UMEÅ UNIVERSITET

Umeå University Medical Dissertations, New Series No 2146

Gait speed, physical activity, cognitive function and dementia

Associations in cross-sectional and longitudinal studies and validity of a physical activity questionnaire in very old people

Jerry Öhlin

Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i Triple Helix, Samverkanshuset, Umeå universitet.
Fredagen den 1:a oktober, kl. 09:00.
Avhandlingen kommer att försvaras på svenska.

Fakultetsopponent: Professor Anna Cristina Åberg, Institutionen för hälsa och välfärd, Högskolan Dalarna. Institutionen för folkhälso- och vårdvetenskap, Uppsala Universitet.

Department of Community Medicine and Rehabilitation
Department of Public Health and Clinical Medicine
Department of Nursing
Umeå University, Umeå, 2021

Organization
Umeå University

Document type
Doctoral thesis

Date of publication
10 September 2021

Author
Jerry Öhlin

Title
Gait speed, physical activity, cognitive function and dementia
- Associations in cross-sectional and longitudinal studies and validity of a physical activity questionnaire in very old people

Abstract
Dementia and cognitive impairment are leading causes of disability in older people (≥ 65 years) and gait speed decline seem to be an early indicator of these conditions, sometimes preceding clinical symptoms. Dementia may be delayed or prevented with management of risk factors, such as low physical activity. However, few studies have investigated associations of gait speed and physical activity with cognitive function and dementia in very old people (≥ 80 years) and a physical activity questionnaire adapted for use in this population is lacking. The overall aims of this thesis were to explore the associations of gait speed and physical activity to cognitive function and dementia in very old people, and to determine the validity of a novel self-reported physical activity questionnaire adapted for very old people (IPAQ-E 80+).
Associations of gait speed with dementia and cognitive function were investigated in a population based cohort of people aged ≥ 85 years, in cross-sectional (*n*=1317) and longitudinal (*n*=296) analyses. Gait speed was measured over 2.4 meters and cognitive function was measured with the Mini-Mental State Examination (MMSE). Associations of physical activity at baseline with dementia, cognitive function and gait speed were studied in a cohort of 541 people aged ≥ 80 years at the time of follow-up. Physical activity was measured using a six level questionnaire and categorized into low, medium and high. Cognitive function was measured with the MMSE and executive function with the Frontal Assessment Battery. ActivPAL accelerometers were used to assess the validity of IPAQ-E 80+ in 76 participants aged ≥ 80 years.
Cross-sectional linear regression analyses showed that gait speed was associated with cognitive function in very old people with and without dementia. An interaction analysis showed that walking aid use attenuated this association. Gait speed 5 years previously, and gait speed decline over 5 years were associated with dementia development in logistic regression analyses. During a two decade long follow-up, 175 (32.3%) developed dementia. Cox proportional–hazard models showed no association between physical activity around 65 years of age and subsequent dementia. In adjusted linear regression analyses, physical activity was not associated with cognitive function. Physical activity was associated with executive function in the unadjusted analysis but not after adjustments. Physical activity was associated with gait speed in unadjusted, but not analyses adjusted for traditional cardiovascular risk factors (hypertension, glucose intolerance, body mass index ≥ 30). IPAQ-E 80+ and accelerometer measures of total inactive time, night–time lying and sedentary times correlated fairly to substantially, according to Spearman's rho values. Bland–Altman plots showed that participants underreported total inactive and sedentary times. Correlations of total active and walking time were moderate; sitting and moderate to vigorous walking and physical activity showed no correlation. The IPAQ–E 80+ showed low degrees of sensitivity and specificity for the accurate identification of participants (not) attaining the recommended physical activity level.
In conclusion, gait speed appears to be associated with cognitive function, and low or declining gait speed seems to be associated with increased odds of subsequent dementia development in very old people, among whom gait and cognitive impairments are common. Furthermore, declining gait speed seems to be associated with declining cognitive function among those who develop dementia. The present results support development of a gait speed screening index for predicting future cognitive decline, even among very old people. Walking aid use may influence the cognitive load and hence the association between gait speed and cognition. In this thesis, a low physical activity level in late middle to older age was not a risk factor for dementia development up to two decades later. The associations between physical activity and subsequent physical function seems to be mediated by traditional cardiovascular risk factors. The novel IPAQ-E 80+ may be a promising tool for studies of relationships between 24–h physical activity patterns and health in this population.

Keywords
Gait speed, cognitive function, dementia, physical activity, aged 80 and over

Language	ISBN	ISSN	Number of pages
English	print: 978-91-7855-605-2 PDF: 978-91-7855-606-9	0346-6612	88 + 4 papers