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BIOMECHANICS, ANTHROPOMETRY, AND WORK PHYSIOLOGY

Amasay, Tal; Latteri, Michael; Karduna, Andrew R. *In Vivo Measurement of Humeral Elevation Angles and Exposure Using a Triaxial Accelerometer*. S. 616-626(11).

Objective: The aim of this study was to measure the capability of a triaxial accelerometer (Virtual Corset) to collect humeral elevation angles and exposure parameters in a simulated occupational environment. **Background:** There is a need for an economical ambulatory device to estimate elevation angles and exposure parameters in occupational groups. **Method:** A magnetic tracking device was used to assess the ability of the Virtual Corset to evaluate humeral elevation angles and identify exposure parameters with in vivo dynamic conditions for 16 female dental hygienists. **Results:** Significant differences were found for the reaching task with the Virtual Corset, underestimating the means of the average humeral elevation angle by 10° and the means for the range of the humeral elevation by 4°. Furthermore, significant differences were found for the exposure parameters with the Virtual Corset, overestimating the jerk by 4% and underestimating the percentage time above 40° and 60° by 9% and 4%, respectively. However, the Virtual Corset was able to identify similar kinematics patterns and exposure data when compared with a magnetic tracking device. **Conclusion:** The outcomes of the study suggest that the Virtual Corset may be useful for data collection during a dental hygienist workday. Professions that have similar patterns of angular velocity and acceleration and humeral range of elevation as the dental hygienist flossing technique may benefit from the use of the Virtual Corset. **Application:** This study provides evidence that the Virtual Corset can be used to reconstruct humeral elevation angles and identify exposure parameters in some tasks of dental hygienists.

- **Keywords:** MODELS AND MEASURES; DENTAL HYGIENIST; UPPER EXTREMITY AND SHOULDER; TRIAXIAL ACCELEROMETER; HUMERAL ELEVATION ANGLES; AMBULATORY DEVICE

Lin, Chieh-Peng. *Understanding Negative Impacts of Perceived Cognitive Load on Job Learning Effectiveness : a Social Capital Solution*. S. 627-642(16).

Objective: This study proposes a model explaining how social capital helps ease excessively required mental effort. **Background:** Although organizational researchers have studied both social capital and cognitive load, no prior research has critically examined the role of social capital in improving individuals' mental load and effort and consequently enhancing job learning effectiveness. **Method:** This study surveys

participants made up of professionals in Taiwan's information technology industry. It measures the constructs with the use of 5-point Likert-type scale items modified from existing literature. The survey data were analyzed with the use of structural equation modeling. **Results:** Job learning effectiveness is negatively influenced by role ambiguity and role conflict. Time pressure has a positive influence on role ambiguity and role conflict. Although the relationship between task complexity and role ambiguity is insignificant, task complexity has a positive influence on role conflict. Because the relationship between network ties and role conflict is insignificant, trust has a negative influence on role conflict. Last, shared vision has a negative influence on role ambiguity. **Conclusion:** This study provides an example of how social capital can be applied as a useful remedy to ease the negative impact of perceived cognitive load on job learning effectiveness. **Application:** The negative relationship between shared vision and role ambiguity suggests that a shared vision helps in disseminating organizationally common goals and directions among employees to alleviate individuals' mental efforts in dealing with the ambiguity of their job roles. A firm's management team should take actions to decrease role conflict by strengthening trust among employees.

- **Keywords:** COGNITIVE LOAD; SHARED VISION; TRUST; NETWORK TIES; ROLE CONFLICT; ROLE AMBIGUITY

Marklin, Richard W.; Saginus, Kyle A.; Seeley, Patricia; Freier, Stephen H. *Comparison of Anthropometry of U.S. Electric Utility Field-Workers With North American General Populations. S. 643-662(20).*

Objective: The primary purpose of this study was to determine whether conventional anthropometric databases of the U.S. general population are applicable to the population of U.S. electric utility field-workers. **Background:** On the basis of anecdotal observations, field-workers for electric power utilities were thought to be generally taller and larger than the general population. However, there were no anthropometric data available on this population, and it was not known whether the conventional anthropometric databases could be used to design for this population. **Method:** For this study, 3 standing and 11 sitting anthropometric measurements were taken from 187 male field-workers from three electric power utilities located in the upper Midwest of the United States and Southern California. The mean and percentile anthropometric data from field-workers were compared with seven well-known conventional anthropometric databases for North American males (United States, Canada, and Mexico). **Results:** In general, the male field-workers were taller and heavier than the people in the reference databases for U.S. males. The field-workers were up to 2.3 cm taller and 10 kg to 18 kg heavier than the averages of the reference databases. **Conclusion:** This study was justified, as it showed that the conventional anthropometric databases of the general population underestimated the size of electric utility field-workers, particularly with respect to weight. **Application:** When designing vehicles and tools for electric utility field-workers, designers and ergonomists should consider the population being designed for and the data from this study to maximize safety, minimize risk of injuries, and optimize performance.

- **Keywords:** ANTHROPOMETRY; ELECTRIC UTILITY; LINEMEN; FLEET VEHICLES; CAESAR

SURFACE TRANSPORTATION SYSTEMS

Johannsdottir, Kamilla R.; Herdman, Chris M. *The Role of Working Memory in Supporting Drivers' Situation Awareness for Surrounding Traffic. S. 663-673(11).*

Objective: To link working memory to driver situational awareness (SA) for surrounding traffic. **Background:** Operating a motor vehicle is a complex activity that requires

drivers to maintain a high level of SA. Working memory has been conceptually linked to SA; however, the roles of working memory subsystems in supporting driver SA is unclear. **Method:** Participants drove a simulated vehicle and monitored surrounding traffic while concurrently performing either visuospatial- or phonological-load tasks. Drivers' SA was indexed as the ability to recall the positions of the surrounding traffic relative to their own vehicle at the end of each trial. **Results:** In Experiment 1, a visuospatial task interfered with drivers' ability to recall the positions of traffic located in front of their vehicle. In contrast, a phonological task interfered with drivers' ability to recall the positions of traffic located behind their vehicle. Experiment 2 confirmed and extended the findings of Experiment 1 with the use of different visuospatial- and phonological-load tasks. **Conclusion:** Visuospatial and phonological codes play a role in supporting driver SA for traffic located in the forward view and the rear view, respectively. **Application:** Drivers' SA for surrounding vehicles is disrupted by concurrent performance on secondary tasks. The development and implementation of new in-cabin communication, navigation, and informational technologies needs to be done with the knowledge that components of drivers' working memory capacity may be exceeded, thereby compromising driving safety.

- **Keywords:** WORKING MEMORY; SITUATIONAL AWARENESS; DRIVER BEHAVIOR; EPISODIC BUFFER; ATTENTIONAL PROCESSES