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Rehabilitation Status Post Spinal Fusion

Move Forward.
Physical Therapy Brings Motion to Life
American Physical Therapy Association

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Objectives

- Outcomes
- Challenges
- Current state of evidence
- Therapeutic neuroscience education (TNE)
- Post operative restrictions
- Exercise interventions

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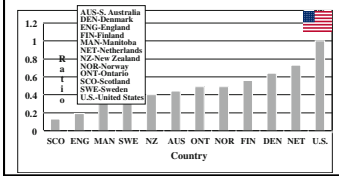
The Numbers

- The likelihood of having spinal surgery in the United States is 5 times higher than that of the United Kingdom, and 2 times that of Australia, Canada and Scandinavian countries.(Lurie Spine 2003)



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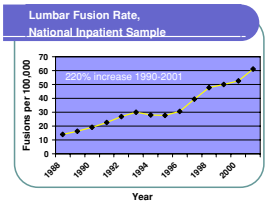
The Numbers

- In the USA lumbar fusion surgery rates have increased 220% from 1990 to 2001,(Deyo Spine 2005, Gray Spine 2006)
- This led to a 500% increase in spending for lumbar fusion from 1992 to 2003. (Weinstein Spine 2006)



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The Numbers

- Although overall lumbar surgical rates in the USA reduced from 2002 to 2007, fusion rates increased 15 fold (Deyo JAMA 2010)

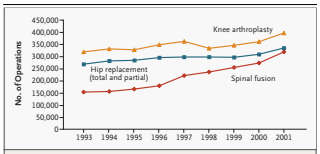

Figure 1. Annual Number of Knee-Arthroplasty, Hip-Replacement, and Spinal-Fusion Operations in the United States, on the Basis of the National Inpatient Sample.
Data are from the Agency for Healthcare Research and Quality.[1]

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Fusion Outcomes from Swedish National Spine Register

- 25% of patients reported no change or worsened pain following lumbar fusion (back and/or leg pain)
- At 1 year 40% of patients reported dissatisfaction regarding the outcome of the surgery.

(Stromqvist 2007)

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Fusion Outcomes

- 70% of patients report significant long-term functional improvement
- Solid fusion as determined from radiographs ranged from 52% to 92% depending on the choice of surgical procedure. (Christensen 2004)
- Re-operation rates reported 14% within 4 years (Martin 2007)
  - 62.5% of reoperations associated with device complications or psuedarthrosis

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Take Home Message

- Fusion can provide functional improvements in the appropriate patient.
- Fusion doesn't really "fix" the patient, it addresses a specific anatomical problem.
- **Outcomes can vary greatly depending on surgical technique, patient selection and criteria for success.**

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Take Home Message

- Increasing rate of lumbar spine fusion
- High costs associated with lumbar fusion
- High re-operation rate
- Lack of consistent outcomes

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"Effective rehabilitation of patients following lumbar spinal fusion surgery is an important issue." (Rushton)

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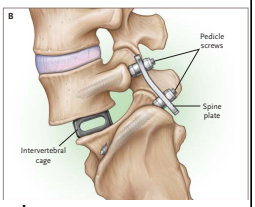
Challenging Patient

- Pain
- Functional limitations/ disability
- ROM
- Psychosocial issues
- High utilization of medical services
- Disc injury above/below the surgical level



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Physical Therapies Role in Rehabilitation

- Pre-op
- Post-op
  - Inpatient
  - Out-patient
- Has PT been shown to be beneficial?

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BMJ open

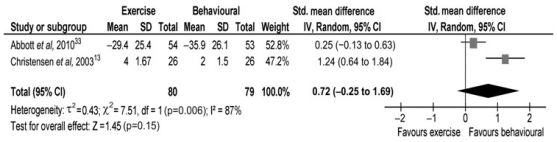
Physiotherapy rehabilitation following lumbar spinal fusion: a systematic review and meta-analysis of randomised controlled trials

BMJ Open 2012;

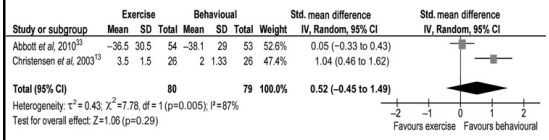
Alison Rushton,[1] Gillian Eveleigh,[1] Emma-Jane Petherick,[2] Nicola Heneghan,[1] Rosalie Bennett,[1] Gill James,[1] Chris Wright[1]

- Conclusions: Inconclusive, very low-quality evidence exists for the effectiveness of physiotherapy management following lumbar spinal fusion. Best practice remains unclear. Limited comparability of outcomes and retrieval of only two trials reflect a lack of research in this area that requires urgent consideration.

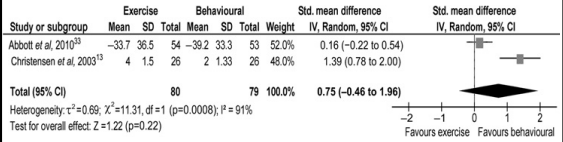
BACK PAIN at 6 Months



1 Year

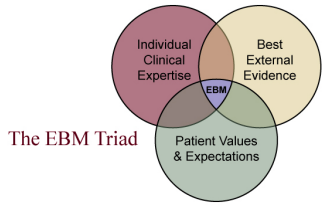


BACK PAIN at 2 Years



- Evidence suggested that intervention might reduce back pain both short/ long term.
- Behavioral intervention may be more beneficial than an exercise intervention.

Evidence-Based Medicine



The EBM Triad

*"The integration of best **research evidence** with **clinical expertise** and **patient values**."*

(Sackett et al, 2000)

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Evidence Based Practice?

- Due to complexity of these patients the medical team must utilize their clinical experience and a patient's values to maximize outcomes.
- It appears that behavioral intervention may be beneficial. How do I incorporate this?

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What is behavioral intervention?

- Back-Café (Christensen 2003)
- Psychomotor Therapy (Abbott 2010)
- Cognitive-Behavioral (Monticone 2014)
- Therapeutic Neuroscience Education (Louw 2011)
  - Neurophysiology of pain education
  - Pain physiology education
  - Pain biology education
  - Pain neurophysiology education

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Cognitive Behavioral Therapy

- Activity pacing
- Attention diversion
- Cognitive restructuring
- Goal setting
- Graded exposure
- Maintenance strategies
- Problem-solving strategies

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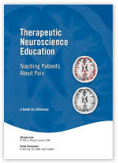
Therapeutic Neuroscience Education

- Altering patients' beliefs to alter their pain experiences.
- Patient's want answers
  - What is wrong with me?
  - How long will it take?
  - What can I do for it?
  - What can you do for it?



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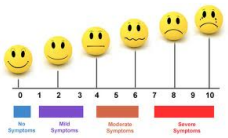
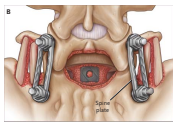
What do patients want to know?

- Patients in pain want to know more about pain, not anatomy.





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Does TNE work?

- For chronic MSK disorders there is compelling evidence that an educational strategy addressing the neurophysiology and neurobiology of pain can have a positive effect on pain, disability, catastrophizing, and physical performance.

SYSTEMATIC REVIEW

The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain

Adriaan Louw, PT, MAppSc, Ina Diener, PT, PhD, David S. Butler, PT, EdD, Emilio J. Puentedura, PT, DPT

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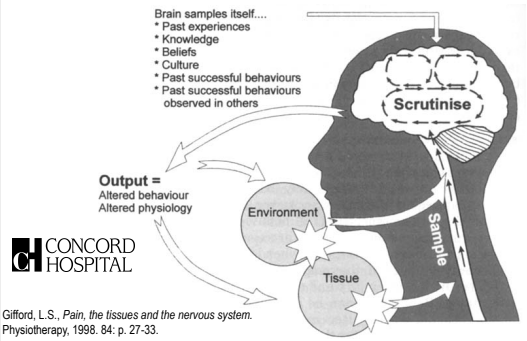
How does TNE work?



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Gifford, L.S., *Pain, the tissues and the nervous system.* Physiotherapy, 1998. 84: p. 27-33.

Key Contents of TNE

- Neurophysiology of pain
- Nociception and nociceptive pathways
- Neurons
- Synapses
- Action potential
- Spinal inhibition and facilitation
- Peripheral sensitization
- Central sensitization
- Plasticity of the nervous system

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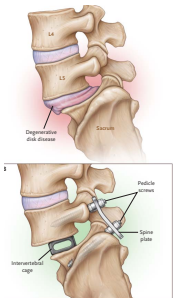
TNE Does Not Include!



- Anatomical or pathoanatomical models
- Discussion of emotional/behavioral aspects of pain

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How to Provide TNE

- One-on-one sessions
- Provide homework
- Answer questions and progress
- Assess patients understanding
  - The Pain Neurophysiology Questionnaire (PNQ)
- This educational approach should include physical movement especially aerobic exercise.

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Educational Tools

- Prepared pictures
- Metaphors
- Hand drawings
- Workbook with reading/Q&A
- YouTube videos
- Pain neurophysiology questionnaire

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Nerves

- Like an alarm system
- Alerts brain of possible danger
- Once danger is removed normally alarm system will calm back down
- In 1 out of 4 patients the alarm system stays extra sensitive

Nerves and your back

- Once nerves become sensitive it takes less activity to cause nerves to fire off danger messages to brain.
- Key for you to understand is that pain may not be only due to original surgery/back pain, but the increased sensitivity of the nerves in the region.

How to Calm Nerves Down

- Knowledge
- Movement
- Medication

- Safe but sore
  - Typically alarm system will turn down gradually over time
  - Recovery will have ups and down
  - Flare ups are expected not due to harm but sensitivity

The Pain Neurophysiology Questionnaire (PNQ)(Moseley 2003)

Pain Neurophysiology Questionnaire(Moseley 2003)

	Question	True	False
1	When part of your body is injured, special pain receptors convey the pain message to your brain.		
2	Pain only occurs when you are injured.		
3	The timing and intensity of pain matches the timing and number of signals in danger messages.		
4	Nerves have to connect a body part to the brain in order for that part to be in pain.		
5	In chronic pain, the central nervous system becomes more sensitive to danger messages from tissues.		
6	The body tells the brain when it is in pain.		
7	The brain can sends messages down your spinal cord that can increase the danger messages going up the spinal cord.		
8	Nerves can adapt by increasing their resting level of excitement.		
9	Chronic pain means an injury hasn't healed properly.		
10	Receptors on nerves work by opening ion channels (sensors) in the wall of the nerve.		
11	The brain decides when you will experience pain.		
12	Worse injuries always result in worse pain.		
13	When you are injured, the environment that you are in will not have an effect on the amount of pain that you experience.		
14	It is possible to have pain and not know about it.		
15	Nerves can adapt by making more ion channels (sensors).		
16	Second order messenger nerves post-synaptic membrane potential (excitement) is dependent on descending modulation.		
17	Nerves adapt by making ion channels (sensors) stay open longer.		
18	When you are injured, chemicals in your tissue can make nerves more sensitive.		
19	In chronic pain, chemicals associated with stress can directly activate danger messenger nerves.		

Moseley, G. L. (2003). "Unravelling the barriers to reconceptualisation of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology." J Pain 4(4): 184-189.

- 19 questions
- Test patient
- Use questions to guide education

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1.) WHEN PART OF YOUR BODY IS INJURED, SPECIAL PAIN RECEPTORS CONVEY THE PAIN MESSAGE TO YOUR BRAIN.

☐ TRUE
☐ FALSE

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Tissues only send DANGER messages

- Eyes: Contain light receptors; not vision
- Ears: Contain vibration receptors; not hearing
- Tissues: Contain nociceptive receptors; not pain
- Tissues: Contain danger receptors; not pain

11.) THE BRAIN DECIDES WHEN YOU WILL EXPERIENCE PAIN.

☐ TRUE
☐ FALSE

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Example

- Ankle vs. Bus

How to include TNE in Tx

- Perform along with or during other treatments
- Neuromuscular re-education
- Use images, books, drawings, internet.
- Not all patients need TNE
  - Central sensitization
  - Failed other treatments
- Use outcome measures to assess progress

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Knowledge is Power

- TNE
- Post Operative precautions
- Safe exercise program

- Re-assure patient to decrease FEARS

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When does PT start?

- Typically immediately in hospital
  - Teach Post Operative Precautions
    - B - Bending
    - L - Lifting often 5-10 lbs first 6 weeks
    - T – Twisting
  - Gait/Transfer training
  - Educate to reduce patient fear

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Key Concerns with Rehabilitation

- What are risks and benefits associated with physical therapy?

- Patient and therapist's fear of exercise causing harm
  - Communication with surgeon
  - Understanding surgery
  - Understanding stress on spine with exercise

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How much stress do common physical therapy exercises place on hardware?

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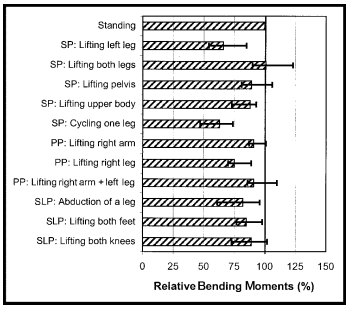
PTJ

Loads on an Internal Spinal Fixation Device During Physical Therapy
Antonius Rohlmann, Friedmar Graichen and Georg Bergmann
PHYS THER. 2002; 82:44-52.



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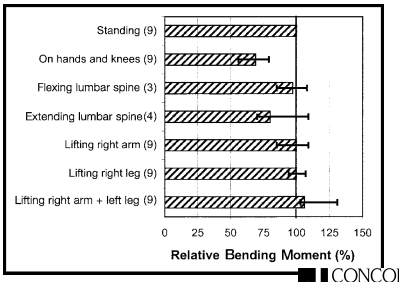

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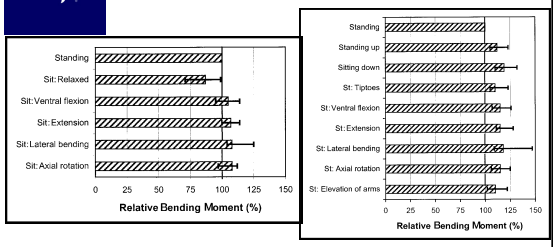

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Loads on an Internal Spinal Fixation Device During Physical Therapy
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PHYS THER. 2002; 82:44-52.

None of the movements studied caused bending moments in the implants higher than those observed during walking 128%.

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What about the discs?

- Good agreement between intradiskal pressure and bending moments in the fixation devices for most activities

(Rohlmann Ergonomics 2001)

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When does outpatient PT begin?

- Safe to start immediately(Abbott 2010)
  - Especially education
- Typically 4-6 weeks
- No difference in outcomes at 1 year post if started 6 or 12 weeks after surgery.(Oestergaard 2013)

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What should PT consist of?

- Education
- Cardiovascular exercise
- Stabilization
- Range of motion/stretching exercise

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Cardiovascular Exercise

- Typically surgeons will ask patients to walk daily
- Gradually increasing
- Use a pedometer
  - 2,100 steps = 1 mile

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Stabilization

- Co-contraction of multifidus and transverses abdominus to provide segmental stabilization
- Improved function of stabilizing muscles decrease unwanted stress on spine
- No evidence on what is best exercise routine currently

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ROM/Stretching

- Minimal research
- Maximize ROM of adjacent joints to decrease stress on surgical site
  - Hip
  - Thoracic

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Conclusions

- Educate
  - Decrease fear
  - Improve understanding of pain
  - Improve understanding of benefits of exercise
- Exercise
  - Stress placed on spine and hardware during common exercises
  - Limited evidence on best exercises
  - Key is knowledge of safe exercises
- Communicate

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QUESTIONS?

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CONTACT INFORMATION

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