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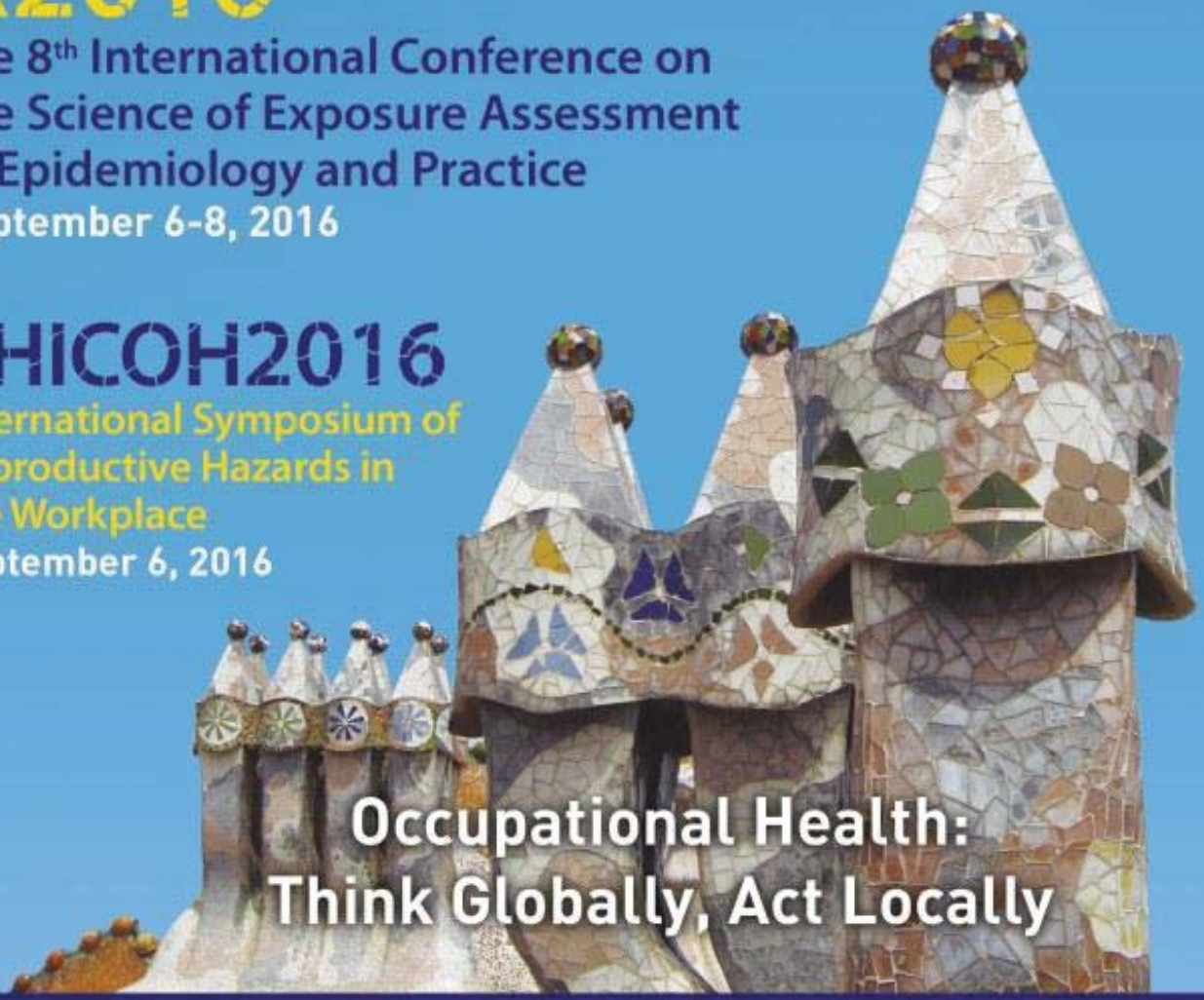

Occupational Health: Think Globally, Act Locally

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Supporter Occupational & Environmental Medicine

BOOK OF ABSTRACTS

Symposium 2 - Longitudinal Analyses of Workplace Distal Upper Limb Disorders: Findings from the NIOSH Consortium Studies

S02-1

ASSOCIATIONS BETWEEN FORCE, REPETITION, POSTURE, DUTY CYCLE, THRESHOLD LIMIT VALUE FOR HAND ACTIVITY LEVEL (TLV FOR HAL) AND RISK OF CARPAL TUNNEL SYNDROME

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Carpal tunnel syndrome (CTS) is a costly disease for employers and a source of long-term disability to workers. Force, repetition, and deviated posture are commonly believed risk factors for CTS. The aim of this study was to quantify associations between workplace biomechanical factors and incidence of dominant-hand CTS after adjusting for personal risk factors.

2751 incident eligible workers were followed prospectively for up to 6.4 years and contributed 6243 person-years of data to this longitudinal study. Applied force, frequency and duty cycle of exertions, wrist posture, and ACGIH TLV for HAL were quantified for each worker and periodically remeasured throughout the study. Incident cases of CTS were determined from symptoms and electrodiagnostic studies. Hazard Ratios were estimated using proportional hazards regression. All models were adjusted for age, gender, BMI, and orthogonal physical exposures.

In the adjusted models, associations were found between CTS and peak force (HR=2.17; 95% CI 1.38 to 3.43), frequency of forceful exertions (HR=1.84; 95% CI 1.19 to 2.86), % of time spent in forceful exertions (HR=2.05; 95% CI 1.34 to 3.15), and the TLV for HAL as a continuous variable (HR=1.32 per unit; 95% CI 1.11-1.57). Conversely, statistical associations with increased risk of CTS were not found between total frequency of, or total % time under exertions, nor for deviated wrist postures.

These results suggest that peak force acts as an independent risk factor for CTS. However, frequency of exertion and % time under exertion are only associated with CTS when a non-trivial amount of force is being applied, thus "repetition" does not appear to be an independent risk factor per se. We found no evidence to suggest that hand/wrist posture is an independent risk factor for CTS.

S02-2

THE STRAIN INDEX AND RISK OF UPPER LIMB MUSCULOSKELETAL DISORDERS: RESULTS FROM THE WISTAH HAND STUDY

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The Strain Index (SI) is a widely used distal upper limb (DUL) physical exposure model that combines six putative risk factors (force, repetition, percent duration of exertion, hand/wrist posture, speed of work,

shift duration) to provide a summary measure of risk. The aim of this study was to quantify exposure-response relationships between the SI and risk of DUL musculoskeletal disorders (MSDs).

A cohort of 536 manufacturing workers was followed for up to 5 years. At baseline, physical exposures were quantified using the SI. Changes to physical exposure were determine quarterly. Age, gender, BMI, and other relevant demographic, health, and psychosocial confounders were determine at baseline. MSD symptoms were evaluated monthly and electrodiagnostic studies and physical examinations were performed to identify incidence cases of carpal tunnel syndrome (CTS), lateral epicondylitis (LE), and trigger digit (TD). Exposure-response relationships were quantified using proportional hazards regression models with time-varying covariates. SI scores were modeled using linear splines.

The SI showed statistically significant exposure-response relationships with each of the three disorders in both unadjusted and adjusted models. Adjusted, peak
hazard ratios (HR) for CTS, LE, and TD were 5.9, 8.6, and 7.1 respectively. Confounders varied in importance between the disorders.

The SI score was consistently associated with increased risk of CTS, LE. And TD regardless of the presence of confounders. This suggests that physical exposure is an important, independent risk factor for developing these occupational illnesses. The SI is a useful tool for quantifying risk of DUL MSDs from job physical exposures.

S02-3

RELATIONSHIPS BETWEEN WORK ORGANIZATION FACTORS AND CARPAL TUNNEL SYNDROME AND EPICONDYLITIS

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Based on analyses of prevalence data on a pooled cohort of 1834 subjects from three research groups, this study examined the relationships between four work organization variables (job rotation, overtime work, having second job and work pacing) and the three musculoskeletal health outcome measures (prevalence of carpal tunnel syndrome (CTS), lateral epicondylitis (LEPI) and medial epicondylitis (MEPI)). There were 249 prevalence CTS cases out of a total 1799 eligible subjects, 65 LEPI out of 1807 eligible subjects, and 14 MEPI out of 1812 eligible subjects in this cohort.

The relationships between the work organization factors and the health outcome variables were assessed using logistic regression models fitted by the generalized estimating equations (GEE) method to account for non-independence of data collected by the same research group. Odds ratios and 95% confidence intervals were estimated for each work organization variable separately, while always adjusting for age, gender, and body mass index (BMI).

Varied degrees of associations between these work organization variables and the health outcome variables were found. Job rotation had significant association with CTS cases (OR = 1.23, 95%CL: 1.00 – 1.50). No statistically significant associations were found between the other work organization variables and CTS cases. Contradictory to common believe, overtime work was significantly associated with lower LEPI prevalence (OR = 0.48, 95%CI: 0.28 – 0.84). For the LEPI, job rotation was marginally associated with LEPI cases (OR = 1.69, 95%CI: 0.96 – 2.97). No associations were found between having second job or different types of work pacing and LEPI. No statistically significant associations were found between the four work organization variables and MEPI.