DO OLDER WOMEN WITH RA DISPLAY SLIP AVOIDANCE BEHAVIOUR WHEN WALKING IN DIFFERENT TYPES OF HOUSEHOLD FOOTWEAR ON TYPICAL HOUSEHOLD SURFACES?

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INTRODUCTION

Falls in the home are the leading cause of unintentional injury, death and disability in persons aged 65 years and above (Campbell et al., 1990). One of the most frequent precipitating events leading to these falls is a loss of traction between an individual’s shoe and the surface they are walking upon. Typically, smooth, shiny or slippery floors, particularly when traversed while wearing inappropriate household footwear, can lead to this loss of traction and have therefore been identified as major contributors to home falls (Hourihan et al., 2000).

Older women with rheumatoid arthritis (RA) often have foot pain and significant deformities resulting in abnormal weight bearing, gait disturbance, and footwear difficulties (Woodburn & Helliwell, 1996). As a result, these women frequently choose slippers as their preferred household footwear, as slippers lack structure and can mould to the shape of any foot (Marr, 1993). However, when combined with typical household surfaces, slippers may not display good frictional characteristics, and may predispose older RA individuals to slips and falls (Marr, 1993). Little is known about how wearing slippers on typical household surfaces affects the gait of older people, particularly those suffering RA, or how either may increase the risk of slipping in older people. Therefore, the purpose of the present study was to determine how variations in slipper and surface type affected the gait of older RA women, specifically the forces generated by these women during the stance phase of gait.

METHODS

Eight older RA women (67.8 ± 7.3 yr) and eight unaffected women (65.3 ± 3.1 yr) matched to the RA subjects for age, height and mass participated in the study. While wearing a custom-designed safety harness system, the subjects walked along an 8 m carpeted walkway, contacting a force platform embedded midway, at a self-selected speed under three footwear conditions (barefoot, toe slippers, closed-back slippers) and three surface conditions (carpet, dry linoleum, wet linoleum). During the five trials per condition, ground reaction force data and EMG data for seven muscles of each subject’s dominant lower limb were sampled (1000 Hz) using a Kistler force platform and a Noraxon Telemyo system, respectively. After visual inspection, the four channels were zero-offset, summed and scaled to obtain force-time curves in three orthogonal directions. The dependent ground reaction force variables were then analysed using a three-way ANOVA with one between factor (subject group) and two within factors (footwear and surface type). This design was used to determine whether interactions between the footwear and surface conditions had any significant ($p \leq 0.05$) effect on the dynamic forces displayed by the women during the stance phase of gait.

RESULTS AND DISCUSSION

There was no significant main effect of subject group on any of the dependent ground reaction force variables. However, subject group effects were moderated by footwear condition, such that RA subjects displayed significantly ($F_{3,33} = 3.801; p = 0.05$) less time from initial foot-ground contact (IC) to when they generated the peak vertical propulsive force while wearing both slipper types compared to when walking barefoot. Although there were significant main effects of both footwear and surface conditions, these effects were moderated by significant interactions between the two conditions. Post-hoc analyses confirmed that when the women walked barefoot on the wet linoleum, they required a significantly longer stance time ($F_{3,34} = 5.784; p = 0.02$) together with significantly reduced peak anteroposterior deceleration ($F_{3,34} = 8.205; p < 0.01$) and propulsion ($F_{3,34} = 11.373; p < 0.01$) forces (Figure 1) compared to the other footwear/surface interactions. It would therefore appear that older women, irrespective of their RA status, had to change their walking patterns when walking on what they deemed was a slippery surface.

SUMMARY

Older women in the present study displayed changes in their gait patterns when walking on a variety of common household surfaces while wearing different types of household footwear. However, when confronted with a situation deemed hazardous, namely walking barefoot on wet linoleum, the older women, irrespective of their RA status, altered their gait patterns in an attempt to decrease their risk of slipping at initial foot-ground contact as well as at terminal stance. It is speculated that this ability to adapt their gait patterns to match the environmental conditions may be negated by wearing slippers as footwear occludes vital plantar sensory information received when walking barefoot. However, further research is required to support or refute this claim.

REFERENCES