Muscular, cardiorespiratory and thermal strain of mast and pole workers

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Mast and pole work is defined as erecting and pulling down masts and poles, putting up and taking down antennas, installing and transposing air traffic guiding lights, installing pipes and cables and carrying out their maintenance. Since physical strain during mast and pole work is not known this study evaluated the level of muscular, cardiorespiratory and thermal strain of mast and pole workers with special emphasis on winter.

Fourteen voluntary male mast and pole workers participated in the study. We measured their muscular strain using electromyography, expressed as percentage in relation to maximal EMG activity (%MEMG). We estimated VO2 from HR measured during work (using individual VO2-HR relationship) and expressed it as %VO2max. To quantify thermal strain skin and deep body temperatures were measured using temperature sensors and telemetric pill and receiver.

We found the highest average muscular strain in the wrist flexor (24±2%MEMG) and extensor (21±1%MEMG) muscles, exceeding the recommendation of 14%MEMG. Average cardiorespiratory strain was 48±3% VO2max. Nearly half (40%) of the subjects exceeded the recommended 50% VO2max. Winter condition increased both muscular and cardiovascular strain on average by 4 and 2%, respectively. Deep body temperature varied between 36.8 and 38.0°C and mean skin temperature between 28.6 and 33.4°C indicating possible occasional superficial cooling. Cooling was most pronounced in extremities during winter. Lowest single temperatures in middle finger, hand and big toe varied between 6.4 and 18.5, 9.4 and 24.9 and 15.4 and 24.6°C, respectively.

In conclusion, this field study shows that workers may be at risk for local and/or systemic muscular and cardiorespiratory overloading (the winter enhancing this effect slightly) and thus for excessive fatigue, reduced work efficiency and increased risk for musculoskeletal symptoms. Generally, thermal strain remained at a tolerable level.

References