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Assessing gait changes in firefighters due to fatigue and protective clothing

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ABSTRACT

Each year, roughly 11,000 firefighters are injured as a result of slips, trips and falls, which account for over 25% of all fireground injuries. Wearing personal protective equipment (PPE) can increase risk of fall-related injuries due to its weight, restrictiveness, and increased heat stress. Modification of PPE may serve to mitigate firefighter injuries related to loss of balance and falls. We examined the effects of choosing 'enhanced' protective clothing (lightweight, breathable, and less restrictive compared to typical firefighting PPE) and simulated firefighting tasks (18-min bout over four activities) on subsequent gait performance. To assess the effect of wearing protective clothing and firefighting activity, seven gait parameters and three movement errors were assessed during level and obstacle-crossing walking tasks. Forty-four firefighters wore one of two types of PPE ('Standard', 'Enhanced') during three testing conditions (baseline in station uniform, pre-firefighting activity in PPE, and post-firefighting activity in PPE). The effect of donning any PPE was found to significantly impair gait performance. Fatigue may impact effective mobility since more movement errors were observed during post-activity than pre-activity assessments. Although the Enhanced PPE did not lead to any significant differences in gait parameters compared to Standard PPE, participants in Enhanced PPE made twice as many movement errors, potentially attributed to lack of familiarity with the gear. These results suggest that wearing firefighting PPE and heat-stress induced fatigue are associated with reduced gait performance and increased risk for tripping over obstacles.