

Effects of age-related gait changes on the biomechanics of slips and falls

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A laboratory study was conducted to examine gait changes associated with aging and the effect of these changes on initiation of slips and frequency of falls utilizing newly defined biomechanical parameters of slips and falls. Twenty-eight participants from two age groups (young and old) walked around a circular track at a comfortable pace wearing a safety harness. A slippery floor surface was placed on the walking track over the force plate at random time intervals without the participants' awareness. Synchronized kinetic and kinematic measurements were obtained on both slippery and non-slippery walking surfaces. The results indicated that older participants' horizontal heel contact velocity was significantly faster, step length was significantly shorter, and transitional acceleration of the whole body centre-of-mass (COM) was significantly slower than younger participants. Older participants' initial friction demand, as measured by required coefficient of friction (RCOF), was not significantly different than their younger counterparts. Additionally, older participants slipped longer and faster, and fell more often than younger participants. A comparison of horizontal heel contact velocity for participants who fell with participants who did not fall indicated that, in general, fallers' horizontal heel contact velocity was faster than non-fallers. However, a comparison of RCOF for participants who fell with participants who did not fall suggested that RCOF was not a totally deterministic factor influencing actual fall events. These findings suggest that gait changes associated with aging (especially higher horizontal heel contact velocity and slower transition of the whole body COM) affect initiation of slip-induced falls.

1. Introduction

Falls and gait instabilities are among the most serious problems facing older adults. Many studies have shown that with advancing age there is an increasing incidence of fatal slip and fall injuries (Campbell *et al.* 1981, Rubenstein *et al.* 1988, Agnew and

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