

'The Pelvic Equilibrium Theory'

'A new theory based on 27 years of clinical practice'.

Australia 2015



- ▶ England V USA 1985
- ▶ 3.57.88 min/secs. New British Indoor Record

Key points

1. Define a pelvic adaption theory based on experience.
2. Describe four pelvic adaptations.
3. Show you how to measure & quantify them using a new clinical protocol.
4. Demonstrate a DPI technique with high inter and intra rater reliability.
5. Show you how to classify a patient into 1 of the 4 pathways (adaptions).



What is the theory?

Definition.

The 'Pelvic Equilibrium Theory' focuses on the changes that occur around the innominate bones and sacrum and describes **four** pelvic adaptations based on the forces, which occur around the acetabular and sacral axes. The purpose of these **four** adaptations is to establish pelvic balance at the expense of symmetry, whilst attempting to maintain a stable upper body CoM.

Hypothesis: that all ambulant humans appear to demonstrate one of the four adaptations and that they may help to explain how injury patterns occur throughout the whole kinetic chain.

Background.

Ancient adaptations.

Ancient adaptive mechanisms

'The Functional Pathways to injury'

- ▶ Our ancestors used a set number of adaptive mechanisms.
- ▶ Each of the adaptations were **SHORT-LIVED & CONSTANTLY CHANGING** as our ancestors moved around a natural world.
- ▶ The extrinsic natural environment was the main driver for these adaptations.
- ▶ Their aim was to achieve vestibular balance in the presence of gravity, GRF and natural asymmetry (internal & external).
- ▶ **PROBLEM** - we use a limited number of these adaptations for a much longer period of time for our intrinsic asymmetry E.g. Leg length inequality.

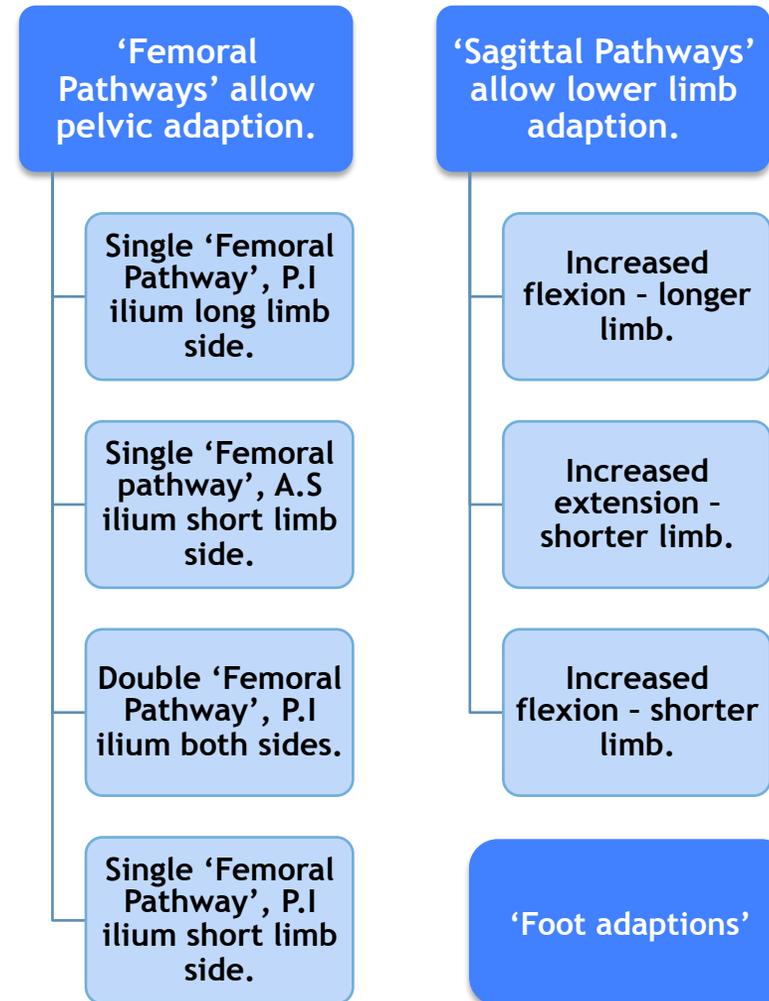


Major adaptations in the pelvis & lower limb

They allow joint adaptation via:

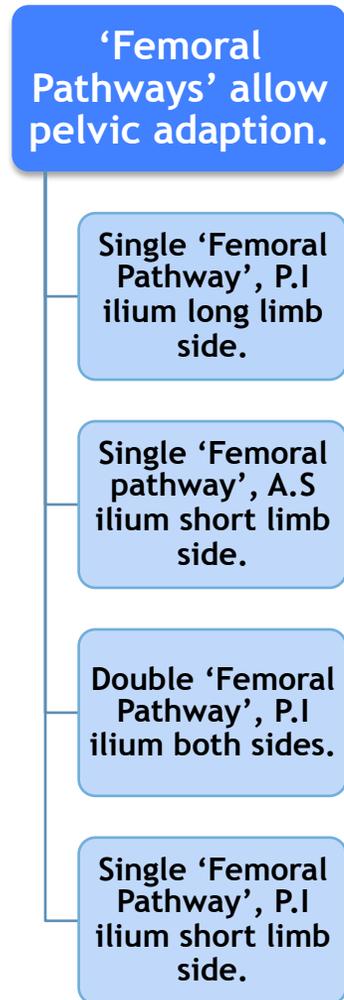
- ▶ Changes in range magnitude
- ▶ Changes in acceleration
- ▶ Changes in vector quality
- ▶ Changes in **temporal** parameters

= **INCREASED TISSUE STRESS**



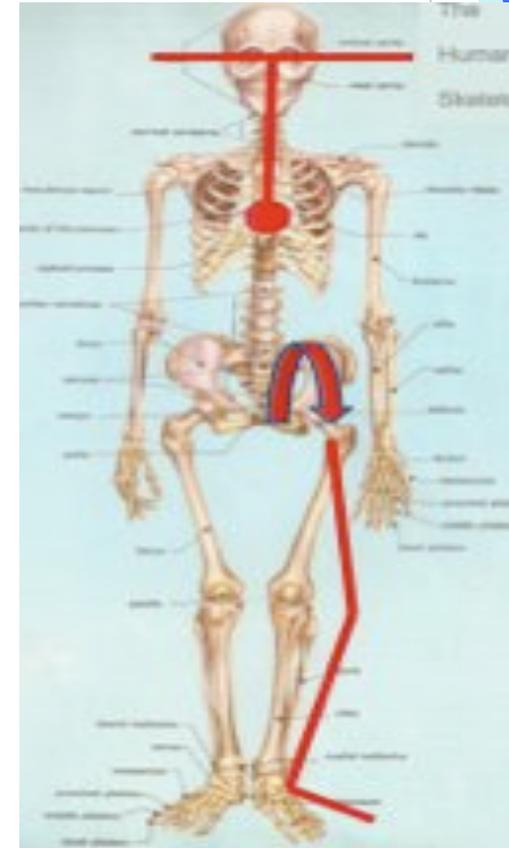
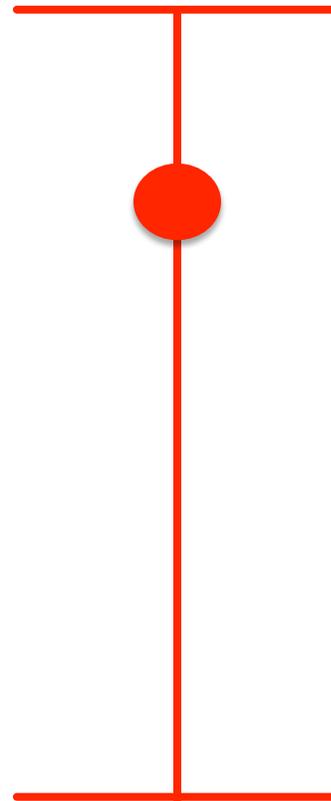
Pelvic adaptations

- ▶ The Pelvic Equilibrium Theory describes the 4 pelvic adaptations.



The MSK adaptations create issues for modern living

- ▶ The geophysics has **NOT** changed.
- ▶ Our adaptive capability has **NOT** changed.
- ▶ The need to establish 'The essential T' has **NOT** changed.
- ▶ What **HAS** changed is...



G

GRF

Our under-foot environment. Concrete has high energy return.



- ▶ Now our natural intrinsic asymmetry becomes the main driver for adaption.
- ▶ We therefore use the same evolved adaptations to achieve the same end goal: **cerobellovestibular balance**.
- ▶ The difference is the duration (**temporal parameters**) of a single adaption.
- ▶ They can last for a **much longer period of time**.

Why?

Instantaneous adaptations: There is no plan for what happens after the adaptation!

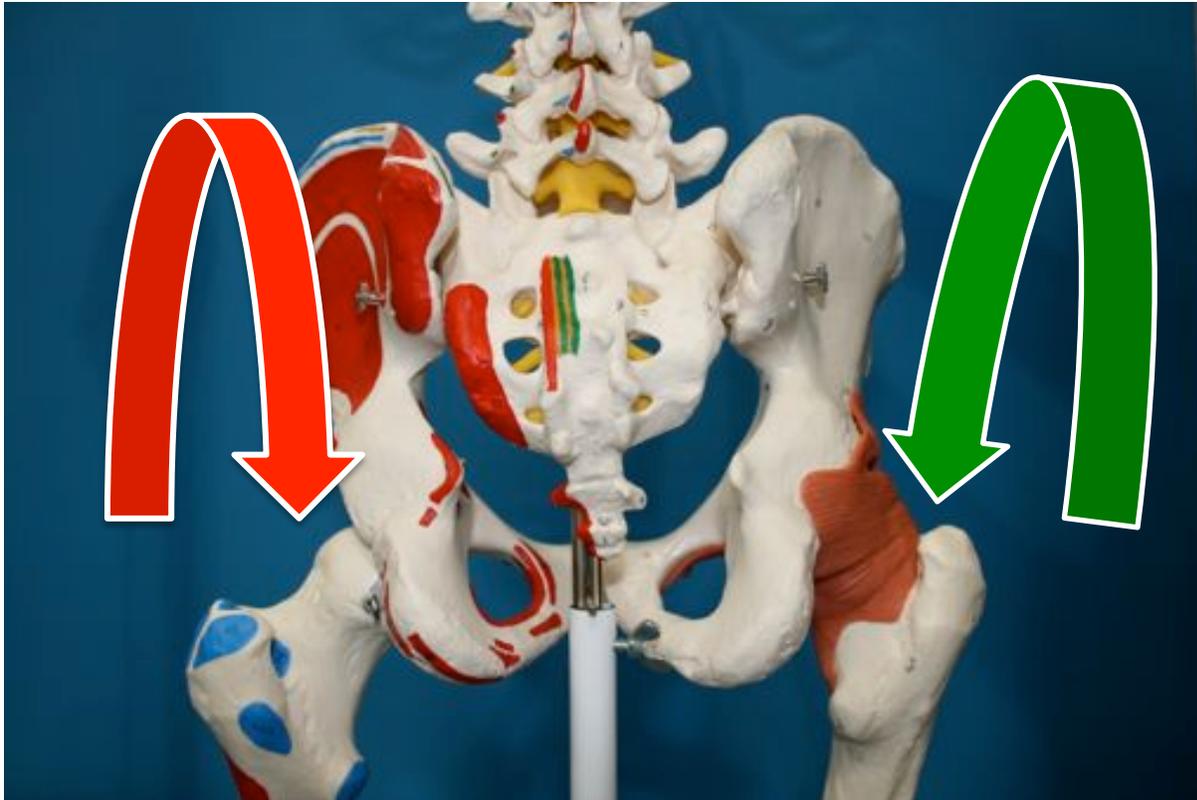
Natural surfaces constantly change as you move.

- ▶ Therefore adaptations are constantly changing.

Modern surfaces change less

- ▶ Therefore your adaptations change less.

Glossary

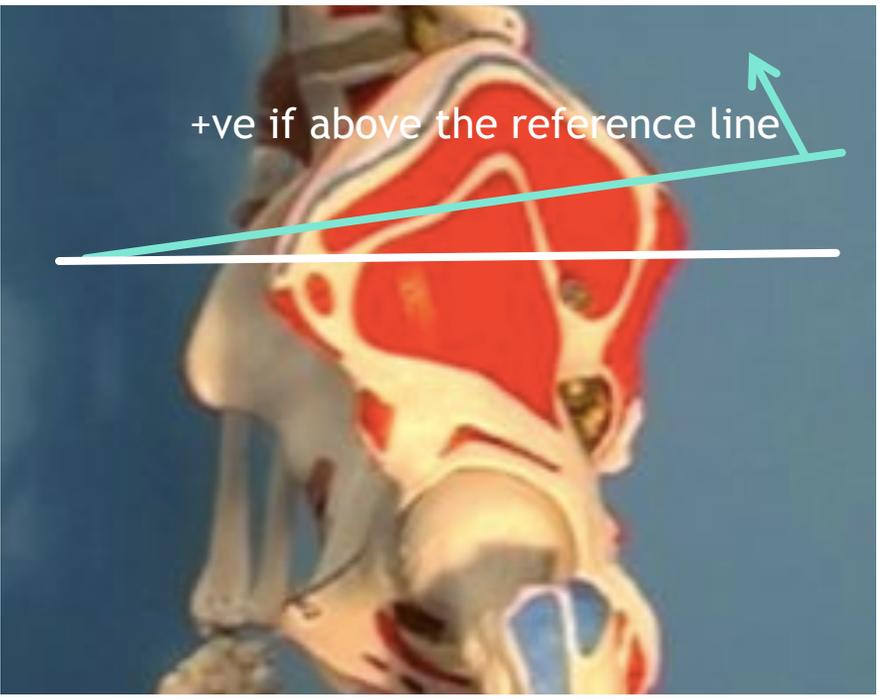


Pelvic torsion

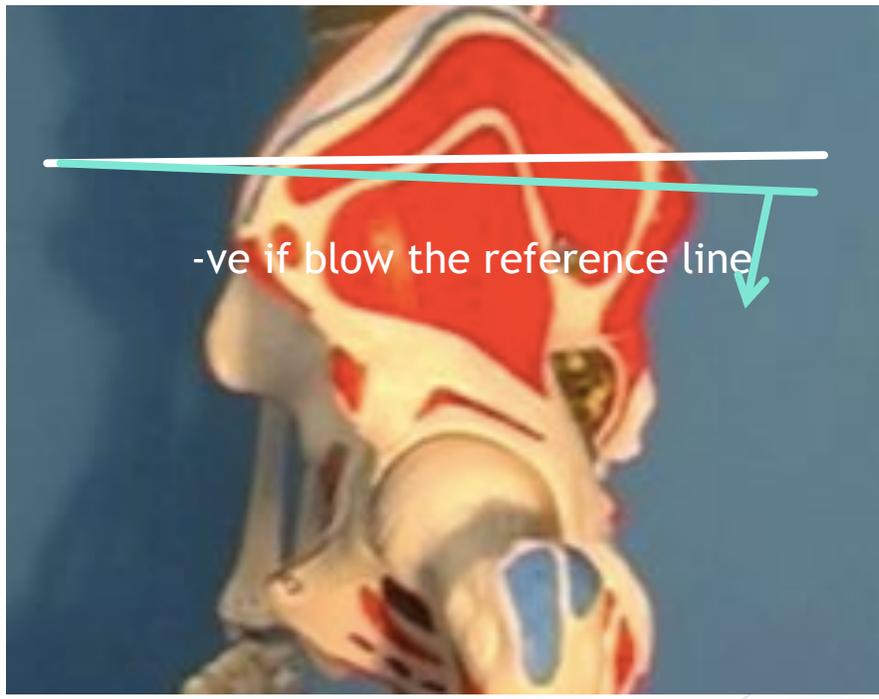
This is one of the most important pieces of data obtained from an assessment.
The future of clinical MSK will be based on pelvic mechanics.

Innominate orientation

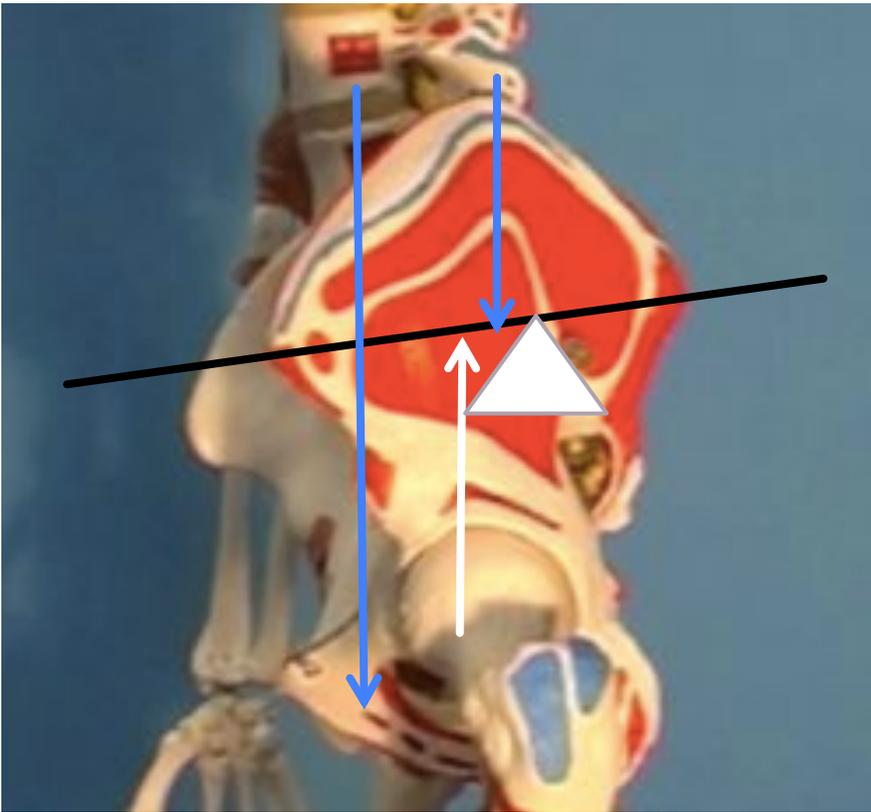
+ve definition



-ve definition



Normal innominate orientation



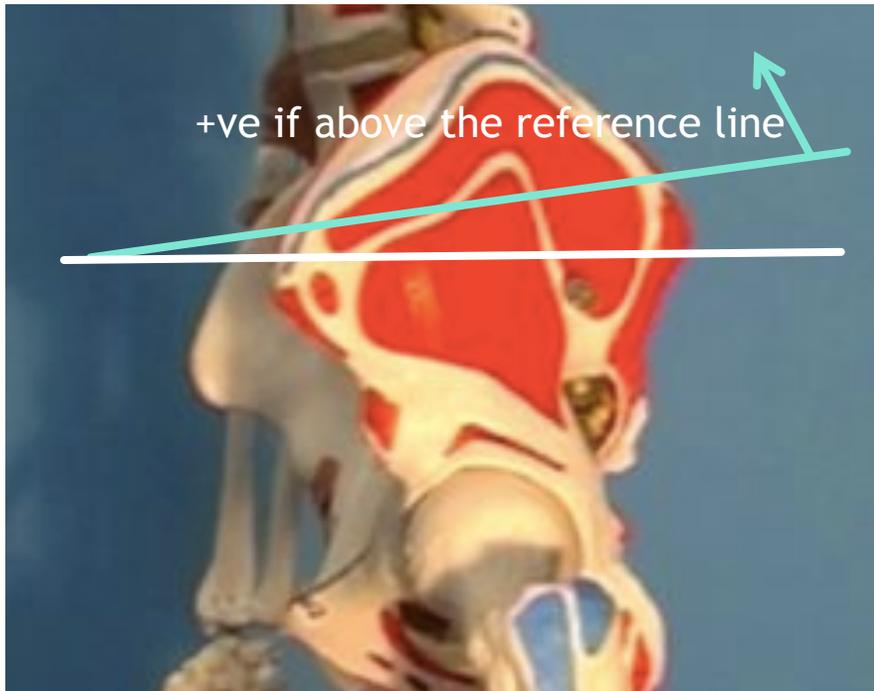
- ▶ **8 to 10 ° +ve**
- ▶ The pelvis appears to be more efficient when +ve.
- ▶ Athletes and stronger individuals tend to be more +ve.
- ▶ Pelvic inclination may influence / determine the type of repetitive injury.
- ▶ It may also determine adaptive mechanisms in the rest of the kinetic chain.

Innominate orientation

Anterior tilt / AS ilium:

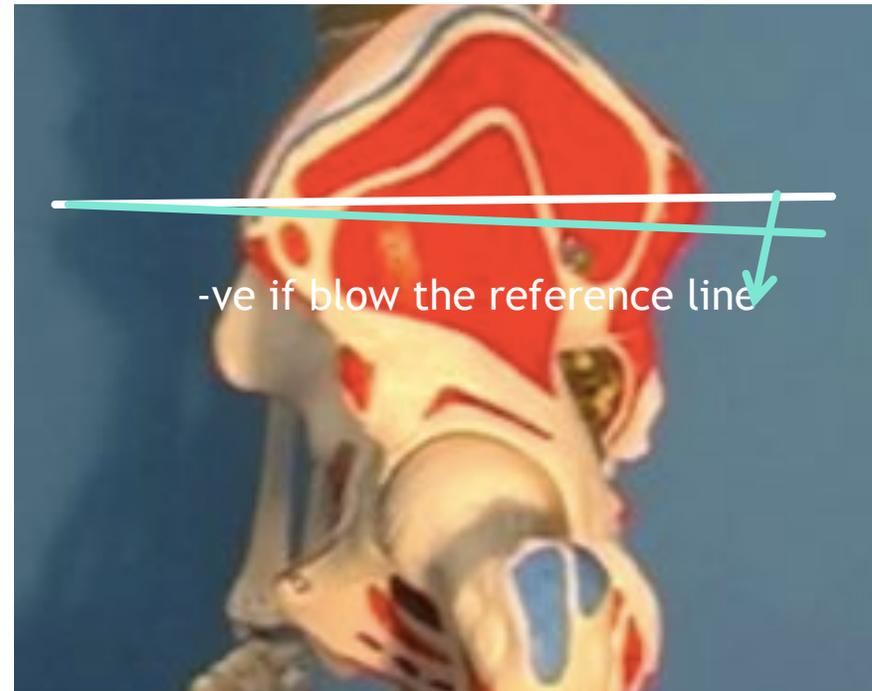
is always +ve

(> 10 +ve)

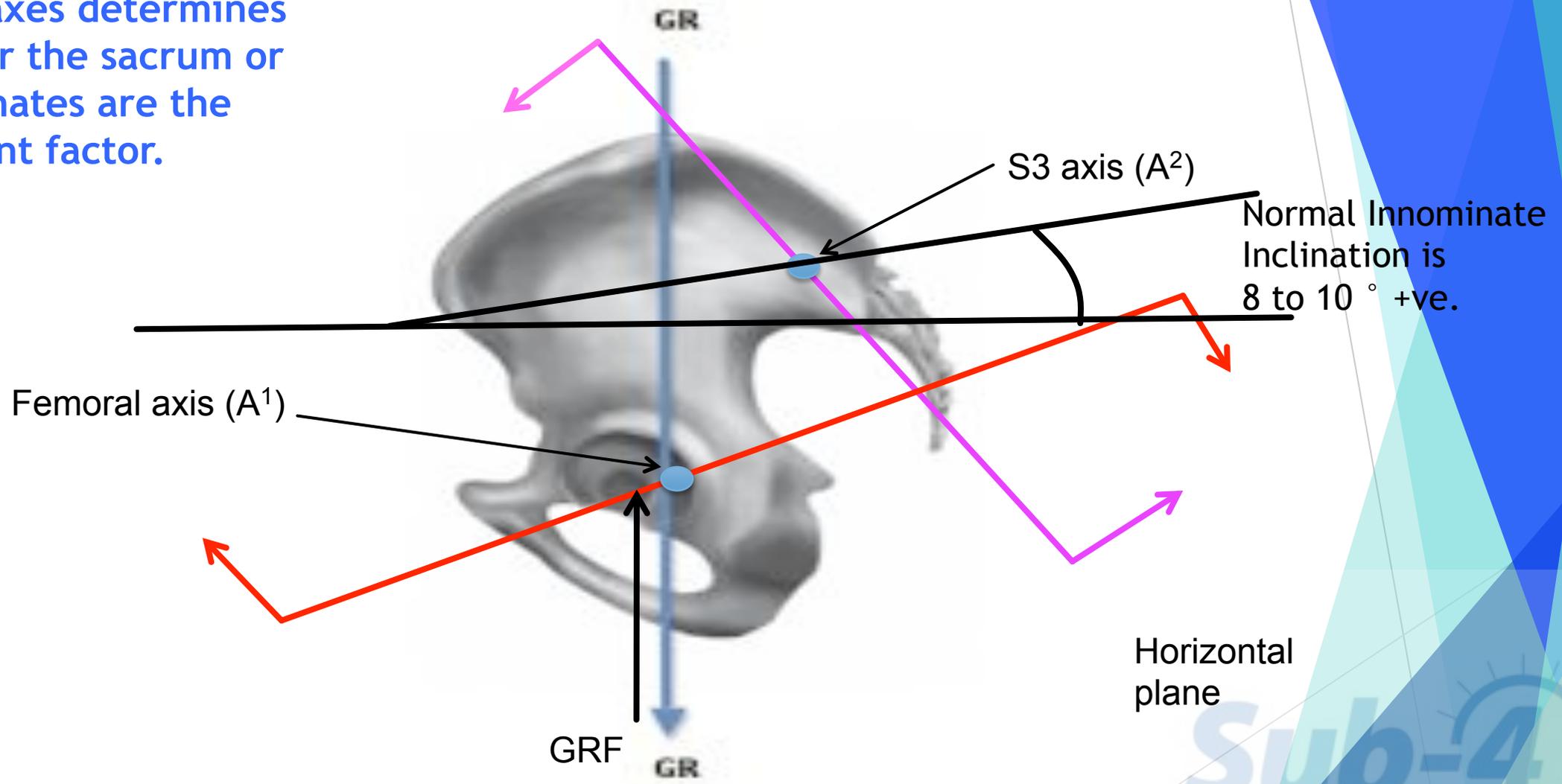


Posterior / PI ilium can be both
+ve & -ve definition

(< 8 +ve)



Vector quality in relation to the axes determines whether the sacrum or innominates are the dominant factor.

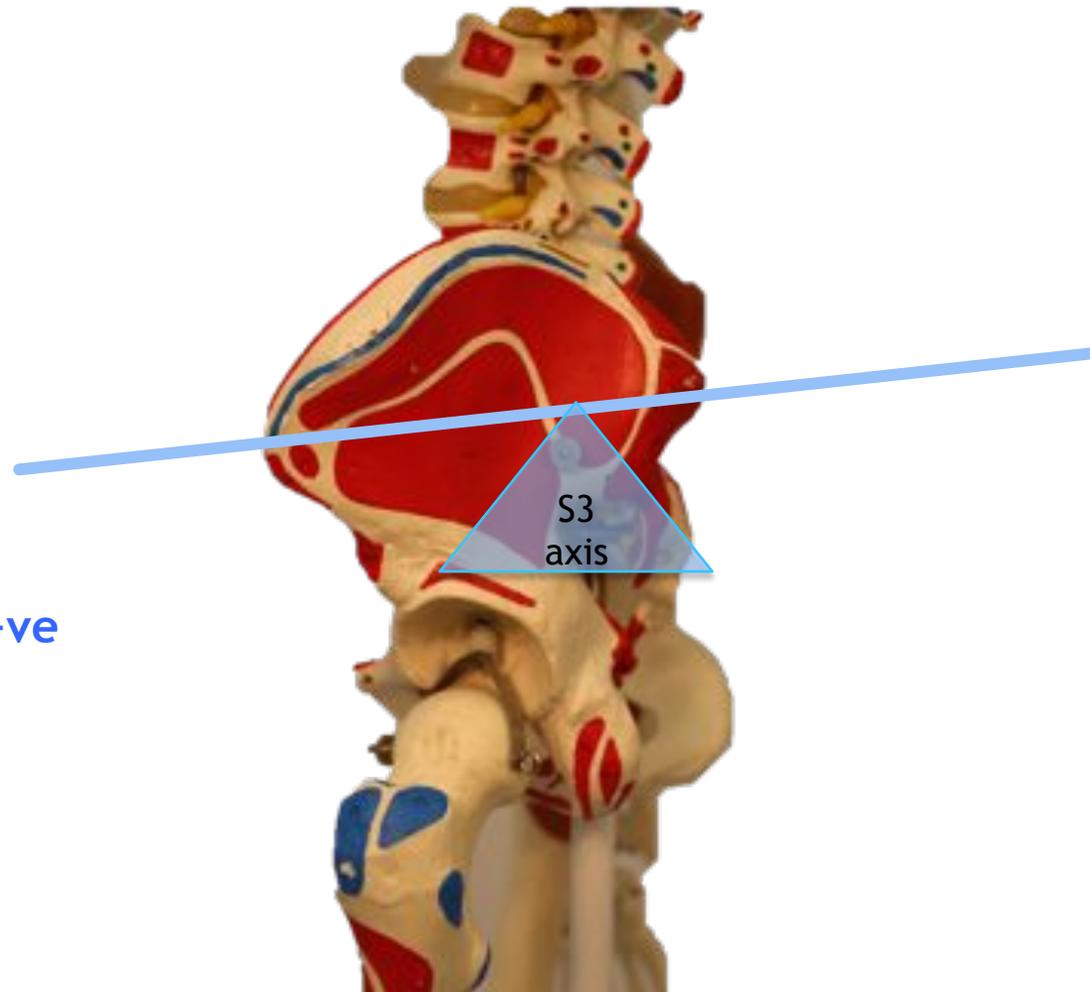


'Seesaw' analogy with Normal pelvic equilibrium

←
ANTERIOR

8 to 10° +ve.

Sacral base 30° +ve



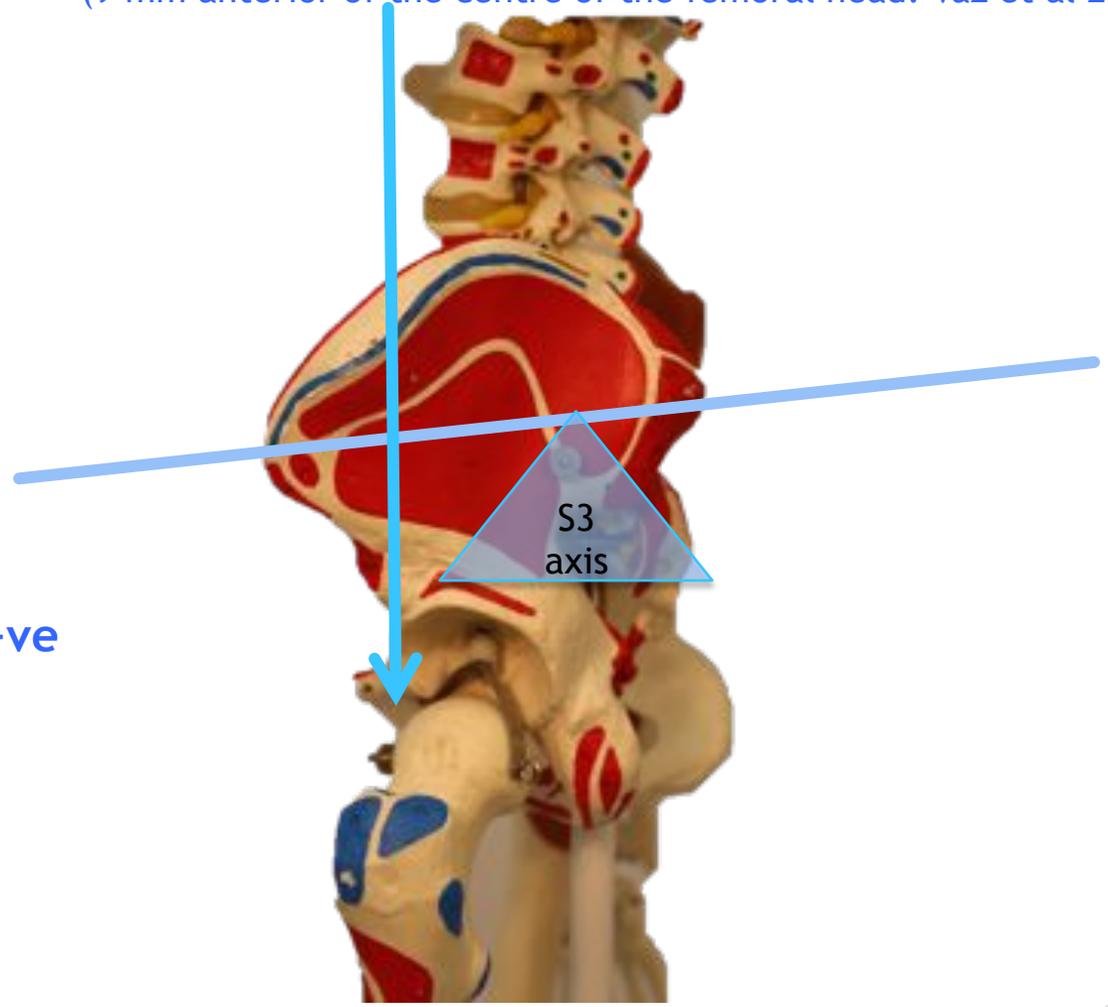
'Seesaw' analogy with Normal pelvic equilibrium

Global axis of gravity
(9 mm anterior of the centre of the femoral head. Vaz et al 2001).

←
ANTERIOR

8 to 10° +ve.

Sacral base 30° +ve



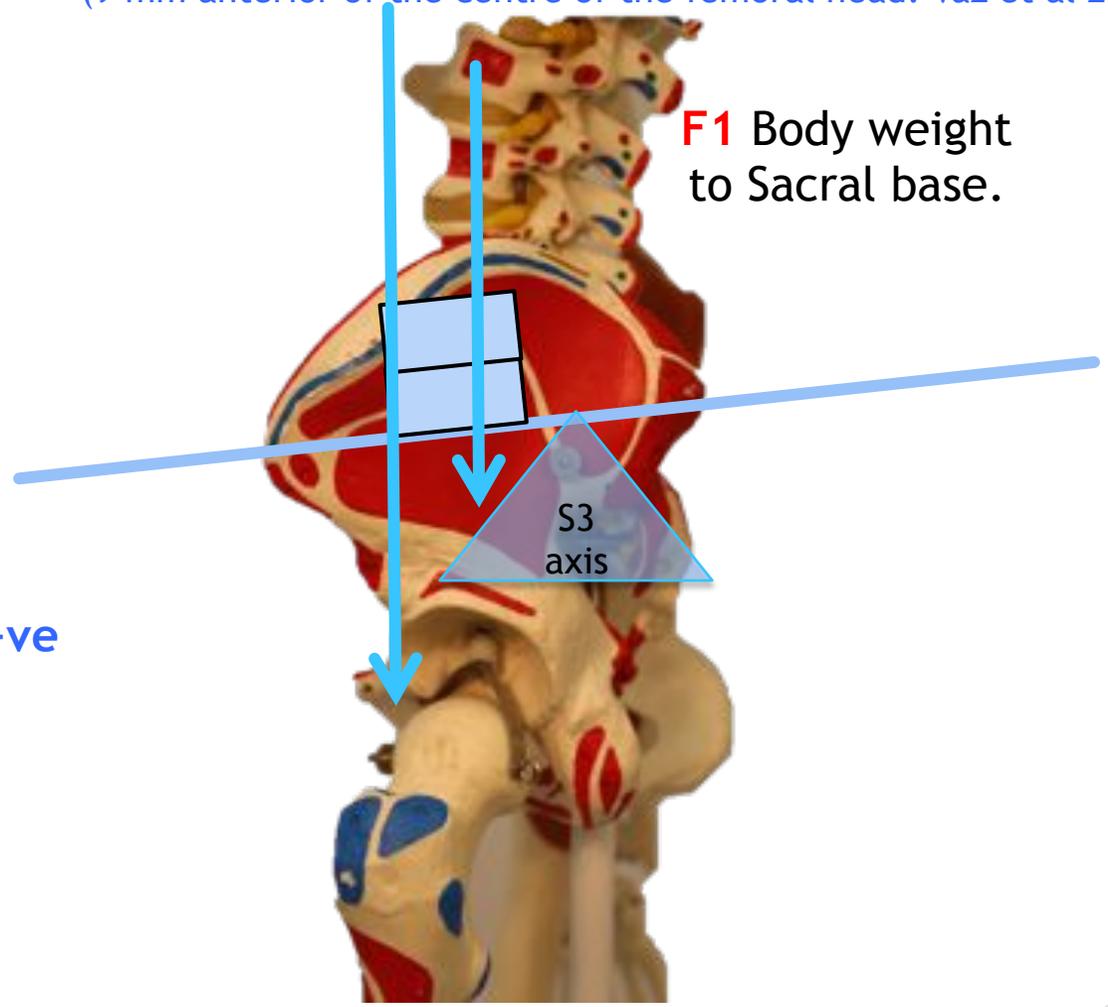
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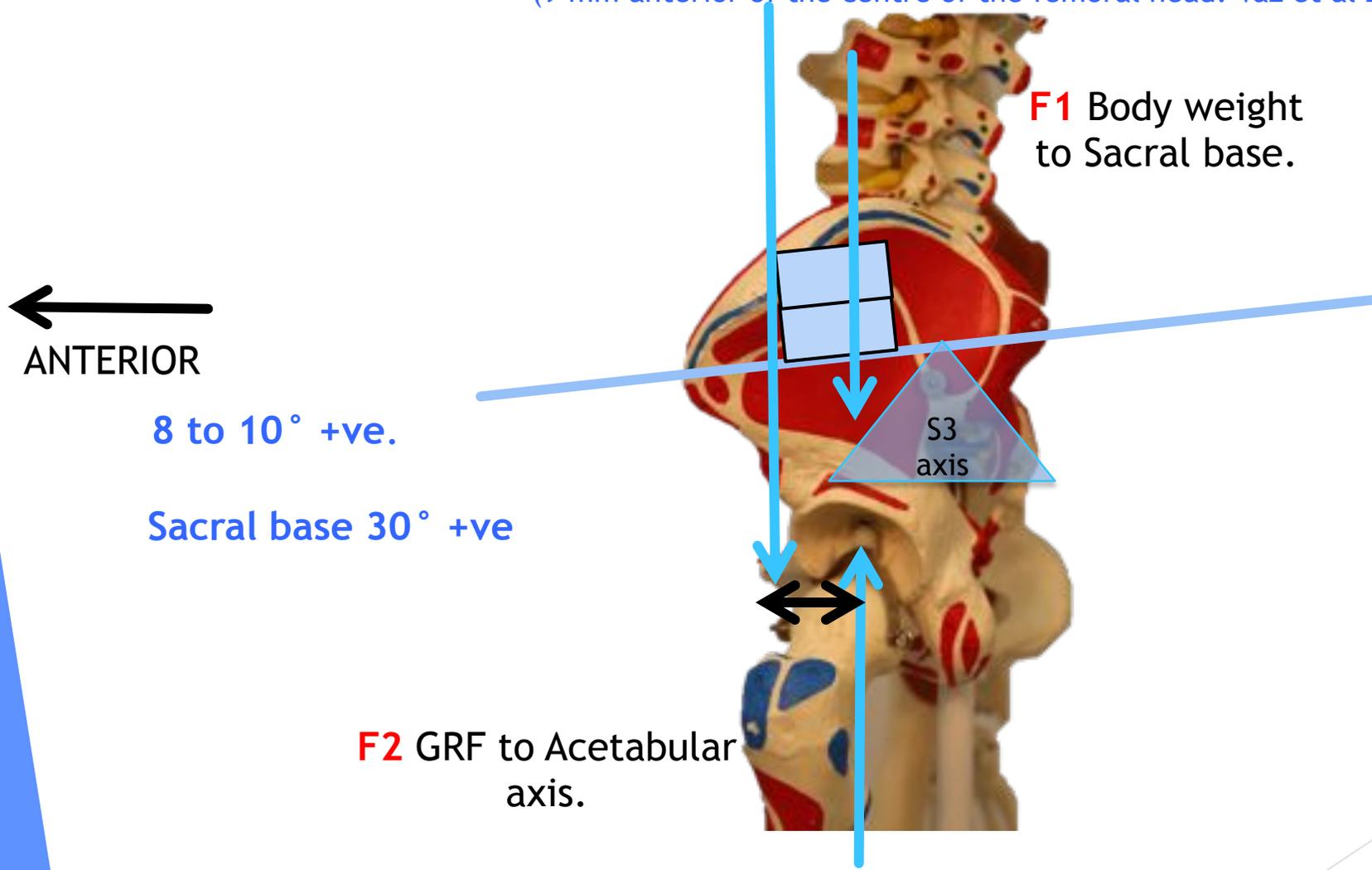
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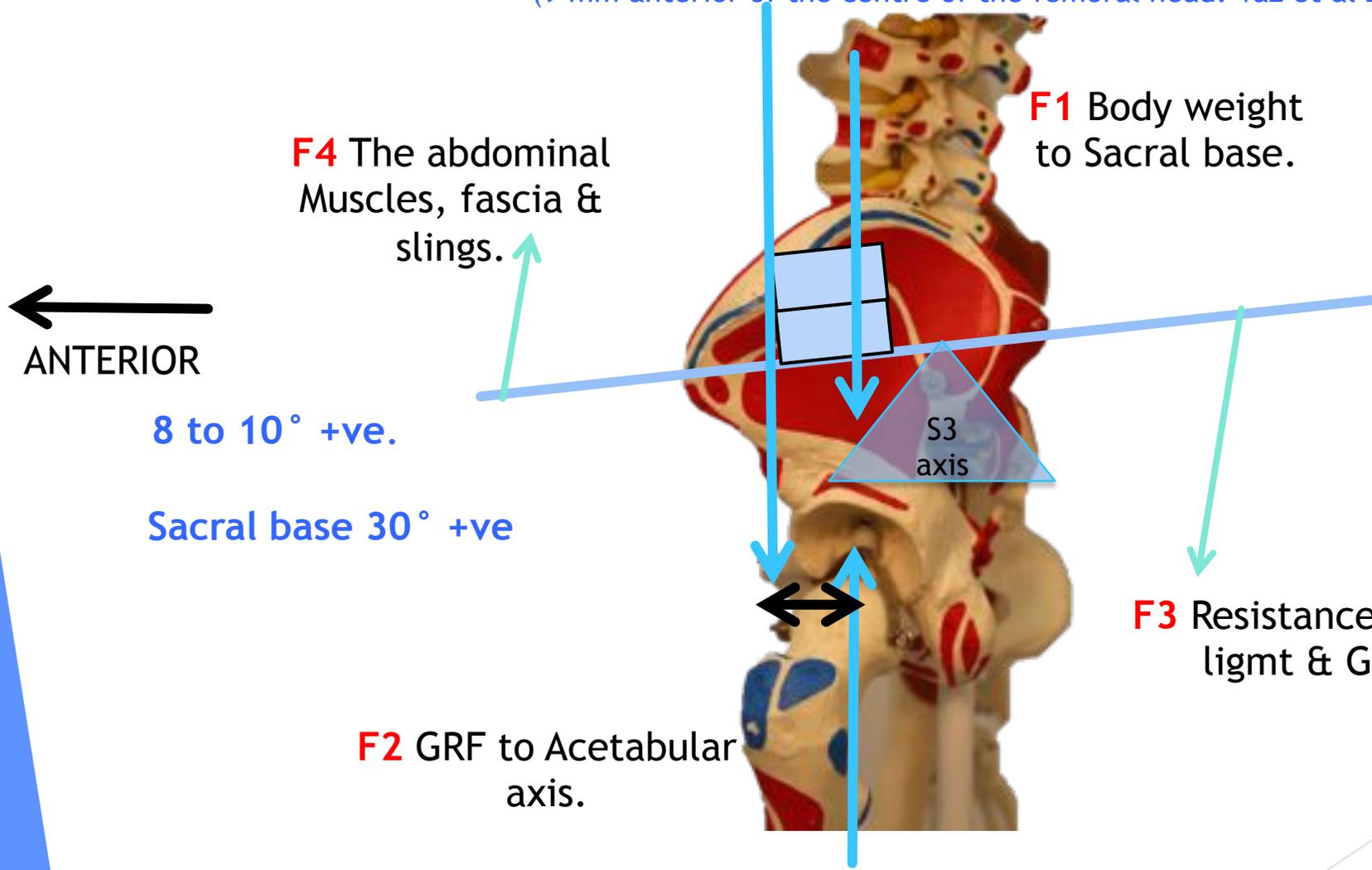
F1 Body weight
to Sacral base.

S3
axis

F2 GRF to Acetabular
axis.

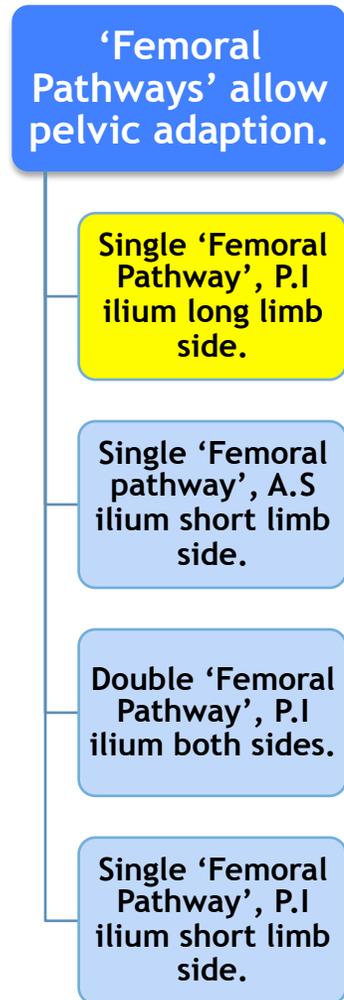
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Single Femoral Pathway P.I ilium - Long Side

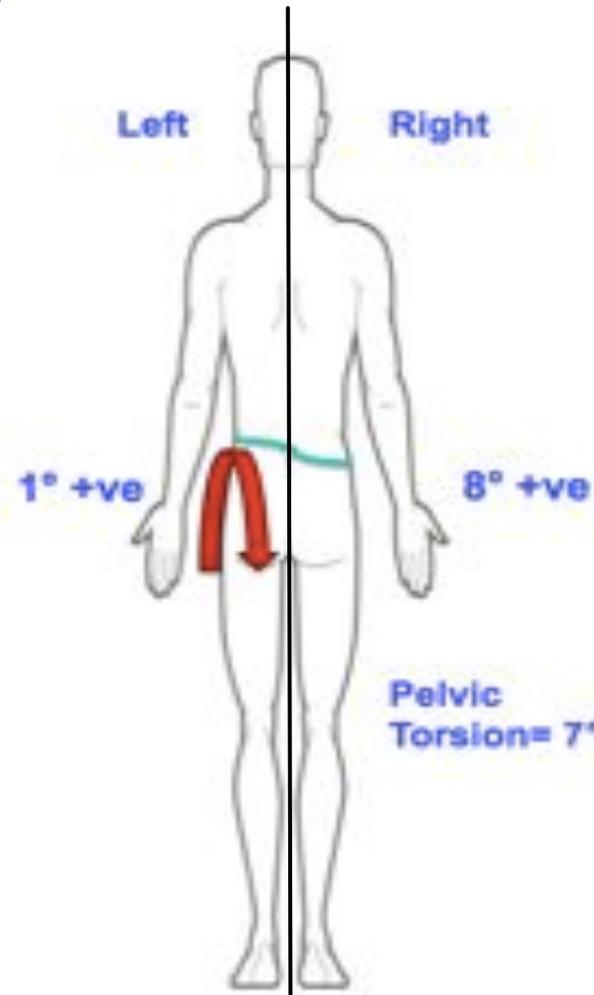
- ▶ The Pelvic Equilibrium Theory describes the 4 pelvic adaptations.



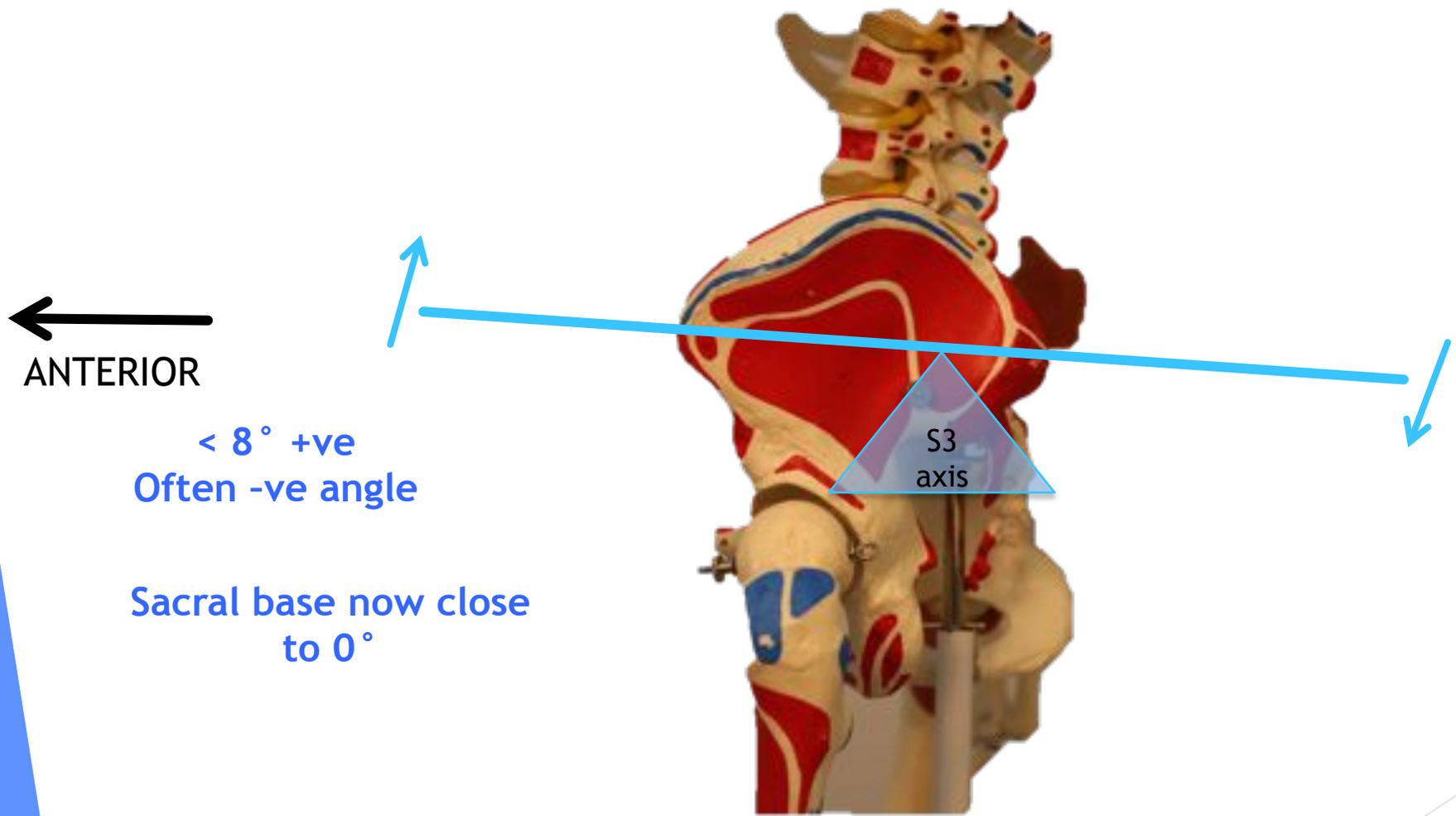
Single Femoral Pathway

PI ilium - Long Side

- ▶ Is the most common pelvic adaption.
- ▶ Often develops from a very early age.
- ▶ Easily identified / quantified / rectified.
- ▶ Can help to explain many repetitive injuries.
- ▶ In an advanced state with develop into the **Double Femoral Pathway**.
- ▶ Will create an oblique axis rotation across the sacrum.



'Seesaw' analogy with a PI ilium



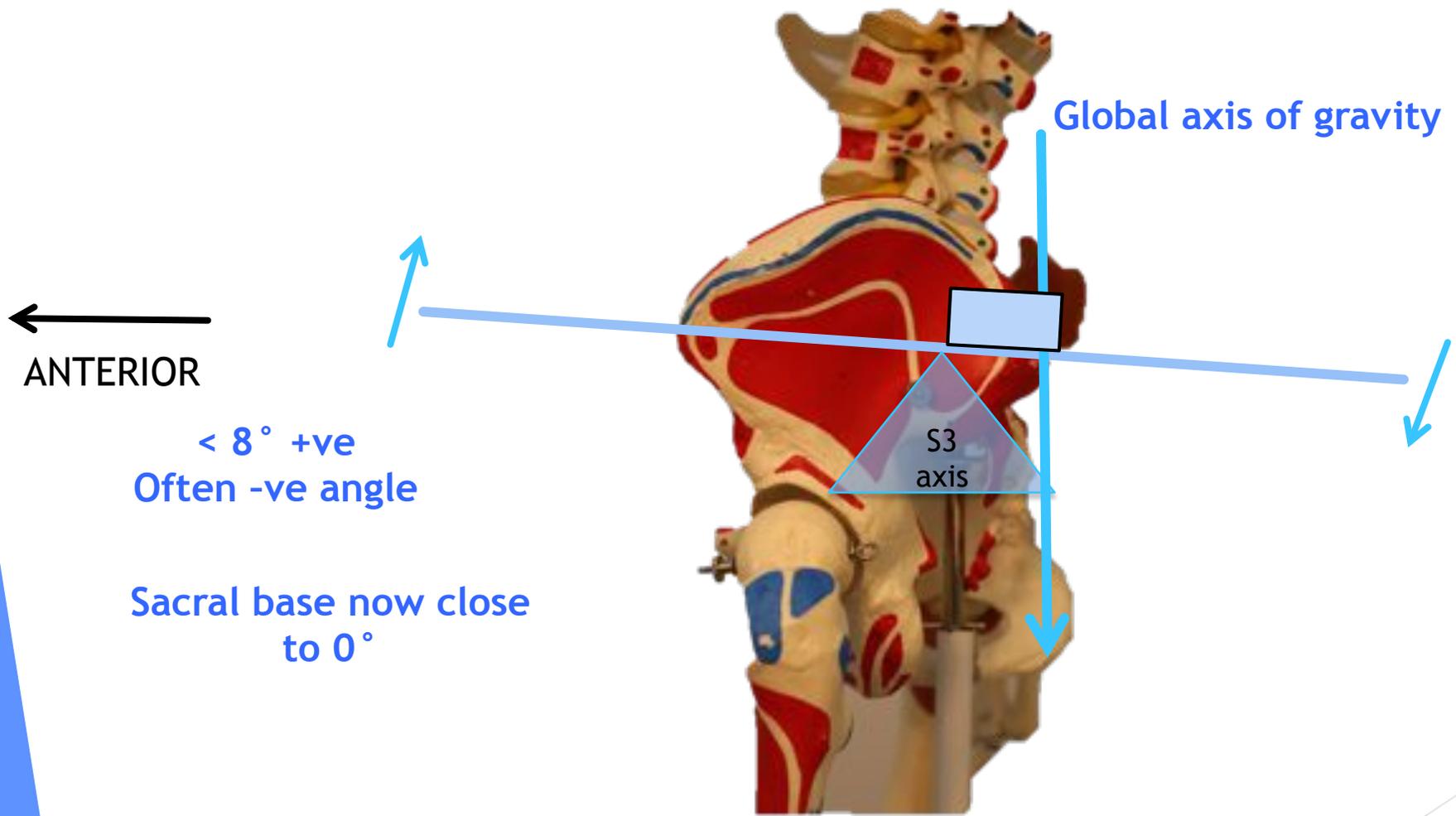
←
ANTERIOR

$< 8^\circ +ve$
Often -ve angle

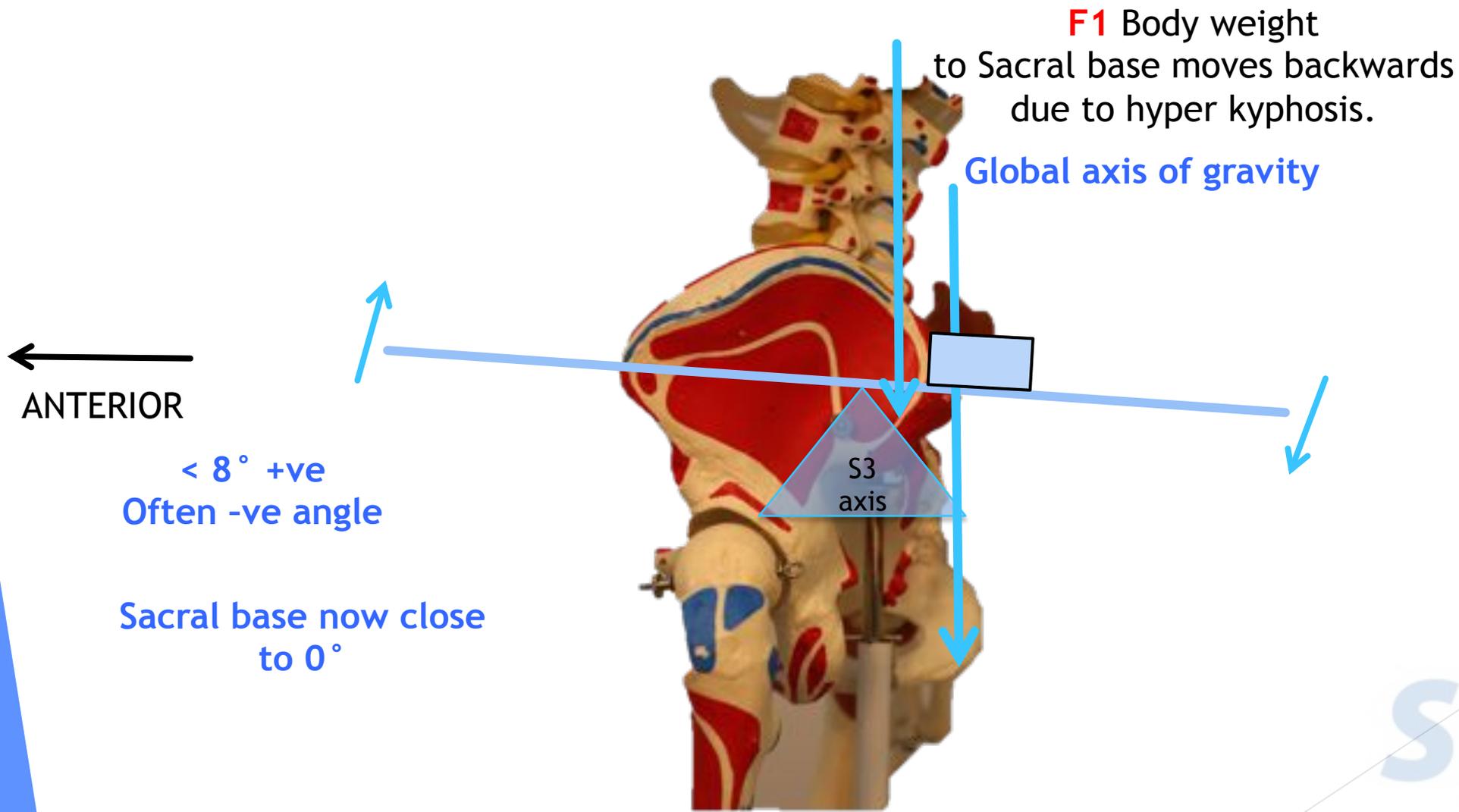
Sacral base now close
to 0°

S3
axis

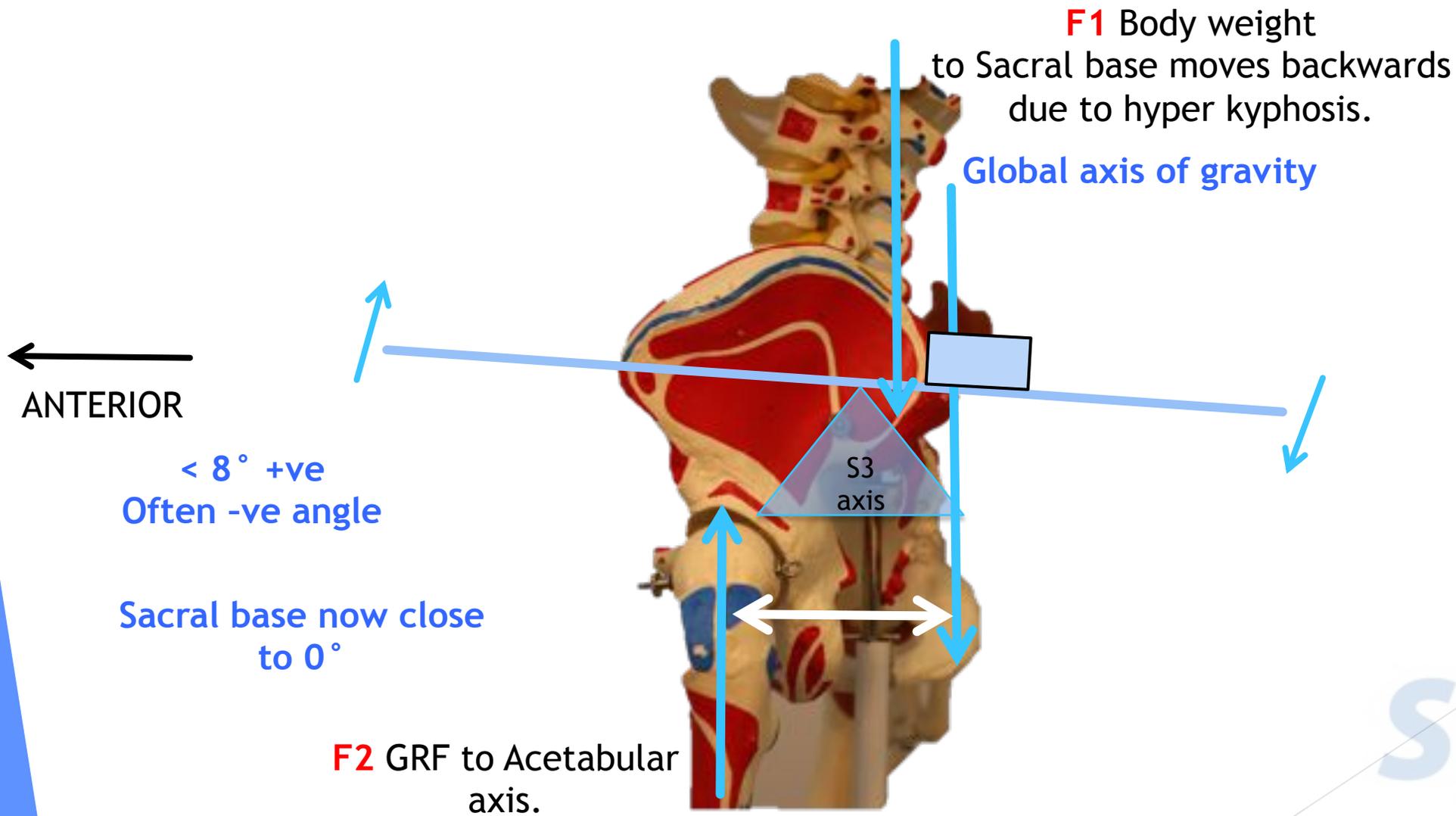
'Seesaw' analogy with a PI ilium



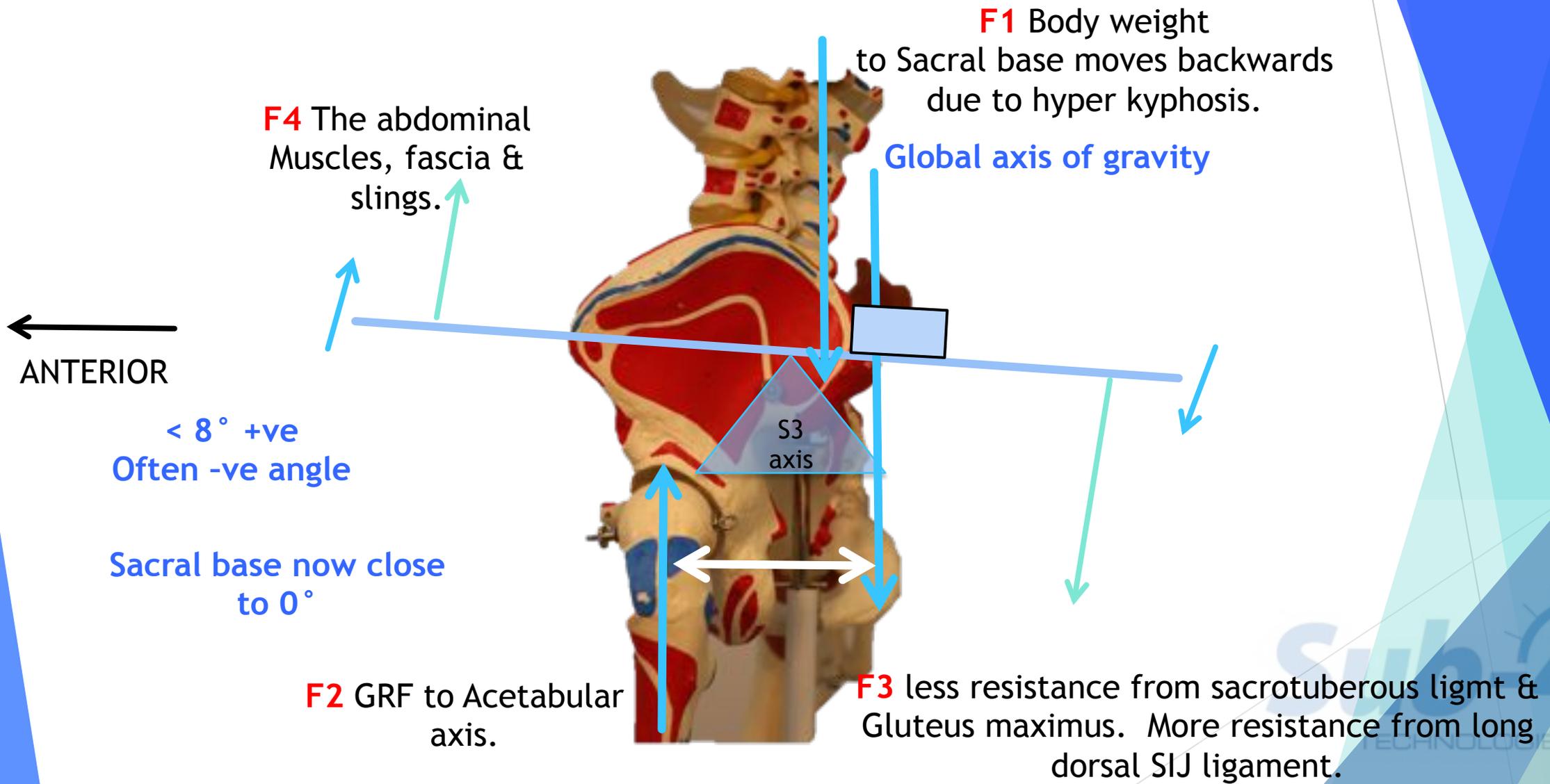
'Seesaw' analogy with a PI ilium



'Seesaw' analogy with a PI ilium

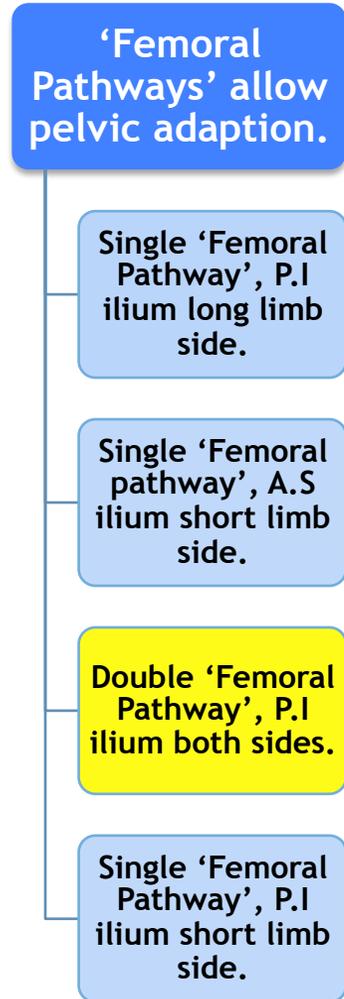


'Seesaw' analogy with a PI ilium



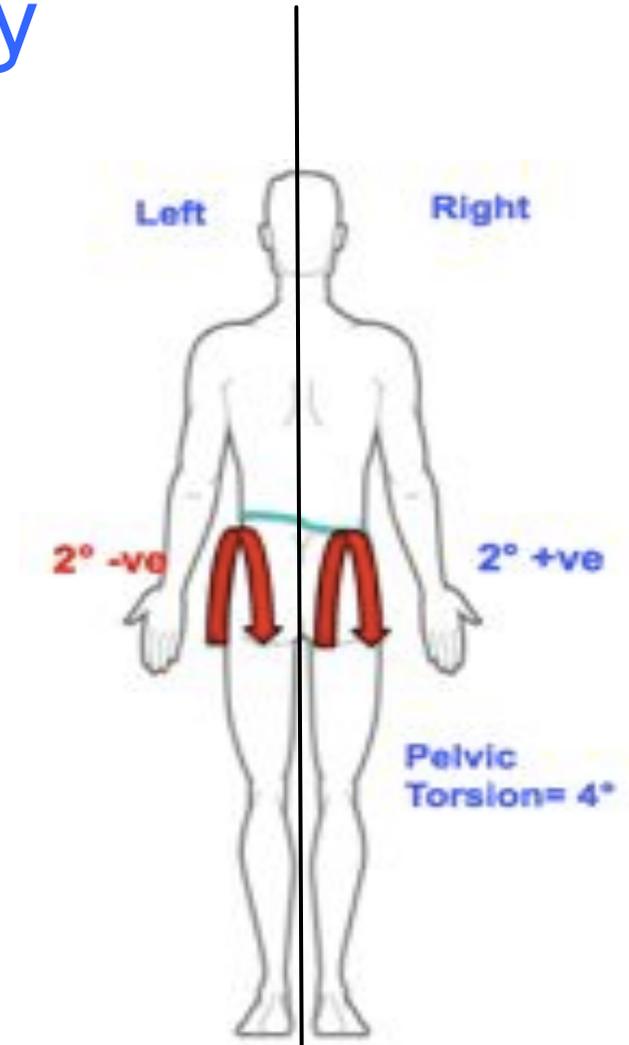
Double Femoral Pathway P.I ilium - Both Sides

- ▶ The Pelvic Equilibrium Theory describes the 4 pelvic adaptations.

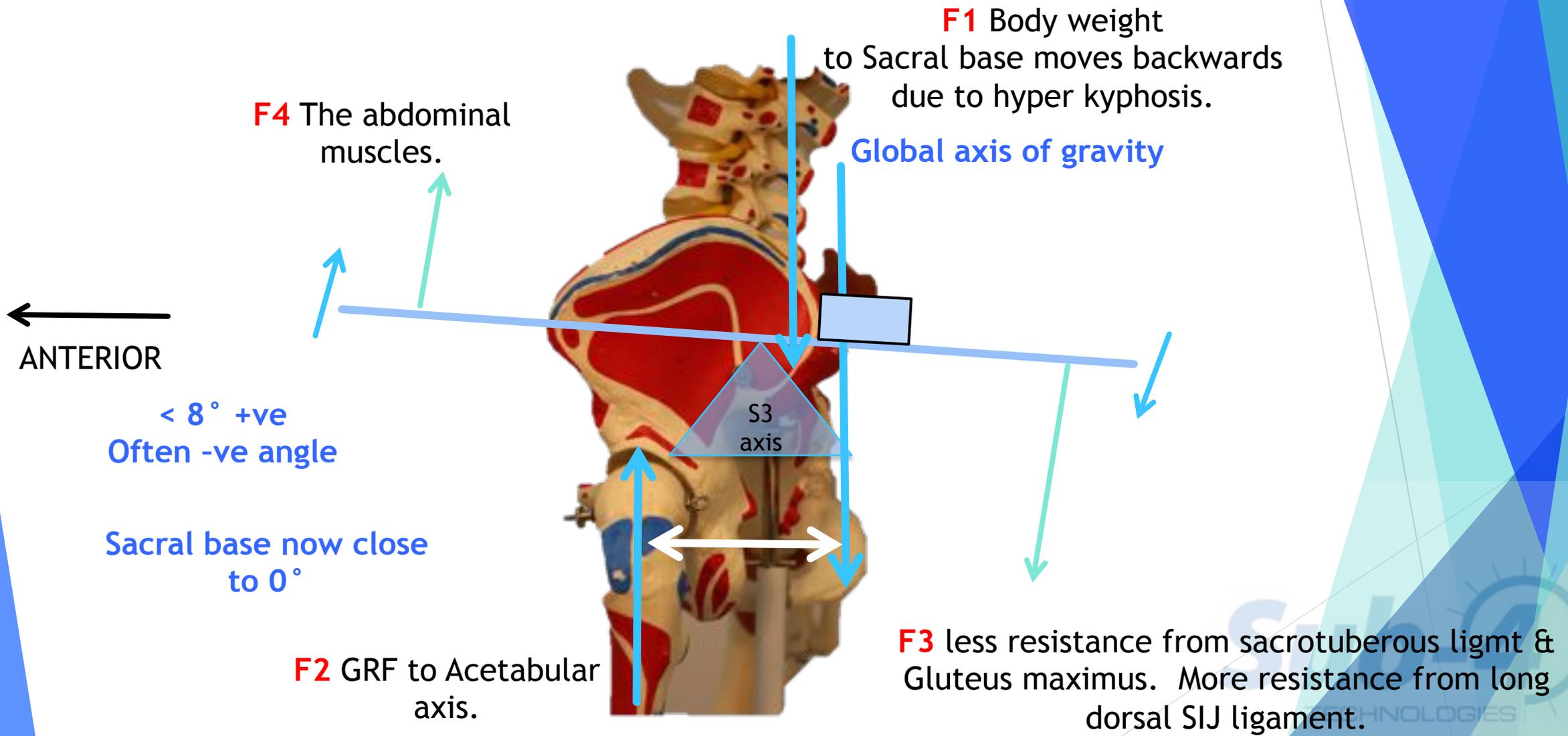


Double Femoral Pathway PI ilium - Both Sides.

- ▶ Occurs more in endomorphs.
- ▶ Can only occur after a Single Femoral Pathway.
- ▶ Occurs where the posterior rotational forces acting on a single innominate, overcomes resistance from the sacrum, and counter-nutation occurs, pulling the contralateral innominate posterior also.
- ▶ Leading to a Double PI ilium.
- ▶ This creates a syndrome of full-kinetic chain dysfunction.
- ▶ ‘Seesaw effect’.

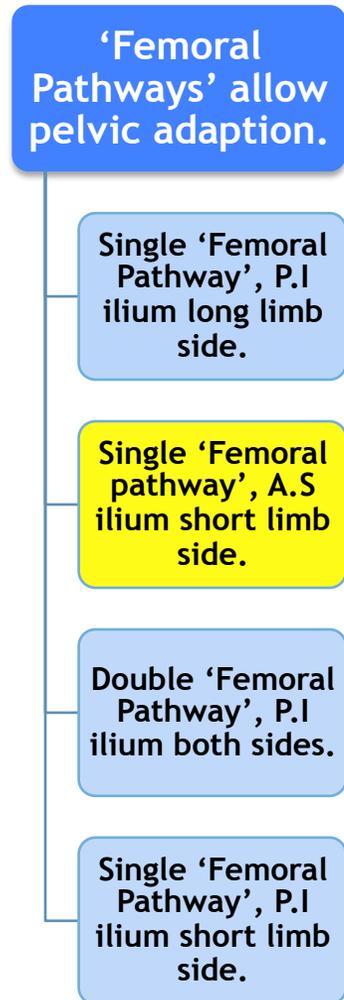


'Seesaw' analogy with a PI ilium both sides.



Single Femoral Pathway AS Ilium - Short Side

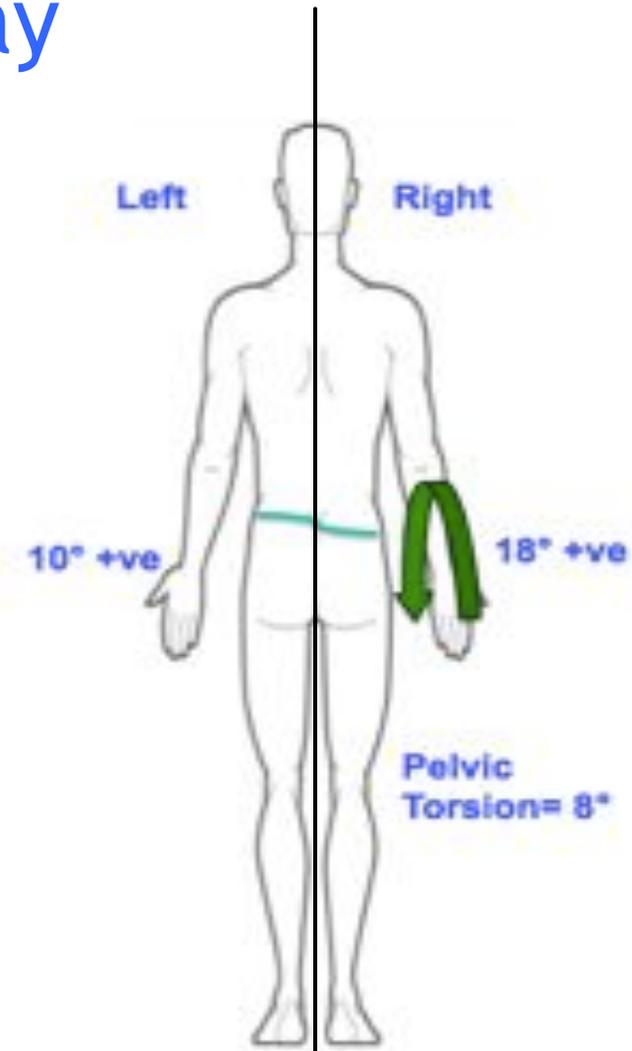
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Single Femoral Pathway

AS ilium - Short Side

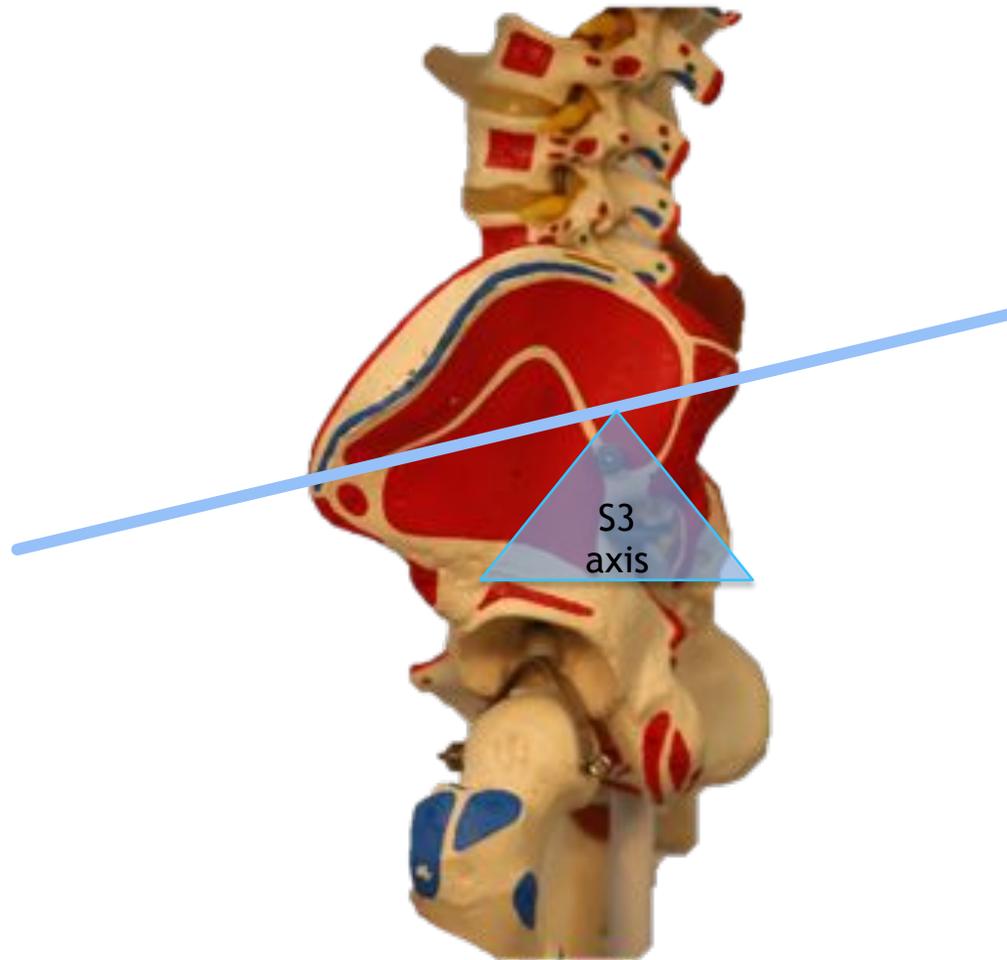
- ▶ Occurs more in mesomorphs and those with a anterior CoM and inc. sacral flexion.
- ▶ Requires specific morphological characteristics to occur.
- ▶ i.e. increased innominate inclination.
- ▶ Powerful muscle groups which influence the sacral 2 axis.
- ▶ E.g. Gluteus maximus, quads, paralumbar muscles.
- ▶ Powerful legs which decrease the contact phase i.e. early heel lift.



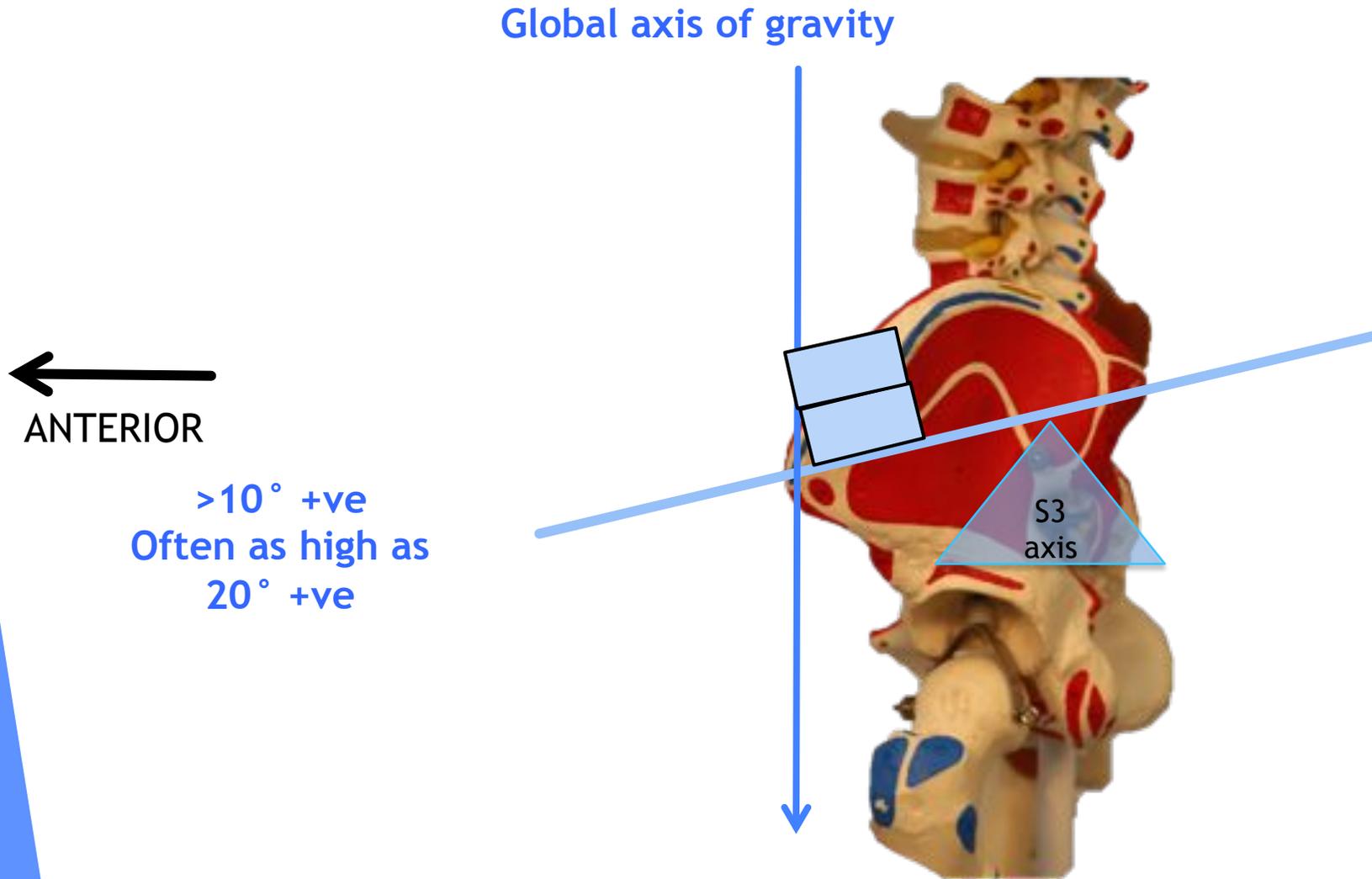
'Seesaw' analogy with an AS ilium

←
ANTERIOR

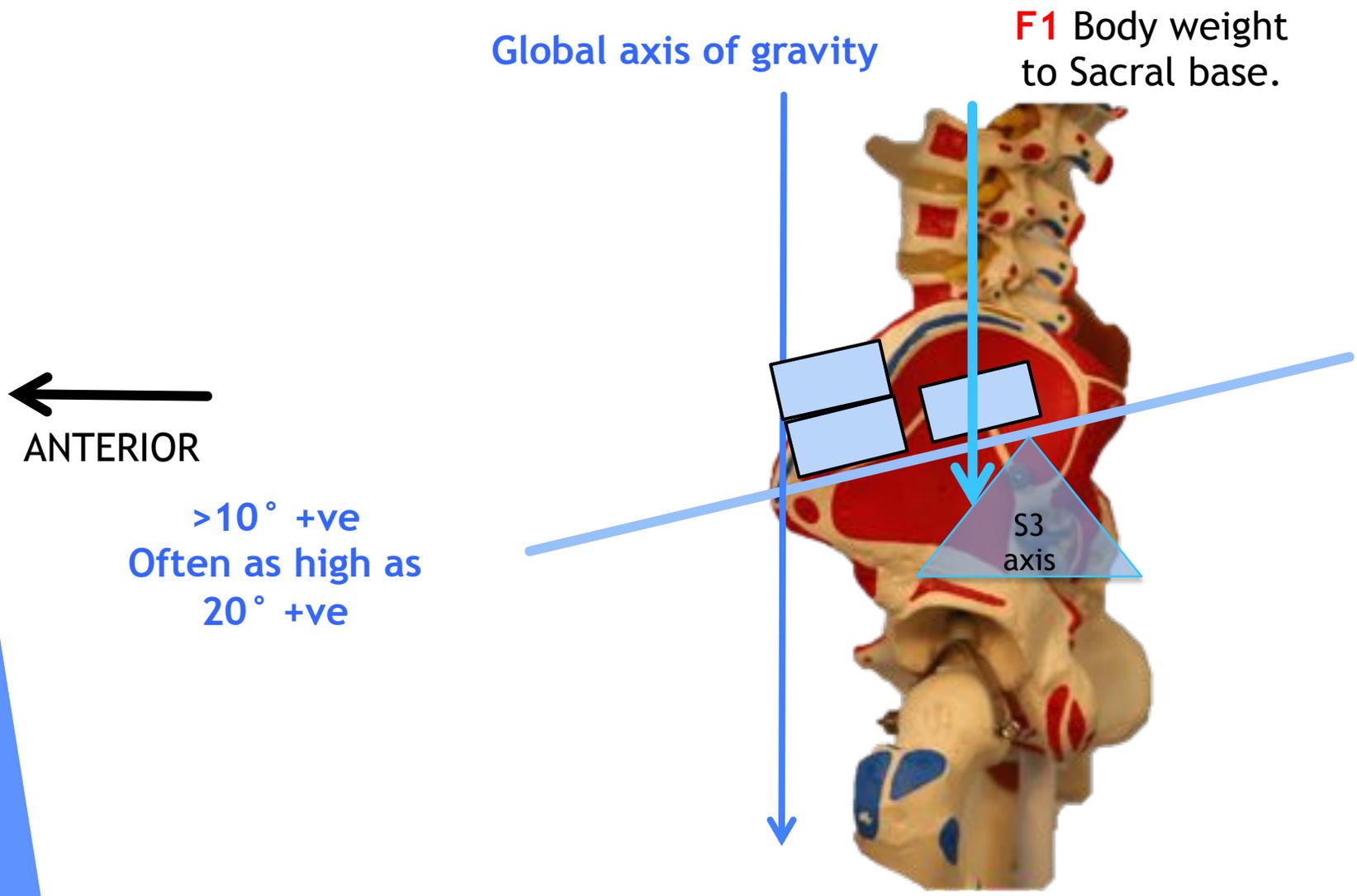
>10° +ve
Often as high as
20° +ve



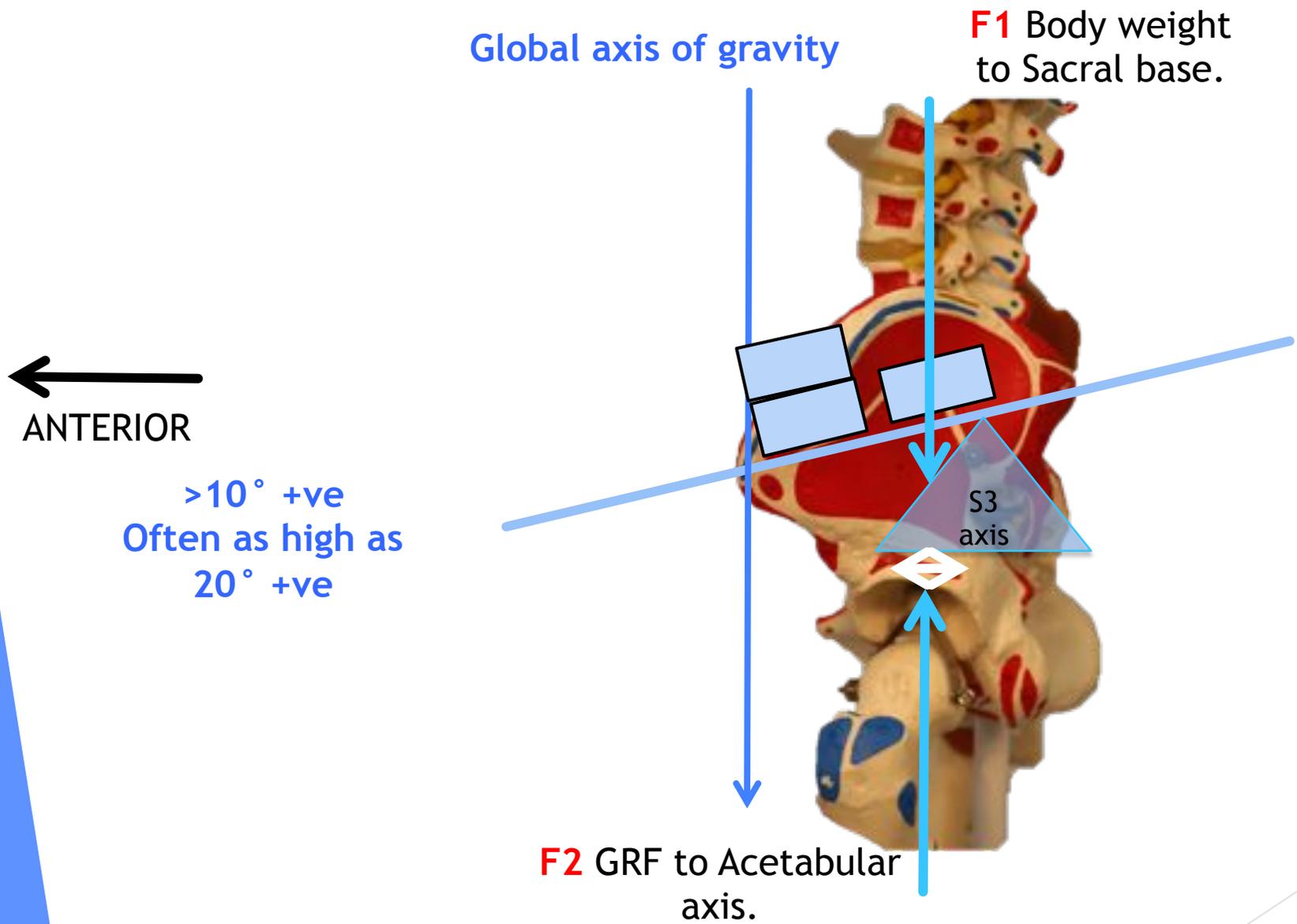
'Seesaw' analogy with an AS ilium



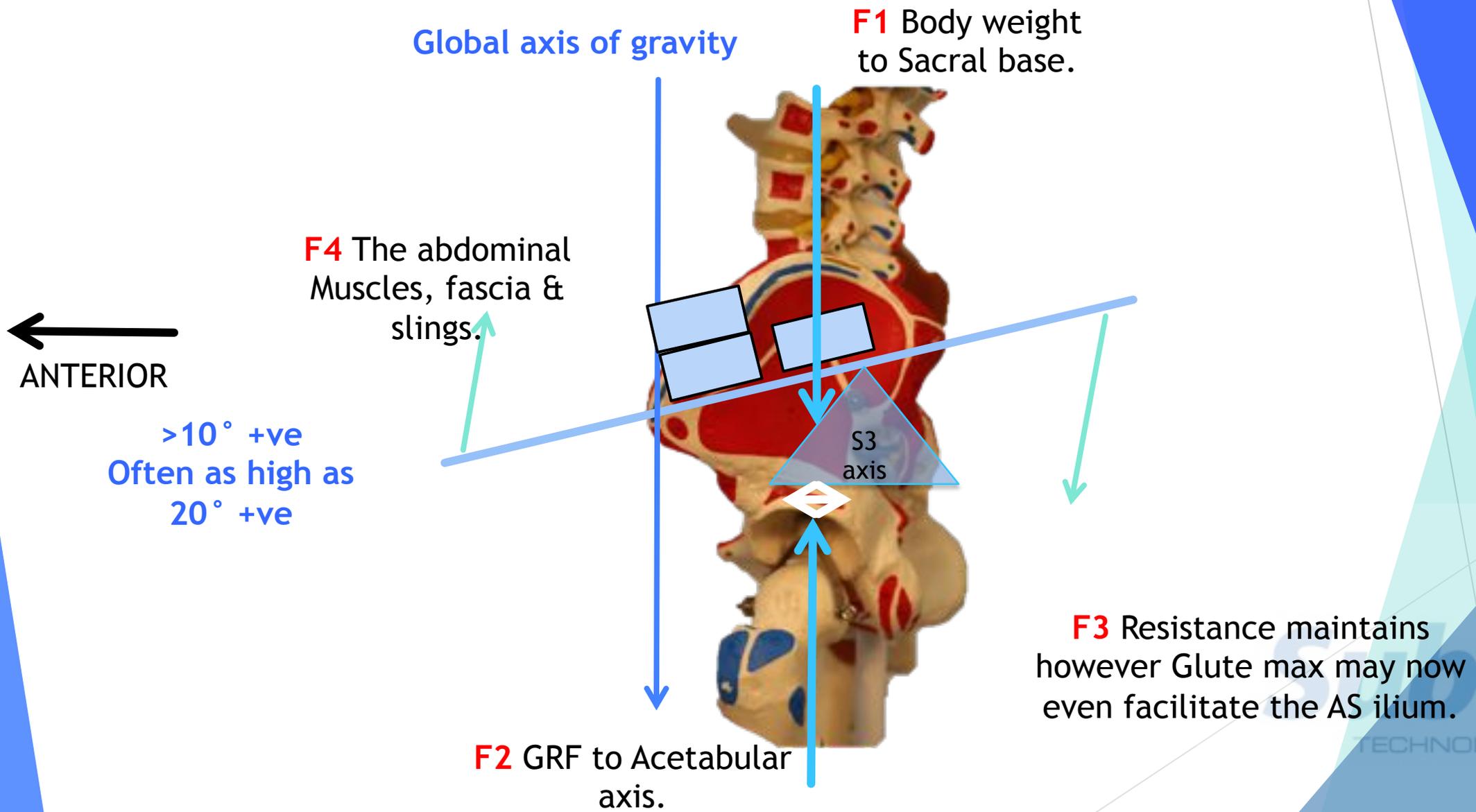
'Seesaw' analogy with an AS ilium



'Seesaw' analogy with an AS ilium

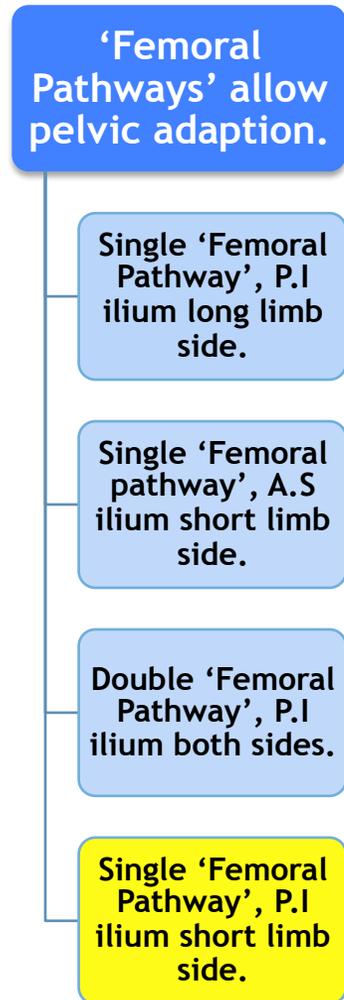


'Seesaw' analogy with an AS ilium



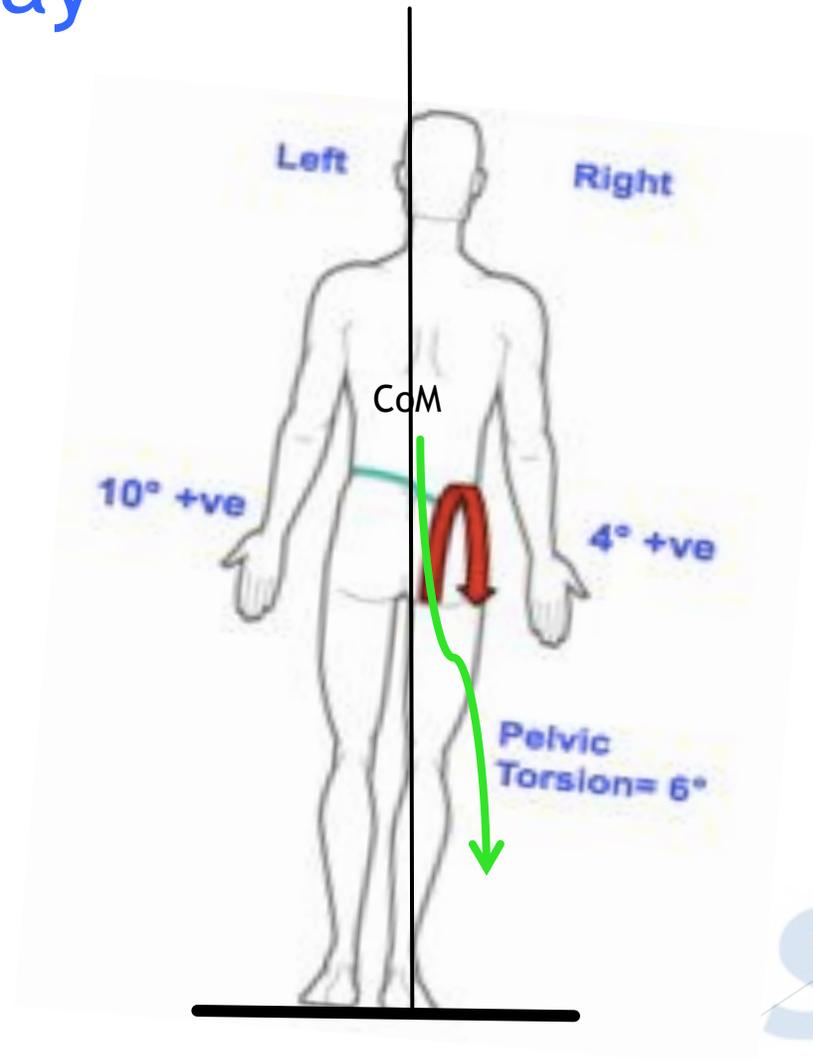
Single Femoral Pathway P.I ilium - Short Side

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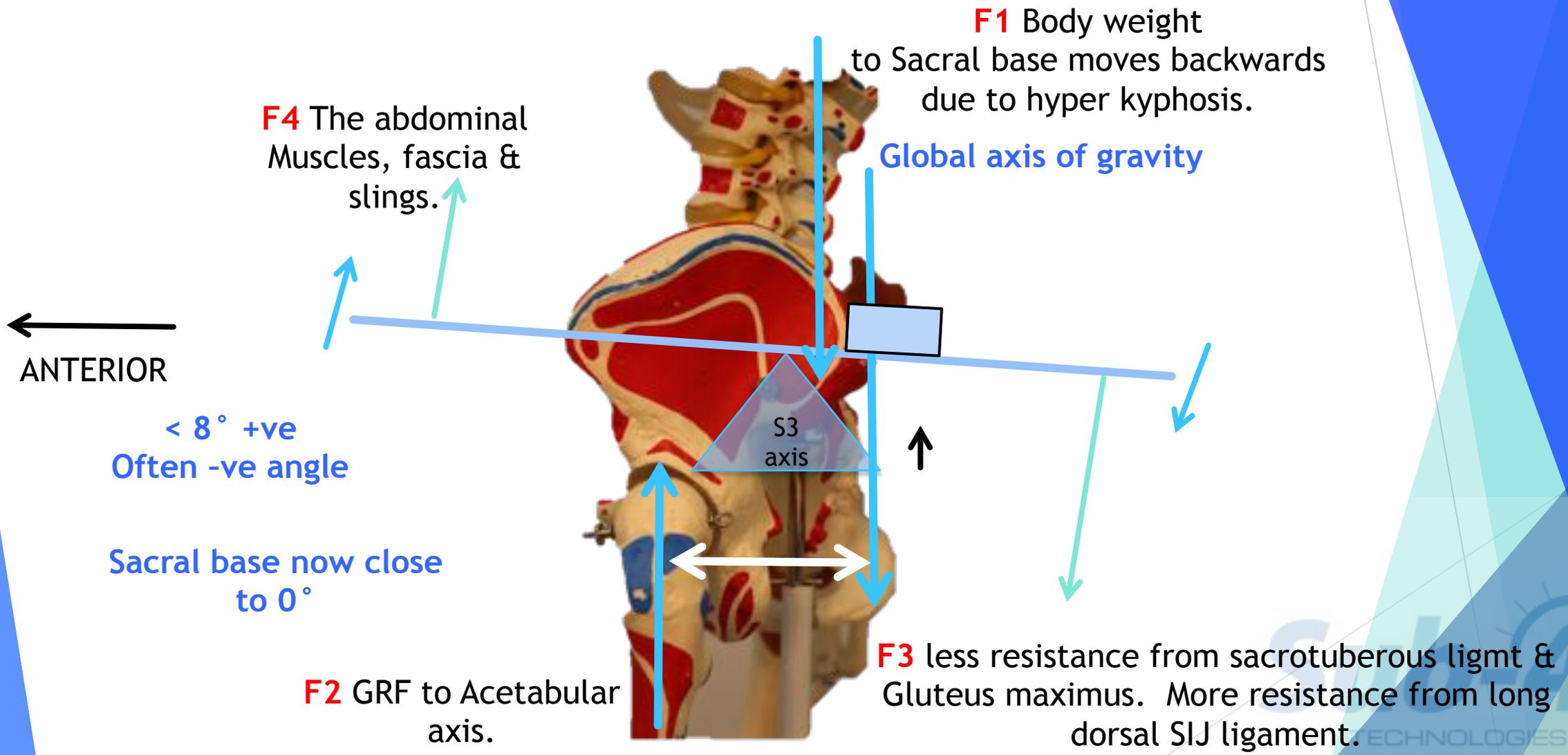


Single Femoral Pathway PI ilium - Short Side.

- ▶ Occurs more in those with high upper body mass ratio compared to the lower limb.
- ▶ With an excursion of the Body CoM to the short side.
- ▶ Occurs with increased flexion on the shorter-limb.
- ▶ Resistant to correction with foot raise therapy.



'Seesaw' analogy with a PI ilium short side.



How to find the pathway.



The 'Pelvic Equilibrium Theory' tells us that:

If your aim is to improve motion patterns and reduce injury risk, you should consider:

- ▶ understanding the global adaptive pathways
&
▶ balancing the pelvis

Conclusion & future work.

- ▶ Pelvic adaptations are still widely misunderstood.
- ▶ It appears that all ambulant individuals may function around one of four pelvic positions.
- ▶ This new protocol may change our understanding of pelvic function.
- ▶ It may change how we treat pelvic, SIJ and spinal dysfunction.
- ▶ The relationship between pelvic motion and lower limb function requires further research.
- ▶ More reliability studies are required.
- ▶ This study has highlighted other areas of interest, that requires further research.
- ▶ Pelvic function has to be assessed as part of an MSK consultation.
- ▶ Not understanding the role of the pelvis in MSK repetitive injury may leave significant causative factors untreated.

Thank you to

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