

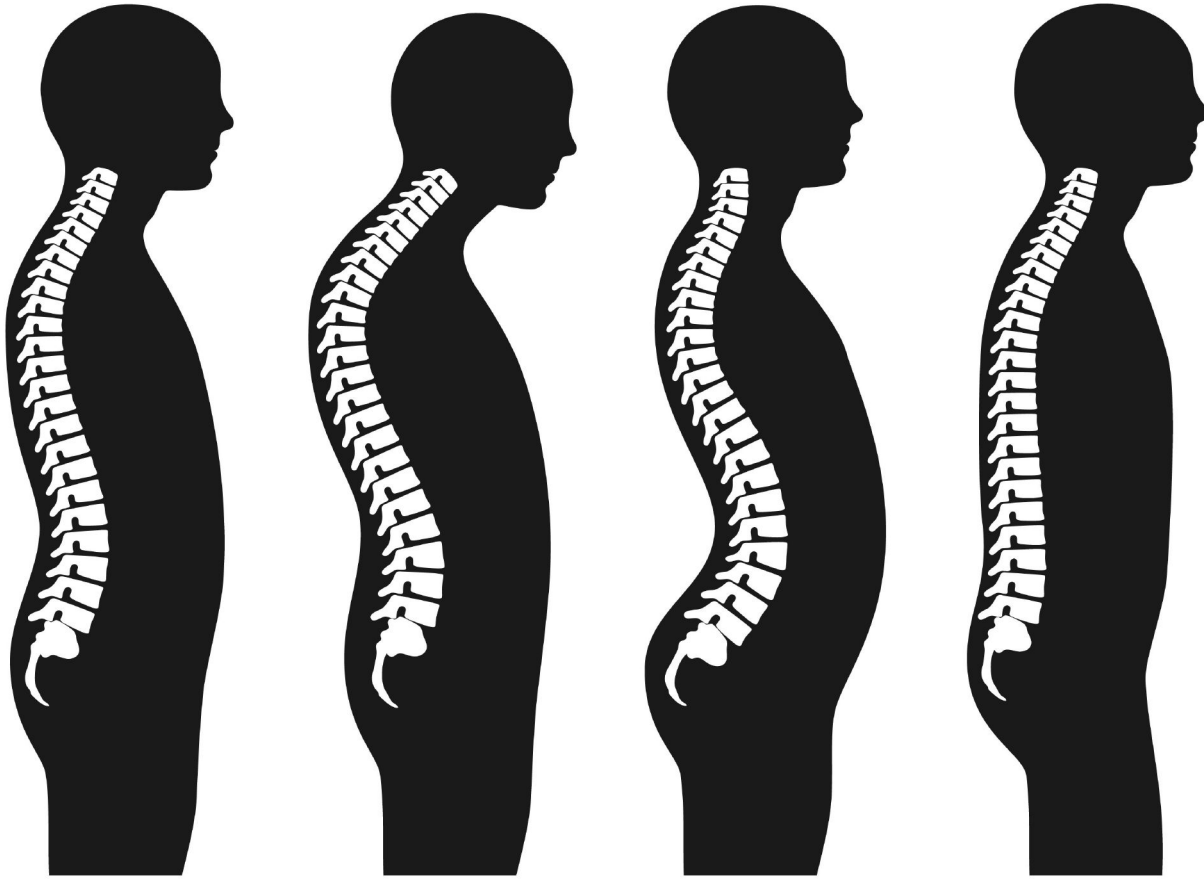
Posture: What
are we really
measuring?





Learning goals

1. Assumptions behind postural model
2. Can we actually measure posture?
3. Does posture correlate with muscle balance?
4. Does posture correlate with pain?



Normal

Kyphosis

Lordosis

Flat back

Assumptions of the postural model

1. Posture correlates with muscle balance
2. Imbalances & asymmetries lead to wear-and-tear injuries & pain
3. We can correct posture by strengthening & stretching muscles



But can we even
measure posture?

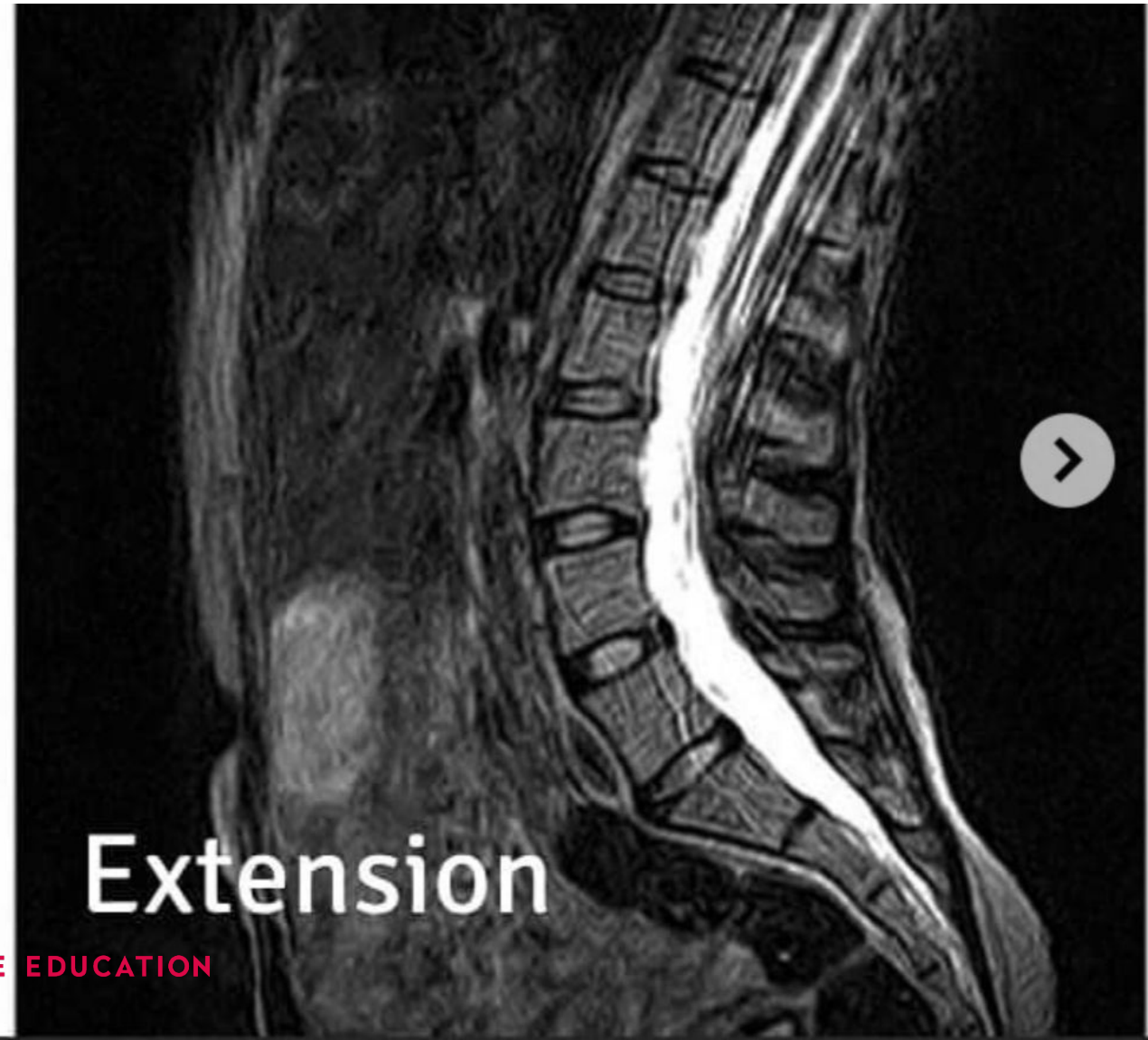


Pelvises are not symmetrical

- Iliac spine height varies 16mm
- ASIS/PSIS angle varies 23 degrees
- Male & female no difference in ASIS/PSIS height

Preece, S. J., Willan, P., Nester, C. J., Graham-Smith, P., Herrington, L., & Bowker, P. (2008). Variation in Pelvic Morphology May Prevent the Identification of Anterior Pelvic Tilt. The Journal of Manual & Manipulative Therapy, 16(2), 113-117. Retrieved from <https://be-research-papers.s3.amazonaws.com/Back+pain/Variation+in+Pelvic+Morphology+May-Preece-2008.pdf>

What we see doesn't match what is inside





Experienced practitioners palpating ASIS & PSIS vary 3-5mm

Alexander, N., Rastelli, A., Webb, T., & Rajendran, D. (2020). The validity of lumbo-pelvic landmark palpation by manual practitioners: a systematic review. International Journal of Osteopathic Medicine. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+17+Sciatica+pt+2/Alexander-2020-The+validity+of+lumbo-pelvic+la.pdf>



People don't have a single posture

It varies throughout the day and
in different activities

Schmidt, H., Bashkuev, M., Weerts, J., Graichen, F., Altenscheidt, J., Maier, C., & Reitmaier, S. (2018). How do we stand? Variations during repeated standing phases of asymptomatic subjects and low back pain patients. *Journal of Biomechanics*, 70, 67-76. Retrieved from https://be-research-papers.s3.amazonaws.com/Back+pain/Schmidt-2018-How+do+we+stand_+Variations+durin.pdf

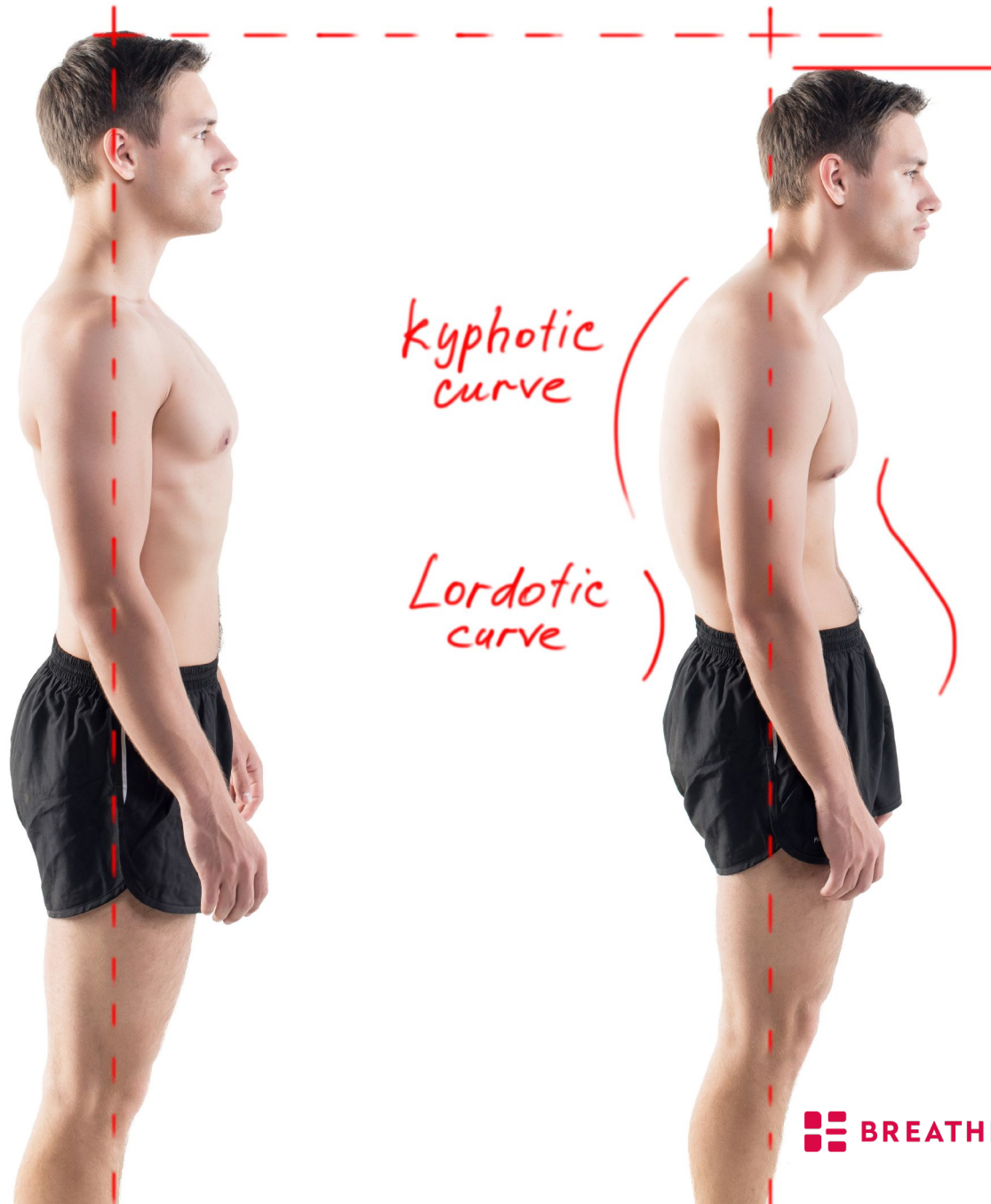


Self-test

- What is the side-to-side variance in ASIS/PSIS angle?
- Do male and female pelvises have different ASIS/PSIS angle?
- When experienced practitioners palpate bony landmarks what is their margin for error?
- True/false: People have a single posture



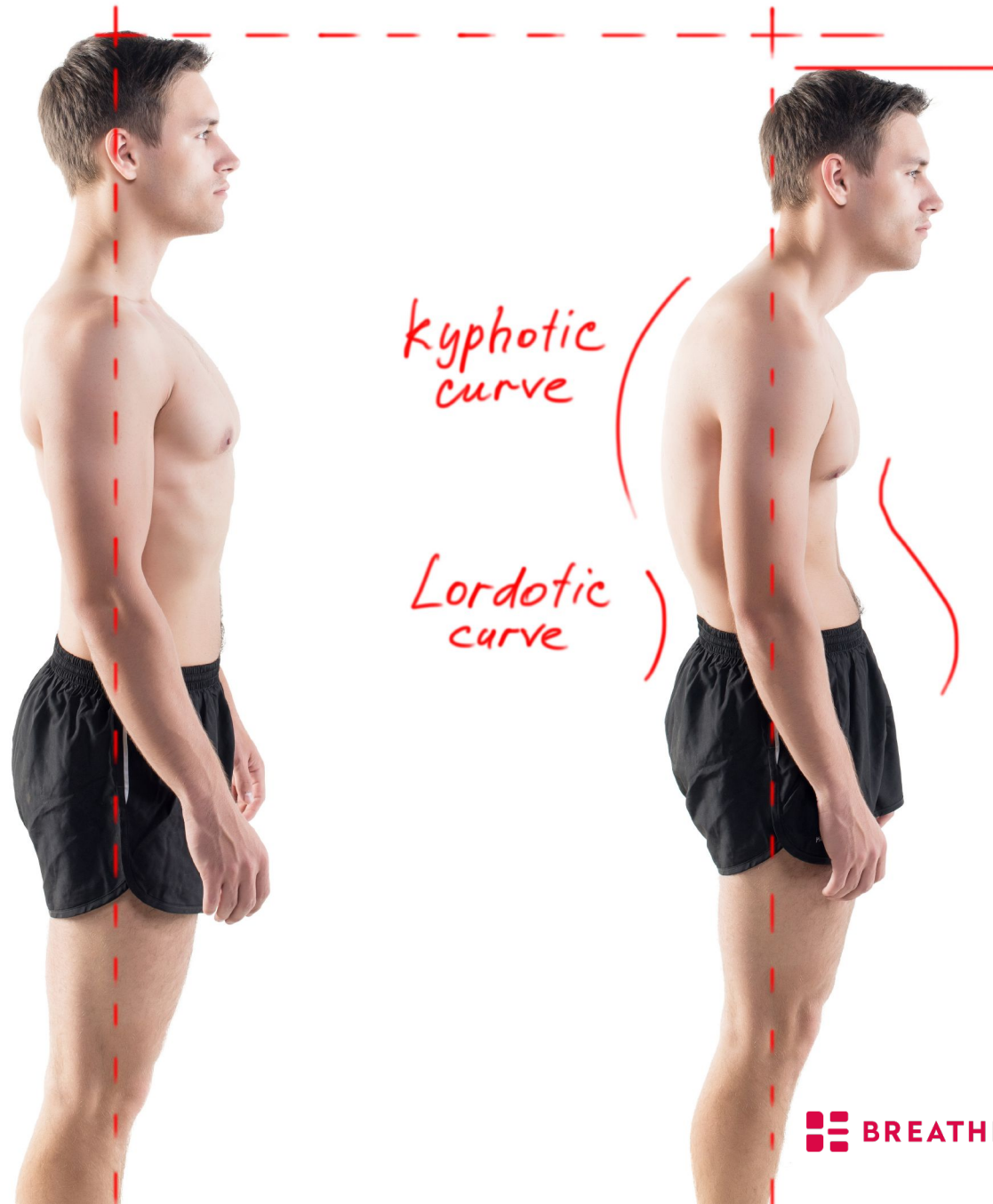
Does posture
correlate with
muscle balance?



For example

Thoracic kyphosis
is not related to
abdominal
strength or
endurance

Asgaonkar, B. & Ghumare, R. P. (2012). A Study to Correlate Postural Thoracic Kyphosis and Abdominal Muscle Strength and Endurance. Indian Journal of Physiotherapy & Occupational Therapy, 6(1). <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Asgaonkar-2012-A+Study+to+Correlate+Postural+T.pdf>



So a test for
thoracic kyphosis
measures
thoracic kyphosis
...Not abdominal
strength



Lumbar lordosis & pelvic tilt are unrelated to abdominal strength

Walker, M. L., Rothstein, J. M., Finucane, S. D., & Lamb, R. L. (1987). Relationships between lumbar lordosis, pelvic tilt, and abdominal muscle performance. *Physical therapy*, 67(4), 512-516. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Walker-1987-Relationships+between+lumbar+lordo.pdf>



Hip & spine flexibility & strength are not related to lumbar lordosis

Elliott, B. J., Hookway, N., Tate, B. M., & Hines, M. G. (2021). Does passive hip stiffness or range of motion correlate with spinal curvature and posture during quiet standing? *Gait & Posture*, 85, 273-279.



Hip stiffness does not correlate with lumbar lordosis

Elliott, B. J., Hookway, N., Tate, B. M., & Hines, M. G. (2021). Does passive hip stiffness or range of motion correlate with spinal curvature and posture during quiet standing? *Gait & Posture*, 85, 273-279.



Self-test

- True/false: Thoracic kyphosis correlates with abdominal strength
- True/false: Lumbar lordosis correlates with abdominal strength
- Hip mobility correlates with pelvic tilt
- True/false: Spine strength & mobility correlate with pelvic tilt



Do strengthening
& stretching
change posture?



BREATHE EDUCATION

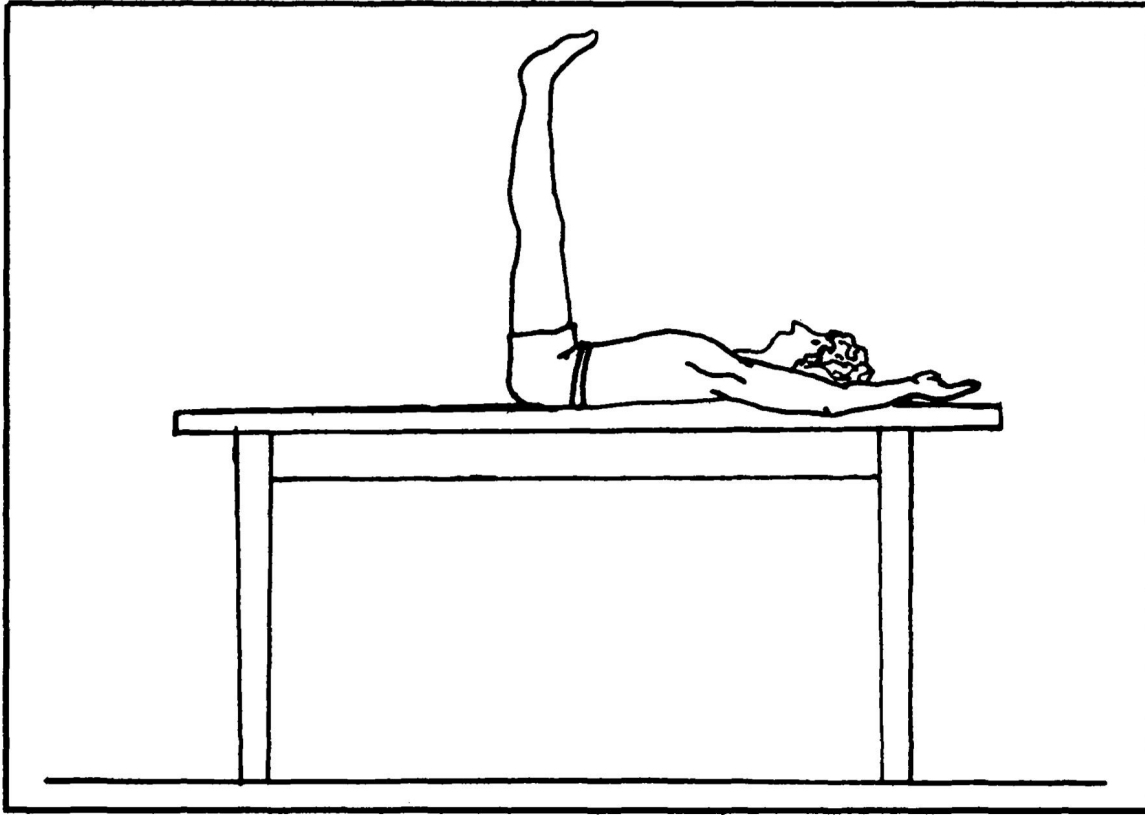


Fig. 3. Starting position for testing abdominal muscle performance.

No change in
pelvic tilt or
lumbar lordosis
after 8 weeks of
abdominal
strengthening

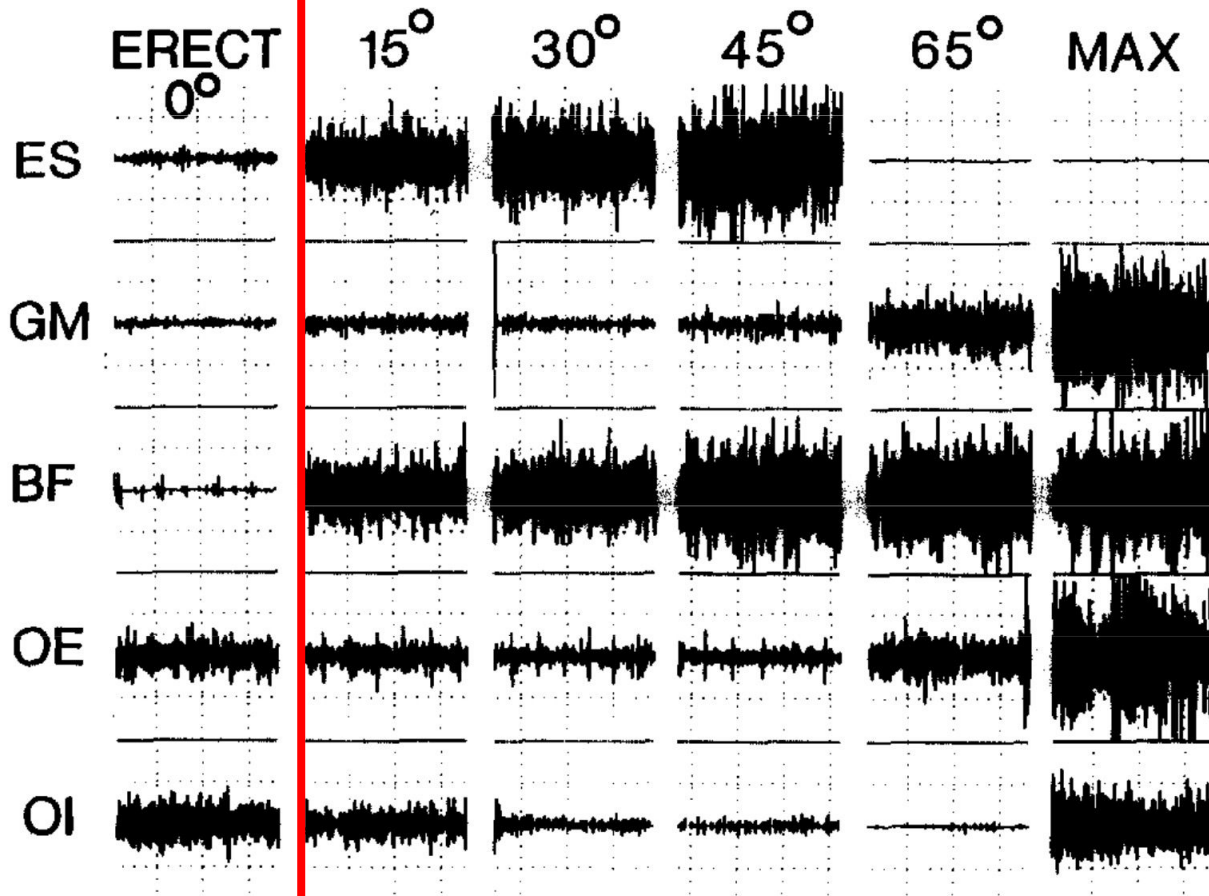
Levine, D., Walker, J. R., & Tillman, L. J. (1997). The effect of abdominal muscle strengthening on pelvic tilt and lumbar lordosis. *Physiotherapy theory and practice*, 13(3), 217-226. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Levine-1997-The+effect+of+abdominal+muscle+str.pdf>



Hamstring
stretching
increases PSLR
but does not
change pelvic tilt

PSLR = passive straight leg raise

Li, Y., McClure, P. W., & Pratt, N. (1996). The effect of hamstring muscle stretching on standing posture and on lumbar and hip motions during forward bending. *Physical therapy*, 76(8), 836-845. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Li-1996-The+effect+of+hamstring+muscle+stretch.pdf>



Erector spinae,
gluteus maximus
& hamstrings are
inactive in erect
standing

Snijders, C., Bakker, M., Vleeming, A., Stoeckart, R., & Stam, H. (1995).
Oblique abdominal muscle activity in standing and in sitting on hard
and soft seats. *Clinical Biomechanics*, 10(2), 73-78. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Sadler-2019-Gluteus+medius+muscle+function+in.pdf>



Why tight
hamstrings do
not limit your
ability to stand
in neutral

*No skeletons were harmed in the
making of this slide



Self-test

- True/false: Strengthening abs changes pelvic tilt
- True/false: Stretching hamstrings changes pelvic tilt



Does posture
correlate with
pain?



LBP is associated with flattened lumbar lordosis

Chun, S.-W., Lim, C.-Y., Kim, K., Hwang, J., & Chung, S. G. (2017). The relationships between low back pain and lumbar lordosis: a systematic review and meta-analysis. The Spine Journal. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Chun-2017-The+relationships+between+low+back+p.pdf>



But which is the
chicken?



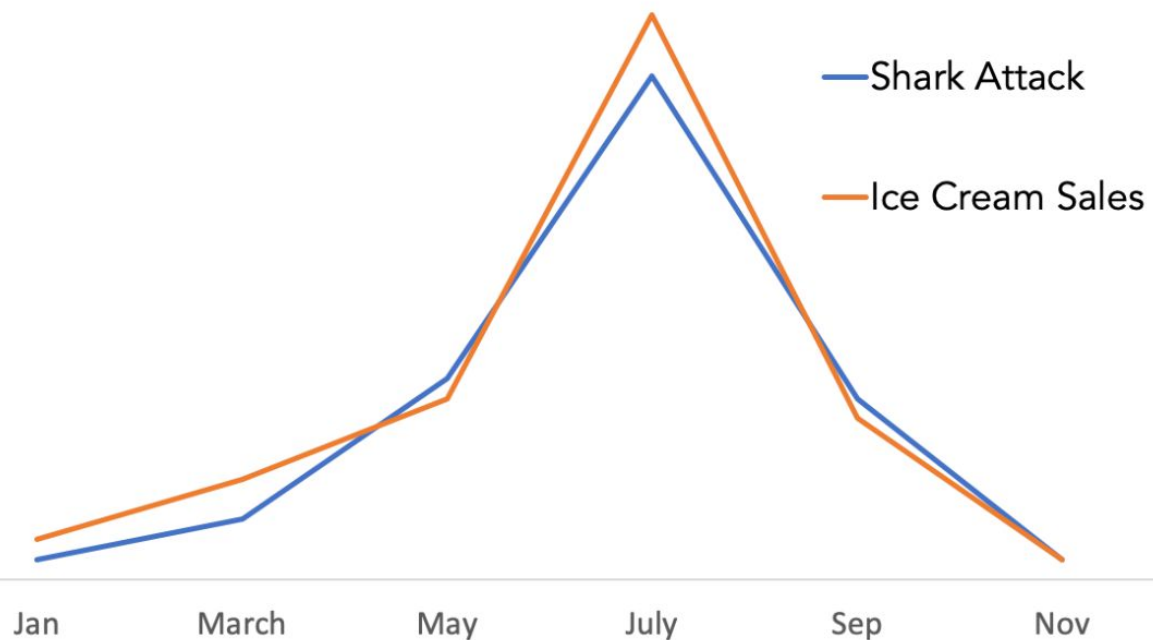


When we do stuff
to increase
lordosis it doesn't
change pain

Swain, C. T., Pan, F., Owen, P. J., Schmidt, H., & Belavy, D. L. (2020). No consensus on causality of spine postures or physical exposure and low back pain: A systematic review of systematic reviews. *Journal of Biomechanics*, 102, 109312. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+17+Sciatica+pt+2/Swain-2020-No+consensus+on+causality+of+spine.pdf>



Maybe neither is
the chicken



Ice cream sales
correlate with
shark attacks

But interventions to reduce ice
cream consumption will not prevent
shark attacks



At the end of the day there's no evidence “poor” posture causes pain

Swain, C. T., Pan, F., Owen, P. J., Schmidt, H., & Belavy, D. L. (2020). No consensus on causality of spine postures or physical exposure and low back pain: A systematic review of systematic reviews. *Journal of Biomechanics*, 102, 109312. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+17+Sciatica+pt+2/Swain-2020-No+consensus+on+causality+of+spine.pdf>



Pain on palpation ✗
Stiffness on palpation ✗
Spinal ROM ✗
Muscle endurance ✗
Muscle strength ✗
SIJ motion ✗
Neurological tests ✗
Centralisation ✓

Which clinical tests predict outcomes in LBP?

LBP = low back pain

Hartvigsen, L, Kongsted, A., & Hestbaek, L. (2015). Clinical examination findings as prognostic factors in low back pain: a systematic review of the literature. *Chiropractic & manual therapies*, 23(1), 1-22. <https://be-research-papers.s3.amazonaws.com/Diploma+lecture+research+papers/Lecture+18+Spinal+assessment+pt+1/Hartvigsen-2015-Clinical+examination+findings.pdf>



Self-test

- Does posture correlate with pain?
- Do interventions to change posture result in less pain?
- Is there evidence of a causal relationship between ice-cream sales and shark attacks?
- Which tests predict outcomes in LBP?



Learning goals

1. Assumptions behind postural model
2. Can we actually measure posture?
3. Does posture correlate with muscle balance?
4. Does posture correlate with pain?

Questions?

