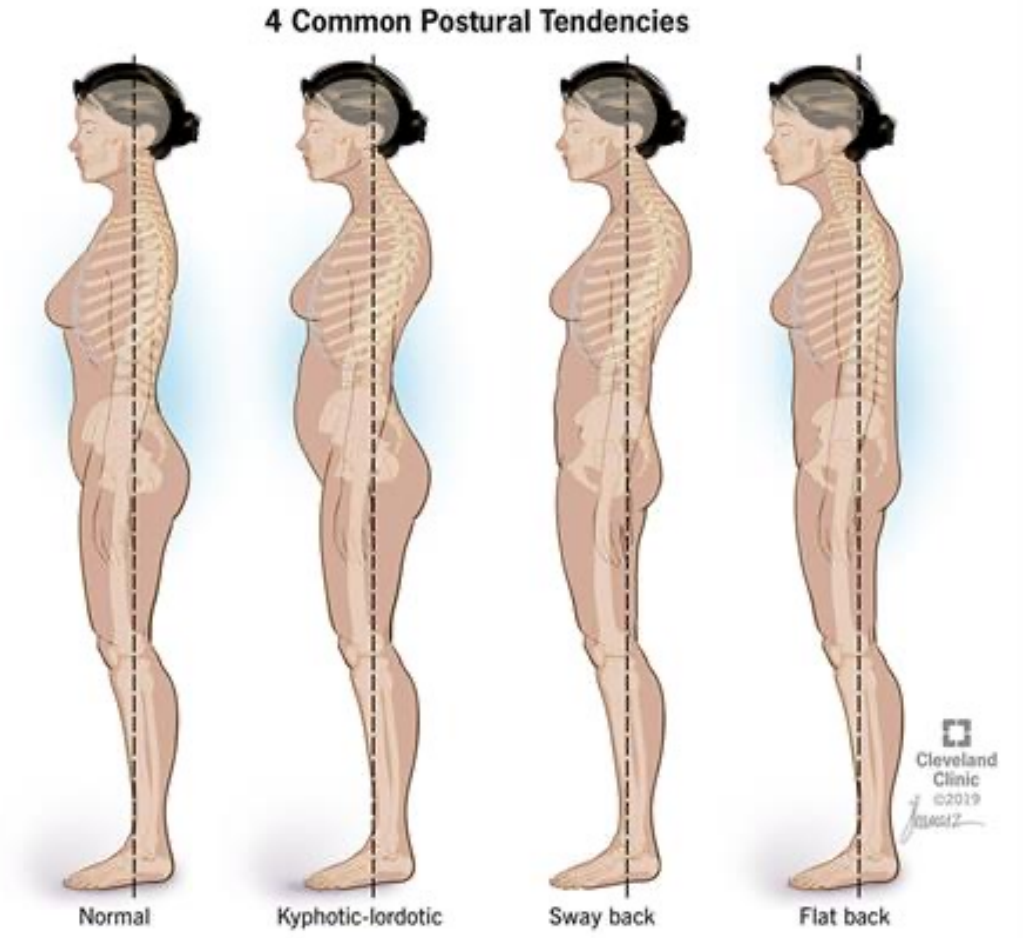
Standing

Standing doesn't seem so hard – why does it hurt so much?

- Good standing posture
- Common problems caused by standing posture
- Factors leading to poor standing posture
  - Tight muscles
  - Poor motor control
  - Weakness
  - Flat feet up the kinetic chain
- How physical therapy can help

Clarkson UNIVERSITY

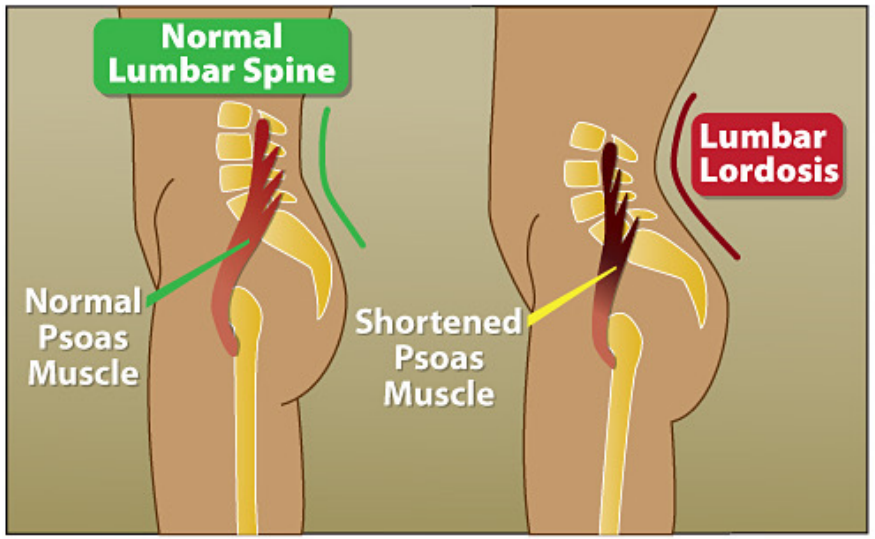
Standing Posture



- Standing posture should have ankles, knees, hips, shoulders and ear aligned
- Gravity compresses the spine
- Tight hip or back muscles further increase arch in the back
- It is ‘easiest’ to hang on our spine, or on our hips
  - But this overstretches the hips and compresses the lumbar spine

Low Back Pain

- Poor posture allows low back to arch too much, hang on ligaments and compress nerves
- Muscles tense to brace unstable spine
- Poor body awareness leads to using improper muscles or overusing proper muscles
- Not using the diaphragm to breathe increases muscle tension in the low back
- Tight hip muscles pull spine forward

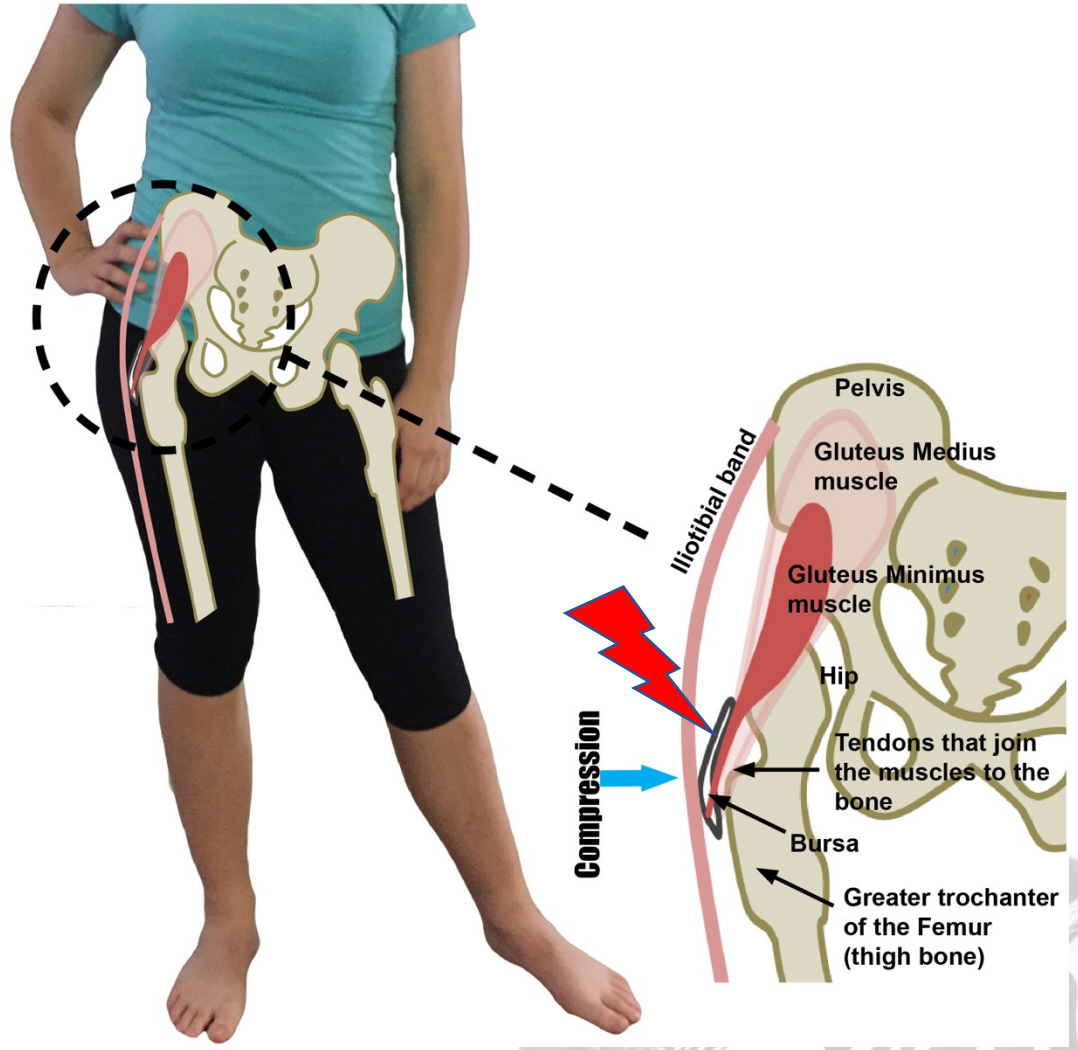


Clarkson UNIVERSITY

Pictures from https://www.spineuniverse.com/conditions/back-pain/muscle-spasms-leading-cause-back-pain-not-primary-cause
https://blog.voltathletics.com/home/2015/3/25/psoas-talk-with-christye

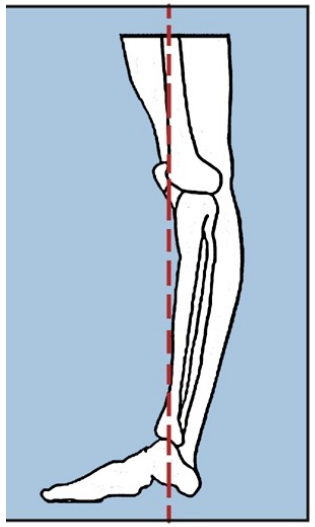
Hip: Trochanteric Pain

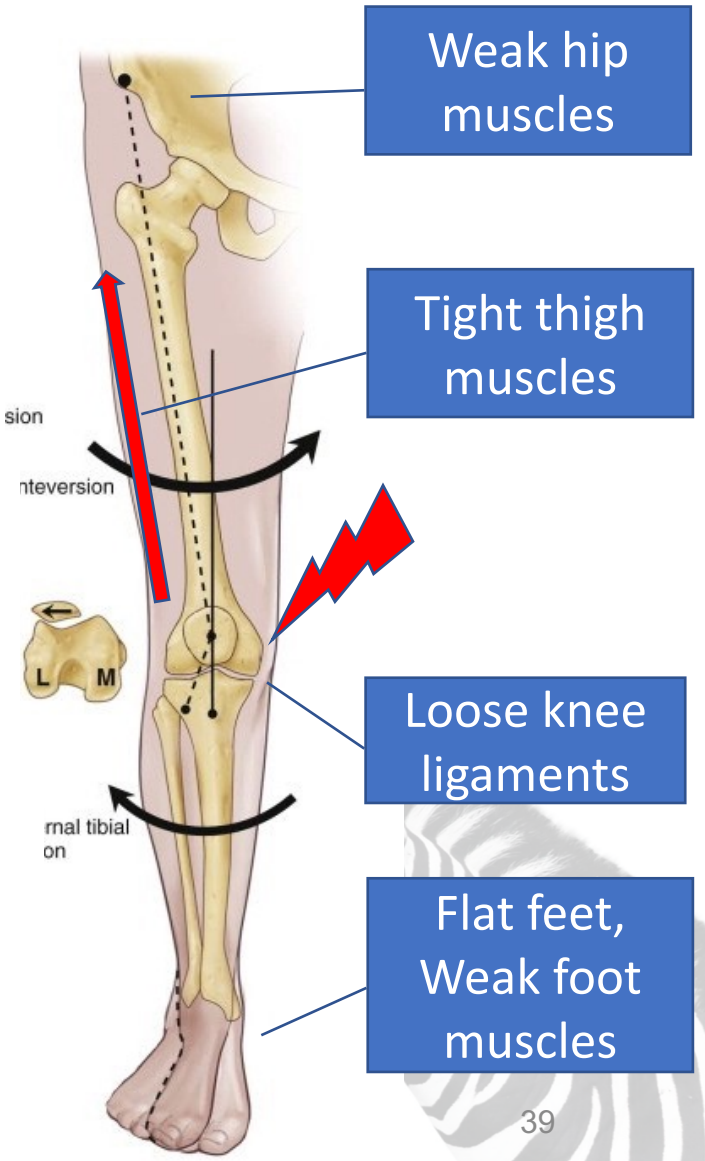
- Dropping pelvis while standing aggravates muscle & tendon
  - From muscle weakness
  - From poor body awareness
- Muscles/tendons are overstretched, bursa compressed
- Flat feet allow knees and hips to turn inward, pulling on hip muscles/tendons
  - May need orthotics for proper alignment of the legs



Knee: Patellofemoral Pain

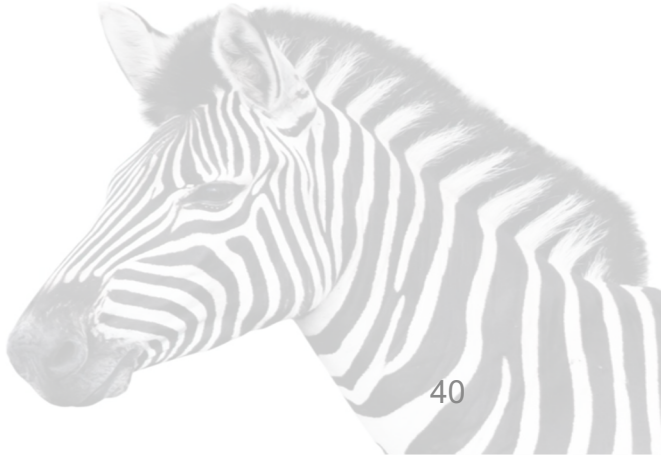
- Loose ligaments allow too much motion of kneecap
- Standing with hyperextended knees allows kneecaps to float
- Tight thigh muscles pull kneecap outward
- Flat feet allow knee to turn inward
- Weak hip muscles allow leg to turn inward





How Physical Therapy Can Help

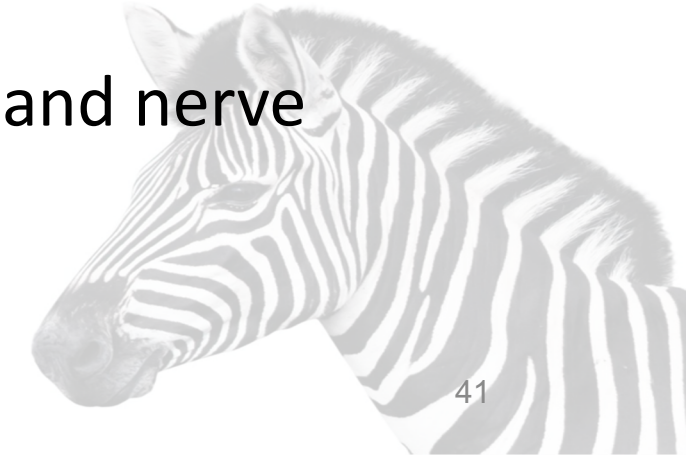
- PTs are experts on how posture affects joints, muscles and nerves, and why alignment is not right
- Evaluate your sitting and standing posture, joint alignment
- Evaluate your muscle strength and flexibility, and motor control
- Figure out why you hurt where you hurt, and how posture contributes



Clarkson UNIVERSITY

How Physical Therapy Can Help

- Teach:
  - Proper posture, body mechanics, and ergonomics
  - Body awareness and joint position sense (proprioception)
  - Motor control, so you are using and relaxing the correct muscles
  - Self-management through heat, ice, topicals, TENS (aka electromassager)
  - When and how to use orthotics or braces to help, when appropriate
- Strengthen weak muscles and (carefully) stretch tight muscles
- Ensure that you are moving/exercising correctly
- Provide hands-on therapy to address soft tissue, joint and nerve problems



Resources for Sitting & Standing

- Info about posture:
  - https://www.usa.edu/blog/how-to-improve-posture/
- Hazards of prolonged sitting:
  - https://www.betterhealth.vic.gov.au/health/healthyliving/the-dangers-of-sitting
- Sitting and standing posture suggestions:
  - https://www.nhs.uk/live-well/exercise/common-posture-mistakes-and-fixes/
- Malanga G. Sitting Disease and Its Impact on Your Spine:
  - https://www.spineuniversity.com/wellness/ergonomics/sitting-disease-its-impact-your-spine
- Valerie DeLaune, *Pain Relief with Trigger Point Self-Help* (2011)

In Summary…

- In managing daily life, the little things matter – how you breathe, sleep, sit and stand!
- People with HSD/EDS are at increased risk of doing these things poorly, increasing pain and other symptoms
- These activities are actually quite complicated in the demands they place on our bodies
  - It may be hard to figure out what you are doing wrong, and why
- PTs are movement experts, and experts in how we use our bodies - they can help you manage daily life!

Journal Article References

- Bordoni B, Morabito B. Symptomatology Correlations Between the Diaphragm and Irritable Bowel Syndrome. *Cureus*. Jul 23 2018;10(7):e3036.
- Ekholm B, Spulber S, Adler M. A randomized controlled study of weighted chain blankets for insomnia in psychiatric disorders. *J Clin Sleep Med*. Sep 15 2020;16(9):1567-1577.
- Hakim A, De Wandele I, O'Callaghan C, Pocinki A, Rowe P. Chronic fatigue in Ehlers-Danlos syndrome-Hypermobile type. *Am J Med Genet C Semin Med Genet.* 2017;175(1):175-180.
- Kocjan J, Adamek M, Gzik-Zroska B, Czyżewski D, Rydel M. Network of breathing. Multifunctional role of the diaphragm: a review. *Adv Respir Med*. 2017;85(4):224-232.
- Russo MA, Santarelli DM, O'Rourke D. The physiological effects of slow breathing in the healthy human. *Breathe (Sheff)*. Dec 2017;13(4):298-309. Ruth A. The health benefits of nose breathing. Nursing in General Praactice. 2015. Available at: https://www.lenus.ie/bitstream/handle/10147/559021/JAN15Art7.pdf. Accessed 7/1/20.
- Sedky K, Gaisl T, Bennett DS. Prevalence of Obstructive Sleep Apnea in Joint Hypermobility Syndrome: A Systematic Review and Meta-Analysis. *J Clin Sleep Med.* 2019;15(2):293-299.
- Szczygieł E, Zielonka K, Mętel S, Golec J. Musculo-skeletal and pulmonary effects of sitting position - a systematic review. *Ann Agric Environ Med*. Mar 31 2017;24(1):8-12.

Thank You!