

Whole Body Vibration

Are there any Substantial Effects on the Human
Spine?

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Whole Body Vibration

- Why discuss WBV?
- Background
- Causality
- Literature
- Controversies
- Cumulative trauma
- Summary/Conclusions

Why a discussion of WBV?

- Litigation from railroad workers (FELA) not WC
- Allegations infer “cumulative loading” caused “LBP”, “degenerative disc disease” and other non-specific conditions
- Other MSK symptoms allegedly caused by WBV include shoulder pain, hip pain, and knee pain
- Science conflicted and weak although the lack of credible science does not dissuade the plaintiff’s bar nor affect jury verdicts
- As an example, a jury concluded that WBV caused isthmic spondylolithesis. This type of decision suggests that legal issues and “junk science” trump known science

Is there a Causal Link between WBV and Specific Low Back Disorders?

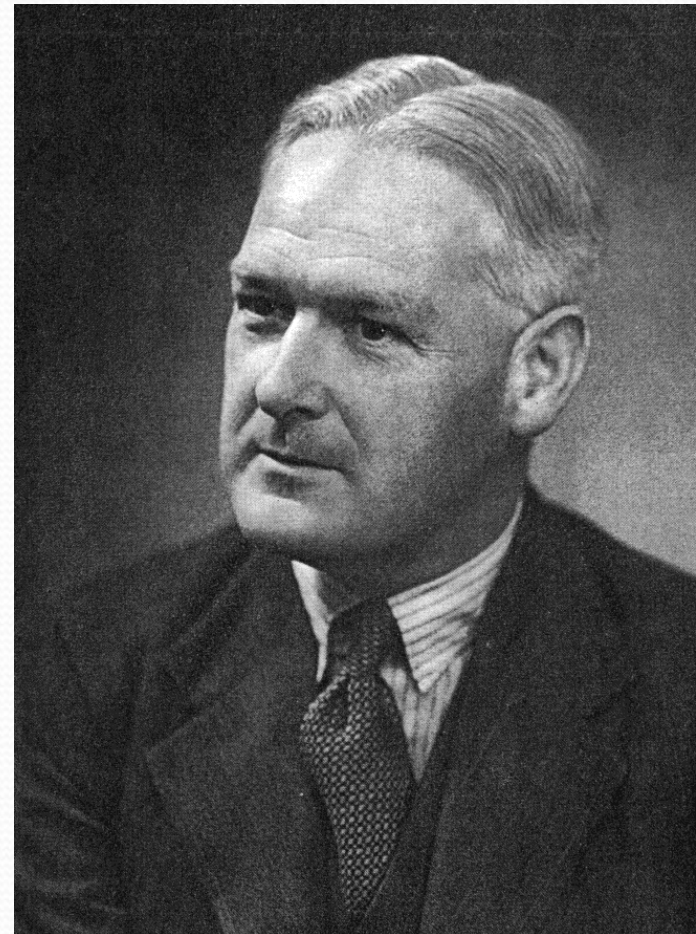
- Where and what is the evidence?
- Causality cannot be established on the basis of cross-sectional studies
- Self-reporting questionnaires are of dubious value with regard to causality
- WBV often linked to symptoms (LBP) rather than to a specific spinal disorder

LBP, DDD, and IDD are not Specific Diagnoses

- These terms refer to symptoms or to conditions with no specificity. They do not constitute a specific spinal disorder
- DDD is not a proxy for LBP
- Symptoms of LBP occur in 80% of the population independent of activity level, vibration exposure or changes in the intervertebral discs noted on MRI
- Not persuasive to conclude that WBV is the “only factor” causing LBP when an employee ages during his/her employment experience
- How can the term “injury” be used when a worker never files a claim for “injury”
- Usual plaintiff strategy in vibration cases (via lawyer) is to file for “cumulative trauma”

How do we establish Causality?

- Bradford Hill's Criteria
- Professor, University of York (1897-1991)
- More information in "Guides to the Evaluation of Disease and Injury Causation" by Melhorn and Ackerman published by the AMA in 2008

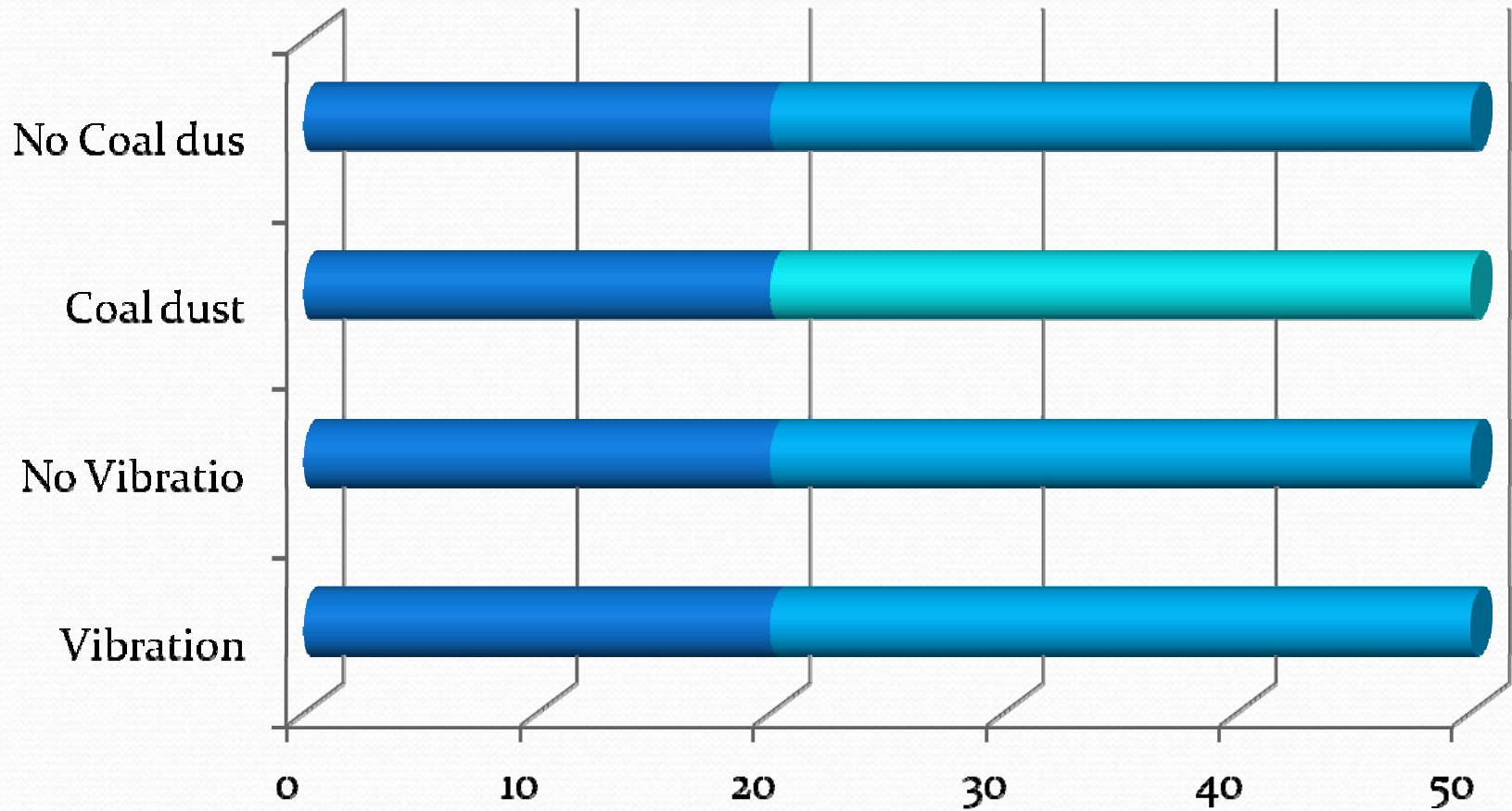


To Establish a Causal Relationship

- Identify evidence of a disease
- Review and assess the quality of epidemiological evidence to consider a causal relationship
- Obtain/assess evidence of exposure
- Consider other factors
- Judge the validity of testimony
- Form conclusion about the work relatedness of the disease in the person

NIOSH, 1979, “A Guide to the Work-Relatedness of Disease”

If the "Factor" is causal then
elimination should result in fewer
cases



Pitfalls in available studies and research on WBV

- Causality criteria not achieved
- Most studies are cross-sectional
- Most use self-reporting of symptoms
- Specific disorders not identified (only symptoms)
- Bias common
- Associations are not causal
- No longitudinal prospective studies to provide clarity
- With regard to railroad locomotives, vibration loads are low level and generally do not meet the levels of concern (VDV) addressed by ISO (2631-5)

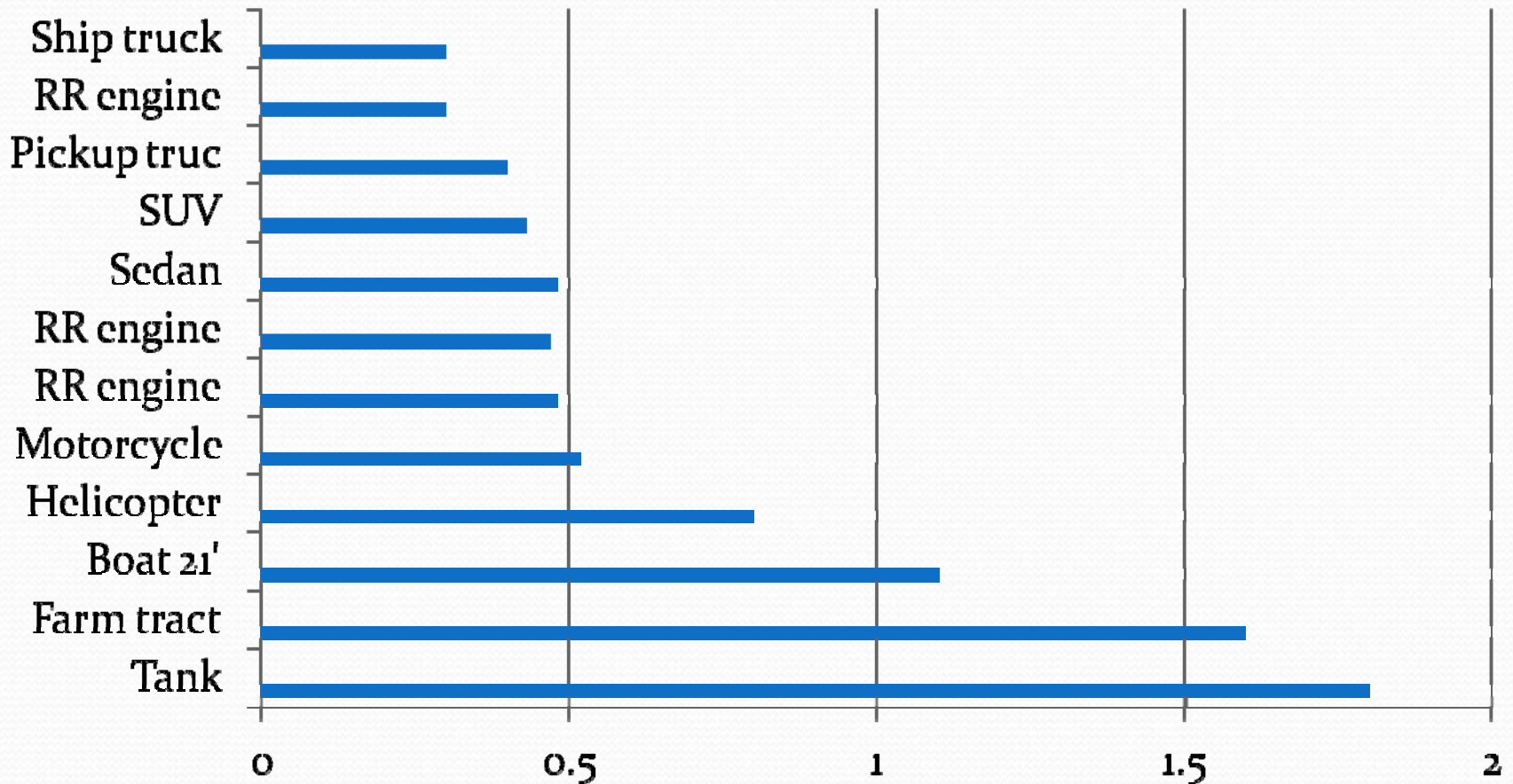
ISO 2631-1 (1997) Root Mean Square (RMS) plus EU Directive

- Daily exposure action (DEA) value of 0.5 m/s^2
- Daily exposure limit (DEL) value of 1.15 m/s^2
- Crest factor (CF) in two or more of the axes (x,y,z) exceeds 9, the VDV analysis is performed as outlined in ISO 2631-1

ISO 2631-1 (1997) Vibration Dose Value (VDV)

- Zone 1 <8.5 VDV units no effect
- Zone 2 8.5 to 17 VDV units caution
- Zone 3 >17 VDV units +/- health risk

RMS (vertical weighted) for various vehicles (Dennis Mitchell, CPE)



WC Board of British Columbia, October 5, 2001 (Chambers, PhD),

- Literature for WBV and LBD is diverse and confusing
- Bias, confounders, and inappropriate scientific “leaps”
- Need prospective, long-term, cohort studies with appropriate metrics
- Cannot conclude that WBV causes LBD

Systematic Review of WBV

- Imaging modalities
- Estimation of WBV exposure
- MEDLINE and EMBASE
- 700 Citations
- Only 7 studies met the inclusion criteria
- No causality established between WBV and any specific spinal disorder

Our paper has been submitted for publication (2/12),
Bible, Choemprayong, O'Neill, Devin, and Spengler

Special Sunday Edition of the NYT September, 2008

Railroad workers' scam (LIRR), receiving large paychecks post retirement
In 2007, 94% of workers who retired after age 50 received disability benefits

In 2004, 97% qualified for disability

Arthritis and rheumatism were primary causes

From 2001 to 2007, LIRR had 753 claims for both arthritis and rheumatism while Metro-North
(similar sized RR) had only 32!

Posted by TJ on trainjotting.com September 21, 2008

Disability “Games”

- Long Island Railroad Workers: 98% retire with disability pensions
- Even white collar LIRR employees were receiving occupational disability pensions
- System is “broken”

Published by a disability lawyer with 20 years experience who stated he never represented a LIRR worker. Troy Rosasco, October 10, 2008.

Update! 3 year followup. NYT 10/27/11, William K. Rashbaum

- 10 arrested in \$1 Billion L.I.R.R. Disability Scheme
- Fraudulent funding to these employees resulted in slashed payments to other government workers such as teachers, police, and others
- Two of the Doctors were orthopaedic surgeons
- Between 1998 and 2008, Dr. A recommended more than 830 LIRR employees for disability
- Dr. L recommended at least 222
- Doctors were paid in cash 800 to 1200 dollars for each “phony” assessment
- The defendants all face a maximum 20 years in prison sentence, if convicted.

Cumulative Trauma

- What is it?
- Why does the assertion of “cumulative trauma” claims with the RR nearly always coincide with “retirement”?
- “Stress” or “fatigue” fracture could fit this definition
- However, stress fractures are symptomatic and easily recognized from radiographs and other imaging studies (e.g. SPECT scan, MRI)
- In most RR cases, the claimant never reports an injury?

Cumulative Trauma

- Can also include hand arm vibration syndrome (HAVS) formerly known as “white finger” syndrome
- A variant of “Raynaud’s” syndrome
- Encountered in individuals who continuously use hand vibrating tools such as “jack hammers”

Cumulative Trauma Disorders and Repetitive Strain injury

- The American Society for Surgery of the Hand believes that the diagnoses of “CTD” and “RSI” are not appropriate and may actually lead the patient to believe that he or she has a condition that is something more than the ordinary aches and pains of life.

Approved by ASSH Council in 1995 and reaffirmed by ASSH Council in 2005.

Wolff's Law or Biologic Adaptation

- Bone remodels according to load applied (elephant vs. bird)
- Human example would be a professional tennis player's dominant arm vs. non-dominant arm
- If the force is excessive then a fracture or a stress fracture may occur (e.g. basketball player). Both of these conditions result in symptoms and a diagnosis
- With regard to low level vibration, there is no immediate and/or visible injury

Impact of “loading” on physical characteristics

Marathon runner



Sprinter



No claim therefore no injury?

- Can we conclude that “major” trauma from WBV would result in a claim for injury since a specific injury would be identified?
- Likewise can we conclude that the lack of a claim by definition implies a “minor” injury or a “minor” event?

Medical-Legal vs. Real World

- Attributing serious LBP complaints to minor trauma events is common in medical-legal arenas.
- Carragee, et al examined the incidence of minor trauma events associated with LBP in a large cohort with defined baseline MRI and clinical variables over an extended period of time.
- Baseline MRI findings (disc degeneration, disc protrusion and annular disruption) did not increase the risk for serious LBP with minor trauma.
- In fact, Carragee, et al noted that minor trauma associated with the least forces were highly correlated with compensation claims or the perception of others being at fault for an accident Spine. 2006, 31(25), 2942-2949.

Medical-Legal vs. Real World

- Most individuals experience these minor events and have excellent resilience with no substantial increase in persisting low back symptoms
- Conversely the issues that adversely affect symptoms include chronic pain, emotional issues, entitlement and the perception of “fault”.
- MRI studies following serious LBP episodes and minor trauma rarely demonstrated new findings.

Carragee et al. Spine 2006, 31(25) 2942-2949

Whole Body Vibration as Therapy

- Reduce LBP
- Improve balance
- Reduce bone loss
- Improve non-specific chronic low back pain (after 12 wk course of low level vibration therapy)

Pozo-Cruz, et al. 2011, J Rehabil Med: Jul. 43(8), 689-694.

Conclusions based on science

- WBV has not been shown to “cause” any specific spinal disorder
- To prove causality, the tenets of Bradford Hill’s criteria must be fulfilled. With regard to WBV the criteria for causality have not been met
- Cumulative trauma is mostly a “bogus” medical diagnosis. Abuse of the term has been recognized by the ASSH
- To prevent financial windfalls based on elusive science would allow optimal compensation and treatment for employees who have well defined injuries and true medical needs

