**Cote P, van der Velde G, et al. The Burden and Determinants of Neck Pain in Workers. J Manipulative Physiol Ther 2009;32:S70-S86.**

Design: systematic review of observational studies

Brief summary of findings:

- The authors searched MEDLINE from 1980 through 2006 for articles on neck pain and associated disorders such as cervicogenic headache and referred pain syndrome into the arm and upper back in workers
    - Studies were considered relevant if they studied at least 20 workers and pertained to the prevalence, incidence, risk factors, or prevention of pain in the neck/shoulder area
    - Studies were excluded if they were about neck pain from serious local pathology or local disease, such and infection, fracture, inflammatory diseases, and tumors
- Quality was assessed using methods outlined in Carroll et al 2008, which pulls together quality assessment tools for a variety of study designs
- The methodology recognized three phases of an analytical approach to the relationship between neck pain and possible risk factors
    - Phase I: Descriptive, hypothesis-generating investigations of crude associations between single factors and neck pain
    - Phase II: Exploratory studies (not designed to test hypotheses) which use stratified or multivariable analyses to identify risk factors for neck pain
    - Phase III: Hypothesis-driven and confirmatory studies which attempt to confirm or refute hypotheses about possible relationships between risk factors and neck pain, after adjusting for potential confounders
- Four levels of evidence were distinguished, depending on the phase and consistency of findings:
    - Preponderance of evidence: At least one Phase III and one Phase II study agree on the strength and direction of an association, suggesting that a risk factor is associated with neck pain occurrence in workers
    - Evidence: A single Phase III study reports an association
    - Preliminary evidence: At least one Phase I or one Phase II study suggests an association, but the association is  not confirmed by a Phase III study
    - Evidence varies: Multiple studies of similar quality do not agree on the presence or direction of an association

- For many possible risk factors, the authors reported preliminary evidence, variable evidence, or no evidence
    - There was no evidence (not evidence against) degenerative changes in the cervical spine and the incidence of neck pain
- There was a preponderance of evidence that neck pain increases with age
- There was a preponderance of evidence that a history of musculoskeletal pain in the neck, lower back, and upper extremities increased the risk of neck pain in workers
- For exposures in the workplace, several factors were considered
    - For job strain, there was a preponderance of evidence that high levels of psychological job strain increases the risk of neck pain
        - Jobs with high quantitative demands, low latitude/decision authority, and low support from co-workers had elevated risks of developing neck/shoulder symptoms
        - The relative risks were mostly in the region of about 2.0 and many had confidence intervals which included the null value
    - For prolonged work in a sedentary position, there was a preponderance of evidence that sitting more than 95% of the time doubled the risk of neck/shoulder symptoms
    - There was a preponderance of evidence that repetitive or precision work on a daily or almost daily basis increased by 30-40% the probability that a worker would report neck pain at least three days per month

Authors' conclusions:

- Neck pain is endemic in workers in the industrialized world; each year, at least 5% of workers will develop frequent or persistent neck disorders, depending on their occupations
- Most neck pain in workers is nontraumatic and its etiology is multifactorial
    - Therefore, it is unlikely that prevention strategies targeting a single risk factor will reduce the occurrence of neck pain in the workplace
        - This may explain why interventions which targeted computer workstations and postures failed to reduce the incidence of neck pain in settings where they were tried
- No single risk factor is sufficient to cause neck pain; combinations of risk factors are necessary to cause neck pain, and the specific combinations are likely to vary between workers
- Neck pain results from complex relationships between age, previous musculoskeletal pain, quantitative job demands, social support at work, low physical fitness, poor computer workstation design and work posture, repetitive and precision work, and prolonged sedentary work position

- Many risk factors (such as job strain) are themselves the consequences of previous risk factors such as type of occupation and how well workers cope with job demands
    - Neck pain follows a recurrent course, and risk factors present at one time may be outcomes of risk factors from a previous time
- Two basic *types* of risk factors lead to neck pain: those *inherent* to the worker (demographics, prior health, health behaviors, occupation) and *workplace* factors (psychosocial exposures, physical exposures, and how the worker copes with stress at work)
- Neck pain is an important source of disability, but most workers remain at their jobs despite reporting neck pain
- Specific workplace exposures, both physical and psychosocial, are risk factors for neck pain, but their effects are small and nonspecific; a single exposure is not likely to cause neck pain on its own

Comments:

- The criterion of "preponderant" evidence, the highest level designated by the authors, can be met by studies which demonstrate small and statistically non-significant effect sizes, as long as the study was hypothesis-driven and adjusted effect sizes for one or more confounders
- Consequently, even the highest level of evidence may be of limited clinical significance
- The authors' discussion section is well-argued, well-supported, and summarizes clearly the principle that multifactorial problems are not amenable to solutions which target single risk factors
- The primary literature presents familiar problems with definitions of common psychosocial workplace factors (high-demand, low-latitude, social support) which may be important in predicating neck pain event even though their measurement is imprecise and often unclear
- The article consist of two separate documents: the article itself and the data supplement, which shows the individual studies and the risk factors they considered
- The methods document the authors cite (in Carroll et al 2008) appears to be based on reasonable current criteria for the evaluation of the quality of medical evidence, but it is not clear which Phase III articles were considered to be of particularly high quality to support the "preponderance of evidence" judgments of risk factors
- Collectively, the central conclusion that neck pain is multifactorial and that narrowly-targeted workplace interventions are likely to fail is supported by enough evidence to qualify as strong
- The main focus of the article is less on establishing causality for purposes of determining work-relatedness of neck pain, and more on the kinds of consideration needed to plan and implement effective workplace ergonomic and other interventions

- Sedentary (sitting) work would likely appear to be a risk factor not by itself, but by association with other factors such as tasks requiring prolonged neck flexion

Assessment: A high-quality systematic review supporting strong evidence that neck pain in the workplace is multifactorial, that a combination of workplace and individual factors is necessary to cause neck pain. Adequate for some evidence that repetitive or precision work are likely risk factors for neck pain in the workplace, with prolonged neck flexion as an associated biomechanical factor

Reference:

Carroll LJ, Cassidy JD, et al. Methods for the Best Evidence Synthesis on Neck Pain and Its Associated Disorders. Spine 2008;33(4S):S33-S38.