

EVALUATION OF DISEASE AND INJURY CAUSATION PROBLEMS IN LOW BACK PAIN

MARK H. HYMAN, MD , FACP,
FAADEP
ASSOCIATE PROFESSOR OF
CLINICAL MEDICINE, UCLA

ACKNOWLEDGMENTS

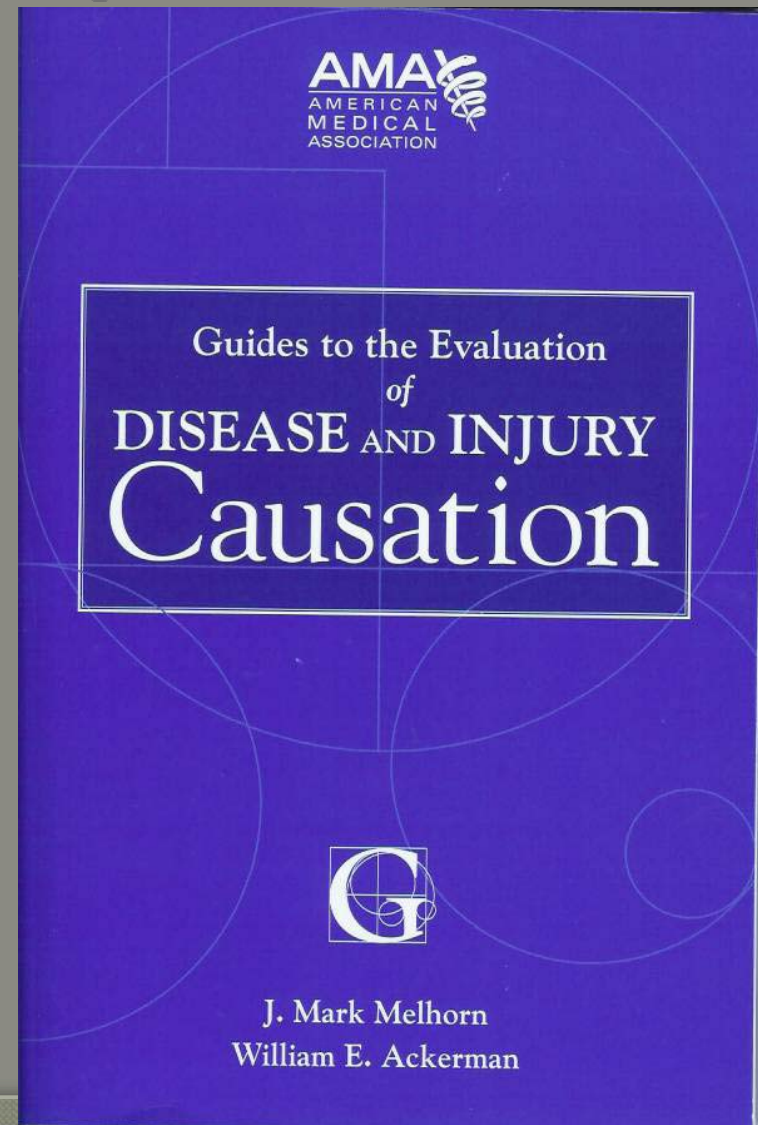
- AMA
- AADEP
- J. MARK MELHORN, MD
- JAMES B. TALMAGE, MD

ACKNOWLEDGMENTS



Guides to the Evaluation of Disease and Injury Causation

- J. Mark Melhorn MD
- William Ackerman MD
- AMA Press
- 2008
- https://catalog.ama-assn.org/Catalog/product/product_detail.jsp?productId=prod980016



Risk Assessment

American Medical Association
Physicians dedicated to the health of America



A Physician's Guide to Return to Work

Editors

James B. Talmage, MD
J. Mark Melhorn, MD

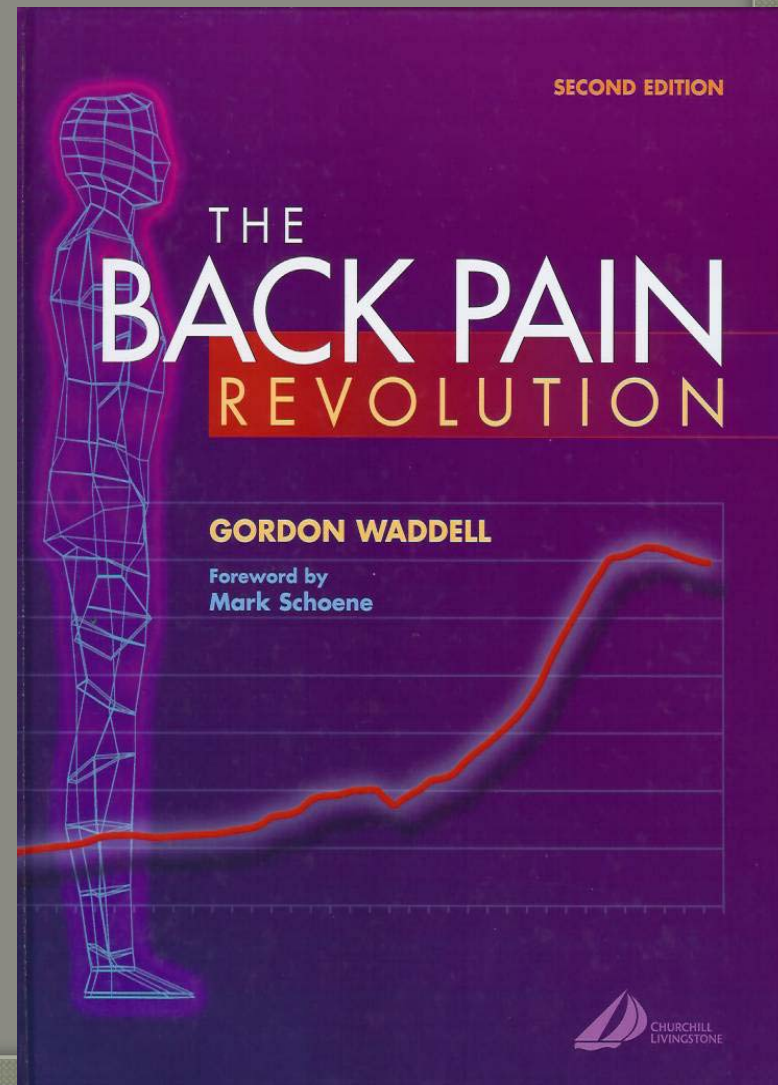
WORKING WITH

- Spine Problems, Chapter 12
- Upper Ext Problems, Chapter 13
- Lower Ext Problems, Chapter 14
- Cardiopulmonary Problems, Ch 15
- Neurologic Problems, Chapter 16
- Rheumatologic Problems, Ch 17
- Psychiatric Problems, Chapter 18
- Functional Syndromes, Chapter 19
 - Fibromyalgia, Chronic Fatigue Syndrome

History of Back Pain CAUSATION

- Churchill Livingstone

Best Single text
to understand
Low back disorders



REFERENCES

- Gordon Waddell
<http://www.workingforhealth.gov.uk/>
- Hadler, Stabbed in the Back: Confronting Back Pain in an Overtreated Society
- Anstadt, JOEM, Dec 2009, Vol 51, No12, p1474

Legal vs. Scientific Definitions

- Establishing benefit eligibility is different than establishing scientific causation
- “More likely than not...” vs. statistical probability
- Aggravation of pre-existing conditions
- “Liberal construction” (Calif. LC)
- Thus, legal theory of causation for the good of society is different than scientific causation

Guides to the Evaluation of Disease and Injury Causation

- “Work relatedness, in the context of industrial injuries, involves concepts of medical and legal causation.”
- “Definitions of medical causation and legal causation arise from different sources—one from science and the other from the desire for social justice.”
- “For physicians treating injured workers, understanding the differences between the two concepts is essential.”

page 14

Guides to the Evaluation of Disease and Injury Causation

- “The courts **did not** have their origins in science, and, therefore, the laws developed are **not** scientifically derived.” page 15
- “Judges and legislatures have the power to **substitute convenience for science**. One common method for doing so in workers’ compensation cases is the establishment, by legislative or judicial decree, **of presumptions** that institutionalize societal choices.” page 17

Scientific analysis and judgement

“The judiciary, faced with *probabilistic* arguments of causality in a debate involving a single individual, has the responsibility for weighing human factors and unmeasured variables and considering the opinion of the attending physicians and others in arriving at a judgment, *even if the judgment is less probable.*”

N. Hadler, 1984

Scientific analysis and judgement

Further,

- Epidemiological studies show associations, it does not prove a theory but can only disprove a theory or the predictions based on the theory. The existence of an association between two events does not mean they are causally related
- Experimental studies show cause and effect

Alpert Am J Med, August 2007; N. Hadler, AMA Disability Evaluations

Scientific analysis and judgement

Paediatric and Perinatal Epidemiology

Volume 18 Issue 1, Pages 88 - 92

Published Online: 22 Jan 2004

Data from Berlin (Germany) show a significant correlation between the increase in the stork population around the city and the increase in deliveries outside city hospitals (out-of-hospital deliveries). However, there is no correlation between deliveries in hospital buildings (clinical deliveries) and the stork population. The decline in the number of pairs of storks in the German state of Lower Saxony between 1970 and 1985 correlated with the decrease of deliveries in that area. The nearly constant number of deliveries from 1985 to 1995 was associated with an unchanged stork population (no statistical significance). However, the relevance of the stork for the birth rate in that part of Germany remains unclear, because the number of out-of-hospital deliveries in this area is not well documented. A lack of statistical information on out-of-hospital deliveries in general is a severe handicap for further proof for the Theory of the Stork.

Quality of medical literature

- n **Randomized**, controlled intervention studies provide the strongest evidence of whether or not there is a relationship between a substance and a disease.
- n **Cohort** studies provide relative estimates of risk by experimenting with specific exposures to groups.
- n **Observational** studies measure associations between substances and diseases. Studies may be prospective or retrospective.
- n **Case-controlled** studies compare subjects with disease with subjects without disease.
- n **Cross-sectional** studies calculate prevalence of disease based on exposure data.
- n **Ecological** studies compare disease incidents across different populations.
- n **Case reports** describe observations of a single subject or small group and are least reliable.

Quality of medical literature

- n **Randomized**, the gold standard *BUT* you can not do these studies in our country because:
 - n *People are hired to do jobs and have different seniorities and abilities*
 - n *Employers do not randomly hire*
 - n *You can not potentially knowingly expose half your workers and see what happens*
- n **Prospective Cohort**, the next best thing for suggesting causation
- n **Historical Cohort**, best for diseases with long latencies

Prospective Cohort Study

- Prospective investigation of the factors that might cause a disorder in which a cohort of individuals who do not have evidence of an outcome of interest but who are exposed to the putative cause are compared with a concurrent cohort who are also free of the outcome but not exposed to the putative cause. Both cohorts are then followed to compare the incidence of the outcome of interest.

- Best study design if subjects can NOT be randomized.

Austin Bradford Hill (1897-1991)

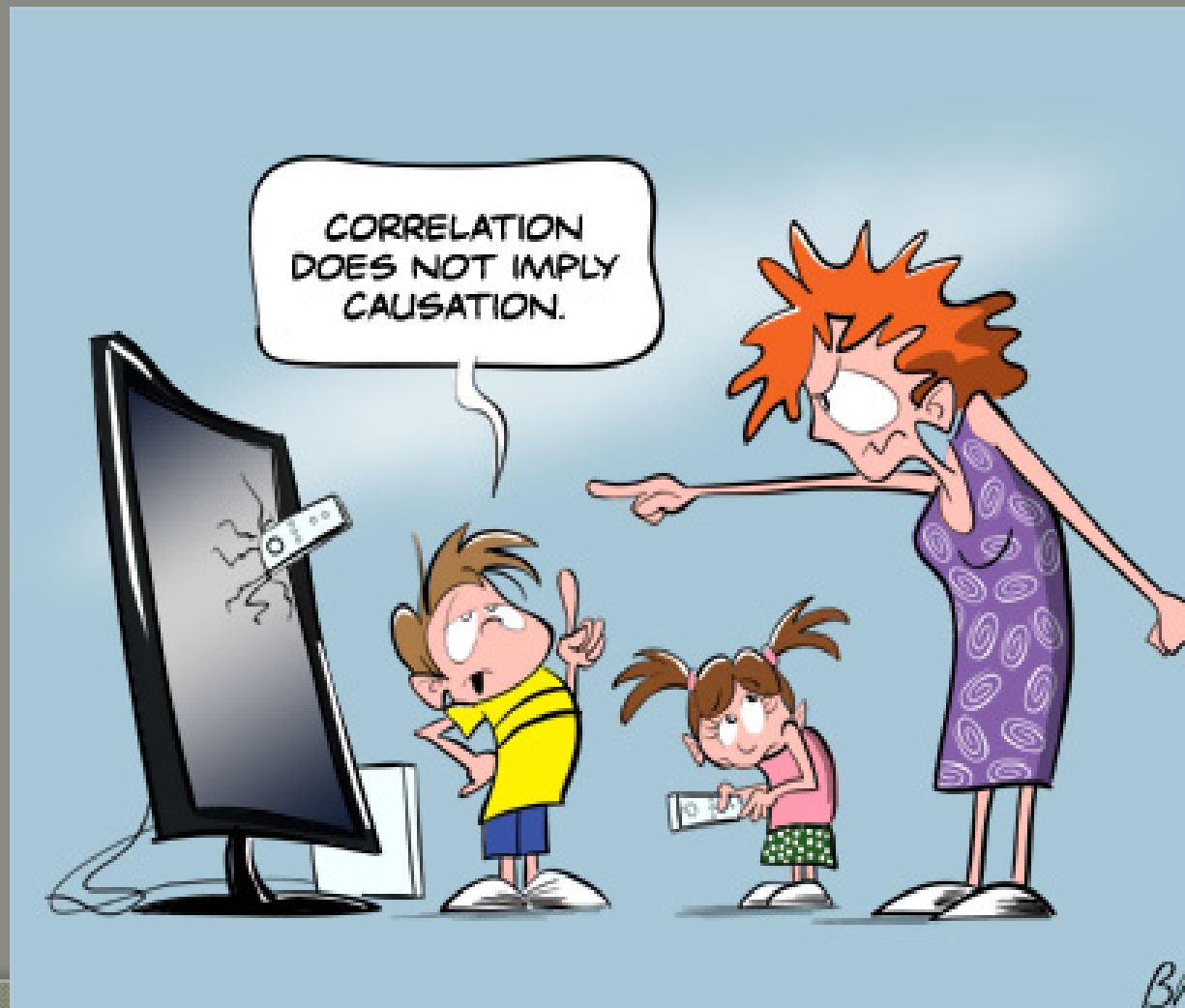


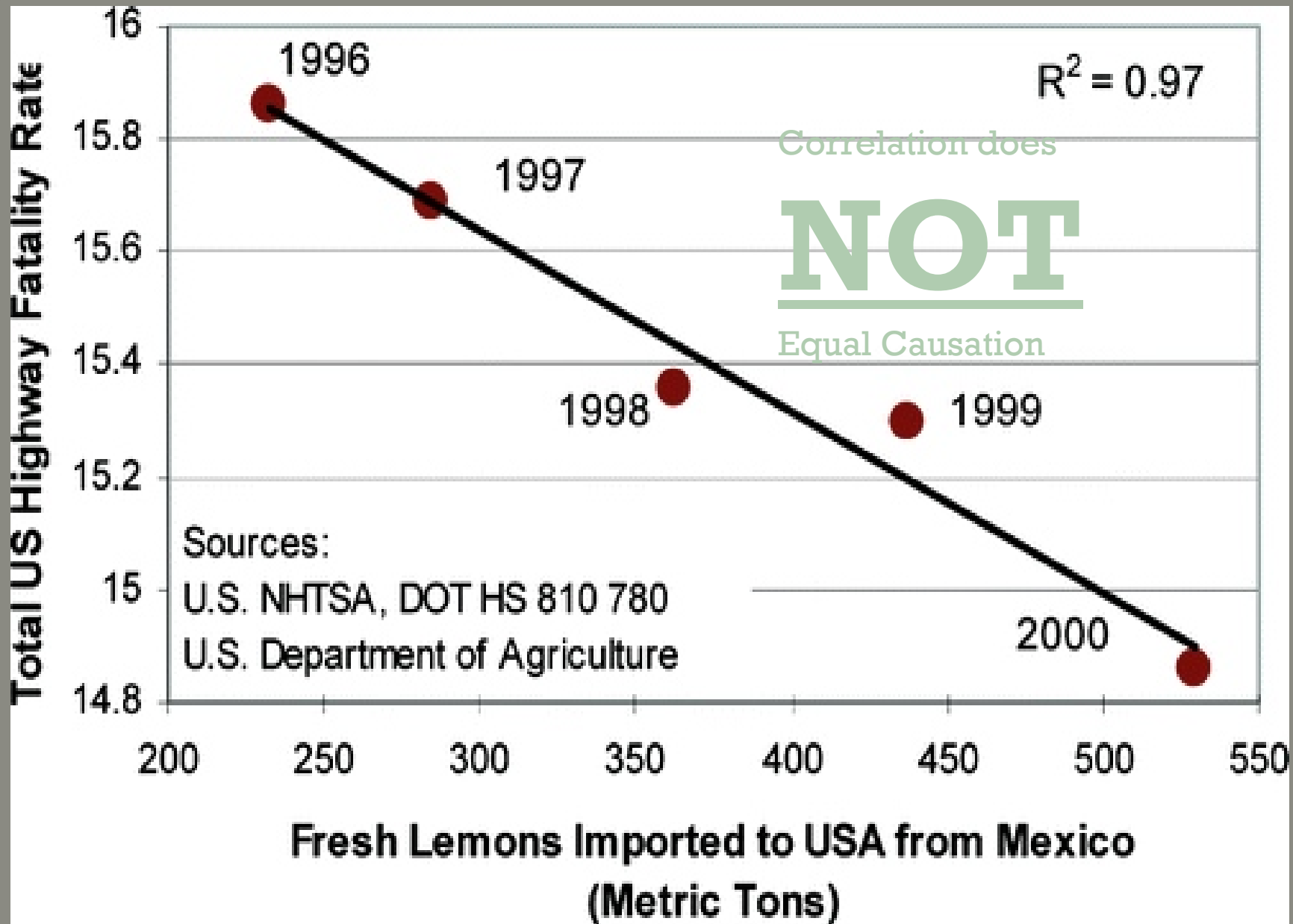
- Professor –
University of York
- President – Royal
Statistical Society

Bradford-Hill criteria

- 1) **Strength** *How often do we see this.*
- 2) **Consistency** *Same association is made by different persons in different places in different circumstances at different times.*
- 3) **Specificity** *Cause is associated with specific disease.*
- 4) **Temporality** *Which is the cart and which is the horse.*
- 5) **Biologic Gradient** *Higher dose causes more frequent (or worse) disease.*
- 6) **Plausibility** *Absurd causes must be ruled out.*
- 7) **Coherence** *Data must not conflict with known facts.*
- 8) **Experimental Evidence** *When obtainable, is strong support.*
- 9) **Analogy** *Is weak evidence but is acceptable if risk is extreme.*

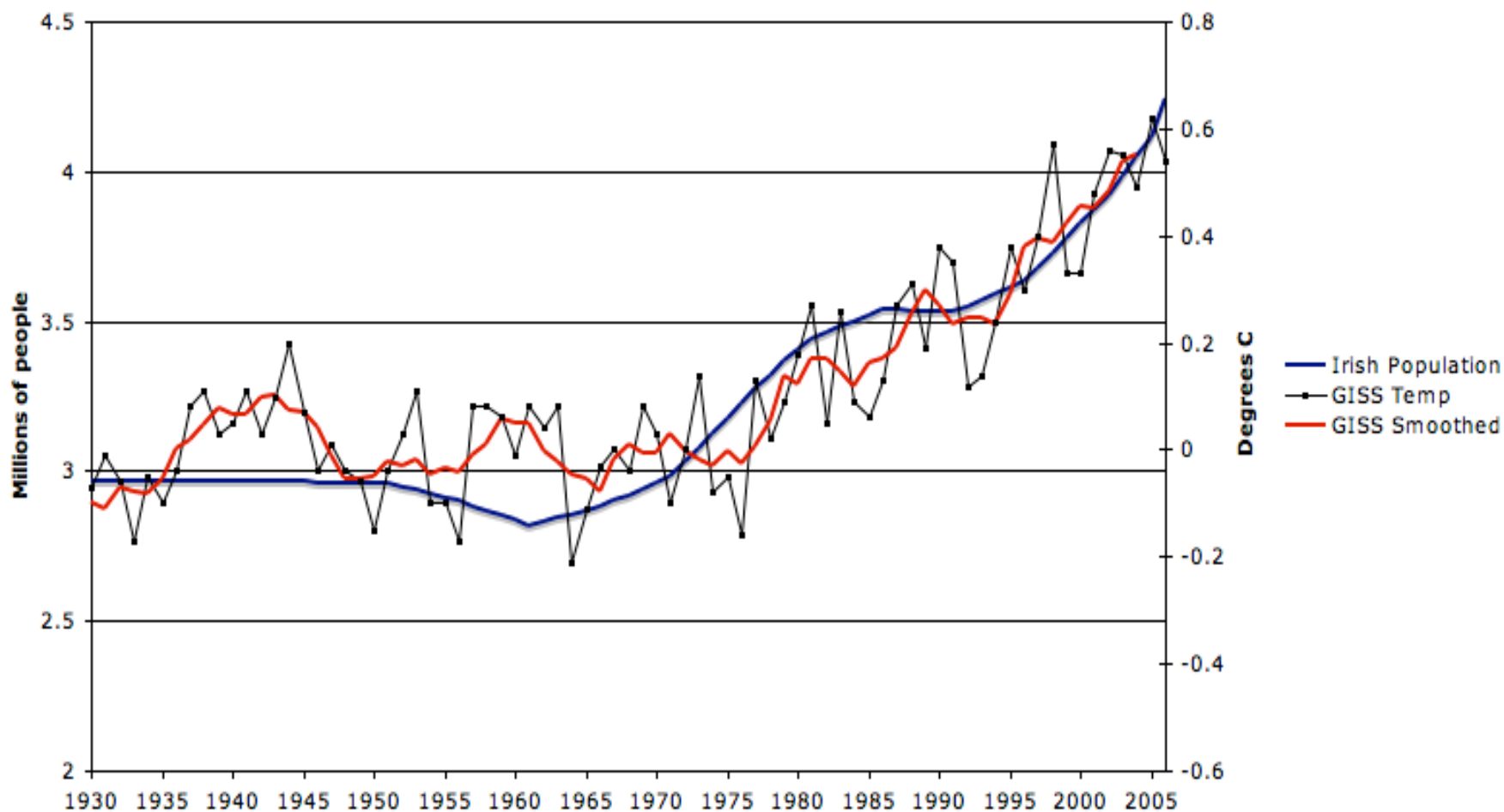
Temporal Correlation does **NOT** prove Causation





Another Non-existent Condition: Global Warming How about we blame the Irish

Leprechauns Cause Climate Change



Causation and Back Pain

- Given the limited time, we will focus on the more recent literature
- However, do not disregard some of the more classic literature in this area including:
 - Bigos(Boeing Study) Spine 1991, Vol 16, No 1
 - AHRQ summary

Carragee et al; Does Minor Trauma Cause Serious Low Back
Illness? *Spine* 2006; 31 (25): 2942-2949

AND

Are first-time episodes of serious LBP associated with new MRI
findings? *The Spine Journal* 2006; 6: 624-635

- “To our knowledge, no study has prospectively assessed the incidence of minor trauma events associated with LBP in a large cohort with defined baseline MRI and clinical variables over an extended period.”

Carragee et al; *Spine* 2006; 31 (25): 2942-2949
AND *The Spine Journal* 2006; 6: 624-635

- 170 of the 200 subjects reported 652 minor traumatic events.
- 323 episodes of serious low back pain in the 200 subjects.
 - 44 short or long term disability episodes
 - 7 workers' compensation claims
 - 4 personal injury claims
- **“Minor trauma was only associated with serious low back pain in a compensation setting.”**

Carragee et al; *Spine* 2006; 31 (25): 2942-2949
AND *The Spine Journal* 2006; 6: 624-635

- “Minor trauma had no independent association with progression to serious low back pain.”
- Spinal structural abnormalities (MRI and discography) had only a weak association with serious back pain and **NO association with disability** or medical utilization.
- Multivariate analysis: predictors of adverse outcome
 - **Baseline history** of depression, somatization, chronic (usually neck) pain, or a workers’ compensation claim.
 - **Current smoking**

Carragee et al; Does Minor Trauma Cause Serious Low Back
Illness? *Spine* 2006; 31 (25): 2942-2949

AND

Are first-time episodes of serious LBP associated with new MRI
findings? *The Spine Journal* 2006; 6: 624-635

- The “injury model” has transformed a largely benign symptom into a dire illness.
- “Our findings do not support the concept that serious low back pain and disability stem from minor trauma, structural problems, or the combination of the two.”

Waddell,

The Back Pain Revolution, 2nd Edition 2004

- As mentioned previously, one of the best sources for literature and interpretation

Back Pain and Heavy Work: Waddell,
The Back Pain Revolution, 2nd Edition 2004

- “We must recognize that these are simply patients’ attempts to explain their pain. The answers tell us more about how people think about back pain than about what really causes it. Most of the answers seem to reflect the **normal activities** of the different group when they happen to have back pain. ... **Most episodes of back pain probably start spontaneously or while doing an everyday activity that we have done many times before.**” p. 117

Back Pain and Heavy Work: Waddell, *The Back Pain Revolution, 2nd Edition* 2004

- “Even if modern work does NOT cause any **structural damage**, it is still important to ask whether it is a risk factor for back pain.”
 - “Strong epidemiological evidence that physical demands of work (manual materials handling, lifting, bending, twisting, and whole body vibration) can be **associated** with increased reports of back symptoms, aggravation of symptoms, and “injuries”. [NOTE the quotation marks]
 - “... the size of the effects is less than that of other individual, non-occupational and unidentified factors.”
 - “... that does not mean that LBP is **caused** by work.”

Back Pain and Heavy Work: Waddell, *The Back Pain Revolution, 2nd Edition* 2004

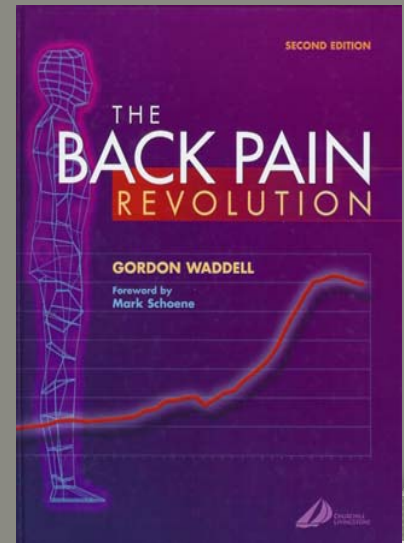
- “There is limited and inconsistent evidence on manual handling as a risk factor for disk prolapse or sciatica.”
- “However, these data do NOT tell us whether or not heavy work is the CAUSE of more disabling back pain. It could equally be effect. It may simply be more difficult to do a heavy job when you have back pain, whatever its cause.”

Back Pain and Heavy Work: Waddell, *The Back Pain Revolution, 2nd Edition* 2004

- “Hoogendoorn et al (1999) reviewed 17 studies of sports and physical activity during leisure time. There is no clear evidence that most sports activity or total physical activity during leisure time are important risk factors for back pain.”
 - Scand J Work and Environ Health 1999; 25: 387-403

LBP Risk Factors: Body Build (Anthropomorphic Features)

- No consistent relationship between height and back pain.
- Doctors and therapists often get excited about unequal leg length, but the literature again does not show any consistent relationship.
- Limping does NOT cause LBP.



Back Pain and Heavy Work: Waddell, *The Back Pain Revolution*, 2nd Edition

- There is moderate scientific evidence that the physical demands of work play only a minor role in the development of degeneration.
- There is strong epidemiologic and clinical evidence that care seeking and disability are due to LBP depend **MORE** on complex individual and work-related psychosocial factors than on clinical features or physical demands of work. - page

103

Back Pain and Heavy Work: Waddell, *The Back Pain Revolution, 2nd Edition* 2004

... there is no actual biomedical evidence
that sitting damages the spine. - Page 104

- Hartvigsen et al (2000) reviewed 35 epidemiologic studies on **sitting**.
 - Only 8 had satisfactory experimental design
 - **7 out of 8 showed no effect.**
 - They concluded that the extensive evidence now available does **not** support the popular belief that sitting is a risk factor for back pain.

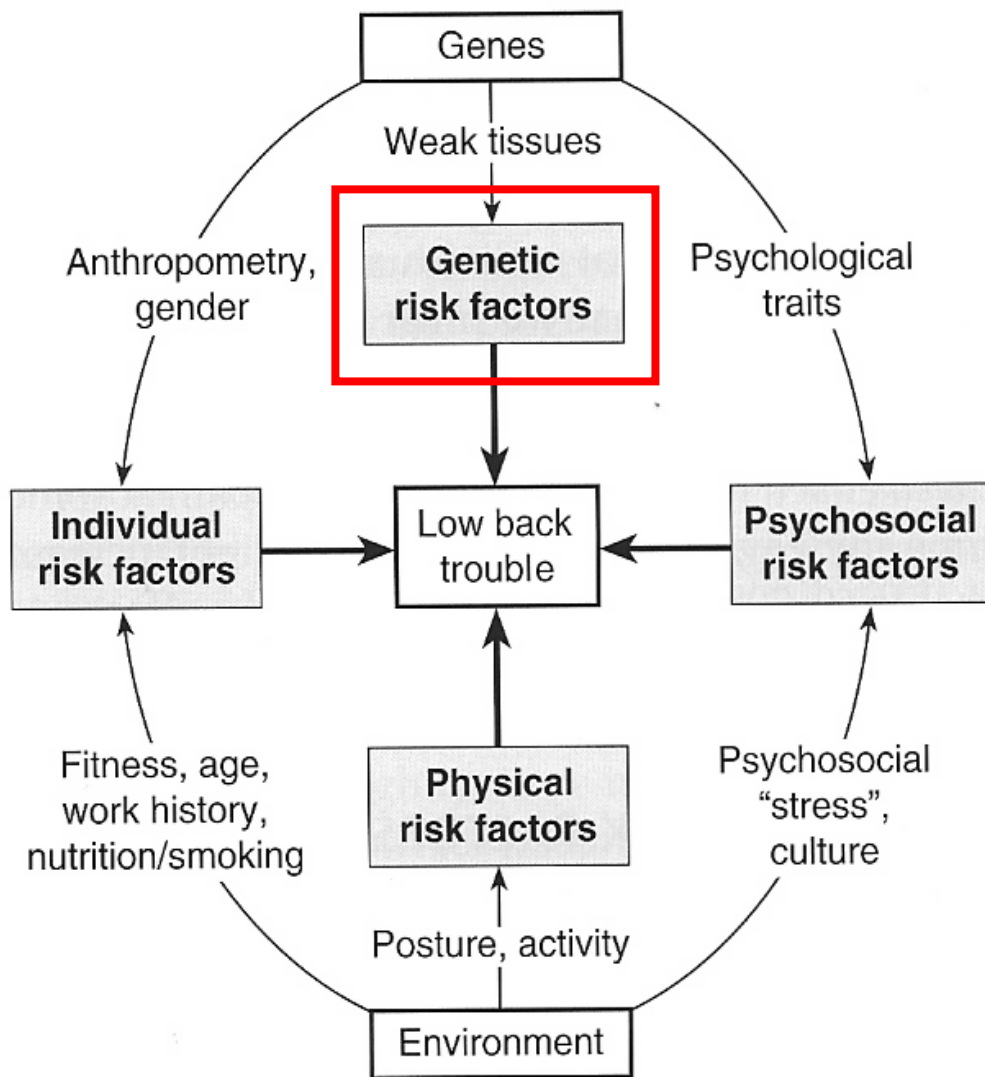


Figure 6.1 Risk factors for low back trouble and the relationship between them. Reproduced with permission from Adams et al (2002).

Causation



Back Pain and Heavy Work: Waddell,
The Back Pain Revolution, 2nd Edition 2004

- **In summary, repetitive strain injury seems to be more of a medicolegal concept than a clinical or pathologic reality.** - Page 104

The Twin Studies

- Michelle Battie and her group from Edmonton and Scandinavia

The Twin Spine Study: Contributions to a changing view of disc degeneration

The Spine Journal 2009; 9: 47-59

BACKGROUND CONTEXT: Disc degeneration was commonly viewed over much of the last century as a result of aging and “wear and tear” from mechanical insults and injuries.

Thus, prevention strategies and research in lumbar degenerative changes and associated clinical conditions focused largely on mechanical factors as primary causes using an “injury model.”

The Twin Spine Study, a research program on the etiology and pathogenesis of disc degeneration, has contributed to a **substantial revision of this view of determinants of lumbar disc degeneration.**

The Twin Spine Study: Contributions to a changing view of disc degeneration

The Spine Journal 2009; 9: 47-59

RESULTS: Among the most significant findings were a **substantial influence of heredity on lumbar disc degeneration** and the identification of the first gene forms associated with disc degeneration.

Conversely, despite extraordinary discordance between twin siblings in **occupational and leisure time physical loading conditions** throughout adulthood, surprisingly **little effect on disc degeneration** was observed.

Studies on the effects of smoking on twins with large discordance in smoking exposure demonstrated an increase in disc degeneration associated with smoking, but this effect was small.

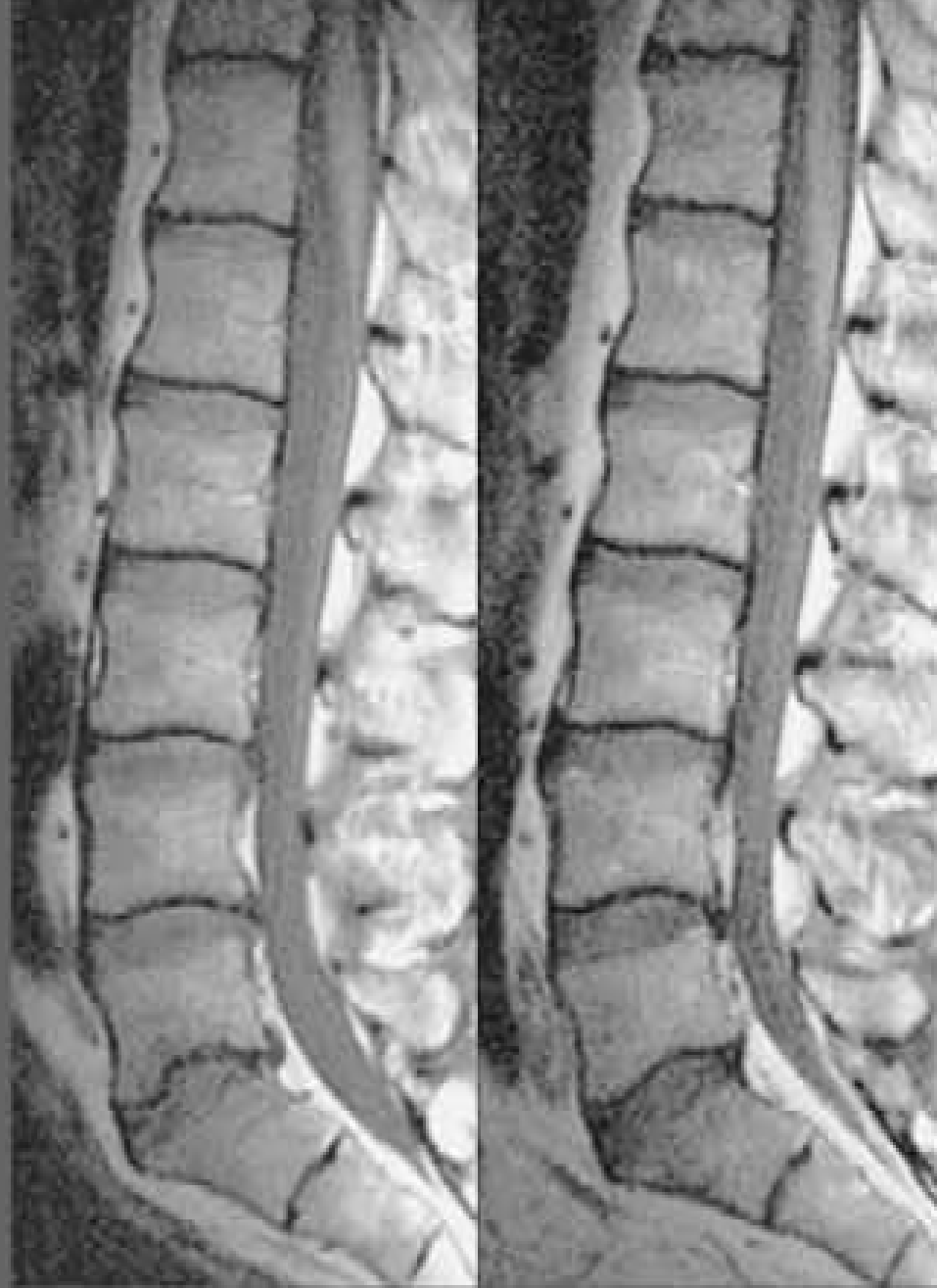
The Twin Spine Study: Contributions to a changing
view of disc degeneration

The Spine Journal 2009; 9: 47-59

No evidence was found to suggest that exposure to whole-body vibration through motorized vehicles leads to accelerated disc degeneration in these well-controlled studies.

More recent results indicate that the **effect** of anthropometric factors, such as **body weight and muscle strength** on disc degeneration, although modest, appear in this work to be **greater than those of occupational physical demands**.

In fact, some indications were found that routine loading may actually have some **benefits** to the disc.



Journalist / Farmer (44-yr old)

Identical Twins Different Occupations

Similar MRIs

The Spine Journal
2009; 9: 47-59

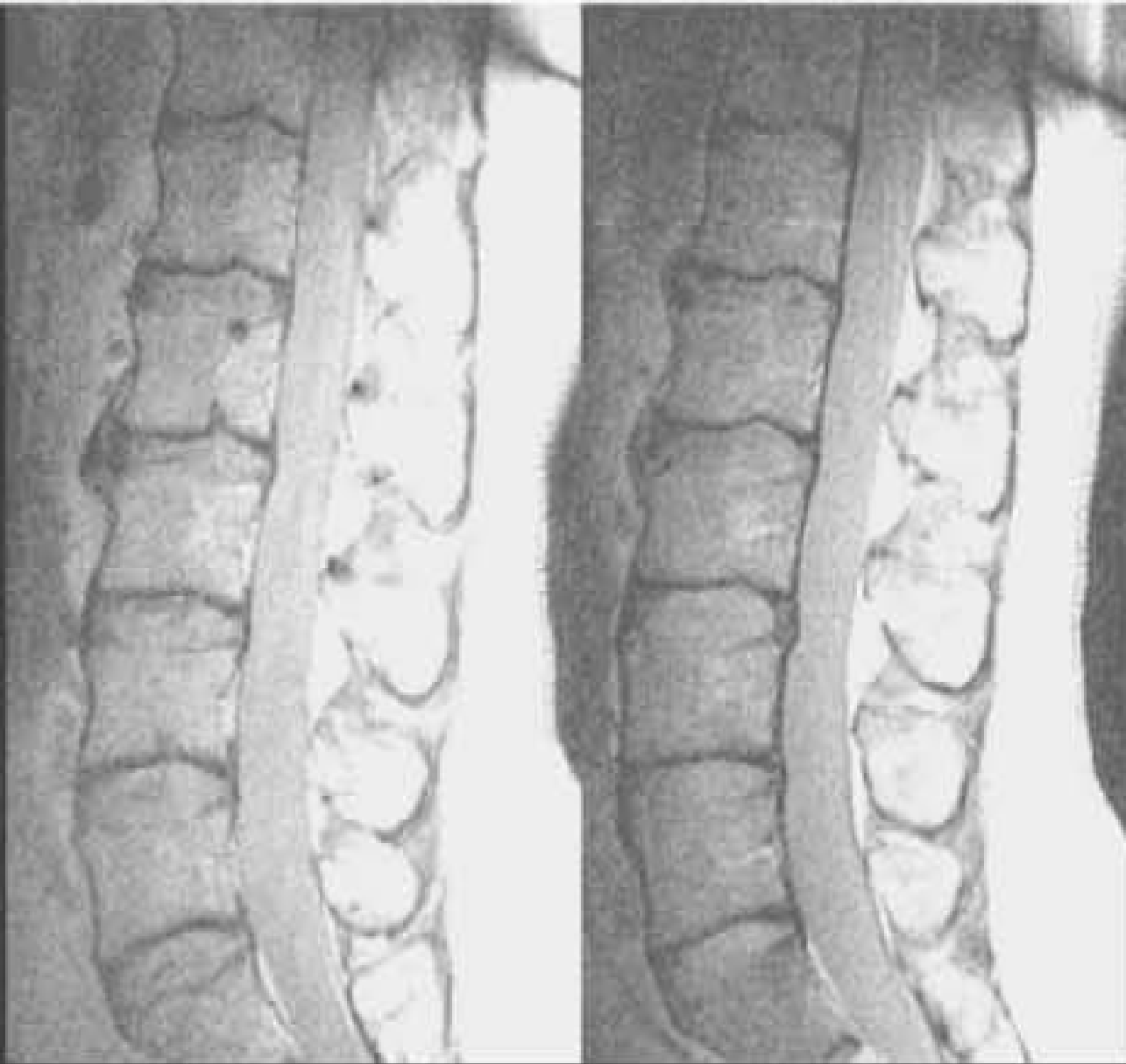
Twins
Different
Occupation
S

Similar
MRIs

The Spine Journal
2009; 9: 47-59



Office worker / Truck driver (56 yrs old)



Identical Twins
Different
Occupations

Similar MRIs

The Spine Journal
2009; 9: 47-59

Typesetter / Farmer (50 yrs old)



Identical Twins
Different
Occupations

Similar MRIs

The Spine Journal
2009; 9: 47–59

Product packager / Taxi driver (49 yrs old)



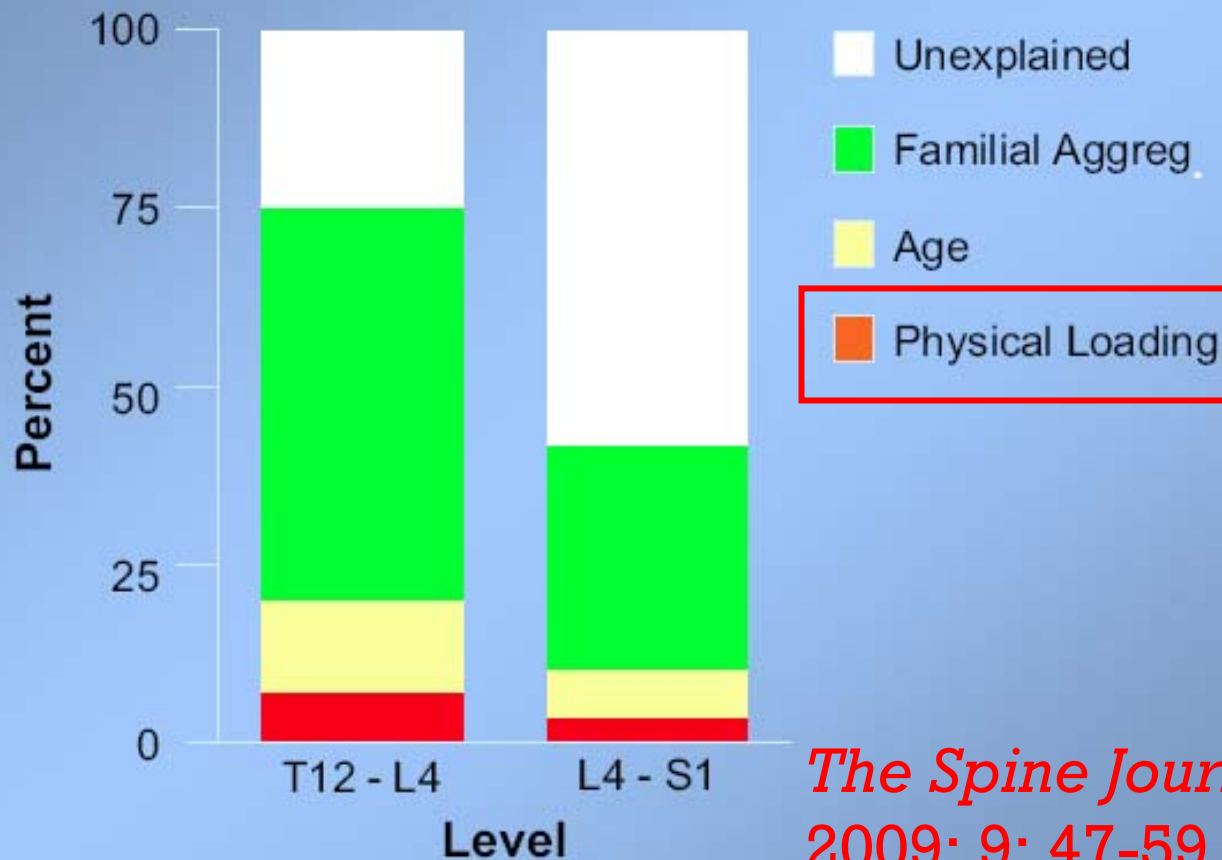
Bus Driver / Carpenter (49-yr old)

Identical Twins Different Occupations

Similar MRIs

The Spine Journal
2009; 9: 47-59

Determinants of Disc Degeneration



The Spine Journal
2009; 9: 47-59

Fig. 7. The variability (adj. R^2) in qualitative disc degeneration summary scores explained by physical loading, age, and familial aggregation (proxy of heredity) demonstrated that significantly more variability remained unexplained in the L4-S1 disc levels. (Modified from *Spine*, Battié et al. 1995 [36]).

Spine 2009; 34 (8): E281-E293

- Dutch SYSTEMATIC REVIEW
- Search strategy, multiple databases
 - High quality prospective cohort studies of working aged adults
 - NON-specific Low Back Pain.

SPINE Volume 34, Number 8, pp E281-E293
©2009, Lippincott Williams & Wilkins

Spinal Mechanical Load as a Risk Factor for Low Back Pain

A Systematic Review of Prospective Cohort Studies

Eric W. P. Bakker, PhD,*† Arianne P. Verhagen, PhD,* Emiel van Trijffel, MSc,†
Cees Lucas, PhD,† and Bart W. Koes, PhD*

Spine 2009; 34 (8): E281-E293

- Dutch SYSTEMATIC REVIEW
- 4487 articles retrieved.
- 18 studies in 29 publications used as the database.
- 24,315 subjects.
- 133 dichotomized exposures.

Spine 2009; 34 (8): E281-E293

- Results show conflicting evidence of the effects of:
 - Heavy physical work
 - Sitting
 - Whole body vibration
 - Bending or twisting
 - Nursing type tasks



ELSEVIER

The Spine Journal ■ (2009) ■

THE
SPINE
JOURNAL

Causal assessment of occupational bending or twisting and low back pain: results of a systematic review

Eugene K. Wai, MD, MSc, CIP, FRCSC^{a,b,*}, Darren M. Roffey, PhD^b,
Paul Bishop, DC, MD, PhD^{c,d,e,f}, Brian K. Kwon, MD, PhD, FRCSC^{d,e,f},
Simon Dagenais, DC, PhD^{a,b,g}

^a*Division of Orthopaedic Surgery, Department of Surgery, University of Ottawa, Ottawa, ON, Canada*

^b*Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, ON, Canada*

^c*Department of Orthopaedics, University of British Columbia, Vancouver, BC, Canada*

^d*UBC Combined Neurosurgical and Orthopaedic Spine Program, Vancouver, BC, Canada*

^e*Vancouver Hospital Spine Program and Acute Spinal Cord Injury Unit, Vancouver, BC, Canada*

^f*International Collaboration on Repair Discoveries, University of British Columbia, Vancouver, BC, Canada*

^g*Department of Epidemiology and Community Medicine, University of Ottawa, Ottawa, ON, Canada*

Received 28 May 2009; accepted 12 June 2009

Wai, The Spine Journal

● Systematic Reviews of:

- Bending and Twisting
 - Conclusions: A summary of existing studies was not able to find high-quality studies that satisfied more than three of the Bradford-Hill criteria for causation for either occupational bending or twisting and LBP. Conflicting evidence in multiple criteria was identified. This suggests that specific subcategories could contribute to LBP. However, the evidence suggests that occupational bending or twisting in general is unlikely to be independently causative of LBP.

Same Group: Published January 2010, vol 10, No 1



The Spine Journal ■ (2009) ■

**THE
SPINE
JOURNAL**

Review Article

Causal assessment of awkward occupational postures and low back pain: results of a systematic review

Darren M. Roffey, PhD^a, Eugene K. Wai, MD, MSc^{a,b,*}, Paul Bishop, DC, MD, PhD^{c,d,e,f},
Brian K. Kwon, MD, PhD, FRCSC^{d,e,f}, Simon Dagenais, DC, PhD^{a,b,g}

^aClinical Epidemiology Program, Ottawa Hospital Research Institute, 725 Parkdale Ave., Ottawa, ON K1Y 4E9, Canada

^bDivision of Orthopaedic Surgery, Department of Surgery, University of Ottawa, 1053 Carling Ave., Ottawa, ON K1Y 4E9, Canada

^cDepartment of Orthopaedics, University of British Columbia, 3114-910 West 10th Ave., Vancouver, BC V5Z 4E3, Canada

^dUBC Combined Neurosurgical and Orthopaedic Spine Program, D6 Heather Pavilion, 2733 Heather Street, Vancouver, BC V5Z 3J5, Canada

^eVancouver Hospital Spine Program and Acute Spinal Cord Injury Unit, D6 Heather Pavilion, 2733 Heather Street, Vancouver, BC V5Z 3J5, Canada

^fInternational Collaboration on Repair Discoveries, University of British Columbia, Blusson Spinal Cord Center, 818 West 10th Ave.,
Vancouver, BC V5Z 1M9, Canada

^gDepartment of Epidemiology and Community Medicine, University of Ottawa, Room 3105-451 Smyth Rd, Ottawa, ON K1H 8M5, Canada

Received 10 July 2009; revised 31 August 2009; accepted 16 September 2009

Wai et. al.: The Spine Journal

- Systematic Reviews of Occupational Posture
 - Conclusions: There was strong evidence from six high quality studies that there was no association between awkward postures and LBP. Similarly there was strong evidence from two high quality studies that there was no temporal relationship. Moreover, subgroup analyses identified only a handful of studies demonstrated only weak associations and no evidence for other aspects of causality in certain specific subcategories. It is therefore unlikely that awkward occupational postures are independently causative of LBP in the populations of workers studied.

Spine 2007; 32 (13): 1406-1413

Videman, Levälahti, and Battié

- A dominant view of disc degeneration has been that disc structures are **damaged** through the **occasional excessive forces** and **cumulative effects of repeated loading**, primarily from **occupational physical demands**.
- **600 men from Finnish Twin Study**

Spine 2007; 32 (13): 1406-1413
Videman, Levälahti, and Battié

- In other words, unlike current views that all loading is detrimental to the spine, routine or repetitive loading may actually have a beneficial effect, delaying disc desiccation associated with aging.

Videman Updated Report: Published January 2010, vol 10, No 1



ELSEVIER

The Spine Journal ■ (2009) ■

THE
SPINE
JOURNAL

2009 Outstanding Paper: Medical and Interventional Science

Challenging the cumulative injury model: positive effects of greater body mass on disc degeneration

Tapio Videman, MD, PhD^{a,b,*}, Laura E. Gibbons, PhD^c, Jaakko Kaprio, MD, PhD^{b,d,e},
Michele C. Battié, PhD^{a,b}

^aThe Finnish Twin Cohort Study, Department of Public Health, University of Alberta, Edmonton T6G 2G4, Canada

^bThe Finnish Twin Cohort Study, Department of Public Health, University of Helsinki, Helsinki 00014, Finland

^cDepartment of General Internal Medicine, University of Washington, Seattle, WA 98195, USA

^dDepartment of Mental Health and Alcohol Research, National Public Health Institute, Helsinki 00300, Finland

^eInstitute of Molecular Medicine, University of Helsinki, Helsinki 00014, Finland

Received 12 February 2009; revised 28 September 2009; accepted 13 October 2009

Videman: Challenging the Cumulative Injury Model - 2010

RESULTS: Higher body weight was associated with 6.2% higher bone density in the lumbar spine, confirming an effective discordance ($p < .0001$). Disc signal variation was 5.4% higher (“better”) among the heavier MZ co-twins ($p = .005$), but the 2.6% higher disc heights and 2.9% higher adjusted disc signals were not statistically significant.

CONCLUSIONS: Contrary to common beliefs, our findings suggest that cumulative or repetitive loading because of higher body mass (nearly 30 pounds on average) was not harmful to the discs. In fact, a slight delay in L1–L4 disc desiccation was observed in the heavier men, as compared with their lighter twin brothers. © 2009 Elsevier Inc. All rights reserved.

Causation problem is also a diagnostic problem



“... and now Nellie will test your hearing.”

Causation problem is also a diagnostic problem

- **No diagnosis** = 85-90 %
- HNP treated surgically = 2 %
- Compression fracture = 4 %
(elderly)
- Spondylolisthesis = 3 %
- Spinal metastases = 0.7%
- Ankylosing Spondylitis = 0.3 %
- Spinal Infection = 0.01 %

• *JAMA 1992; 268 (6): 760-765*

Can we be more specific than just “Non-specific Low Back Pain” ?

- P Kent, et al; Classification in Nonspecific Low Back Pain: What methods do Primary Care Clinicians currently use?
Spine 2005; 30 (12): 1433-1440
- 651 “clinicians” surveyed
 - Physical therapists, chiropractors, osteopaths, and primary care and musculoskeletal MDs
- “Is it possible for you to recognize sub-groups of Non-specific low back pain?”
 - **74 % said “YES”**
 - 4 most common “syndromes” were
 - Facet pain
 - Contained disc
 - Instability
 - Sacro-iliac joint pain

“Can you recognize ...?” (% “Yes”)

Practitioner	Facet Syndrome	Contained Disc	Instability Syndrome	Sacroiliac Syndrome
Physical Therapists	59%	67%	23%	10%
Chiropractors	34%	24%	10%	24%
Primary care MD	20%	11%	1%	11%
Musculoskeletal MDs	27%	18%	3%	18%

“What **Two** signs do you use to Dx?”

Facet	Contained Disc	Instability Syndrome	Sacro-iliac Syndrome
Reduced extension 39% ± 6%	List 31% ± 6%	Mid range catch 45% ± 10%	Asymmetric SI movement palpation 55% ± 11%
Reduced lateral flexion 23% ± 5%	+ SLR 31% ± 6%	Palpated hypermobility 28% ± 9%	SI provocation 29% ± 10%
Palpated hypomobility 20% ± 5%	Pain sitting 29% ± 6%	Recurrent pain 12% ± 6%	Buttock pain 29% ± 10%
Reduced movement 17% ± 5%	Cough, Valsalva 23% ± 5%	Pain standing 11% ± 6%	Leg pain 20% ± 8%
Paracentral pain 12% ± 4%	Extension helps 14% ± 4%	Imaging findings 10% ± 6%	

P Kent, et al; Classification in Nonspecific Low Back Pain:
What methods do Primary Care Clinicians currently use?
Spine 2005; 30 (12): 1433-1440

- **“Conclusions: A lack of consensus among participating clinicians regarding NSLBP subgroups and a lack of evidence for the validity of NSLBP subgrouping are a compelling argument for further research into this clinical practice.”**

Terminology Hinders Communication

“That depends on what your definition
of ‘Sexual Relations’ is”



OR

“That depends on what your definition of ‘Is’ is”

Both Quotes Courtesy of William Jefferson Clinton



ACOEEM Guidelines

2007 Low Back Disorders Chapter Update

- LBP lasting longer than 3 months (12 weeks) is defined in this document as “chronic.”
- Classification of the types of LBP patients studied (e.g., chronic vs. subacute) in interventional studies evaluated in this document use this definition regardless of whether other definitions were used at the onset of chronic LBP (e.g., some use a 6-month duration).
- **Chronic LBP is labeled as “nonspecific” when it is deemed to be not attributable to a recognized, known specific pathology.**

ACOEM Guidelines

2007 Low Back Disorders Chapter Update

- The vast majority of chronic LBP is in the category of **non-specific LBP**.
- There is no scientific consensus that the pain-generating structure can be reliably identified in these pain syndromes.

Included in this category are terms used to attempt to describe these patients with specificity that includes “specific” terms such as:

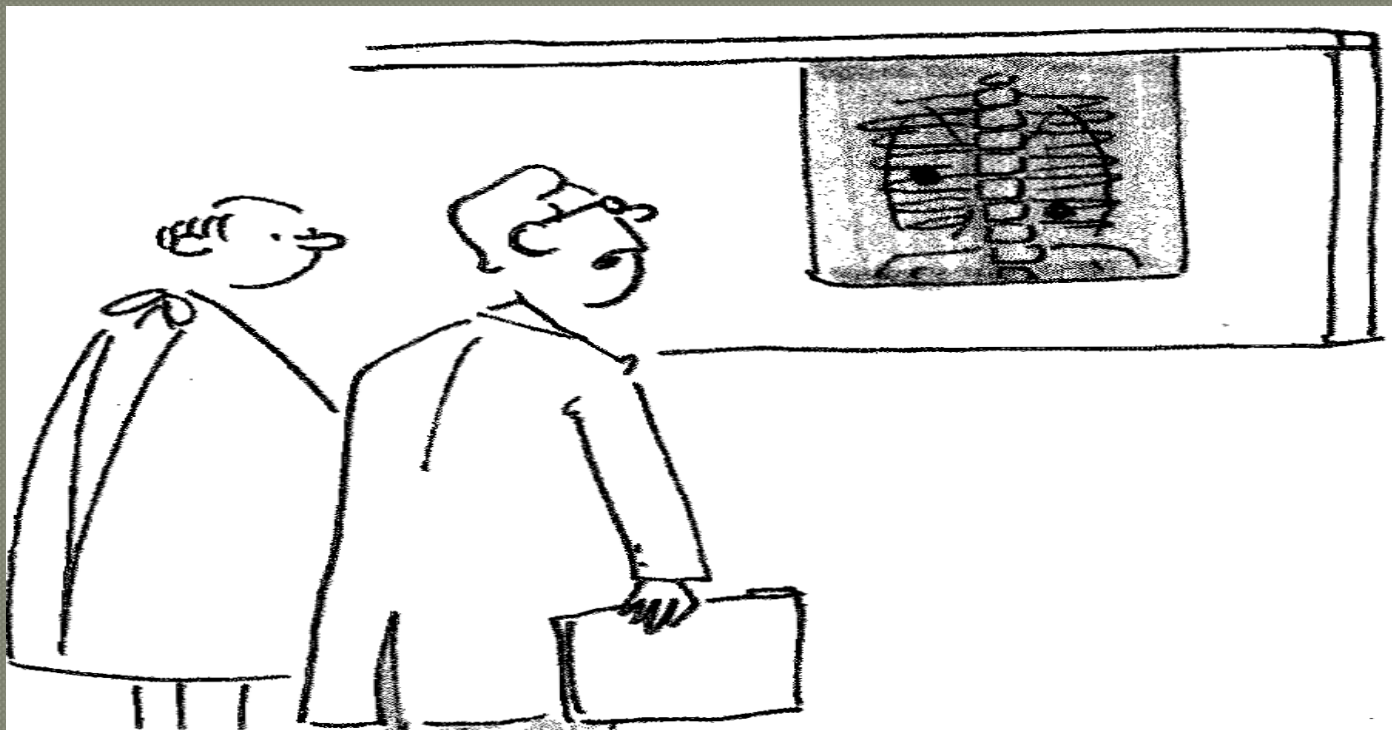
- degenerative disc disease,
- discogenic back pain,
- black disc disease,
- micro instability,
- lumbar spondylosis,
- facet syndrome,
- piriformis syndrome,
- sacroiliac joint syndrome,
- myofascial pain.

ACOEM Guidelines

2007 Low Back Disorders Chapter Update

- There are specific treatments that are used to target these patients and most of these are **not supported** by evidence from high-quality randomized controlled trials (RCTs).
- As the placebo or control populations used in many studies included throughout this document routinely improve, health care providers should not infer that improvement in pain with such treatment is quality evidence in support of a mechanistic theory.

Causation problem is also a radiology “image” problem



**“The good news is it’s not cancer.
The bad news is it’s your testicles.”**

Value of Imaging Studies

- “Spinal Radiographic Findings and Non-specific Low Back Pain: A systemic review of observational studies.” M.W. van Tulder, et. al. *Spine* 1997; 22 (4): 427-434
- 35 observational studies, 18 of which had methodological quality judged as “acceptable or good”.
- Examples:
 - assessment of radiographs (58 % of studies)
 - assessment of LBP status (61 % of studies) was NOT blinded.

Spine 1997; 22 (4): 427-434

- Several potential biases, so associations may be over or under estimated by existing studies.
- “**Even if there is a true association between radiographic findings and degeneration, the strength of the association as expressed by the ORs is not convincing. Further, the temporality of the association was overlooked in most studies. Therefore, we conclude that no firm evidence exists for the presence or absence of a causal relationship between radiographic findings and nonspecific LBP.”**

SPINE 2004; 29 (23): 2679–2690

Table 1. Prevalence of Disc-Related Degenerative Findings on MRI Images of the Lumbar Spine in "Asymptomatic Subjects"

Author, year	N	Age (years) [mean ± SD (range)]	Gender	Bulge	Protrusion	Extrusion	Reduced Signal Intensity	Reduced Disc Height	Annular Tears (HIZ)	Schmorl's Nodes
Salo, 1995	49	8 (0–14)	NA	—	—	—	22%	—	—	—
Gibson, 1986	20	19 (17–21)	50% M	—	—	—	20%	—	—	—
Terti, 1991	39	15	44% M	—	3%	—	26%	3%	—	8%
Paajanen, 1989	34	20 ± 1	100% M	—	—	—	35%	—	—	—
Burns 1996	41	26 (21–31)	100% M	0–10% level	0–32% ^{pe} level	—	0–24% level	—	—	7–15% level
Weinreb, 1989	41	30 (19–40)	100% F	44	—	10%	—	—	—	—
Evans, 1989	59	30	52% M	—	—	—	—	37%	—	—
Schellhas, 1996	17	30 (22–54)	NA	—	—	0%	23%	—	6%	—
Weishaupt, 1998	60	35 (20–50)	50% M	20–28%	38–42%	18%	—	—	32–33%	—
Boos, 1995	46	36 (20–50)	74% M	51%	63%	13%	—	—	—	—
Stadnick, 1998	36	42 (17–71)	56% M	81%	33%	—	55%	—	56%	—
Boden, 1990	67	42 (20–80)	45% M	—	59%	24%	—	—	—	—
Boden, 1996 (L3S1)	67	42 (20–79)	NA	22% discs	—	—	54%	—	9% discs	—
Jensen, 1994	98	42 (20–80)	51% M	52%	27%	1%	—	—	14%	19%
Jarvik, 2001	148	54 (36–71)	78% M	64%	32%	6%	83%	56%	38%	—
Paajanen, 1997	216	(10–49)	51% M	—	—	—	44%	—	—	—
Parkkolla, 1993	60	(30–47)	NA	15% bpe	—	—	—	—	—	—
Danielson, 2001	43	(20–60)	49% M	—	26%	—	—	—	—	—
Hamanishi, 1994	106	(1–82)	NA	—	—	—	—	—	—	9%
Powell, 1986	302	(16–80)	100% F	11–13% bpe	—	—	6–79% age	—	—	—

NA = not available, % disc = % from discs studied; % level = % of subjects at a given intervertebral level; % age = % per age strata; bpe = bulges, protrusions, or extrusions; pe = protrusions or extrusions.

Note: no study of 'asymptomatic subjects' reported on the prevalence of vertebral rim osteophytes.

Longitudinal Assessment of Imaging and Disability of the Back (LAIDBack) study

Spine 2001; 26 (10): 1158-66

- VA population.
- 148 subjects without current low back pain or problems, mean age 36-71.
- 46 % had **NEVER had back pain**, others had had 1-5 episodes of prior pain.
- MRI findings correlated with age and prior episodes of pain by regression analysis.

Spine 2001; 26 (10): 1158-66

Imaging Finding	% overall	% “never had”
Desiccation (\geq Moderate)	83	86
Loss of disc height	56	57
Bulge	64	65
Protrusion	32	35
Extrusion	6	5
Nerve Root Compression	3	3
Annular Tear	38	42
Stenosis (\geq Moderate)	10	7
Facet DJD (\geq Moderate)	18	18

Imaging Conclusion

- **Imaging will not define back diagnoses for epidemiologic studies needed for conclusions about causation, except for:**
 - Major disc herniation with nerve root compression
 - Fracture
 - Spondylolisthesis
 - Inflammatory arthritis/cancer [not injuries]

Causation problem is also
a return to work problem

British Columbia Bureau of WC
Unpublished Systematic Review
donald.krawciw@worksafebc.com

- 1037 articles retrieved
 - 15 articles apply to physical limitations
 - 11 articles apply to medical restrictions
- “No study contained a description of adverse consequences following return to defined levels of occupationally relevant activities.”

If work caused this, does Prevention help

The Spine Journal 2009; 9: 147-168

- Bigos et al. Systematic Review
- 185 retrieved articles, 20 trials met inclusion criteria
- **CONCLUSIONS:** Twenty high-quality controlled trials found strong, consistent evidence to guide prevention of LBP episodes in working-age adults. Trials found **exercise interventions effective and other interventions not effective**, including stress management, shoe inserts, back supports, ergonomic/back education, and reduced lifting programs. The varied successful exercise approaches suggest possible benefits beyond their intended physiologic goals.

Causation problem is also
a money problem



Causation problem is rarely a type of work problem



Thank You

