provided the same dynamic values under the medium oily condition. Other analyses performed on old shoes showed that the interaction of surface condition/percent of tread available demonstrated significance on subjective scores and dynamic COF for the left shoe only. This interaction was only significant on subjective scores for the right shoe. Thus, the effect of tread pattern was more important on oily surfaces than would be expected from this factor alone. Results from this study would help in better understanding of the factors critical to providing adequate COF in the prevention of foot slips, as well as the components influencing workers' assessment of floor slipperiness.

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A TEST-RETEST RELIABILITY STUDY OF A WORK-RELATED MUSCULOSKELETAL DISORDER QUESTIONNAIRE. A. Booth-Jones, G.K. Lemasters, P. Succop, A. Bhattacharya, University of Cincinnati, Cincinnati, OH 45267-0182 and M. Atterbury, H. Applegate, R. Stinson, Greater Cincinnati Occupational Health Center, 10475 Reading Rd., Cincinnati, OH 45241.

This study was designed to assess the test-retest reliability of a musculoskeletal symptom and work history (MSWH) questionnaire administered to 522 carpenters. Work-related chronic musculoskeletal disorders (WRMD) are now recognized as a major occupational health problem. Carpenters are at high risk for these disorders because their jobs involve repetitive motion, high force, and continuous repeated or awkward postures. A questionnaire that reliably identifies the prevalence, causes the risk factors of WRMD is critical. The hypothesis of this study was that there would be at least 80% agreement between the responses given by the carpenters in the initial interview and the retesting of the MSWH questionnaire adapted several NIOSH instruments.

The test-retest reliability of the MSWH questionnaire was evaluated by comparing the responses given by a 10% randomly selected subgroup of carpenters from the original interview with the responses given by them on the retest.

The MSWH questionnaire was comprised of four sections and the agreement in the responses for each of these sections was computed. The prior medical history section had an observed agreement of 95.7% and the section regarding occurrence of symptoms and injuries in past 12 months resulted in an observed agreement of 81.8%. The third section included responses about carpenter's work history. They had a 71.4% perfect agreement on date beginning work as a carpenter. The final section concerning psychosocial items had an overall observed agreement of 82.7%. Observed versus expected agreements were used to compute a reliability measure. The reliability measure for each section was good, ranging between Kappa=0.5-0.7.

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Papers 40 - 45
Ergonomics in Construction

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IMPLEMENTING ERGONOMIC SOLUTIONS IN CONSTRUCTION. Scott Schneider, CIH, Center to Protect Workers' Rights, 111 Massachusetts Avenue, N.W., Washington, D.C. 20001.

Construction workers face enormous ergonomic risks because of the nature of their work. Construction work requires a lot of handling of heavy materials and much of the work is overhead or at floor level. Awkward postures are common and often must be held for long periods of time. Construction sites are temporary workplaces which cannot be approached by ergonomist in the same way as industrial worksites. But ergonomic solutions do exist for construction work. They involve improved materials handling, better tool design, and better work organization. Evaluation and implementation of these solutions can be very complex. There are many concerns that must be addressed. For example, will the intervention by increasing productivity put us out of a job? Will it deskill the work and make their labor less valuable or marketable? These are critical issues as each day, as construction progresses, workers work themselves out of a job and must find new work. This paper will address the area of ergonomic interventions in construction and how these solutions should be implemented. Case studies will be presented where interventions were successful and those where they were not. The reasons for this will be discussed.

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"PATH": A MODIFIED WORK SAMPLING METHOD TO COLLECT ERGONOMIC HAZARD DATA IN CONSTRUSTION WORK. D.M. Lee, B. Buchholz, L. Punnett, S.M. Moir, E. Alexeeva, V. Paquet, D.H. Wegman, Department of Work Environment, University of Massachusetts Lowell, One University Avenue, Lowell, MA 01854.

Construction work imposes ergonomic hazards on its work force. Little effort has been made to charcterize construction work and quantify the hazardous exposures due to the highly dynamic work environment, unstable employment (i.e., being called on "as needed" basis by different contractors and sub-contractors), and the relatively low level of repetition involved in the work. PATH (Poasture Activity, Tools and Handling analysis), a work sampling-based method, was developed as an accurate and time-efficient method of collecting large amonuts of data to charcterize and quantify ergonomic hazards in heavy and highway construction. Modified work sampling was chosen as the first level of analysis so as to significantly reduce the analysis time that is often required in continuous video analysis methods and to estimate cumulative exposer over the course of a whole day (versus biomechanical models that better quantify peak exposures associated with specific actions but do not incorporate frequency or duration of exposure). Instantaneous information was recorded using a posture coding system for four major body parts [a modification of the Ovako Working Posture Analyzing System (OWAS)] and a checklist format covering work tasks/activities,tools/equipment, and types of grasp used. Work samples were taken at one-minute or 45 second intervals during real-time observation of workers. Observations were preceded by dialogue with construction site supervisors and workers to obtain background information such as job titles and trades of observed workers, specific phase of work being performed,and accurate descriptions of workers' tasks and tools used. Data analysis provides information which can be used to quantify exposures such as: percentage of work time spent performing specific tasks and in at-risk postures, overall and subdivided by type of grasp or tool used. Results can be used to describe the ergonomic stressors presented in specific construction processes and operations, and to target tasks for more detailed analyses. Duplicate real-time coding was performed by a second observer and by the original observer using videotape, to examine reproducibility of the results. This reliability has been further compared between body parts and between trades.

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FOCUS GROUPS AS A METHOD OF DATA COLLECTION VERIFICATION IN ERGONOMIC HAZARD IDENTIFICATION AMONG HIGHWAY CONSTRUCTION WORKERS. S.M. Moir, B.O. Buchholz, L.Punnett, C. Slatin and D.H. Wegman, Department of Work Environment, University of Massachusetts Lowell, One University Avenue, Lowell, MA 01854.

Identification of ergonomics hazards among construction workers presents challenges not faced in the production and service sectors of the economy. The transient and dynamic nature of construction work, the relative low level of repetition and the absence of a fixed work station make the characterization of component tasks and quantification of movement difficult. Highway construction adds another level of difficulty due to its large scale and limited accessibility of the worksites. As a means of collecting baseline data on tasks and associated stressors, standardized focus group methods were modified for use with construction workers. The goal was to find out what construction workers do and what they find stressful about their jobs. Groups were composed of 4-8 participants contacted through unions and construction-related organizations. Where data concerning highway construction processes and work organization was so ıght, cross-trade groups were assembled. Where data particular to the tasks performed and hazards involved in specific trades was sought, single-trade groups were assembled. Basic demographic questionnaires were administered before the discussion began. A prepared script was used by the moderator to facilitate a directed discussion by the participants. The script underwent successive modifications to probe for greater detail and to build on what had previously been learned. The results included detailed information on the activities of construction workers when involved in various tasks, identification of work cycles by trade and task and direction for the more efficient use of quantifiable observational methods in the field.

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PREVALENCE OF WORK RELATED MUSCULOSKELETAL DISEASE IN CARPENTERS. G. Lemasters, A. Bhattacharya, A. Booth-Jones, University of Cincinnati, Cincinnati, OH 45267-0182; M. Atterbury, H. Applegate, R. Stinson, Y. Li, H. Pierson, and C. Forrester, Greater Cincinnati Occupational Health Center, 10475 Reading Rd., Cincinnati, OH 45241.

Carpenters are high risk for work related musculoskeletal disorders (WRMD). Their work involves repetitive motion, use of force, awkward postures, and use of vibrating tools. The purpose of this study is to determine the prevalence of upper body WRMD in carpenters. Our case definition for WRMD is as follows: symptoms of pain, aching, burning, numbness or tingling in the past twelve months, occurring at least once per month or at least one episode lasting for one week, with no injury to that body part, and onset of symptoms after entry into the trade. The upper body parts evaluated included the neck, shoulder, elbow, and the hand/wrist.

A systematic random sample of 627 current, nonretired members of the Southwest Ohio District Council of Carpenters was selected to participate. An in-depth NIOSH revised questionnaire was administered concerning musculoskeletal disorders, general health, and work history. The reliability and validity of the instrument also was assessed and shown to be good. Of the 627, 83.3% (N-522) participated. Due to incomplete

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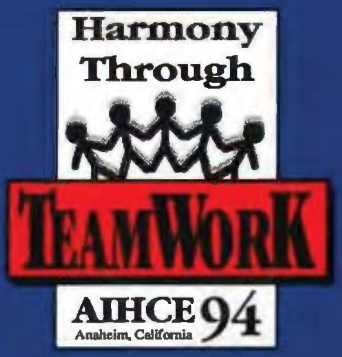

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Abstracts

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