Hoogendoorn WE, Bongers PM, et al. High physical work load and low job satisfaction increase the risk of a sickness absence due to low back pain: results of a prospective cohort study. Occup Environ Med 2002;59:323-328.

Design: Prospective cohort study

Population/sample size/setting:

- 732 workers (25% women, mean age 36.4) recruited from 21 companies in the Netherlands for a study of factors associated with absence from work
- Participating companies were asked to select workers who had been in their current jobs for at least one year and were working at least 24 hours per week
- The purpose of the study was to measure psychosocial factors and physical load demands of the jobs for possible association with later work absence due to low back pain

Main outcome measures:

- In 1994 and 1995, participants completed a questionnaire and had a physical examination, which measured body mass index
- Questionnaire asked about age, sex, smoking, exercise habits, and coping skills
- Psychosocial work characteristics were assessed by questions about quantitative job demands, decision authority, skill discretion, supervisor support, and coworker support
- About 2/3 of the workers were production workers in various industries, and about 1/3 were office staff or computer software workers
- Physical load factors were trunk flexion, trunk rotation, and lifting of loads in workplace
    - Four video recordings were made randomly during the course of one work day, each lasting 10-14 minutes
    - Project assistants who made the recordings classified all workers into groups with similar tasks and physical loads
    - Analyses of posture, movement, and force exertion were done on one in four workers by observations of the video recordings, and the mean values for flexion of the trunk, rotation of the trunk, and force exertion were assigned to all workers in the same group
- Trunk flexion was classified into four categories: neutral (<30°), mild flexion (30-60°), extreme flexion (60-90°), and very extreme flexion (>90°)
- Trunk rotation was classified as neutral (<30°) and twisting (>=30°)
    - The percentage of time spent in trunk rotation was based on multi-moment observations from the video recordings
- The video recordings also were the basis for assessment of the number of times workers lifted a load of any weight, or a load of at least 10 or 25 kg during a working day; the number of lifts during the 10-14 minutes of video was extrapolated to the number of lifts during an 8 hour day

- Main outcome was the number of sickness absences lasting at least 3 days due to low back pain between study entry and the end of 1997, based on physician coding of the Dutch version of ICD-9
    - The number of such absences during the follow-up period was computed, with the overall person-time at risk calculated in person-years
    - Workers with less than 6 months of follow-up were excluded from the analysis (n=20); workers with 3 days of low back pain absence in the 3 months before baseline measurement (n=30), as were workers with missing data on the reasons for work absence (n=42)
- Analysis of data was done by multivariable Poisson regression, with psychosocial factors and physical load factors as the major variables of interest
- Correlation between physical and psychosocial factors was low (<0.3), but correlation between work-related physical factors was higher >0.5
- 149 workers had at least one work absence due to low back pain during the follow-up period; 100 were absent once, 34 were absent twice, 14 were absent three times, and one was absent four times
- Men had twice the rate of absence (11.35/100 person-years) as women (5.82/100 person-years); the rate of absence did not appear to depend on age group (12.4/100 p-y in the 18-25 group and 10.5/100 p-y for age >45)
- Some physical factors were associated with work absence
    - Trunk flexion was associated with work absence, and a dose-response relationship was found in a regression model which adjusted flexion for other risk factors
        - Using the neutral trunk posture as the reference group, the group with 5% of the working day in extreme flexion had 2.65 times the risk of the reference group for back pain absence
    - Trunk rotation was not associated with work absence when rotation was adjusted for the other risk factors in the regression model
    - Lifting was associated with work absence; the group with the highest lifting exposure (>15 times lifting >25 kg) had 3.81 times the rate of work absence as the reference group with no lifting; when this was adjusted for other risk factors, the rate ratio was reduced to 2.18
- The analysis of psychosocial factors showed a relation with work absence only for low job satisfaction; the least satisfied group had 1.95 times the rate of absence as the most satisfied group
- Additional analyses were done, with rate ratios reported for long work absence (<7 days); in these analyses, trunk flexion, trunk rotation, and lifting were all associated with long work absence, and these elevated rate ratios remained significant when adjusted for the other risk factors in the regression model
- The possibility of a healthy worker effect was tested by doing a separate analysis on workers employed less than 5 years at baseline (n=265); the adjusted absence rates were generally higher in this group than for the analysis of the entire cohort (n=635)

Authors' conclusions:

- Trunk flexion, trunk rotation, and lifting at work were associated with an increased risk of work absence due to back pain
- No increase in risk was found with increased frequency of lifting, or with increasing weight of the load being lifted
- There may have been a healthy worker effect in the entire cohort, since workers with shorter work histories had higher rates of absence due to back pain than did the cohort as a whole
- Due to strong correlation between flexion and rotation of the trunk, independent effects of these exposures could not be assessed
- The estimates of risk factors may have been influenced by the fact many eligible workers did not give consent to participate in the study, and these workers had a higher rate of recent back pain and higher exposure to physical factors at work than did the workers who agreed to participate (data not shown); this may have obscured accurate estimation of a dose-response relationship with trunk flexion/rotation and work absence
- These findings are consistent with other reviews of low back pain in workers, with trunk flexion/rotation, manual material handling, and low job satisfaction as risk factors for low back pain
- The results suggest that high physical load is more strongly associated with low back pain absence than high psychosocial load, and decreasing the physical load at work may prevent work absence from back pain

Comments:

- There are several sources of measurement error for work exposure; it appears that exposures for an entire group of workers were estimated from examining videotape for only one in four members of that group
    - However, imprecision in exposure measurement is more likely to underestimate than to overestimate the relationship between work exposures and sickness absence outcomes
    - The reported risks are therefore unlikely to be inflated
- Table 1 shows no relationship between age and work absence, a relationship which might be expected
    - However, there is no reported relationship between age and physical work load; if older workers are more likely to be in supervisory positions and if younger workers are more likely to be in jobs requiring twisting and lifting, the lack of an age association is not surprising
- The tables presenting the results of the Poisson regression models are somewhat unclear, but the analyses are appropriate
    - These tables make it appear that Poisson regression is being done on numbers of work absences, not on numbers of workers
    - Poisson regression is not appropriate for work absences, since it assumes that all of the observations are independent, and this is not

true (the occurrence of a work absence is likely to depend on whether or not an earlier work absence has occurred)
    - However, it can be inferred from the tables that work absences are not used for the Poisson models, since the crude rate ratios reported in the tables are slightly different from the ratios that can be calculated manually
        - For example, in Table 2, for the percentage of working time with trunk rotated >30°, the manually calculated RR is 1.39, and the crude RR in the table is 1.65
        - This discrepancy shows that the ratios in the tables are not calculated from work absences, despite appearances to the contrary
        - This in turn means that the ratios in the table are probably based on workers rather than on absences, and therefore can be accepted as they are reported
- Both exposure and outcome are reported in terms which do not entirely depend on recall and self-report; the exposure is measured by videotape and the outcome by work absences in company records; this helps to control many of the common biases that accrue when exposure and outcome are based on self-report
- The authors measured correlations between factors such as trunk rotation, trunk flexion, and load lifting; this explains why these factors may not appear to be independently predictive of back pain
    - Since work-relatedness of back pain has been challenged on the basis of a lack of independent predictiveness of work factors, this study answers some objections to work-relatedness based on this lack of independent predictiveness

Assessment: Adequate for evidence that trunk flexion, rotation, and lifting in the workplace are associated with an increased risk of work absence due to low back pain