

Effort-reward imbalance and risk of musculoskeletal injuries among transit operators

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Background

- The model of effort-reward imbalance (ERI) posits that an imbalance between high efforts and low rewards (in terms of salary, promotion prospects, appreciation and respect, and job security) increases risk of ill-health
- Studies have shown that ERI is a risk factor for various health endpoints, including cardiovascular disease and mental disorders
- However, no prospective studies have been published so far on ERI and incident doctor-diagnosed musculoskeletal disorders

Objective

To investigate if ERI predicts incident doctor-diagnosed low back and neck injuries in urban transit operators



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Study participants

- 1,179 San Francisco transit operators, including bus drivers, light rail drivers, and cable car operators
- Time of follow-up: 7.5-years

Data sets used

- Baseline (1993 to 1995) survey and examination on demographics, anthropometric measures and the physical and psychosocial work environment
- Company records on separation covering the period between baseline to February 2001
- Workers compensation database with information on all work-related injuries between baseline and February 2001
- Medical bill file on physician diagnoses (ICD-9 codes) made throughout the history of the claims

Definition and measurement of low back and neck injury

- Only "definite" low back and neck injuries, based on ICD-9 codes, were eligible
- Injuries, which were caused by an acute trauma (burn, open wound, fracture, acts of violence etc.) were excluded

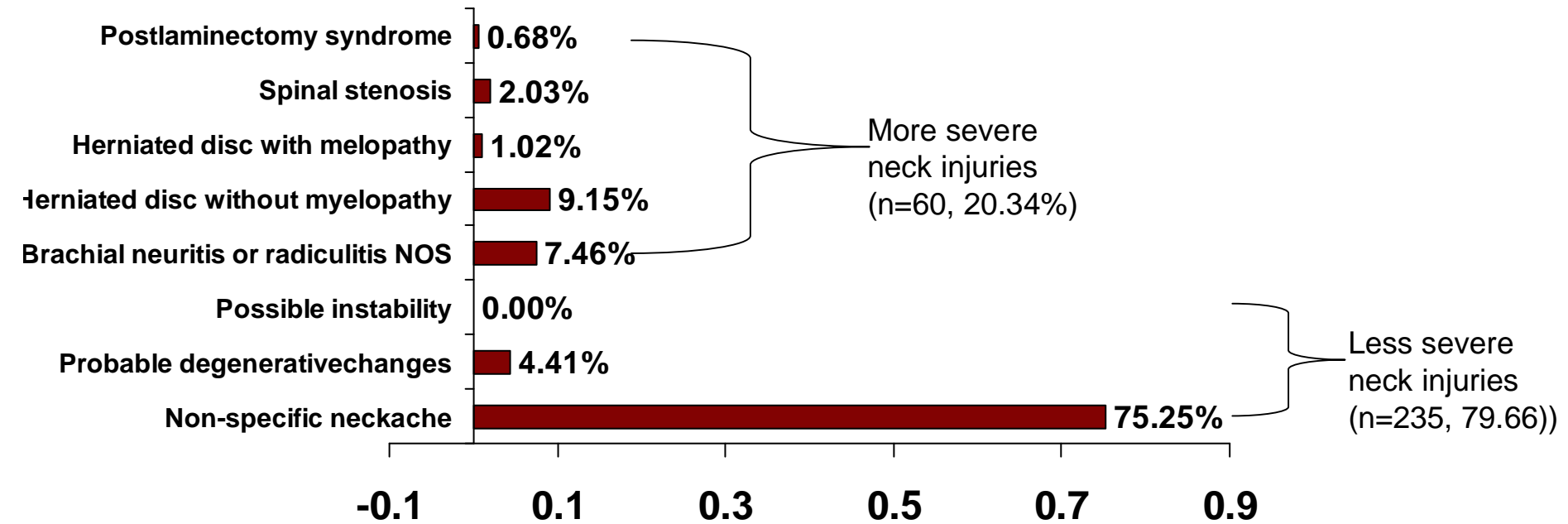
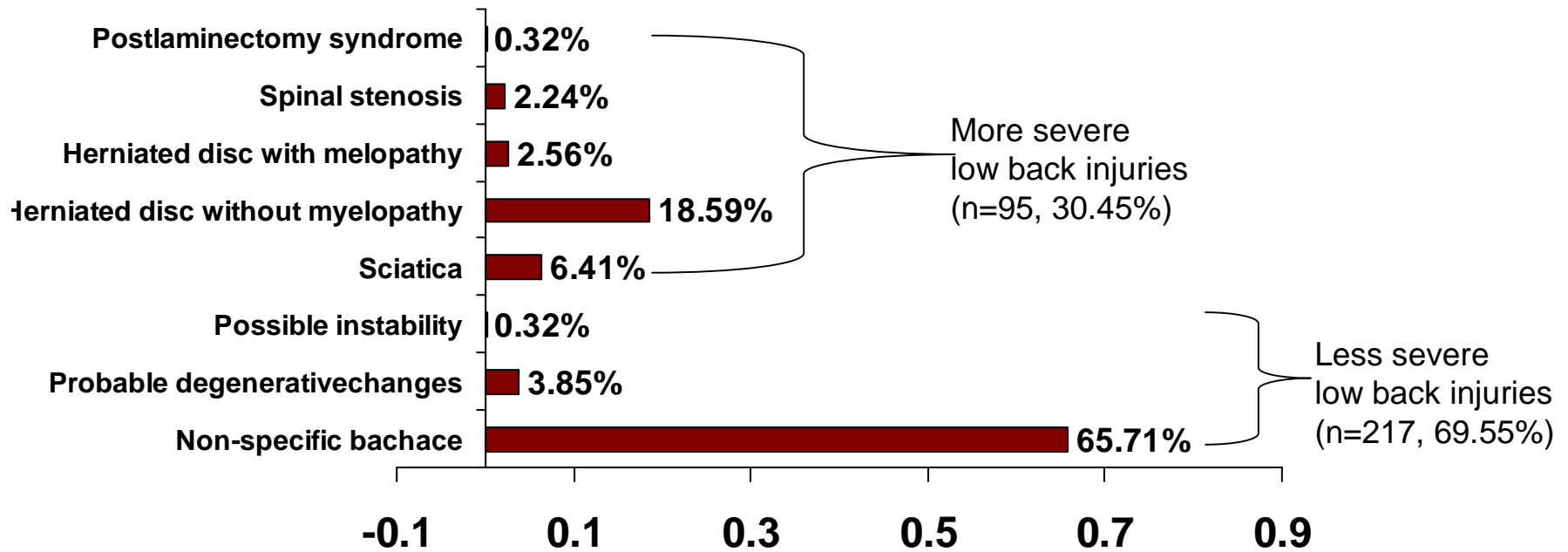
Definition and measurement of ERI

- Because the original ERI questionnaire was not included in the study, we used proxy measures
- **High effort was measured with 4 items:**
 - Spread of shift more than 10 hours
 - Working through recovery time
 - Actual recovery time less than 5 minutes
 - Required to drive without a break for more than 6 hours
- **Low reward was measured with 2 items:**
 - Superintendent/dispatcher paying attention to what I am saying
 - My job security is good
- Effort-reward imbalance ratio was calculated by dividing the effort score through the reward score

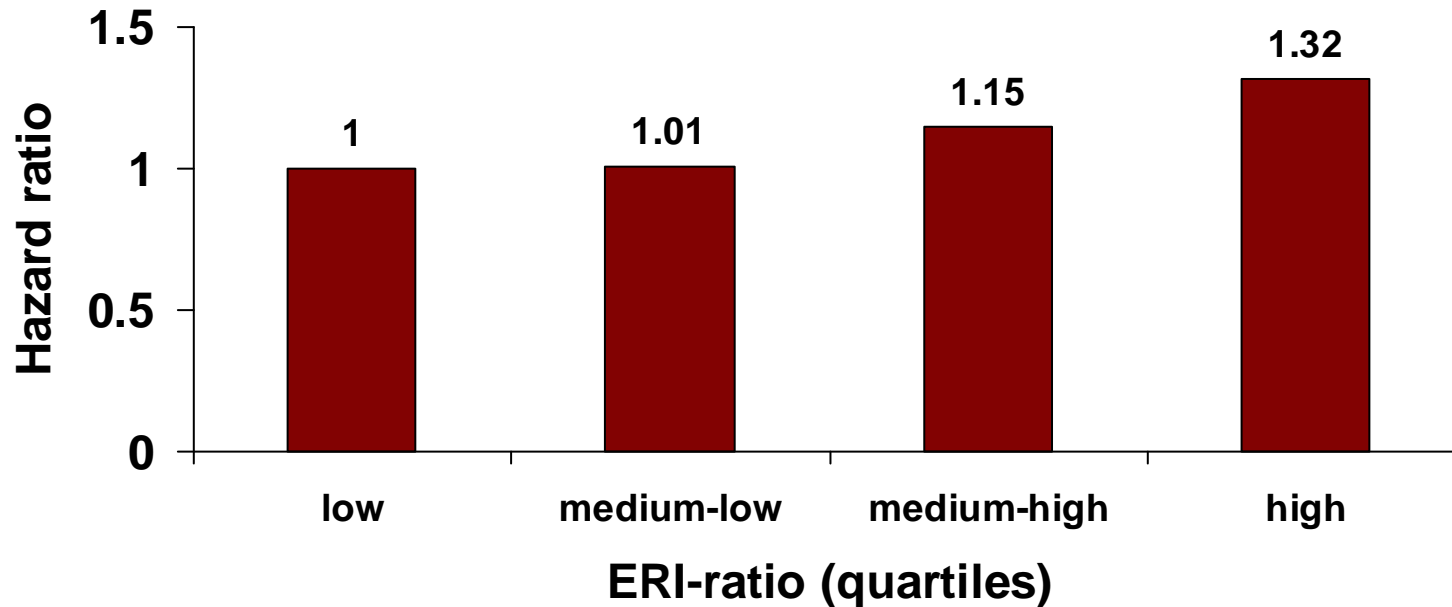
Data Analysis

- Multivariate Cox proportional hazard regression analyses conducted separately for low back and neck injuries
- Analyses were adjusted for: gender, age, height, weight, physical workload (years of professional driving, driving hours per week, vehicle type), ergonomic problems, low back or neck pain at baseline, and job strain
- Note: Job strain and iso-strain had predicted low back and neck injuries in this cohort in previous analyses (Rugulies & Krause, Social Science and Medicine 2005; 61(1):27-39.)

Incidence low back and neck injuries



ERI and risk of low back injury (all low back injuries)



Adjusted for gender, age, height, weight, years of professional driving, driving hours per week, vehicle type, ergonomic problems, low back or neck pain at baseline, and job strain

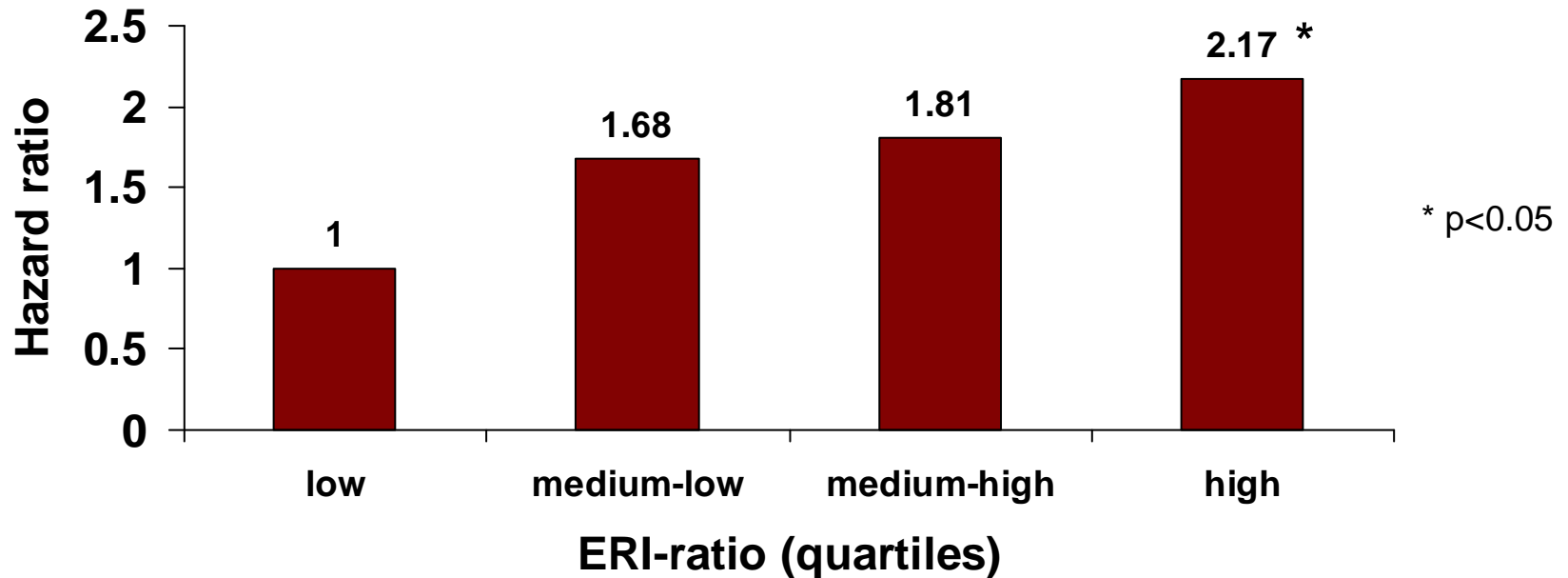


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ERI and risk of low back injury (severe low back injuries only)



Adjusted for gender, age, height, weight, years of professional driving, driving hours per week, vehicle type, ergonomic problems, low back or neck pain at baseline, and job strain

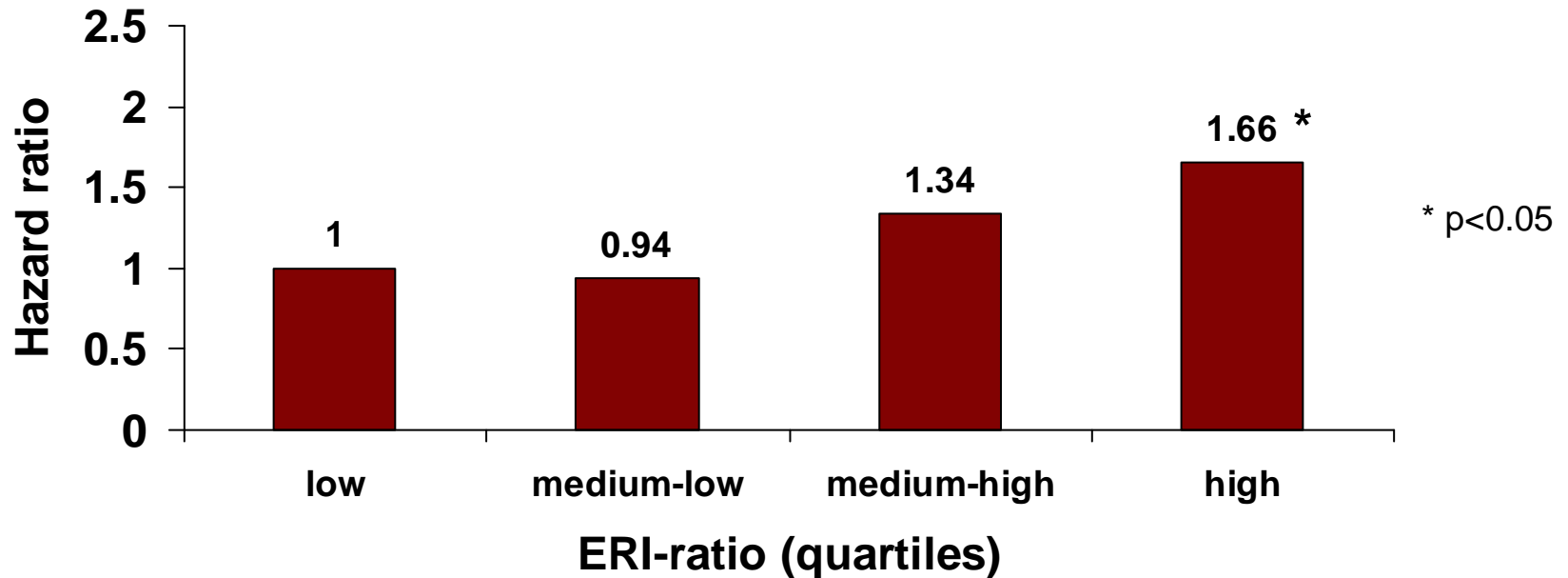


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ERI and risk of neck injury (all neck injuries)



Adjusted for gender, age, height, weight, years of professional driving, driving hours per week, vehicle type, ergonomic problems, low back or neck pain at baseline, and job strain

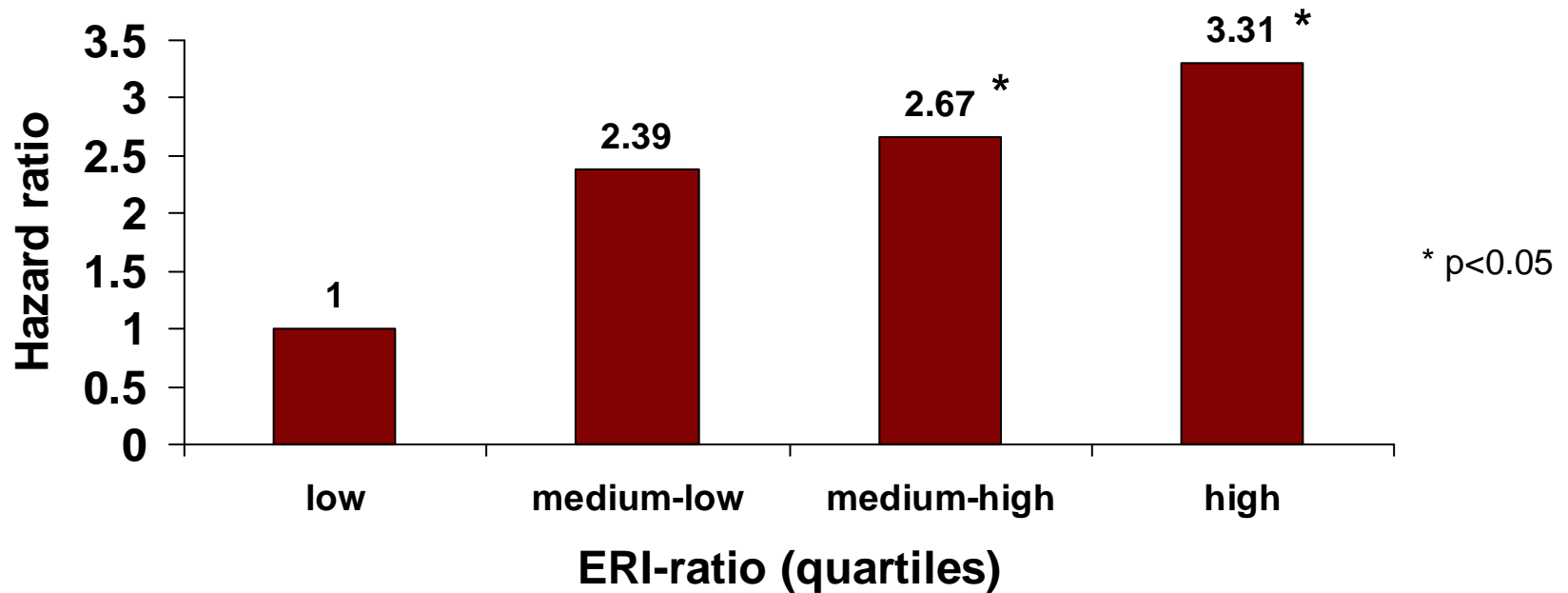


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ERI and risk of neck injury (severe neck injuries only)



Adjusted for gender, age, height, weight, years of professional driving, driving hours per week, vehicle type, ergonomic problems, low back or neck pain at baseline, and job strain



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Summary of results

- ERI predicted incident low back injury and incident neck injury in this cohort of urban transit operators
- The effects were independent of physical and ergonomic workload, pain at baseline, and job strain
- Associations were stronger for more severe injuries

How might ERI affect risk of MSD?

- Psycho-physiological pathway:
 - Sympathetic arousal might increase harmful muscle activity
 - Release of cortisol might increase vulnerability of muscles to mechanical load
- Coping pathway:
 - Drivers with high ERI might not have more injuries, but they might file more workers' compensation claims in order to improve the balance between effort and rewards
- However, coping pathway seems unlikely because
 - all claims were accepted claims, i.e. the injury was diagnosed by a doctor and assessed as work-related by workers' compensation authorities
 - ERI was more strongly related to more severe injuries (e.g., herniated disc), which were objectively verifiable through clinical and objective tests

Thank you!

The results are published in:

Rugulies, R. & Krause, N. Effort-reward imbalance and incidence of low back and neck injuries in San Francisco Transit operators. Occupational and Environmental Medicine 2008; 65(8):525-533

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This presentation can be downloaded from the homepage of the research group “Psychological health and well-being at work” (PIWA) at NRCWE

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