# Hardness, Abrasion, ans Slip-Resistance of New and Used Shoes

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## Abstract

The factors affecting the slip-resistance of footwear such as footwear and floor materials, floor surface conditions, floor roughness, and shoe sole tread design have been discussed in the literature. However, most of the investigations were conducted using new footwear and floor materials. Theoretically, shoe sole materials change after repetitive exposure to the sun and rain during normal usage. Sliding of shoe sole on the floor results in the wear-out the tread patterns. Repetitive impact of shoe sole on the floor may also result in physical properties change. The hypotheses of this project were that footwear usage result in reduction in slip-resistance which could lead to higher likelihood of slip & fall incidence and the reduction in slip-resistance is footwear material-dependent. The objectives of this study were to test these hypotheses. Twenty male subjects, split into two groups evenly, were recruited and tested in a footwear usage experiment for six months. One type of footwear will be assigned to each group. The roughness, abrasion, and slip-resistance of the shoe sole of the new and used shoes were measured and compared. The effects of footwear usage on slip-resistance for two types of shoes tested were discussed along with the consideration of the changes in physical properties such as hardness, abrasion, and tread patterns. The results of the study show that the hardness and abrasive values of the shoe soles did not change significantly after a six month usage. The tread pattern, or sole-floor contact area, and the coefficient of friction of the used shoes were significantly different from those of the new shoes.

Keyword：slips & falls, wear, footwear material, slip-resistance