

MOVEMENT THERAPY IN THE TREATMENT OF LUMBAR DEGENERATIVE DISC DISEASE[©]

Greg Moore, MD

James Fox, PhD



CHRONIC LOW BACK PAIN IN THE US



- ▶ Impacts 29% of the population
- ▶ \$200 billion in annual healthcare expenditures
- ▶ 33 million people disabled
- ▶ 102 million lost workdays annually
- ▶ Opioid Crisis



THE OPIOID EPIDEMIC BY THE NUMBERS

IN 2016...



116

People died every day from opioid-related drug overdoses



11.5 m

People misused prescription opioids¹



42,249

People died from overdosing on opioids²



2.1 million

People had an opioid use disorder¹



948,000

People used heroin¹



170,000

People used heroin for the first time¹



2.1 million

People misused prescription opioids for the first time¹



17,087

Deaths attributed to overdosing on commonly prescribed opioids²



19,413

Deaths attributed to overdosing on synthetic opioids other than methadone²



15,469

Deaths attributed to overdosing on heroin²



504 billion

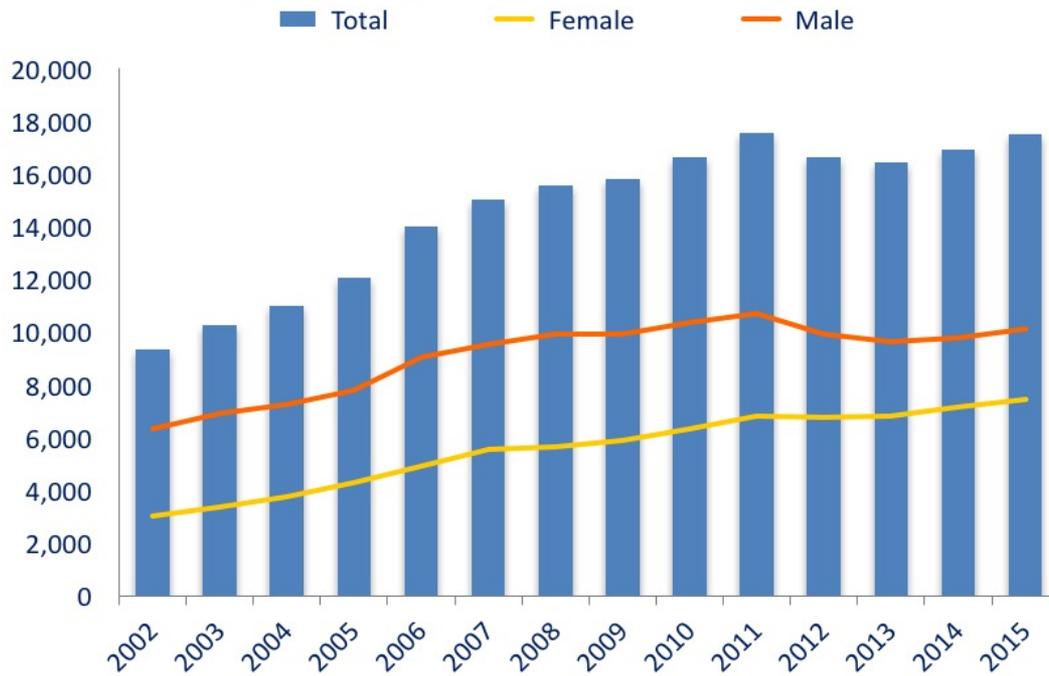
In economic costs³

Sources: ¹ 2016 National Survey on Drug Use and Health, ² Mortality in the United States, 2016 NCHS Data Brief No. 293, December 2017, ³ CEA Report: The underestimated cost of the opioid crisis, 2017



National Overdose Deaths

Number of Deaths Involving Prescription Opioid Pain Relievers (excluding non-methadone synthetics)



Source: National Center for Health Statistics, CDC Wonder

COMMON PAIN GENERATORS OF THE SPINE

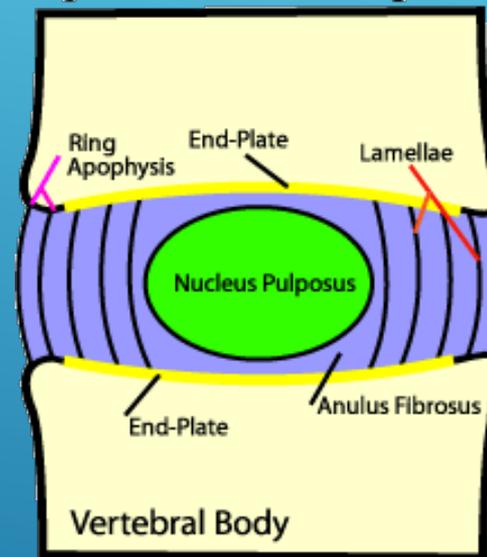
- ▶ Muscular
- ▶ Ligamentous
- ▶ Vertebral Bodies
- ▶ Discogenic
- ▶ Spinal Stenosis
- ▶ Facet-mediated
- ▶ Spondylolysis
- ▶ Sacroiliac Joint



DISCOGENIC-ANATOMY

- ▶ Outer Annulus-lamella
 - ▶ Obliquely oriented
 - ▶ Resists torsion
 - ▶ Outer third sensitive (sinuvertebral nerve)
 - ▶ Sinuvertebral-sympathetic
- ▶ Inner aspect-Nucleus Pulposus
- ▶ With compression (esp if loss of nucleus) leads to bulging anulus (McGill)

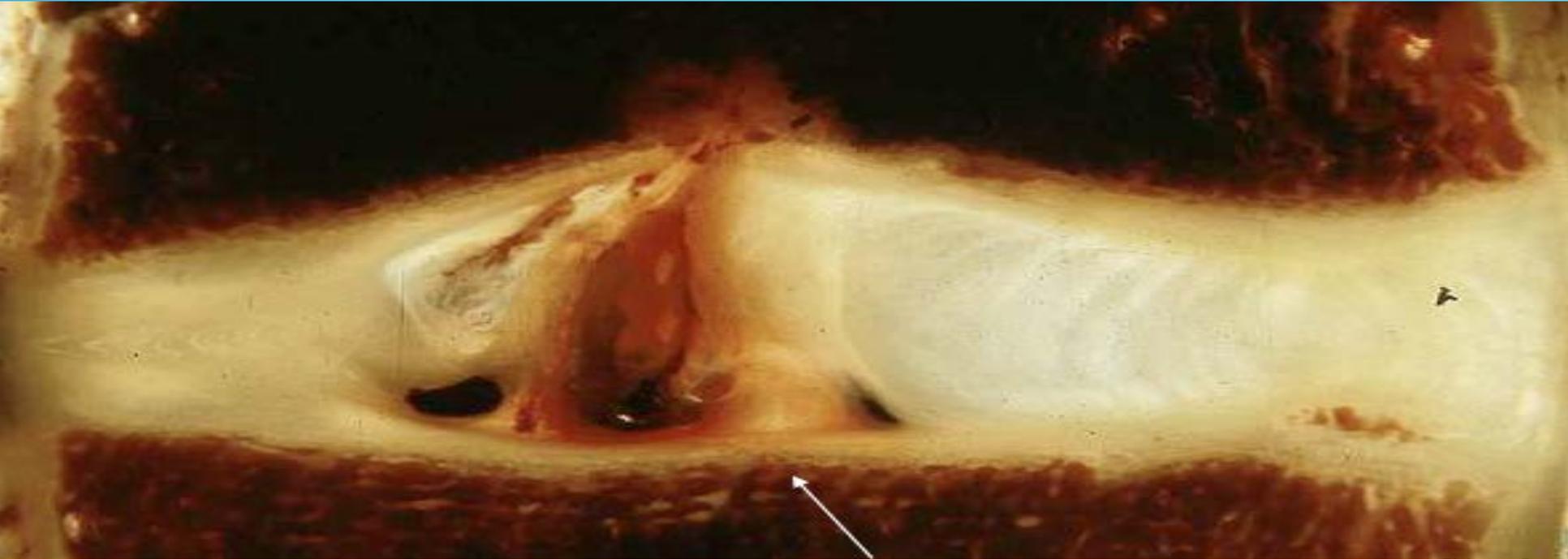
Figure #2 The 'Motion Segment'



DISCOGENIC PAIN: INTERNAL DISK DISRUPTION (IDD)

- ▶ Vertebral endplate trauma induces disc cell death and promotes degeneration
 - ▶ Exposure of isolated nuclear tissue to circulation following endplate trauma elicits an inflammatory autoimmune response leading to chondrocyte death and ultimately the disruption of the disc nucleus and annulus (IDD)
 - ▶ Radial annular tears extending into the outer annular layers promote the pathologic in-growth of granulation tissue containing nociceptive nerve fibers and blood vessels which can extend to the inner annulus and even the nucleus pulposus.
- 

INTERNAL DISK DISRUPTION (IDD)



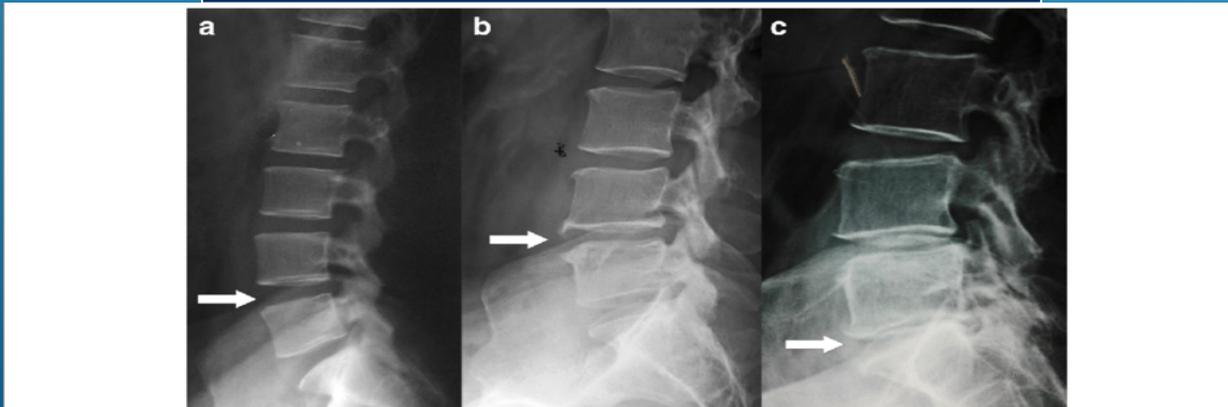
- ▶ Prevalence estimated to be 40-50% of patients with chronic spinal pain.
- ▶ Largest Segment of Back Pain Population

DISCOGENIC DEGENERATIVE CASCADE

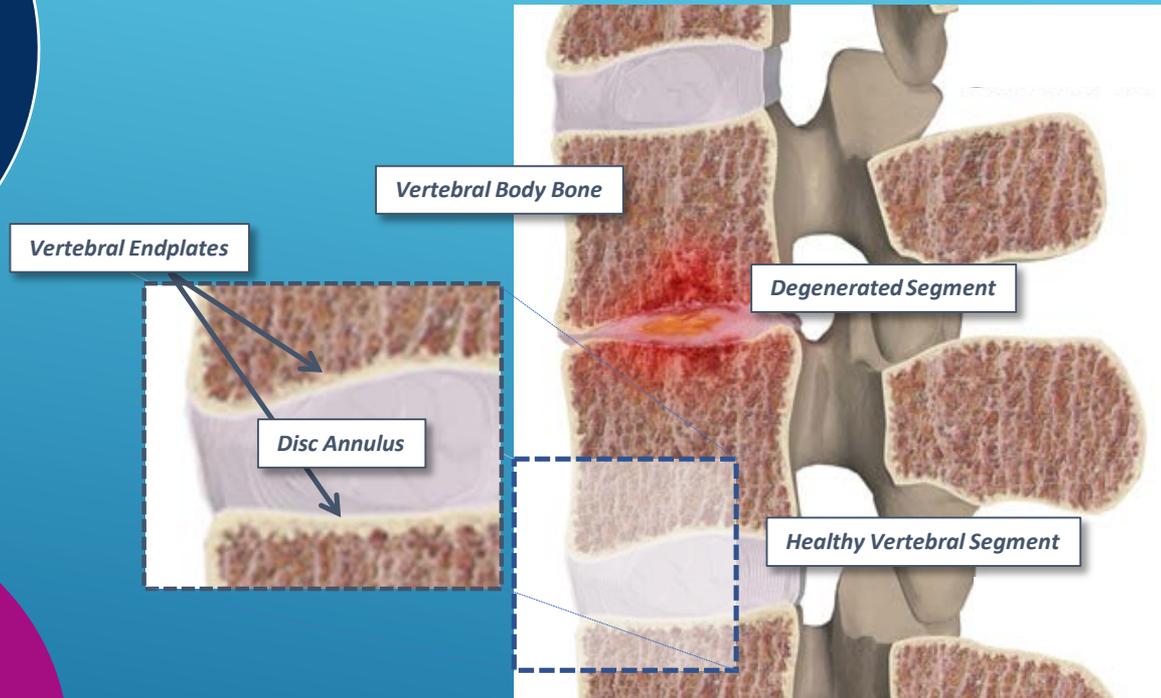
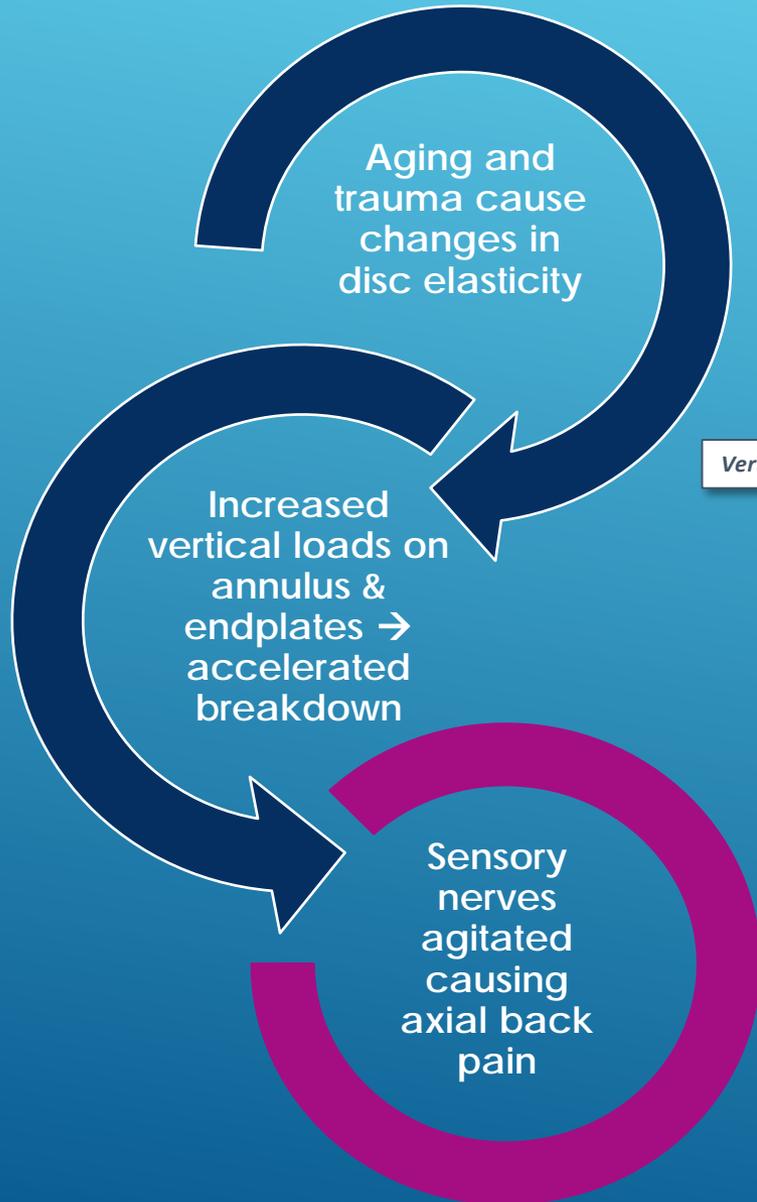
Circumferential Tears
Radial tears (Herniation)

Internal Disruption
Disc Resorption

Osteophytes
Spondylosis



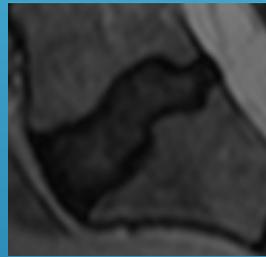
DEGENERATIVE DISEASE & BACK PAIN



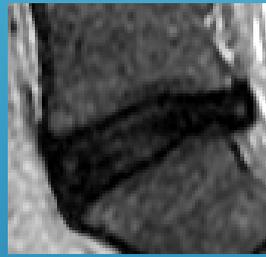
MRI: DISC DEGENERATION



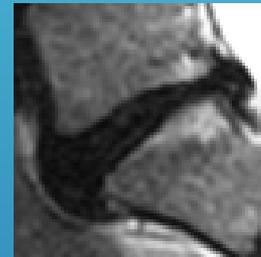
Grade 1



Grade 2



Grade 3



Grade 4



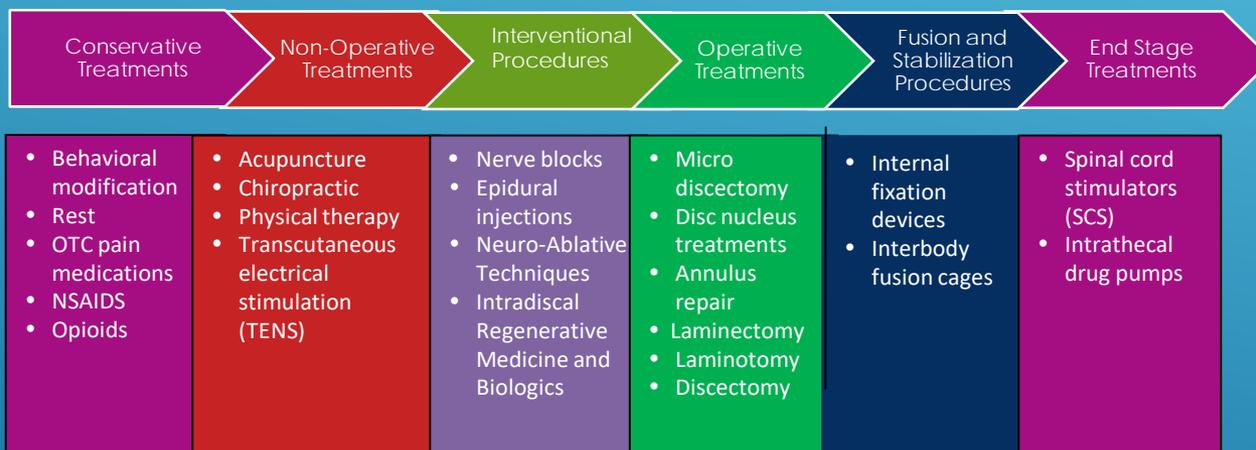
Grade 5

Pfirrmann CS, Boos N, et al: Magnetic resonance imaging classification of lumbar intervertebral disc degeneration. Spine 26:1873-78,2001

CURRENT TREATMENT CONTINUUM

Two treatment modalities: address the structural cause, or manage the pain

INCREASING PAIN AND DEGENERATION
INCREASING INVASIVENESS AND EXPENSE 



TAI CHI FOR LBP

Weifen W, Muheremu A, Chaohui C, et al. Effectiveness of tai chi practice for non-specific chronic low back pain on retired athletes: a randomized controlled study. *J Musculoskeletal Pain*. 2013;21:37–45.

Qing, G. M. Study on the curative effective of Taiji boxing in treatment of lumbar disc herniation. *Mod Preventi Med*. 39, 4170–4172 (Chinese) (2012).

Song, H. & Gao, L. A study on effect of Taijiquan on lumbar disc protrusion. *J Beijing Spt Univ*. 3, 627–629 (Chinese) (2008).

Arthritis Care & Research
Vol. 63, No. 11, November 2011, pp 1576–1583
DOI 10.1002/acr.20594
© 2011, American College of Rheumatology

ORIGINAL ARTICLE

Tai Chi Exercise for Treatment of Pain and Disability in People With Persistent Low Back Pain: A Randomized Controlled Trial

AMANDA M. HALL,¹ CHRIS G. MAHER,¹ PAUL LAM,² MANUELA FERREIRA,¹ AND JANE LATIMER¹

Objective. To determine the effect of tai chi exercise on persistent low back pain.

Methods. We performed a randomized controlled trial in a general community setting in Sydney, New South Wales, Australia. Participants consisted of 160 volunteers between ages 18 and 70 years with persistent nonspecific low back pain. The tai chi group (n = 80) consisted of 18 40-minute sessions over a 10-week period delivered in a group format by a qualified instructor. The waitlist control group continued with their usual health care. Bothersomeness of back symptoms was the primary outcome. Secondary outcomes included pain intensity and pain-related disability. Data were collected at pre- and postintervention and analyzed by intent-to-treat.

Results. Tai chi exercise reduced bothersomeness of back symptoms by 1.7 points on a 0–10 scale, reduced pain intensity by 1.3 points on a 0–10 scale, and improved self-report disability by 2.6 points on the 0–24 Roland-Morris Disability Questionnaire scale. The followup rate was >90% for all outcomes. These results were considered a worthwhile treatment effect by researchers and participants.

Conclusion. This is the first pragmatic randomized controlled trial of tai chi exercise for people with low back pain. It showed that a 10-week tai chi program improved pain and disability outcomes and can be considered a safe and effective intervention for those experiencing long-term low back pain symptoms.

INTRODUCTION

Low back pain is one of the most common reasons for presenting to a general practitioner (1–3). Despite numerous treatments aimed at remedying this condition, it is estimated that 43% of patients with an acute episode will

have disabling symptoms 3 months later and develop persistent low back pain (4,5). In addition to their pain symptoms, people with persistent symptoms typically report reduced physical function and social participation, increased psychological distress, and resulting work loss. These factors, in combination with its high prevalence, have made low back pain the single most costly musculoskeletal disorder in Australia, with an estimated \$1 billion spent on direct health care costs per annum and a further \$8 billion on indirect costs (6).

A recent review of the current nonpharmacologic treatments for long-term low back pain reported 16 different types of interventions that have been tested in clinical trials, with the majority showing little to no effect (7). Exercise therapy is among the more effective interventions showing small to moderate effects (8,9). It can be delivered at low cost, making it an attractive choice for such a prevalent condition. However, there are many exercise therapy approaches and the most effective exercise approach remains uncertain. Recently, a meta-analysis of 23 types of exercise therapy found the components of supervision, strengthening, and stretching to be the most predictive of good outcomes, and consequently these elements have been recommended for inclusion in exercise therapy programs (10).

Tai chi originating in China is an established form of

ACTRN: 1260000270314.

Tai Chi for Health Program was supported by the Arthritis Foundation of Australia and Arthritis Care of the UK, and adapted by the Arthritis Foundation of the US. Ms Hall's PhD scholarship is supported by an Australian Government Endeavour International Post-Graduate Research Scholarship. Dr. Maher's research fellowship is supported by Australia's National Health and Medical Research Council. Dr. Latimer's Future Fellowship is supported by the Australian Research Council.

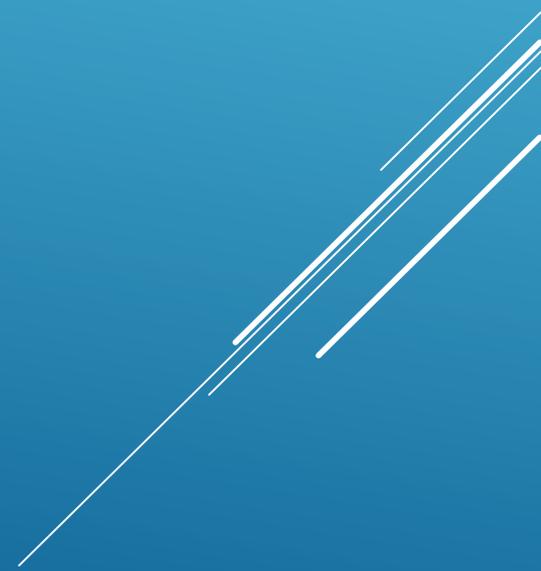
¹Amanda M. Hall, MPE, BKin, Chris G. Maher, PhD, Manuela Ferreira, PhD, Jane Latimer, PhD: The George Institute for Global Health and University of Sydney, Sydney, New South Wales, Australia; ²Paul Lam, MD: University of New South Wales, Sydney, New South Wales, Australia. Dr. Lam has received royalties from the instructional DVD *Tai Chi for Back Pain*.

Address correspondence to Amanda M. Hall, MPE, BKin, PO Box M201, Missenden Road, Sydney, New South Wales, Australia, 2050. E-mail: amandahall@georgeinstitute.org.au.

Submitted for publication February 1, 2011; accepted in revised form August 5, 2011.

THERAPEUTIC MOVEMENT

A NON-INVASIVE TREATMENT OPTION FOR LOW
BACK PAIN AND SELECTED SPINAL DISORDERS



CONCEPTUAL AND EMPIRICAL FRAMEWORK: AN INTEGRATIVE APPROACH

- ▶ (1) Traditional Chinese Medicine
 - ▶ (2) Traditional Yang Family Tai Chi Chuan
 - ▶ (3) Traditional Medical Qigong (internal)
 - ▶ (4) Published Scientific Research
- 

TRADITIONAL CHINESE MEDICINE INFLUENCE

Whole Body Approach in Assessment and Intervention

Patient Assumes Greater Personal Responsibility for Rehabilitation

Emphasis Given to Internal and External Qi Flow (vital life force energy)

Balancing Yin and Yang Energies

Mind-Body Emphasis:

- Forming Mental Intention

- Mind Directed Movements

- Continuous Mental Assessment of Movement Outcomes

TRADITIONAL YANG FAMILY TAI CHI CHUAN INFLUENCES

Yang Chengfu's Ten Essentials

1. Straighten the Head

Stand straight and hold the head and neck naturally erect, with the mind concentrated to the top. The head extends upward so that the spirit extends energy to the top of the head.

2. Qi Sinks to the Lower Dantian

The pre-natal Qi is sinking down and the post-natal Qi (or breathing) is smooth and flowing (or regulating). There should be tranquility in movement.

3. Withdrawing (Sink) the Chest and Extending (Lifting) the Back

Do not extend the chest forward. When relaxing the chest, do not cave the chest inward; maintain a relaxed chest posture. If you relax the chest, the shoulders become free and the back can extended discharging energy through the spine. There should be a rounded and extended feeling of the back.

4. Sink the Shoulders, Drop the Elbows, Settle the Wrists, and Extend the Fingers

Avoid extending the elbows sideways and lifting the shoulders. The armpits should be kept open throughout all movements. The hands should be held in a natural position, with the fingers slightly apart, not stiff.

5. Relax the Waist

If the hips and waist are relaxed, the strength of the back increases. As you discharge energy, use the spine (back, waist, hips) as the axis of movement. The waist is the dividing point; going downwards, sinking and dropping downward (Sinking into your root); going upwards, expanding the energy from the waist upward all the way to fingers (allowing energy or Qi to extend outward). Energy can be very quickly discharged from the waist to the fingers if the chest and the waist is relaxed and the back and arms are extended.

6. Distinguish the Substantial from the Insubstantial

This essential principle lies in the rootedness of the stance and posture. The lower body supports the upper body weight, movements, and balance. It is important to distinguish between the different stances and the substantiality of each stance. Yin and Yang is separated by transferring the weight across the body from each leg. The knee is slightly bent, but not extending over the toe; the knee should be pointing in the same direction as the toes. The elbow should be aligned over the knee. The arms and legs must move together, arriving at the completion of the posture at the same time. All movements and energy moving through the body in transitions must be smooth and not rigid.

7. Combine the Internal and External

If the internal and external energy can combine; that is, if the physical movement combines with the intention (mind intent), the energy and movements will be appropriate and harmonious. If you express intention realistically your movements will combine and express purpose.

8. Use the Mind Instead of Force

The spirit (expression of mind intent) must raise to the top of the head and flow smoothly through the movements. When the spirit is raised, the arms and waist contain and express energy but appear to be relaxed, yet have strength. It is said that four ounces can move two thousand pounds; the principle is achieved through relaxed, but intentional movements.

9. Integrate the Upper and Lower Body

The upper body is viewed as from the waist upward; the lower body is from the waist downward. As the lower body moves, the upper body must move in a manner which integrates the whole body to coordinate movements and energy. The movement must not be forceful, but smooth and connected to the intention of the posture.

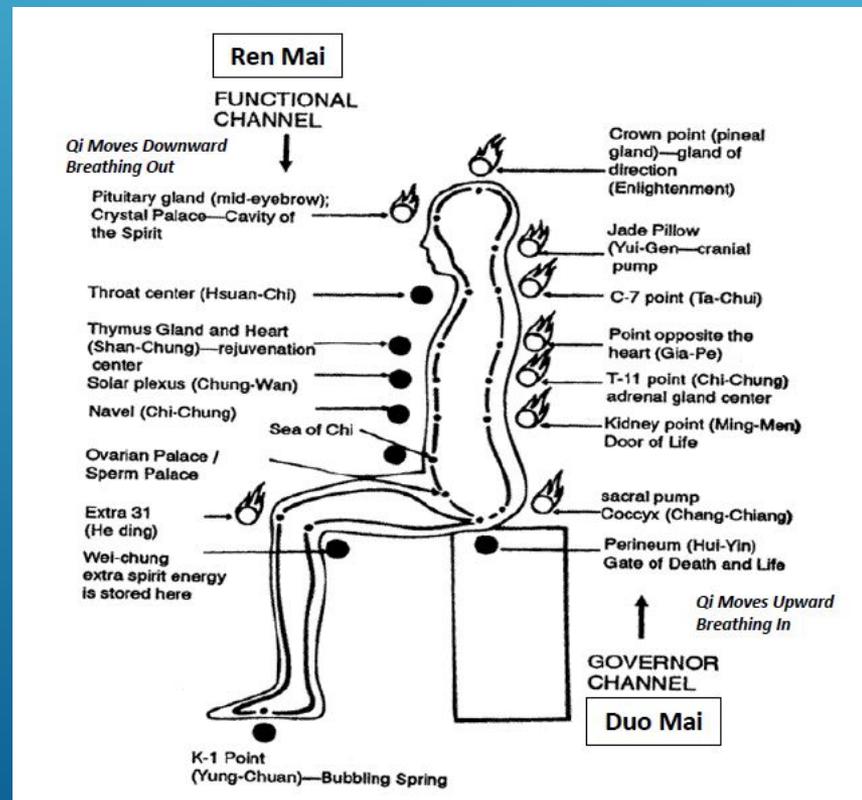
10. Movement Must be Continuous and Without Interruption

The importance of continuity is central to all tai chi chuan movement; the movements of the legs, arms, waist, and upper and lower body must coincide and form a continuous flow of energy and movement.

INTERNAL MEDICAL QIGONG INFLUENCE

Internal Qigong refers to movements and/or exercises intended to achieve optimal dynamic mind-body integration and patient awareness of Internal Energy (Qi) Flow:

The internal Qi flow is to be coordinated with activation of the "bubbling spring" point (K-1) which moves upward along the Duo Mai channel, then as the patient exhales and relaxes the back muscles, the Qi moves downward along the Ren Mai to complete the micro-cosmic orbit.



PRINCIPLES OF THERAPEUTIC MOVEMENT

Mind-Body Intervention

Whole Body Coordination

Whole Body Awareness

Slow and Controlled Movements

Controlled Muscle Activation-Deactivation

Continuity of Movement



TYPES OF DISORDER AND USE OF THERAPEUTIC MOVEMENT

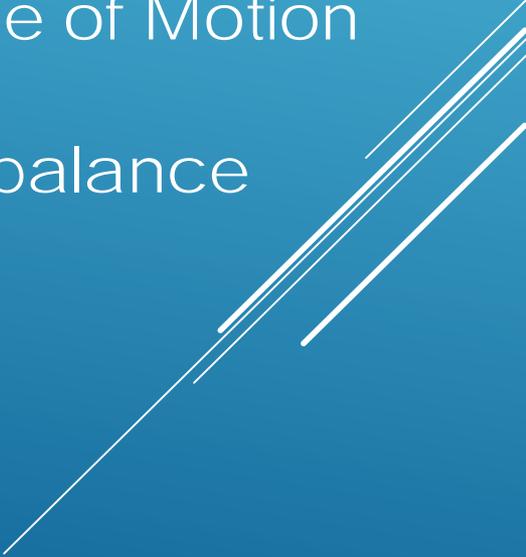
Spinal Disorders

Chronic Lower Back Pain

Degenerative Disk Disease

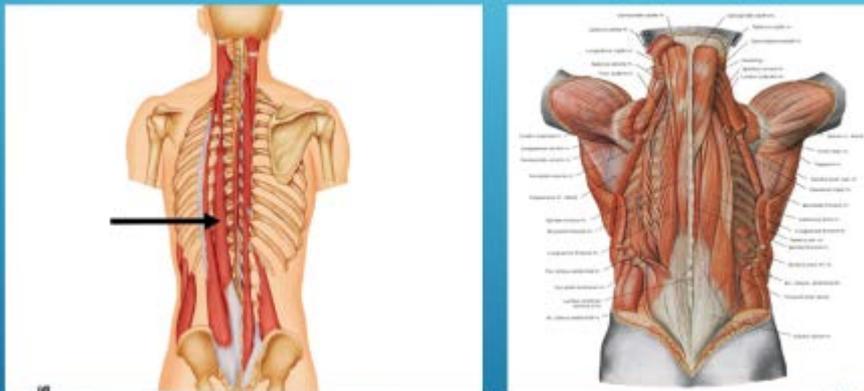
Post-Operative (e.g., spinal fusion) Range of Motion
Restrictions

Disorders Resulting in Instability or Imbalance



CONTROLLED SPINAL EXTENSION (CSE)

DEEP MUSCLES OF THE BACK

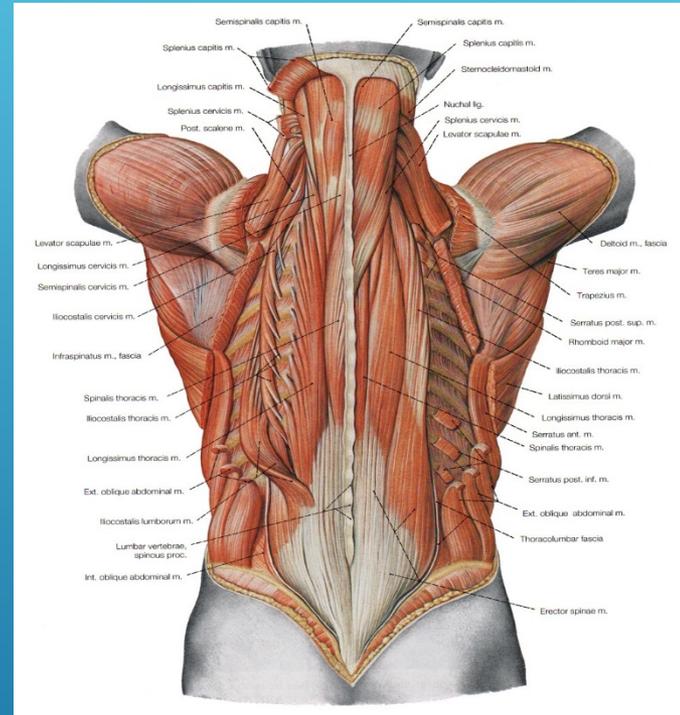
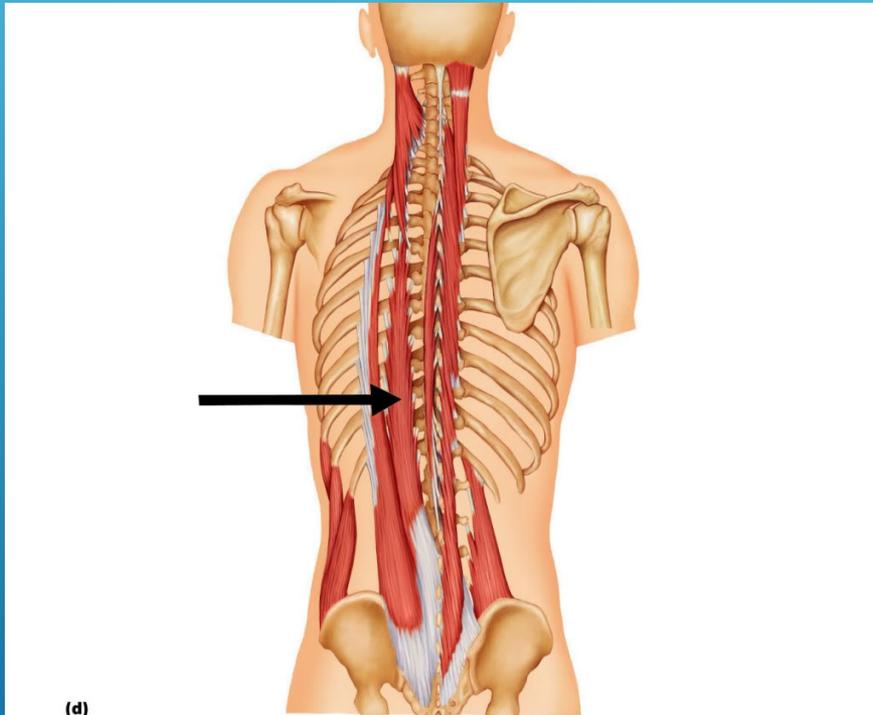


Controlled Movement of Deep
Muscles of Back using Muscle
Control

Whole Body Coordination
(including breath cycles)

Activating Qi Flow from K-1
through the Micro-Cosmic Orbit

DEEP MUSCLES OF THE BACK



CONTROLLED SPINAL EXTENSION (CSE) THERAPEUTIC PROCESS

Five Stages of Therapeutic Intervention:

1. Manual Guidance by Therapist in Extending Spinal Column (seated position)
2. Patient and Therapist Extend Spinal Column Together (seated position)
3. Patient Extending Spinal Column without Assistance (seated position)
4. Patient Extending Spinal Column with Verbal Assistance (standing position)
5. Patient Including CSE in Subsequent Therapeutic Movements



The first stage of the CSE is Shown above

CLINICAL OF THERAPEUTIC MOVEMENT PROGRAM IMPACTS OBSERVATIONS

Over a five year period nearly 1200 patients were instructed in performing the Controlled Spinal Extension

Approximately 800 of these patients continued their treatment after their initial session

Approximately 80 percent of these patients reported a reduction of low back pain at least temporarily

Approximately half of these patients reported increased mobility and activity levels, with some resuming normal work and recreational activity



REFLECTIONS ON CLINICAL PRACTICE

Therapeutic Movement appears to be a minimally invasive and clinically effective therapeutic intervention for patients with Degenerative Disk Disease (or other spinal disorders)

A Mind-Body approach appears to enhance patients awareness of pain level changes during the rehabilitative/recovery process

The Ten Essentials of traditional Yang family tai chi chuan and the principles of Medical Qigong (as a modality of TCM) are robust tools in both the rehabilitative stage of spinal disorders and chronic pain management

Soft, slow, mind-directed movement provide a foundation for patients to develop enhanced muscle control skills and whole body awareness

Continuity of treatment and continued performance of therapeutic movement is essential to comprehensive rehabilitation and positive long term effects