



**Karolinska
Institutet**

Department of Neurobiology, Care Sciences and Society

Balance Control in Older Adults with Parkinson's disease – effects of medication and exercise

THESIS FOR DOCTORAL DEGREE

Friday 22 January, 2016, 09:15

Hörsal H2 Grön, Alfred Nobels allé 23, Huddinge

David Conradsson

Registered Physiotherapist, MSc

Principal Supervisor:

Associate professor Erika Franzén
Karolinska Institutet
Department of Neurobiology, Care Sciences
and Society
Division of Physiotherapy

Co-supervisors:

Professor Agneta Ståhle
Karolinska Institutet
Department of Neurobiology, Care Sciences
and Society
Division of Physiotherapy

Assistant professor Caroline Paquette
McGill University
Department of Kinesiology
and Physical Education

Professor Johan Lökk
Karolinska Institutet
Department of Neurobiology,
Care Sciences and Society
Division of Clinical Geriatrics

Opponent:

Professor Jorunn L. Helbostad
Norwegian University of Science and
Technology
Department of Neuroscience

Examination Board:

Associate professor Maria Ekblom
The Swedish School of Sport and Health
Sciences (GIH)

Professor Per Svenningsson
Karolinska Institutet
Department of Clinical Neuroscience and
Neurology (CNS)

Associate professor Britta Lindström
Umeå universitet
Department of Community Medicine and
Rehabilitation
Division of Physiotherapy

Stockholm 2016

ABSTRACT

Aim: To investigate the effects of dopaminergic medications on turning while walking in older adults with mild to moderate Parkinson's disease (PD). A further aim was to develop a training program targeting balance impairments related to PD, to verify the progression of this program and the specific effects on balance and gait, as well as the transfer effects on everyday living.

Methods: This thesis contains an experimental and a clinical part. In the experimental part, quantitative motion analysis was used to evaluate pre- and unplanned walking turns. Nineteen individuals with PD were tested after overnight withdrawal of dopaminergic medication and approximately one hour after taking their usual dose of medication, and were compared with 17 healthy control subjects. In the clinical part, a training program with highly-challenging balance exercise and dual-tasking was developed through workshops and pilot testing. Thereafter, training progression of dynamic exercises throughout this program was evaluated with accelerometers in two training groups (n = 6 and 4). In a randomized controlled trial, 100 individuals with PD were randomized, either to a training group that received a 10-week highly-challenging balance exercise intervention with dual-tasking or to a control group (usual care). The efficacy of this intervention was evaluated before and after the intervention which included specific effects; balance, gait with and without performing a concurrent cognitive task, and transfer effects which were concerns about falling, level of physical activity and activities of daily living. **Results:** Dopaminergic medication had a positive increasing effect on turning distance, whereas no effects on body rotation were found. Compared with the healthy control group, individuals with PD demonstrated lower turning distance and body rotation, and turned with a narrower step width. The objective evaluation of training activity revealed that training progression was accomplished in two independent training groups. The randomized controlled trial demonstrated significant improvements in balance control and gait performance in the training group, compared with the control group. The training group also improved their performance of the cognitive task while walking; however, no group differences were found for any gait parameters during dual-tasking. Significant differences, in favor of the training group, were found for the level of physical activity and activities of daily living, while no group difference was found for concerns about falling. **Conclusions:** Compared with the performance of the healthy control group, dopaminergic medication does not normalize turning performance. These residual turning impairments were accompanied by difficulties alternating step width during turning, which could be important to address in the rehabilitation of individuals with PD. Highly-challenging balance exercises, including dual-task, for a 10-week period was progressive and improved balance and gait performance in older adults with PD, compared with usual care. Positive transfer effects on activities of everyday living were also revealed, indicating that appropriate training programs could promote physical activity and daily activities in individuals with PD.