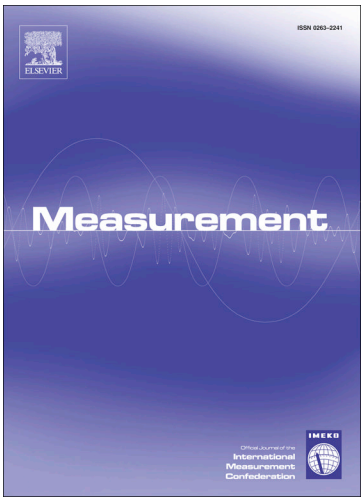

Effect of body movement on the thermophysiological responses of an adaptive manikin and human subjects

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Effect of body movement on the thermophysiological responses of an adaptive manikin and human subjects

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Abstract

Adaptive (or thermoregulatory model controlled) manikins are useful in quantifying thermal exchanges of the human-clothing-environment system and in simulating human thermophysiological behaviours. Current existing adaptive manikins didn't take account into the body movement/posture during simulations and this may greatly affect the precision of simulation results. Hence, in this study, the impact of body movement on human physiological responses was investigated using a 'Newton' type adaptive thermal manikin and human subjects in a warm environment (i.e., T_a=30.0±0.5 °C, RH=60±5%, v_a=0.17±0.05 m/s). Results demonstrated that the body movement significantly affected the thermal exchange between the clothed manikin and its surrounding environment. Significantly greater mean skin and core temperatures were noted on the standing manikin than those on the walking manikin. In contrast, simulation results obtained from the walking manikin were much closer to human trial data than those obtained from the standing adaptive manikin. Particularly, no significant difference was found in the mean core temperature between the walking adaptive manikin and human subjects. Therefore, the standing adaptive manikin significantly overestimated thermal stress for the two studied conditions. It was thus suggested the body movement should be considered when mimicking human activities on adaptive manikins.

Keywords: adaptive manikin; human trials; thermophysiological responses; human thermoregulatory model; body movement