

Category: Slips, Trips and Falls

Title: Effect of Boot Weight on Obstacle Negotiation in Men and Women Firefighters

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Abstract

Firefighters have traditionally worn heavily insulated boots as protective footwear. These boots can add an extra 10 pounds to firefighters' turnout gear, which may restrict their movements and increase risks for fall-related injuries. The objective of this study was to determine the effect of boot weight on firefighters' potential risks for tripping while negotiating obstacles.

Twelve men and nine women firefighters, while wearing full turnout gear and different boots of varying weights, walked for five minutes while stepping over two 30-cm and two 15-cm obstacles. A six-camera motion analyzer was used to examine foot trajectories during obstacle crossing at the beginning and the end of the task. Toe clearances over the obstacles and the lateral positions of the swing foot were determined. Repeated-measure ANCOVA was used to test the effects of boot weight and time period.

The effects of boot weight and time period were found significant on toe clearance ($p \leq 0.05$). Per one kg increase in boot weight, there is a 2.8 cm decrease in toe clearance. Additionally, there were significant time period and gender effects on the lateral foot position ($p \leq 0.05$). There were also significant decreases in toe clearances and increases in lateral displacement of the foot at the end compared to the beginning of the task.

It appears that subjects are more likely to trip over obstacles when wearing heavier boots and after walking for a period of time. Findings from this study are helpful in identifying risk factors for tripping, which are important for prevention of falls.

Objectives: The objective of this study was to determine the effect of boot weight on firefighters' potential risks for tripping while negotiating obstacles.

Methods: Twelve men and nine women firefighters, while wearing full turnout gear and different boots of varying weights, walked for five minutes while stepping over two 30-cm and two 15-cm obstacles. A six-camera motion analyzer was used to examine foot trajectories during obstacle crossing at the beginning and the end of the task. Toe clearances over the obstacles and the lateral positions of the swing foot were determined. Repeated-measure ANCOVA was used to test the effects of boot weight and time period.

Results: The effects of boot weight and time period were found significant on toe clearance ($p \leq 0.05$). Per one kg increase in boot weight, there is a 2.8 cm decrease in toe clearance. Additionally, there were significant time period and gender effects on the lateral foot position ($p \leq 0.05$). There were also significant decreases in toe clearances and increases in lateral displacement of the foot at the end compared to the beginning of the task.

Conclusions: It appears that subjects are more likely to trip over obstacles when wearing heavier boots and after walking for a period of time. Findings from this study are helpful in identifying risk factors for tripping, which are important for prevention of falls.

