UMEÅ UNIVERSITET

The Healthy Ageing Initiative
Prevention of falls and fractures

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i Stora hörsalen (KBE303), KBC-huset.
Fredagen den 9 februari, kl. 09:00.
Avhandlingen kommer att försvaras på svenska.

Fakultetsopponent: Professor, Jon Karlsson, Institutionen för kliniska vetenskaper, Göteborgs universitet, Göteborg, Sverige.

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Title

The Healthy Ageing Initiative – Prevention of falls and fractures

Abstract

Background: The world is currently experiencing a dramatic increase in the number of older individuals, an amount that is expected to double between 2015 and 2050. This increase will likely affect the prevalence of age-related functional impairments, such as those caused by fractures. Fractures are often immobilizing events leading to increased individual suffering and vast healthcare costs. Prevention of these events and detection of underlying risk factors are hence of utmost importance. Fracture prevention strategies have traditionally focused on strengthening the skeleton by improving bone mineral density, partly through the mechanical load of increased physical activity. However, research has shown that nine out of ten hip fractures are attributed to falls. While several risk factors behind falls have been identified, there is less knowledge about how aspects such as gait patterns and postural stability predicts future falls. The aim of this thesis was to expand upon the current knowledge by investigating objective measures of physical activity in relation to bone parameters, and measures of gait patterns and postural stability in relation to incident falls, in a large population-based sample of 70-year-olds.

Methods: The samples investigated in the four included studies were drawn from the Healthy Ageing Initiative (HAI) cohort. Study I examined associations between physical activity, objectively measured using accelerometers, and bone parameters, measured by Dual-energy X-ray Absorptiometry and Peripheral Quantitative Computed Tomography. Study II examined how gait variability, measured using the GAITRite electronic walkway system, predicted incident falls in men and women. Studies III and IV examined how center of pressure (COP) sway and limits of stability (LOS), measured using a force platform, predicted incident falls. Independent prediction of bone parameters and incident falls were investigated using multiple linear and logistic regression models.

Results: Study I revealed that moderate-to-vigorous physical activity and vertical peak acceleration independently predicted parameters of bone in the weight-bearing skeleton. Study II showed that women's increased risk of falling could be explained by increased gait variability during dual-task assignments. Study III revealed that the risk of falling was increased by 75-90 % for individuals in the highest quintile of COP sway. Study IV integrated COP and LOS data, showing that fall risk was increased by 9-16% per 1-unit increase in COP-LOS ratio.

Conclusions: This thesis highlighted several objective predictors of incident falls among older adults. Future studies and recommendations should emphasize strategies to improve balance, muscle strength and physical activity in order to prevent falls and fractures.