

# ***Un-Controlled Movement (UCM):***



***Evidence based exercise in the rehab of the  
post operative lumbar spine patient***

***Mater GP education lecture – July 2010***

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(Performance Rehab)***

# ***A good reason for needing back surgery !***

- ***Uncontrolled movement...or poor judgement?***



# ***Evidence re: post operative pain***

***Most of the evidence in the literature is supporting the use of pharmacological agents for the management of post operative pain***

*(Macintyre et al 2010)*

- The evidence for psychological and behavioural therapies is moderate***

*(Macintyre et al 2010)*



# ***Evidence re: post operative pain***

- ***The evidence for high intensity TENS to significantly reduce postoperative analgesic requirements is good***

*(Bjordal et al 2003)*

- ***The evidence is strong that acupuncture reduces postoperative pain as well as opioid-related adverse effects***

*(Sun et al 2008 )*



# ***Evidence re: post operative pain***

- ***The evidence for cold to reduce opioid consumption and pain scores after a variety of orthopaedic operations is moderate (not clear re: the spine)***

(Brandner et al 1996; Barber et al 1998; Saito et al 2004)

- ***The evidence for heat to produce short term pain reduction in acute or sub-acute low-back pain is good***

(French et al 2006 )



# ***What is the evidence for the influence of exercise on musculoskeletal pain?***

## ***Good evidence...***

- ***The evidence is moderate that any exercise and staying active is better than no exercise or bed rest for pain and dysfunction (conflicting data on the type of exercise)***

*(NHMRC 2003)*

- ***The evidence is strong for segmental stabilising exercises (multifidus) to decrease recurrence***

*(Hides et al 1996, 2001)*



# Evidence

- ***There is strong evidence linking motor control deficiencies in deep local stability muscles that control inter-segmental movement (e.g. TrA & Mult) – to pain and recurrence***

*(Hodges et al 2006, Moseley & Hodges 2006, Richardson et al 2004, Jull 2000, Sterling et al 2005)*

- ***The evidence to support isolated retraining of these local muscles to treat pain is poor***

*(McGill & Karpowicz 2009, Mottram & Comerford 2008)*



# Evidence



- ***There is strong evidence linking motor control deficiencies in the control of direction related function to the provocative movement direction***

*(Janda 1996, Sahrmann 2002, Comerford & Mottram 2001, Falla et al 2004, O'Sullivan 2005, Dankaerts et al 2006, O'Sullivan et al 2006)*



# *The Identification & Subclassification of Uncontrolled Movement (UCM)*

*Aberrant movement is described in terms of site and direction of uncontrolled movement and is related to changes in motor recruitment and strength*

*(Comerford & Mottram 2001, Sahrman 2002)*

*Site and Direction of Uncontrolled Movement (UCM)*



# ***Un-Controlled Movement is linked to Relative Stiffness / Relative Flexibility***

- ***Body moves in the path of least resistance***

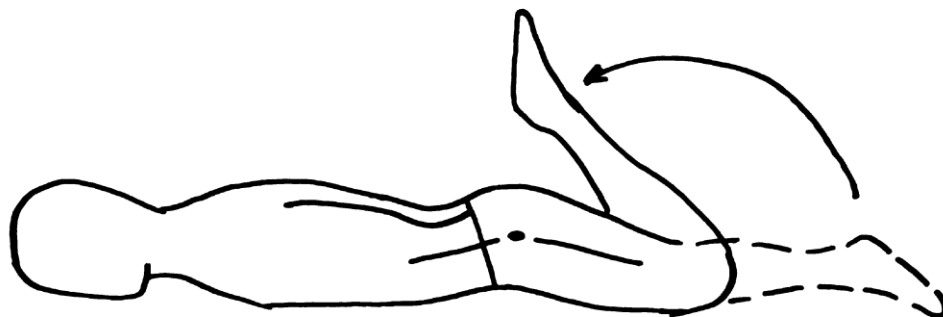
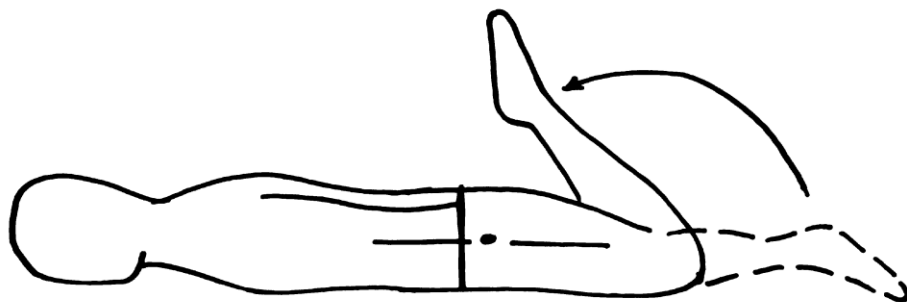
Sahrmann 2002

- ***Relatively flexible structures compensate for relatively stiffer***

Hip flexors are relatively stiffer and resist knee flexion. This is compensated for elsewhere in the movement system

The abdominals elongate to allow the pelvis to compensate. They become more flexible (less stiff)

**Result: uncontrolled lumbar extension & anterior tilt**

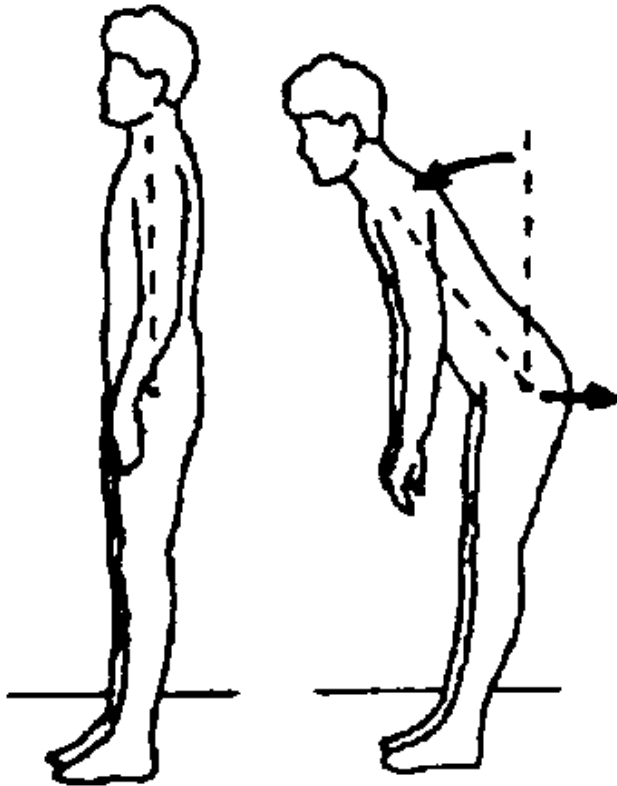


# ***Reliability of Measuring UCM***

- ***The reliability of therapist observation to identify and make consistent clinical judgements based on the patient's ability to cognitively perform learned movement patterns or motor control tests has significant support***
- ***Van Dillen et al (2003 2007), Dankaerts et al (2006), Luomajoki et al (2007), Vibe Fersum et al (2008) and Roussel et al (2009) have all demonstrated good intra-tester and inter-tester reliability for these tests of movement control.***



# ***Lumbar Flexion UCM***



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- ***Excellent intra-observer reliability***
- ***Substantial inter-observer reliability***

*Luomajoki et. al. 2007*

- ***Inter-observer reliability and clinical importance LBP-patients and healthy subjects***

*Roussel et. al. 2007*



# *History of Pain & UCM*

- *UCM linked to a History of Pain*
  - *Mottram et al (2009) has linked uncontrolled scapular movement to a history of shoulder pain*
- *Altered recruitment linked to a History of Pain*
  - *Hodges (2006), Hides et al (2001) Moseley et al (2004) has linked aberrant recruitment of trunk muscles to an history of back pain*



# ***Current Pain & UCM***

***Contemporary research clearly demonstrates that individuals with pain present with aberrant movement patterns***

(Falla et. al. 2004, Ludewig & Cook 2000, O'Sullivan et. al. 1997)

***The systems with the greatest volume of evidenced based support are those that look for the inter-relationships between:***

- ***altered patterns of muscle recruitment and motor control strategies and ...***
- ***a direction based mechanism of provocation or relief of symptoms***

(Sahrmann 2002, O'Sullivan et al 2003 2005, Dankaerts et al 2005, Van Dillen et al 2007, Luomajoki et al 2007 2008, Roussel 2009)



# ***Normal (pain free) recruitment pattern:***

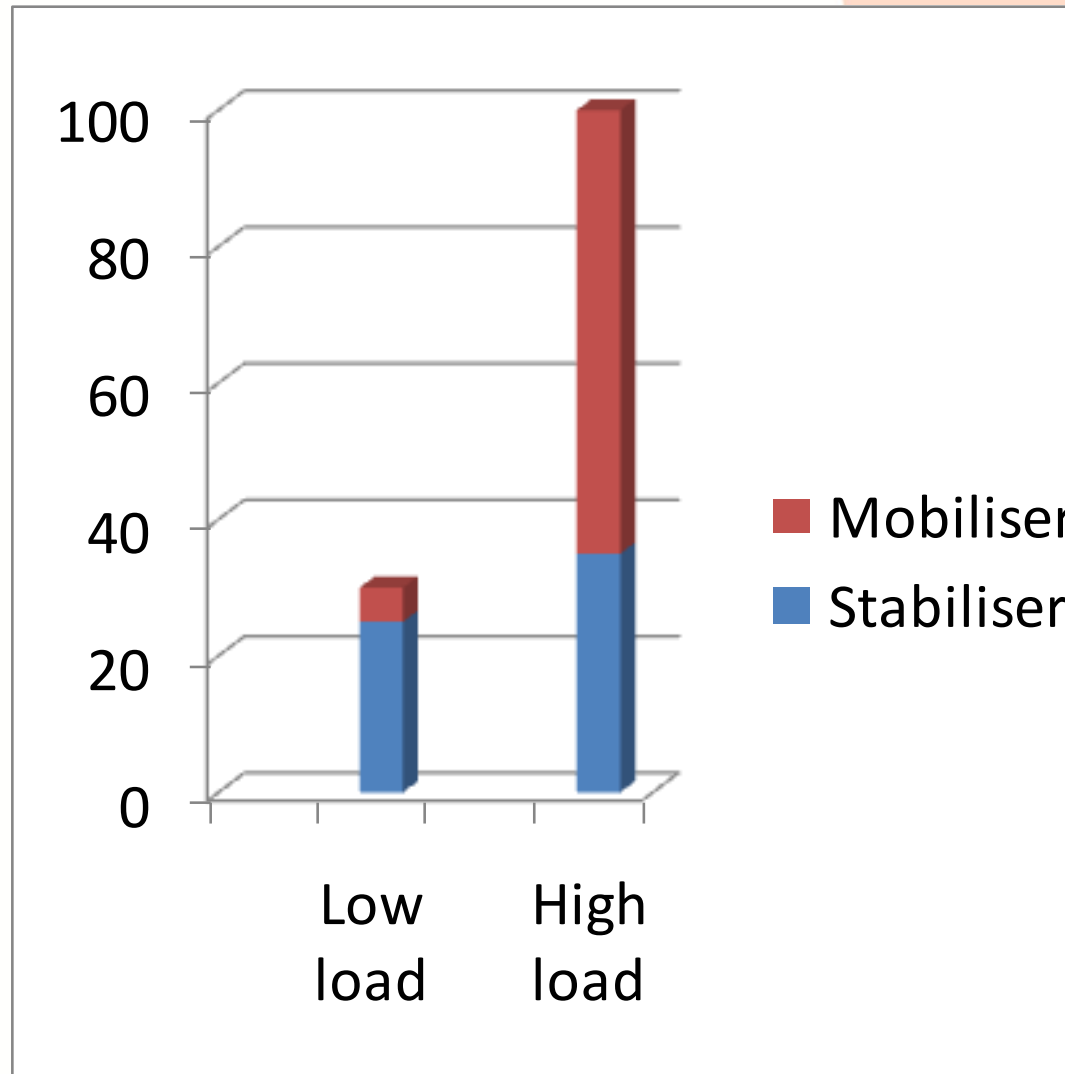
***Non-fatiguing normal postural control and unloaded movement demonstrates dominant and efficient recruitment of the deep 1-joint (stabiliser) muscles that provide a stability role***

***Fatiguing high load or speed activities demonstrate dominance of superficial multi-joint (mobiliser) muscles that provide a movement and force role (e.g. high load, large range or high speed)***



# ***Stabiliser : Mobiliser recruitment patterns***

***Painfree (normal / ideal)***



# *In the pain free (normal) state...*

- *Brain & CNS are able to utilise a variety of motor control strategies to perform functional tasks*
- *Lots of valid options*
- *CNS 'chooses' best option available*

*(Hodges 2005)*



# *In the pain state...*

- *Options available to the brain & CNS become limited*
- *Altered motor control strategies utilised*
  - *Uncontrolled movement*
- *'One strategy to fit all demands'*
  - *co-contraction: multi-joint > segmental*

*(Hodges 2005)*

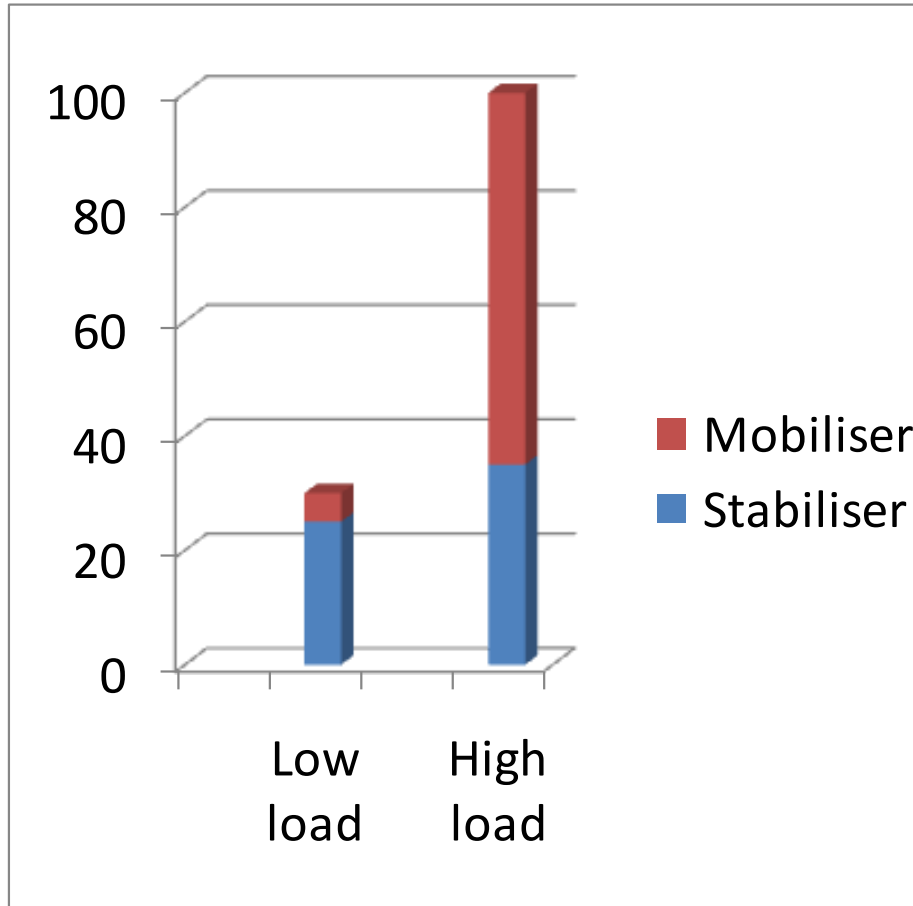
- *Excessive recruitment & shortening of 'mobilisers'*
- *Inhibition & lengthening of 'stabilisers'*

*(Sahrmann 2002, Falla et al 2007)*

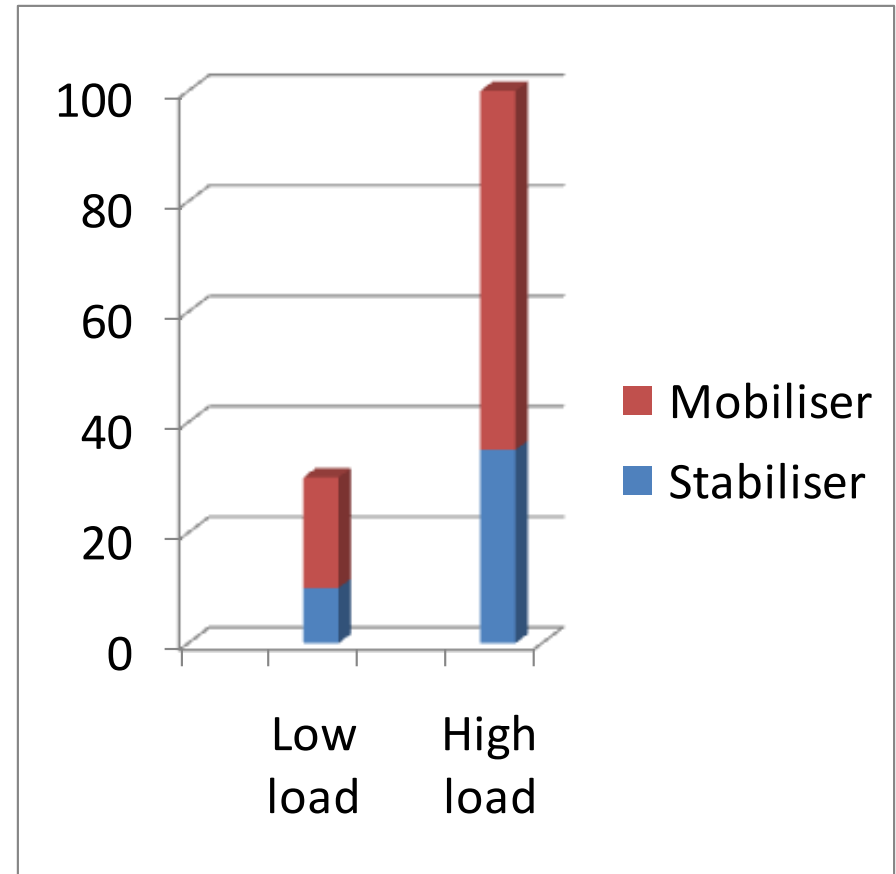


# Stabiliser: Mobiliser recruitment patterns

## Painfree (normal / ideal)

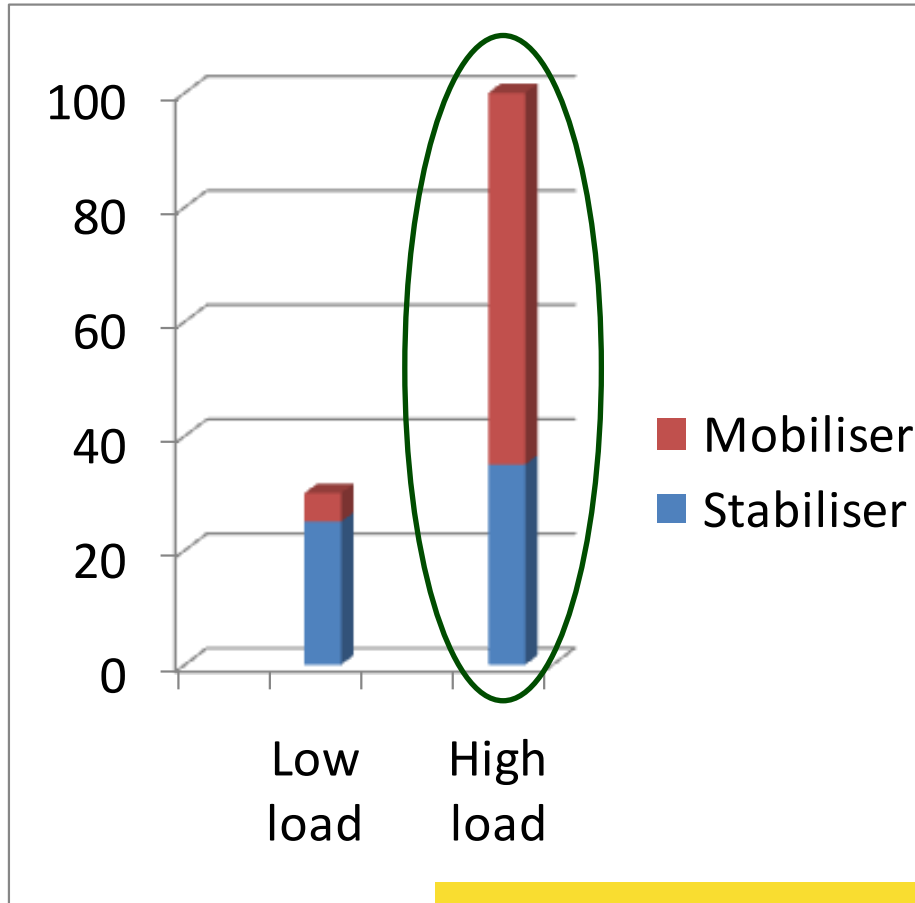


## Musculo-skeletal Pain

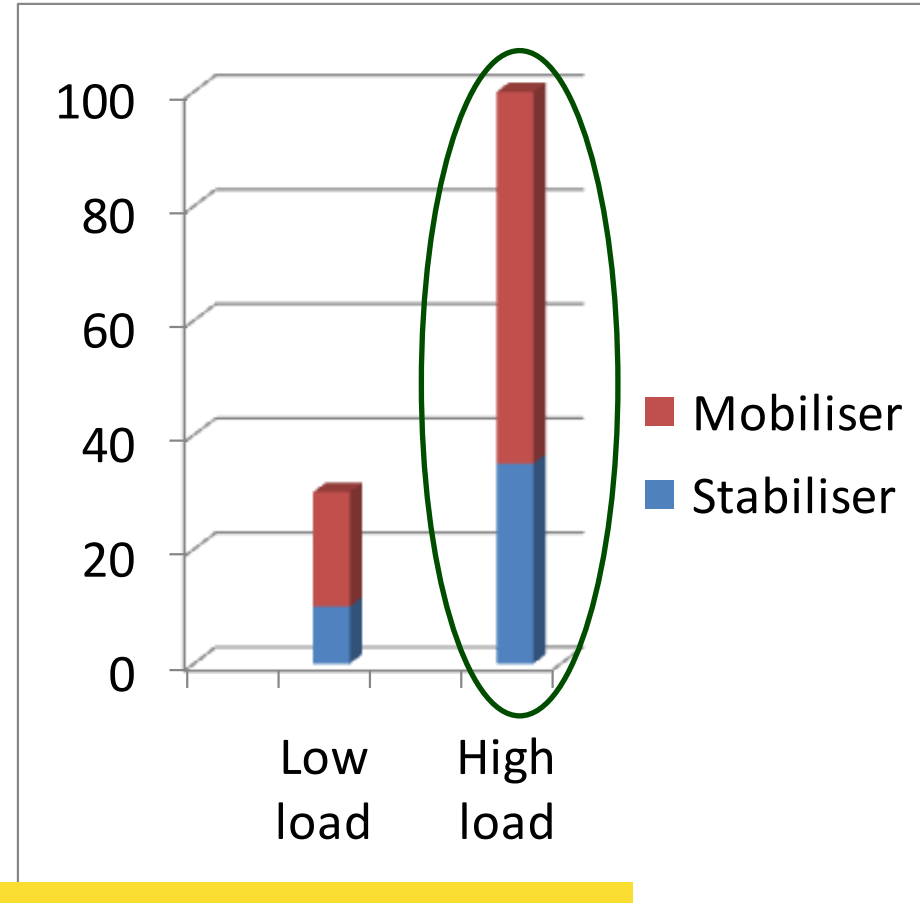


# Stabiliser: Mobiliser recruitment patterns

## Painfree (normal / ideal)



## Musculo-skeletal Pain

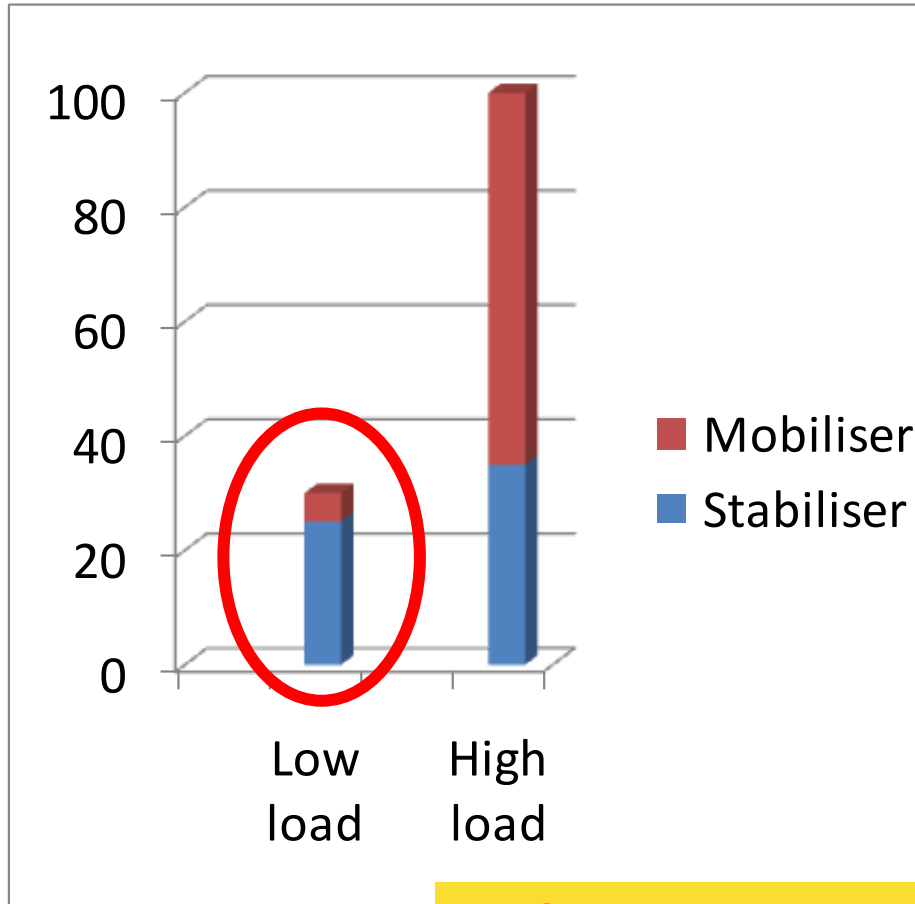


**No pain related change with high load ...  
? benefit of strengthening programmes**

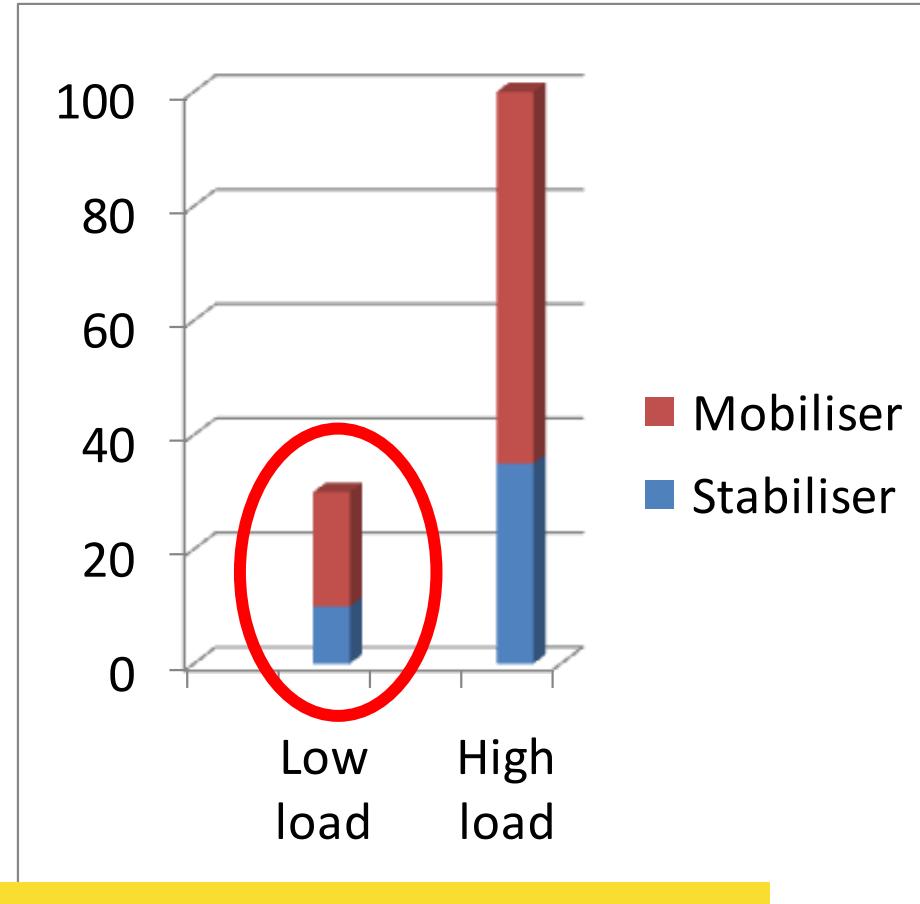


# Stabiliser: Mobiliser recruitment patterns

## Painfree (normal / ideal)



## Musculo-skeletal Pain



**Significant pain related change with low load ...  
? need to emphasise low threshold re-training**



# ***In the presence of chronic or recurrent musculo-skeletal pain***

- Subjects employ strategies or patterns of muscle recruitment that are normally reserved for high load function (mobiliser dominant)***

***... to perform low load postural control and normal non-fatiguing functional movements***

***(Sterling et al 2001 2005, Hodges 2003, Moseley & Hodges 2006, Hodges & Moseley 2003, Jull 2000, Falla et al 2004a&b, 2005, Lee 1999, Sahrman 2002, Richardson et al 2004, Dankaerts et al 2006, 'Sullivan 2005 O'Sullivan et al 2006)***



# ***Altered Strategies***

***These altered strategies are referred to in the research and clinical literature as:***

- ***Substitution strategies***
- ***Compensatory movements***
- ***Muscle imbalance***
- ***Faulty movements***
- ***Co-contraction rigidity***
- ***Control impairments***



# *Quick Test: what is the substitution strategy?*



# ***In the presence of chronic or recurrent musculo-skeletal pain***

## ***These altered strategies***

- ***are reversible with low threshold training***

*(O'Sullivan 2005)*

- ***High load training (if it is the only training) is likely to re-enforce or maintain this state***

***There is no need to stop high load training***

***... just add low threshold motor control training***



# ***SMU Threshold & Timing***

***There is a link between:***

- ***the timing of automatic activation in function***
- and
- ***the threshold of SMU recruitment***



# Low threshold neuro-physiology demo

- *Stand in walk stance*
- *Palpate multifidus at L5 on the rear leg side*
- *Shift body weight backwards to the rear foot*
- *Shift body weight forwards to the front foot*
- *Note the pattern and timing of multifidus recruitment*

***Recovery time frame: 2-4 weeks***



***It is all about threshold ... Not force!***



# ***Motor control training***

- ***Is primarily directed towards restoring normal or ideal recruitment thresholds (software)***
- ***It is not based on directly restoring function***
- ***Improvements in function are an indirect consequence of recovering SMU recruitment thresholds and restoring more ideal patterns of recruitment***



# Management Results

**Poor Stability**

**Good Stability**

