

Roffey DM, Wai EK et al. Causal assessment of occupational standing or walking and low back pain: results of a systematic review. Spine J 2010; 10:262-272

Design Systematic review of observational studies

## PICOS

- Population: Currently employed workers in a variety of industries
- Intervention (exposure): occupational standing and walking
- Comparison exposure: lower levels of occupational standing and walking
- Outcome: low back pain by self-report
- Study types: Articles published in English or French related to occupational standing or walking in relation to low back pain
  - o Exclusion criteria included studies with no measures of exposure or outcome, studies related to only the treatment or social costs of LBP, biomechanical and cadaver studies, and studies of only whole body vibration or only psychosocial factors

Study selection:

- Databases were MEDLINE from 1966 to August 2008, EMBASE 1980 through November 2007, and CINAHL from 1982 to November 2007
- Review also included unpublished studies from professional conferences, government occupational safety databases, and a general internet search for related materials
- Two reviewers independently screened articles for inclusion and for quality assessment, using quality considerations for case-control and cohort studies
  - o Exposed cohort was representative
  - o Selection of nonexposed cohort
  - o Ascertainment of exposure
  - o Demonstration that LBP was not present at the start of the study
  - o Study analysis controls for at least one non-work related risk factor
  - o Study controls for two or more confounding factors
  - o Assessment of LBP
  - o Adequate length of followup
  - o Adequacy of response rate and completeness of followup
- Causation criteria were based on commonly accepted considerations
  - o Strength of association
  - o Dose response

- Experiment
- Temporal relationship
- Biological plausibility

#### Results:

- 2766 electronic citations yielded 275 for a first level of screening; of these, 18 studies, with 31,810 subjects, satisfied the inclusion/exclusion criteria, and 5 studies with 5309 subjects were considered high quality
- A “strong” association was defined differently according to the measure of effect in the study
  - For studies reporting an odds ratio, an OR of  $\geq 4.0$  was strong, moderate was an OR from 2.5 to 3.9, and weak was 1.0 to 2.4, and a protective effect was inferred for an  $OR < 1.0$
- Among the 18 studies, a total of 84 estimates were assessed for association between standing/walking and LBP; 21 of these (25%) were statistically significant; 11 of the 21 were weak, 5 were moderate, 2 were protective, and 3 did not provide a numerical estimate of association
  - None of the 84 reported associations was strong in favor of standing/walking and LBP
  - When only the 5 high quality studies were considered, one risk estimate for standing and LBP was statistically significant, but the association was weak and conflicting
    - One high quality study reported a dose-response measurement, which was not supportive of a dose-response relationship
  - Two of the high-quality studies reported on walking and LBP, both of them case-control studies in nurses; neither reported a statistically significant relationship between walking and LBP

#### Authors’ conclusions:

- Occupational standing and sitting did not meet accepted criteria for causation with respect to LBP
- Walking and sitting often occur outside occupational settings, and it is desirable to control for this exposure when possible; however, none of the studies considered non-occupational walking and sitting
- Future studies should focus on specific types of walking and standing, such as on uneven or slippery surfaces
- The prevalence of LBP in this review was 43% across all studies
- Case-control studies are poorly equipped to examine causal relationships, due to lack of clarity in defining temporality and in susceptibility to recall bias

- It is unlikely that occupational standing or walking are independently associated with LBP

Comments:

- Even though the selected studies are vulnerable to various biases, not all of the potential biases are expected to undermine the findings of the review
  - o For example, recall bias in case-control studies is more likely to inflate than to underestimate the association between exposure and disease
  - o Since the case-control studies did not find a significant relationship between exposure and LBP, it is unlikely that a significant relationship was overlooked
- The authors repeatedly refer to Bradford Hill “criteria” for causation; however, Bradford Hill never referred to his viewpoints as criteria, and the common misuse of his framework for causality should be avoided
- Although not listed among the Bradford Hill considerations of causality, consistency of findings in different settings and study designs was probably met in this review
- The high prevalence of LBP (43%) means that occupational associations with occurrence of new onset LBP are not likely to be discovered even if they are present in the population
  - o One of the included studies (Andersen 2007) was done on a cohort of workers free of LBP at the onset of the study, and found an odds ratio for LBP of 0.9 for sitting more than 30 minutes an hour
  - o The same study did estimate an odds ratio of 2.1 for standing more than 30 minutes per hour, which is considered a weak relationship

Assessment: Will support a statement that there is good evidence that walking and standing in the workplace are not causally associated with the occurrence of LBP, and some evidence that sitting is not associated with LBP

Reference:

Andersen JH, Haahr JP, Frost P. Risk Factor for More Severe Regional Musculoskeletal Symptoms. *Arthritis Rheumatism* 2007;56(4):1355-1364