

Understanding Posture, Ergonomics, and Spine Health

Exploring the relationship between posture, ergonomics, and maintaining a healthy spine.

Health Implications of Posture
Lumbar
Neck
Shoulder
Cervical

Posture
Poor posture can lead to a variety of health problems, including:
- Neck pain
- Shoulder pain
- Back pain
- Headaches
- Fatigue
- Decreased productivity

Concussion
Concussion is a mild traumatic brain injury (MTBI) that can occur as a result of a blow to the head or a sudden jolt to the body. Symptoms include:
- Headache
- Dizziness
- Nausea
- Vomiting
- Loss of consciousness
- Memory loss
- Irritability
- Changes in sleep patterns

Marine Posture
Marine posture is a common posture among people who spend a lot of time sitting at a desk. It is characterized by rounded shoulders, a protruding head, and a curved lower back. This posture can lead to neck pain, shoulder pain, and back pain.

Build strength
Strong muscles support your spine and help you maintain good posture. To build strength, try these exercises:
- Plank
- Bridge
- Bird-dog
- Side plank
- Dead bug

Spinal Health and Posture
The spine is a complex structure that supports the body and allows for movement. It is made up of vertebrae, discs, and ligaments. Good posture is essential for maintaining a healthy spine.

The Importance of Good Posture
Good posture is essential for maintaining a healthy spine and preventing pain. It helps to align the vertebrae and discs, reducing the risk of injury. Poor posture can lead to a variety of health problems, including neck pain, shoulder pain, and back pain.

Spinal Recommendations and Key Statistics
- 80% of people experience back pain at some point in their lives.
- 25% of people experience neck pain at some point in their lives.
- 15% of people experience shoulder pain at some point in their lives.
- 10% of people experience head pain at some point in their lives.

The Healthy Spine
A healthy spine is one that is able to support the body and allow for movement. It is made up of vertebrae, discs, and ligaments. Good posture is essential for maintaining a healthy spine.

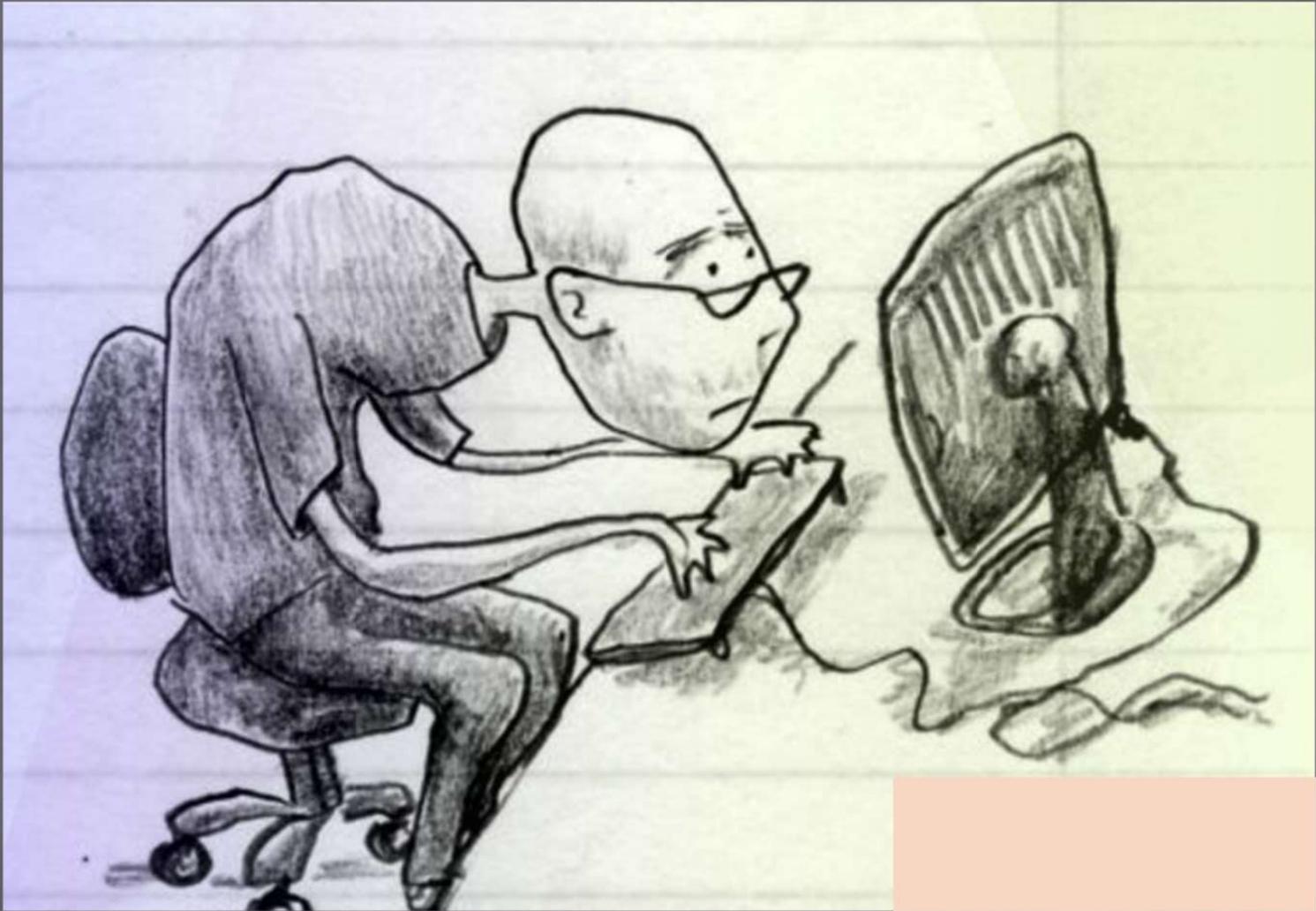
The Office Neck, Headaches and Dizziness
Office neck, headaches, and dizziness are common symptoms of poor posture. They are caused by the strain on the neck and head muscles. To prevent these symptoms, it is important to maintain good posture and take regular breaks from sitting at a desk.

Low back pain and Sciatica
Low back pain and sciatica are common conditions that can be caused by poor posture. They are caused by the strain on the lower back and sciatic nerve. To prevent these conditions, it is important to maintain good posture and take regular breaks from sitting at a desk.

Recommendations
- Maintain good posture.
- Take regular breaks from sitting at a desk.
- Exercise regularly.
- Eat a healthy diet.
- Get enough sleep.

Upper Cross Syndrome
Upper Cross Syndrome is a condition characterized by tightness in the upper back and neck muscles, and weakness in the lower back and neck muscles. It is caused by poor posture and can lead to neck pain, shoulder pain, and back pain.

Lower Cross Syndrome
Lower Cross Syndrome is a condition characterized by tightness in the lower back and hip muscles, and weakness in the upper back and neck muscles. It is caused by poor posture and can lead to lower back pain, hip pain, and neck pain.





Marios Panagi

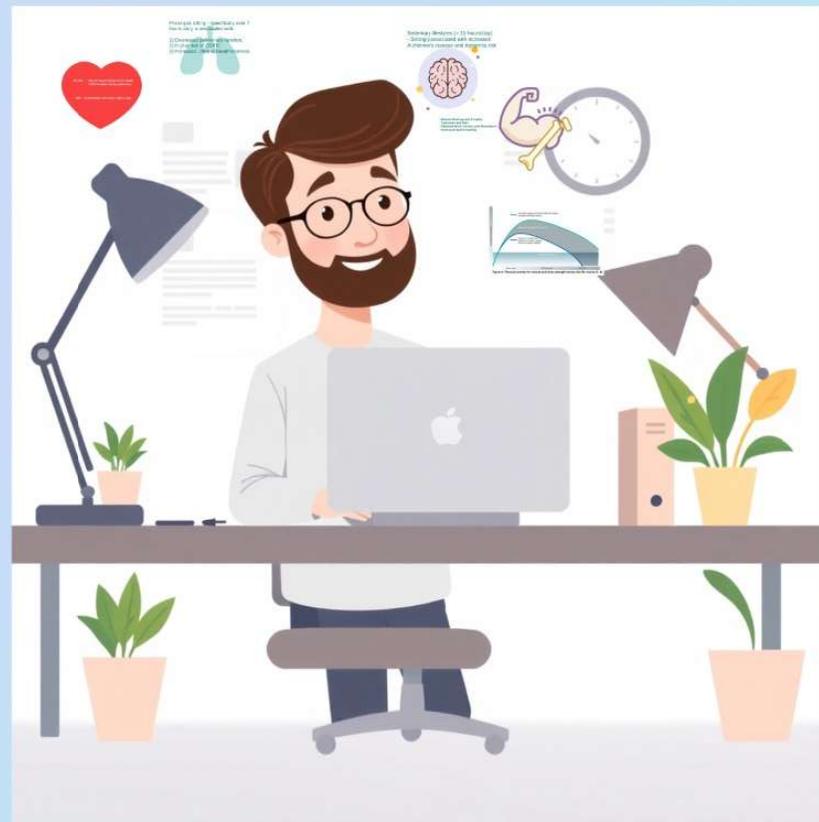
BSc (Hons), MSc, HCPC, MCSP, MACPSEM

- Spine Physiotherapy Specialist
- Musculoskeletal and Sport Physiotherapist
- Certified ISST Schroth-Method Therapist
- Vestibular rehabilitation (Dizziness and Vertigo)



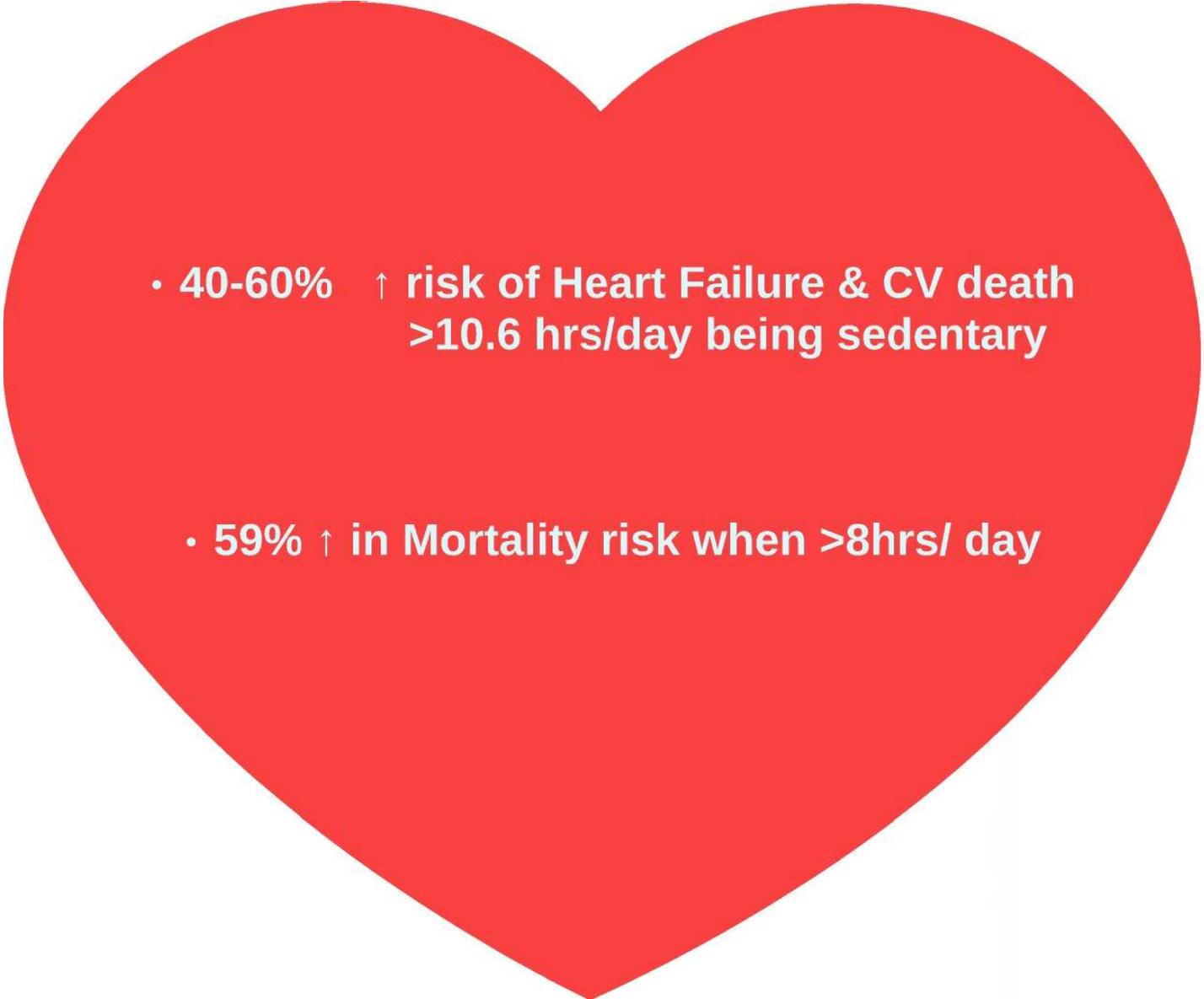
Health Implications of Sedentary Lifestyle

Adults (18-64 years)		
Health Outcome	Impact of Higher Sedentary Behaviour	Evidence Certainty
All-cause mortality	Increased risk	Moderate-High
CVD mortality	Increased risk	Moderate-High
Cancer mortality	Increased risk	Moderate
Incident CVD	Increased incidence	Moderate-High
Incident Type 2 Diabetes	Increased incidence	Moderate-High
Incident Cancer	Increased site-specific cancers	Moderate



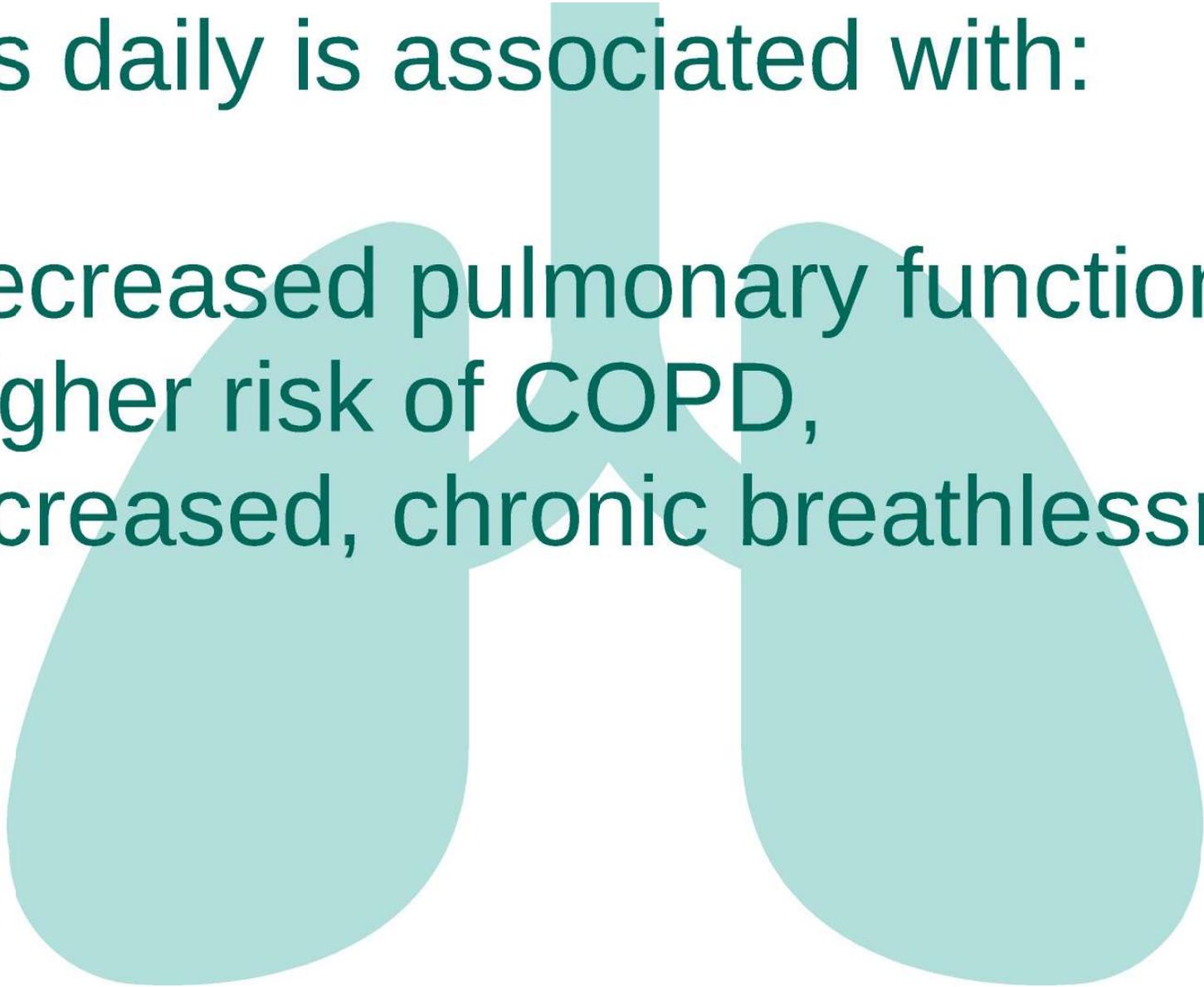
Adults (18-64 years)

Health Outcome	Impact of Higher Sedentary Behaviour	Evidence Certainty
All-cause mortality	Increased risk	Moderate-High
CVD mortality	Increased risk	Moderate-High
Cancer mortality	Increased risk	Moderate
Incident CVD	Increased incidence	Moderate-High
Incident Type 2 Diabetes	Increased incidence	Moderate-High
Incident Cancer	Increased site-specific cancers	Moderate

- 
- **40-60%** ↑ risk of Heart Failure & CV death
 >10.6 hrs/day being sedentary
 - **59%** ↑ in Mortality risk when **>8hrs/ day**

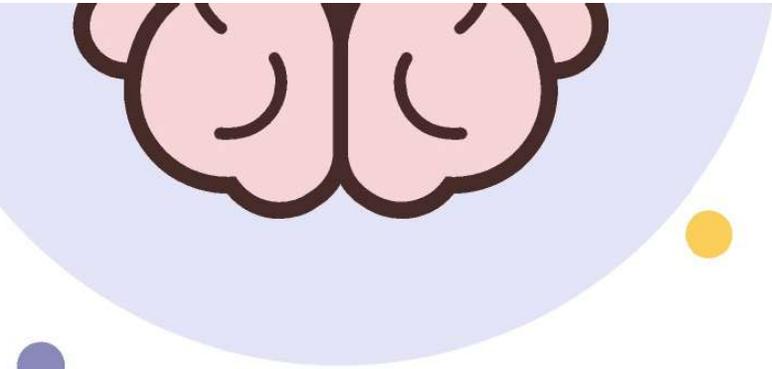
hours daily is associated with:

- 1) Decreased pulmonary function,
- 2) Higher risk of COPD,
- 3) Increased, chronic breathlessness.



7. NEURONS & GLIALS AND NEUROTRANSMITTERS





- **Muscle Wasting and Atrophy**
- **Tightness and Pain**
- **Reduced Bone Density and Resorption**
- **Increased Spinal loading**



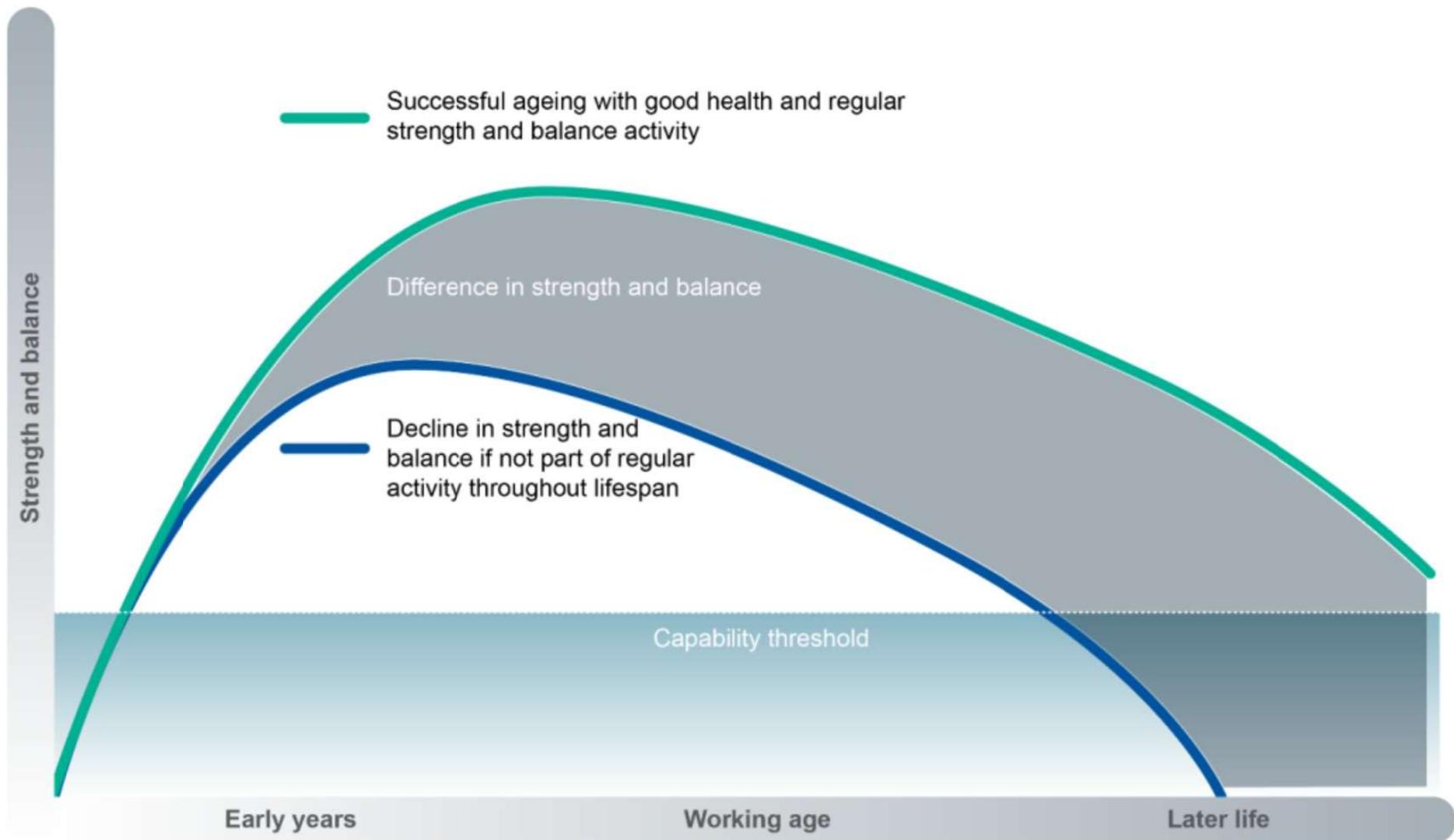


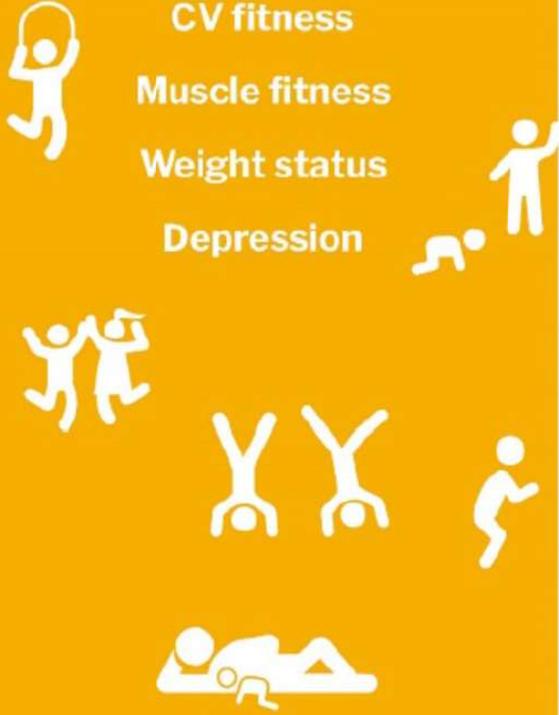
Figure 4: Physical activity for muscle and bone strength across the life course (7, 8)

Intensity of exercise

As the intensity increases, heart rate, respiratory rate and energy consumption also increase further



Moderate or strong evidence for health benefit

Children	Adults	Older Adults
<p>Bone Health</p> <p>Cognitive function</p> <p>CV fitness</p> <p>Muscle fitness</p> <p>Weight status</p> <p>Depression</p> 	<p>All-cause mortality</p> <p>Stroke and heart disease</p> <p>Hypertension</p> <p>Type 2 diabetes</p> <p>8 cancers</p> <p>Depression</p> <p>Cognitive function</p> <p>Dementia</p> <p>Quality of life</p> <p>Sleep</p> <p>Anxiety/depression</p> <p>Weight status</p> 	<p>Falls</p> <p>Frailty</p> <p>Physical function</p> 

Type of sport, physical activity or exercise	 Improvement in muscle function	 Improvement in bone health	 Improvement in balance
 Running	★	★★	★
 Resistance Training	★★★	★★★	★★
 Aerobics, circuit training	★★★	★★★	★★
 Ball Games	★★	★★★	★★★
 Racquet Sports	★★	★★★	★★★
 Yoga, Tai Chi	★	★	★
 Dance	★	★★	★
 Walking	★	★	☆
 Nordic Walking	★★	?	★★
 Cycling	★	★	★

★★★ Strong effect ★★ Medium effect ★ Low effect ☆ No effect ? Not known

Table 2: Types of activities that can help maintain or improve aerobic capacity, strength, balance and bone health and contribute to meeting the physical activity guidelines (8)

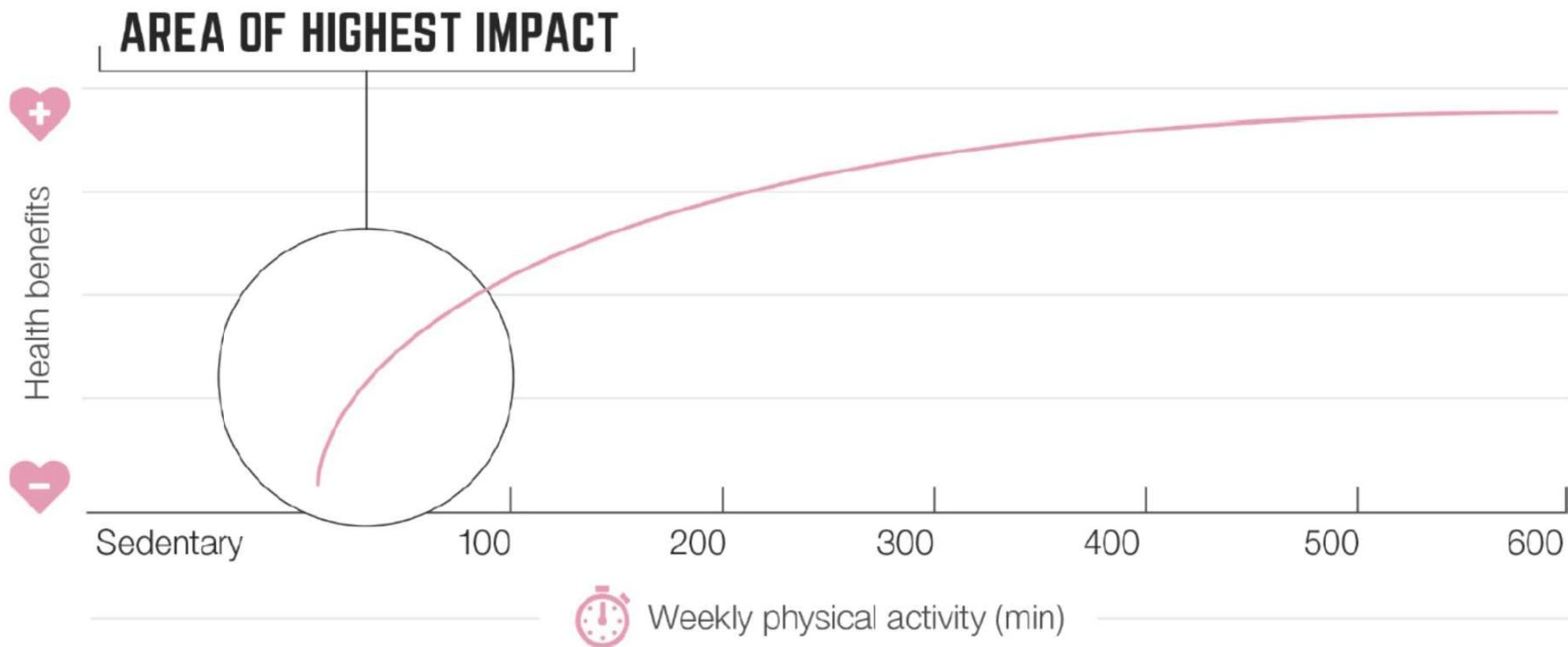


Figure 2: Dose-response curve of physical activity and health benefits. Adapted from (2)

Physical activity for adults and older adults

Benefits health	Reduces your chance of	Type II Diabetes	-40%
Improves sleep		Cardiovascular disease	-35%
Maintains healthy weight		Falls, depression etc.	-30%
Manages stress		Joint and back pain	-25%
Improves quality of life		Cancers (colon and breast)	-20%

Some is good, more is better Make a start today: it's never too late Every minute counts

Be active

at least **150** minutes moderate intensity per week
increased breathing able to talk

OR

at least **75** minutes vigorous intensity per week
breathing fast difficulty talking

or a combination of both

Build strength
to keep muscles, bones and joints strong
on at least **2** days a week

Minimise sedentary time
Break up periods of inactivity

Improve balance
For older adults, to reduce the chance of frailty and falls
2 days a week

UK Chief Medical Officers' Physical Activity Guidelines 2019

Type of sport, physical activity or exercise
Running
Resistance Training
Aerobics, circuit training
Ball Games
Racquet Sports
Yoga, Tai Chi
Dance
Walking
Nordic Walking
Cycling

*** Strong effect

Table 2: Types of activity for strength, balance and guidelines (8)

Be active

at least **150** minutes moderate intensity per week
increased breathing
able to talk

OR

at least **75** minutes vigorous intensity per week
breathing fast
difficulty talking

or a combination of both

Build strength
to keep muscles, bones and joints strong
on at least **2** days a week

Swim
Brisk walk
Cycle
Run
Stairs
Sport

Practical Tips and Tricks

- You need 30 minutes per working day
- Could you park 15 minutes walking distance away from work?
- Or a 20 minute walk after lunch everyday?
- Maybe cycling or running with friends or family?
- What if you took the stairs instead of the elevator?

What are your obstacles to meeting the minimum criteria?



Dosage Matters:

How many times per week will you dedicate?

What exercises will you do?

Do you prefer to train alone or in a group?

What are your obstacles to meeting the minimum criteria?

Minimise sedentary time

Break up periods of inactivity



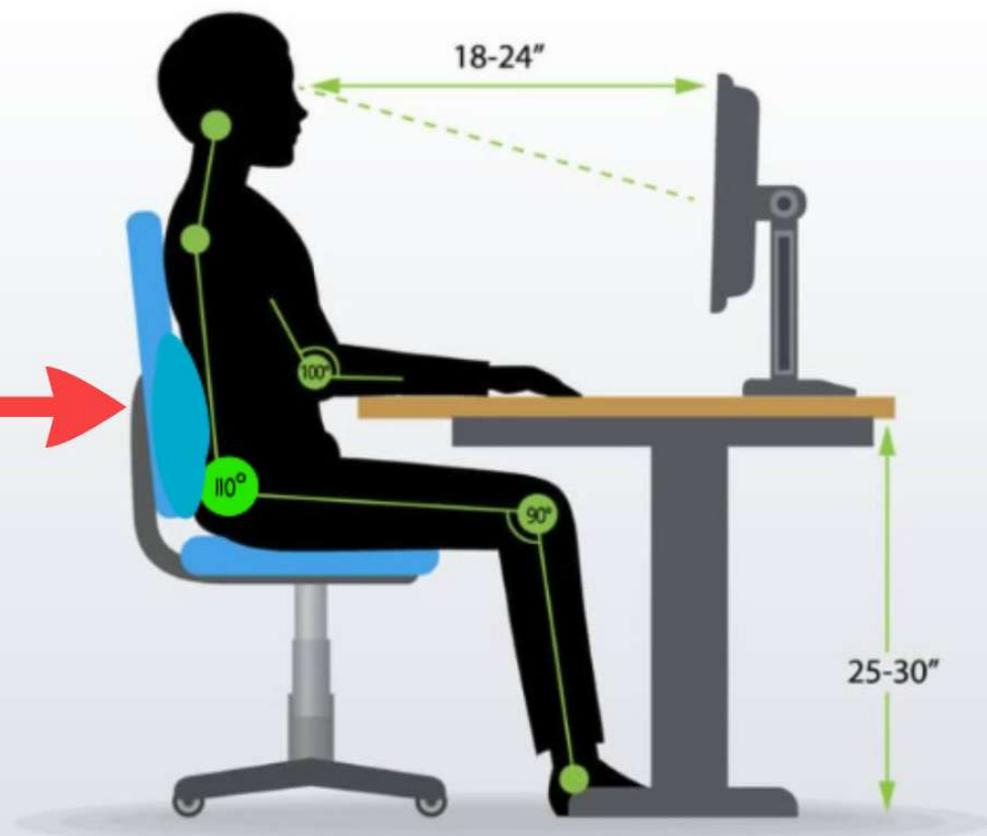
Activity Breaks and Interrupting Prolonged Sitting

- Light-intensity walking breaks significantly reduce postprandial glucose and insulin
- Standing breaks significantly reduce postprandial glucose but no effect on insulin or blood pressure
- **Walking breaks are more effective than standing breaks for metabolic outcomes**

6. Clinical Recommendations and Key Thresholds

Parameter	Evidence-Based Recommendation
Daily Sitting Threshold	Risk accelerates beyond 7-8 hours/day; limit where possible
MVPA to Offset Sitting	60-75 min/day moderate-intensity activity can attenuate (not eliminate) mortality risk
Activity Break Frequency	Every 30-60 minutes; light walking more beneficial than standing alone
Screen Break Rule	20-20-20 rule: Every 20 min, look 20 feet away for 20 seconds
Remote Work Configuration	Hybrid models (1-2 days remote) may be optimal for mental health
<u>Workstation Intervention</u>	Sit-stand desks reduce sedentary time by ~75 min/day when used consistently

CHAIR



- ✓ Shoulders relaxed
- ✓ Straight back
- ✓ Circulation in legs
- ✓ Healthy hip and knee joints
- ✓ Feet flat on the floor

Component	Optimal Setup
Chair Height	Feet flat on floor; knees at ~90–100°; thighs parallel to floor
Lumbar Support	Adjustable; maintains natural lordotic curve; hips positioned far back in chair
Backrest Angle	Slight recline 100–110°; continuous support lumbar to mid-thoracic
Armrests	Slightly lift arms at shoulders; close to body; not blocking desk access
Monitor Height	Top of screen at/below eye level; gaze 15–20° downward to content
Monitor Distance	Arm's length (~50–70 cm)
Monitor Angle	Tilt back 10–20°; perpendicular to windows
Keyboard	Flat or negative tilt; elbows ~90°; wrists neutral; close to body
Mouse	Same level as keyboard; adjacent; minimal arm abduction; neutral wrist
Desk Height	Forearms parallel to floor when seated correctly
Lighting	~500 lux; indirect; screen brightness matches ambient light

Multi-Modal Approach

Workstation + Education + Exercise + Breaks

More effective than any single intervention

Ergonomic adjustments alone may not prevent pain in ~39% of the population

Calf is the Heart of the Office worker

1. Calf muscle - Body's most efficient peripheral venous return mechanism – a single contraction ejects 40–60% of the venous volume.
Prolonged sitting deactivates this pump entirely.
2. Venous stasis
 - increases intramuscular pressure,
 - lower limb swelling,
 - discomfort, and
 - **DVT risk.**
 - Multiple authoritative clinical sources (Mayo Clinic, Cleveland Clinic, AHA) specifically recommend **calf raises for prevention.**
3. The Soleus Pushup: Seated heel raises
 - Elevated oxidative metabolism for hours,
 - Reducing postprandial glucose excursion by 52% and hyperinsulinemia by 60%,
 - Doubling fat metabolism – effects more potent than many traditional interventions.
4. The soleus uses blood glucose and fats directly - **fatigue-resistant and suited to sustained metabolic regulation during sedentary periods.**
5. Both seated (soleus-dominant) and standing (gastrocnemius-dominant) heel raises have value – **Incorporate both!!!**
6. Recommended: 15–20 repetitions every 20–30 minutes.
7. This is one of the **most powerful clinical recommendations available**: it addresses metabolic, vascular, and musculoskeletal health simultaneously with a single, equipment-free intervention performable at any desk.

Under Desk Ergometers

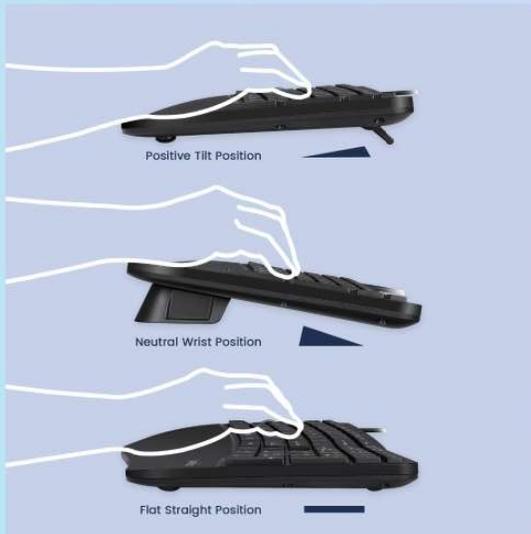


Walking Pads

- When taking meetings
- Phone Calls
- Briefing/summarizing
- Taking a 5 minute break



Ergonomic Keyboards and mouse

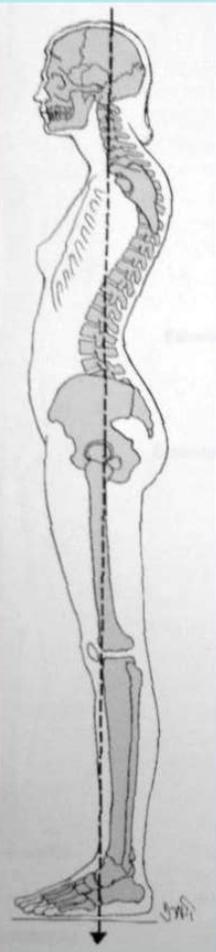


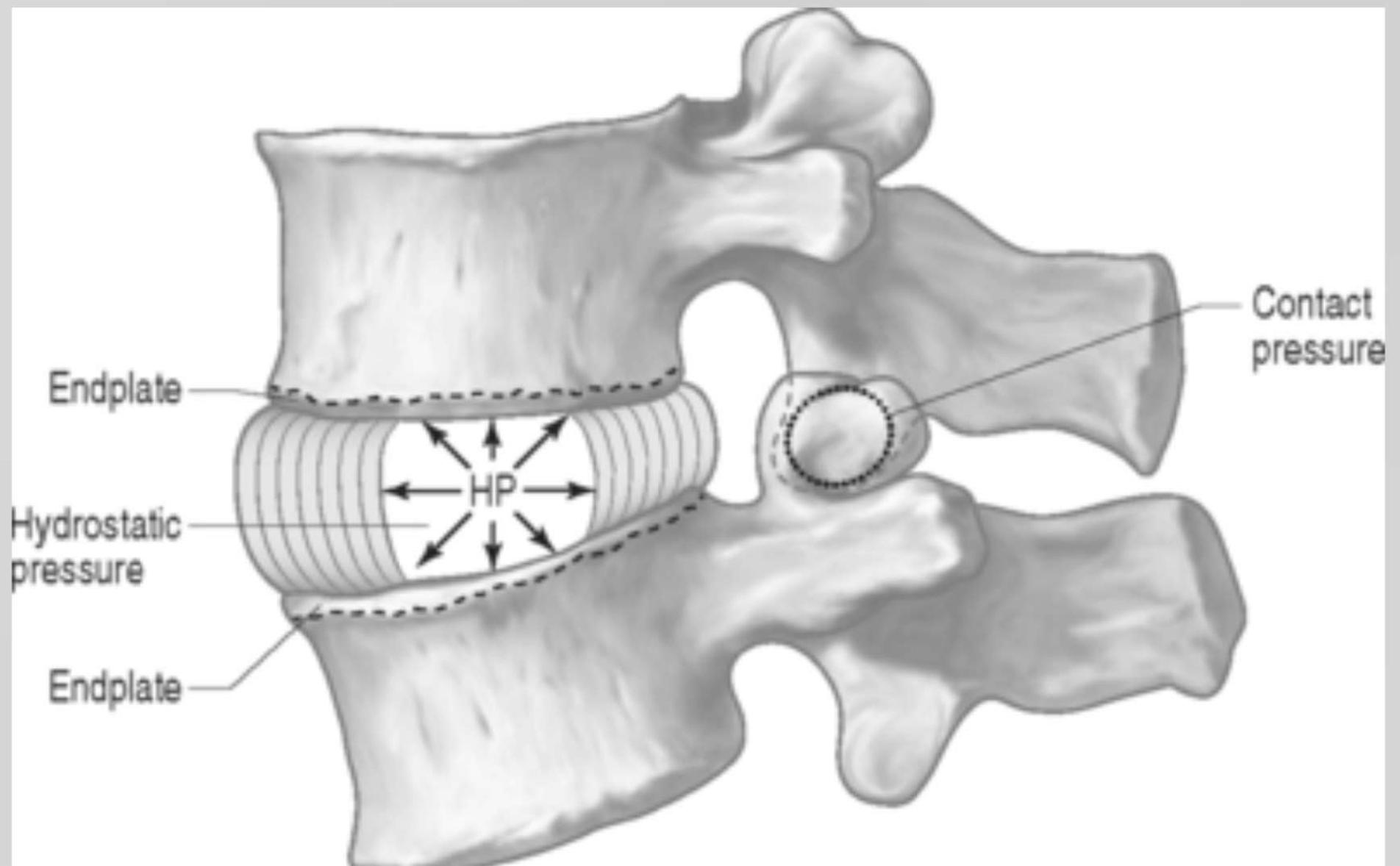
The Healthy Spine

The healthy spine maintains four physiological curves:

- 1) Cervical lordosis ($\approx 20^\circ\text{--}40^\circ$)
- 2) Thoracic kyphosis ($\approx 20^\circ\text{--}45^\circ$)
- 3) Lumbar lordosis ($\approx 40^\circ\text{--}60^\circ$)
- 4) Sacral kyphosis. ($\approx 35^\circ\text{--}45^\circ$)

These curves create a **spring-like mechanism** able to distribute loading forces on vertebrae and discs by up to 10-fold compared to a straight column.





The Static Loading Problem

Normal daily activities: Dynamic loading with regular postural changes

- > Facilitate fluid exchange within the disc.
- > Cycles of compression and decompression
- > Pumping mechanism to transport nutrients into the disc and remove waste products.

Sustained static sitting: Eliminates this fluid exchange mechanism.

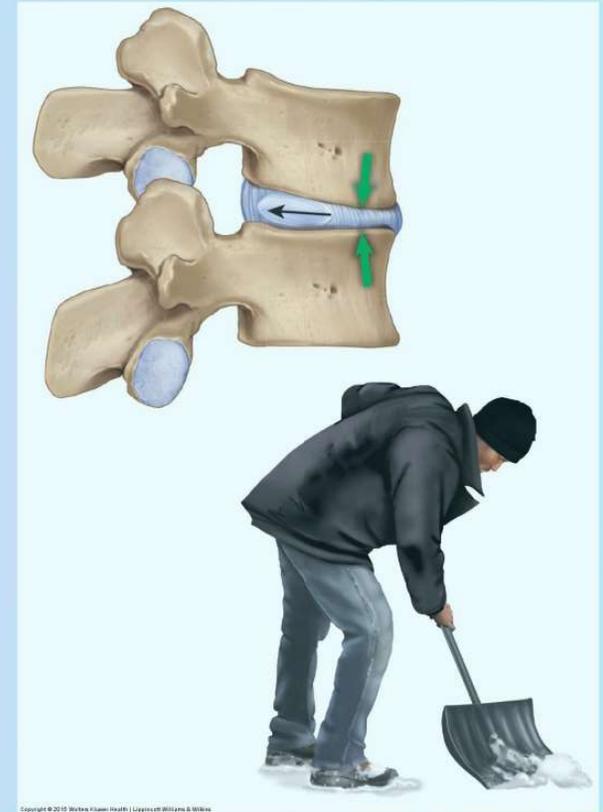
- > Billy et al. (2014): 4hrs of sitting loss lumbar disc height (esp. L4–5 level)

What can we do?

Wilke et al. Constantly changing position is important to promote fluid flow and nutrition to the disc.

- > ***Sedentary, immobile posture is more harmful than the postural position itself.***

- Spinal creep - Time-dependent deformation of viscoelastic spinal tissues (ligaments, discs, muscles)
- Prolonged, sustained, or repetitive loading, particularly in lumbar flexion



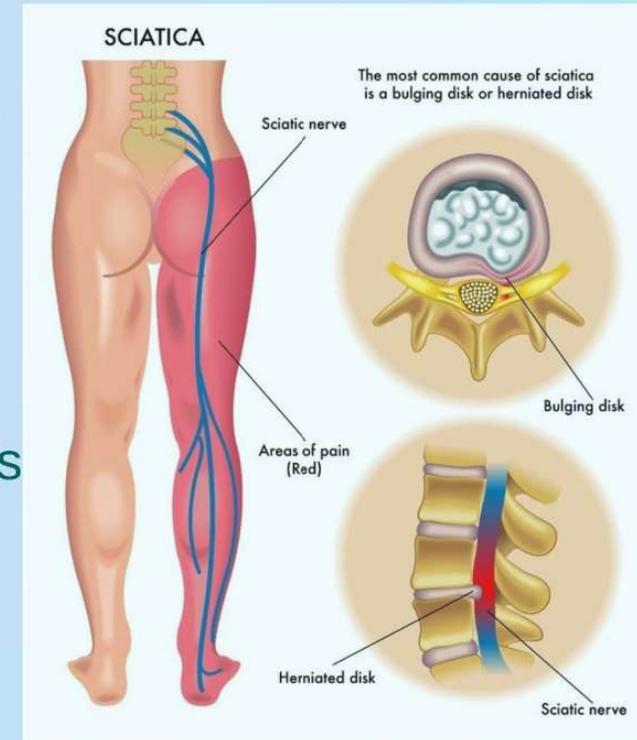
The Office Neck, Headaches and Dizziness

- Loss of Cervical Lordosis: Disc creep and ligamentous laxity cause straightening and ultimately kyphotic reversal of the cervical curve
- FHP - 61.3% in those using computers
- Accelerated Disc Degeneration: Chronic asymmetric loading accelerates disc failure, particularly at C5–C6 and C6–C7.
- Cervical Radiculopathy: Reduced disc height narrows the intervertebral foramina, potentially compressing exiting nerve roots.
- Cervicogenic Headache: Sustained upper cervical extension and ligamentous stress contribute to referred pain patterns producing cervicogenic headache
- Cervicogenic Dizziness: Mismatch between proprioceptive, vestibular, and visual signals in the central nervous system



Low back pain and Sciatica

- Disc: most common cause of CLBP
- Pain in the midline with occasional radiation to the flanks or buttocks
- Worse with axial loading, sitting, or lumbar flexion
- Relieved with lumbar extension or lying supine
- Seating position: Increase in intradiscal pressure
- > lead to disc bulges, protrusions, and potentially herniations
- Sciatica: Nerve root impingement leading radicular pain radiating from the low back region along the course of the sciatic nerve

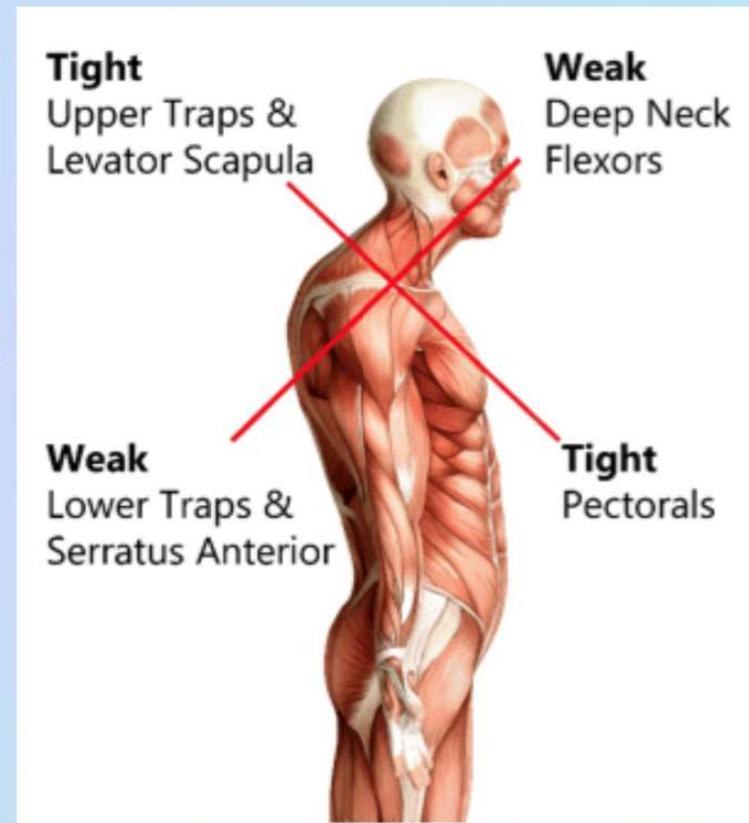


Recommendations

- Postural Interruption: Every 15 minutes significantly reduce the creep-mediated disc changes associated with prolonged sitting (Billy et al., 2014).
- Ergonomic Workstation Design:
- Extension-Based Recovery: Spine hyperextension shifts fluid to return into the intervertebral disc via facet joint fulcrum mechanisms.
- Thoracic Mobility Exercises: Consistent mobility exercises targeting thoracic extension and rotation
- Cervical Retraction and Strengthening: Deep cervical flexor strengthening and cervical retraction
- Daily Physical Activity

Upper Cross Syndrome

TIGHT / OVERACTIVE	WEAK / UNDERACTIVE
Upper Trapezius	Deep Neck Flexors (Longus Colli, Longus Capitis)
Levator Scapulae	Middle Trapezius
Sternocleidomastoid (SCM)	Lower Trapezius
Suboccipital Muscles	Serratus Anterior
Pectoralis Major & Minor	Rhomboids



Lower Cross Syndrome

TIGHT / OVERACTIVE	WEAK / UNDERACTIVE
Iliopsoas Complex	Gluteus Maximus
Rectus Femoris	Gluteus Medius
Tensor Fasciae Latae (TFL)	Transversus Abdominis
Lumbar Erector Spinae	Internal Obliques
Quadratus Lumborum	Deep Multifidus

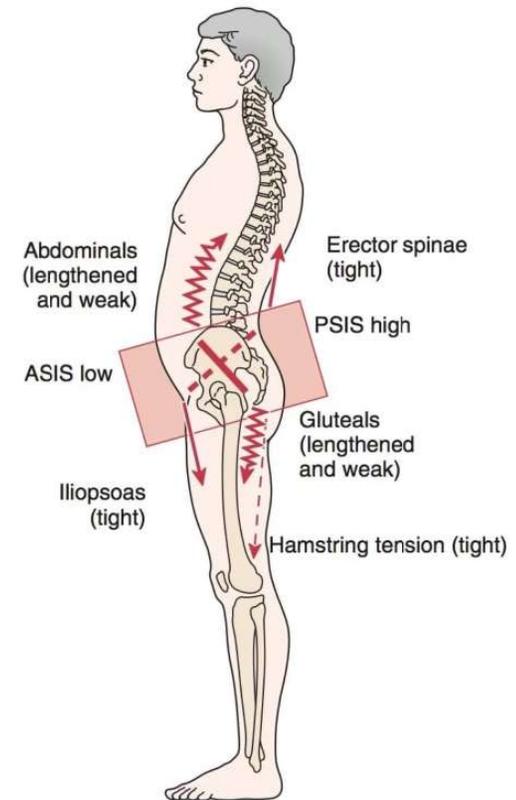


Figure 9-21 The pelvic crossed syndrome as described by Janda and Jull.

Upper Crossed Syndrome

#	Exercise	Target	Category	Frequency
1	UT / Levator Scapulae Stretch	Upper trap, levator scapulae	Stretch	2–3×/day
2	Doorway Pec Stretch	Pec major/minor	Stretch	Daily
3	Suboccipital / SCM Release	<u>Suboccipitals</u> , SCM	SMR	1–2×/day
4	Chin Tuck / CCF	Deep neck flexors	Strengthen	3–4×/day
5	Prone Y/T/W Raises	Lower/mid trapezius, SA	Strengthen	3×/week
6	Wall Slide / Push-Up Plus	Serratus anterior	Strengthen	3×/week
7	Shoulder Ext. Rotation	Infraspinatus, teres minor	Strengthen	3×/week
8	Thoracic Extension and rotation	Thoracic spine mobility	Integration	Daily
9	Scapular Retraction	Mid/lower trap, rhomboids	Integration	Throughout day

Lower Crossed Syndrome

#	Exercise	Target	Category	Frequency
1	Half-Kneeling Hip Flexor Stretch	Iliopsoas, rectus femoris	Stretch	Daily
2	Rectus Femoris Stretch	Rectus femoris	Stretch	Daily
3	Cobra Pose	Lumbar disc	Stretch	Daily
4	Prone Lumbar extension	Lumbar ES	SMR	Daily
5	Glute Bridge	Gluteus maximus	Strengthen	3×/week
6	Bird-Dog (Quad. Hip Ext.)	Glute max, deep stabilisers	Strengthen	3×/week
7	Dead Bug	TVA, internal obliques	Strengthen	3×/week
8	Side-Lying Abduction / Clam	Gluteus medius	Strengthen	3×/week
9	Pelvic Tilt Training	Abdominals, pelvic control	Integration	Multiple×/day
10	Hip Ext. Firing Pattern	Glute max (firing order)	Integration	Clinical + home

Thank you very much for your attention!



Marios Panagi
M.P. From Physio 2 Health

QUESTIONS?

Download your Handout

