

The Evaluation of Repetitive Overhead Movements in Heating Ventilation and Air Conditioning Technicians

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ABSTRACT

Air conditioning technicians are the most non-fatally injured amongst construction workers. It has been identified that the shoulder is one of joints most commonly affected areas in industrial workers. While repetitive overhead movements have been evaluated in construction workers, it has not been described in air conditioning (AC) technicians. **PURPOSE:** To describe repetitive arm movement performed by AC technicians using inertial measurement unit (IMU) system, throughout a full work day. **METHODS:** An IMU is a small portable motion detection monitor that combines information from triaxial accelerometers, gyroscopes, and magnetometers to track translational movements. Six AC technicians participated on six separate days. Four IMU monitors were secured 2cm below the spinous process of the 7th cervical vertebrae (C7), the flat broad portion of the acromion process on the dominant arm, the posterior aspect of the dominant arm just superior of the elbow, and on the dorsal aspect of the dominant-side wrist to track multi-axial joint kinematics. An investigator then accompanied each participant to their work place to capture data and log when the participants were performing work-specific (e.g., mounting ceiling vents, installing and repairing air conditioning units), tasks and non-work-specific tasks. The arm activity was described separately and compared between times when the technicians performed work-specific and non-work specific tasks. Wilcoxon signed rank tests were used to compare the variables between times spent performing work-specific tasks and non-work-specific tasks. **RESULTS:** It was found that they spent 3.9 ± 1.4 hours (41.6 \pm 15.6 %) performing work-specific tasks and 4.9 ± 1.1 hours (53.8 \pm 11.9 %) performing non-work-specific tasks. The participants' arm were elevated above 60° for 1.7 ± 0.7 hours (18.5 \pm 8.0 %), and above 90° for 0.4 ± 0.2 hours (4.2 \pm 2.6 %). It was also found that the participants spent 7.1 – 18.5% of their work shift with arm above 60° for more than 5 seconds and 1.0 – 4.9% above 90° for more than 5 seconds. **CONCLUSION:** These findings were similar to what has been reported in previous studies on electricians. Previous studies on manual laborers identified arm exposure as a risk factor for shoulder musculoskeletal disorders. Specifically, the greater time spent with arm maintained above 60° for more than 5 seconds has been correlated with shoulder pain. Our group of participants spent 7.1 – 18.5% of the work shift maintaining arm above 60° for more than 5 seconds, which is comparable to the ranges reported in a previous longitudinal study (2 – 21%). Considering that 27% of the participants in the previous study developed shoulder pain within 2.5 years of the follow up period, similar proportion of AC technicians may be at risk for developing pain and additional dysfunctional pathology.