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More Balance – Less Fear

The effect of an eight-week group-based balance training program on the balance and fear of falling of independently living elderly people

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Thesis abstract

School of Health Care and Social Work

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More Balance – Less Fear: The effect of an eight-week group-based balance training program on the balance and fear of falling of independently living elderly people

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The Finnish population is rapidly aging. It is estimated that by 2060 the number of Finnish citizens over 65 years of age will almost double. In Finland, falls and slips make up 80 percent of the accidents of the elderly aged 65 years and over. Falls are also a major public health and economic burden. As muscular strength and balance decline with aging the risk of falls increases. Falling is closely related to fear of falling, which can accelerate balance deterioration through loss of confidence and restriction of physical activities. By preventing falls through balance training it is possible to prolong elderly people's independent ability to function as well as influence the economic burden that falls inflict on society.

The purpose of this Bachelor thesis was to produce a group-based balance training program, which can contribute to elderly people's independent ability to function. In addition it can be a beneficial tool for physiotherapists in the context of working-life. The aim was to find out the effect of a group-based balance training program on balance and fear of falling of independently living elderly people. This Bachelor thesis was realized within the Nordplus project, which brought together Nordic and Baltic physiotherapy students. Our partners in cooperation were students from Lahti University of Applied Sciences and Tartu University.

The group-based balance training program was carried out as an eight-week intervention with participants training one hour twice a week. There were altogether 24 male and female participants, aged 69–79 years. Balance and fear of falling were tested prior and post intervention. Measurement methods for balance were the Berg Balance Scale (BBS) and the Timed Up and Go test (TUG). Fear of falling was measured using the Falls Efficacy Scale-International (FES-I). The results were analyzed with the SPSS19-program using nonparametric testing with the significance level $p \leq 0,05$.

The balance training program reduced fear of falling statistically significantly ($p \leq 0,05$). The results from BBS and TUG were contradictory: BBS showed statistically significant improvement ($p \leq 0,001$), whereas the results from TUG were not statistically significant ($p > 0,05$).

Keywords: Aged, Postural Balance, Accidental Falls, Fear, Exercise

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Opinnäytetyön tiivistelmä

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Enemmän tasapainoa – vähemmän pelkoa: Ryhmässä toteutettavan kahdeksan viikon tasapainoharjoitusohjelman vaikutus kotona asuvien ikäihmisten tasapainoon ja kaatumisen pelkoon

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Suomen väestö on nopeasti ikääntymässä. Arvion mukaan vuoteen 2060 mennessä yli 65-vuotiaiden suomalaisten määrä lähes kaksinkertaistuu. Kaatumiset ja liukastumiset muodostavat 80 prosenttia yli 65-vuotiaiden tapaturmista Suomessa. Kaatumiset ovat myös merkittävä kansanterveydellinen ja taloudellinen rasite. Kaatumisriski lisääntyy, kun lihasvoima ja tasapaino heikkenevät iän myötä. Kaatuminen liittyy läheisesti kaatumisen pelkoon. Kaatumisen pelko voi heikentää itseluottamusta sekä aikaansaada fyysisen aktiivisuuden rajoittamista, mikä puolestaan voi kiihdyttää tasapainon heikkenemistä. Ehkäisemällä kaatumisia tasapainoharjoittelun avulla on mahdollista pidentää ikäihmisten itsenäistä toimintakykyä sekä vaikuttaa kaatumisista koituviin kustannuksiin.

Opinnäytetyön tarkoituksena oli tuottaa ryhmässä toteutettava tasapainoharjoitusohjelma, joka voi edistää ikäihmisten itsenäistä toimintakykyä. Lisäksi harjoitusohjelma voi olla hyödyllinen työkalu fysioterapeuteille. Tavoitteena oli selvittää ryhmässä toteutettavan, kahdeksan viikkoa kestävän tasapainoharjoitusohjelman vaikutus kotona asuvien ikäihmisten tasapainoon ja kaatumisen pelkoon. Opinnäytetyö toteutettiin osana Nordplus-projektia, jossa pohjoismaiset ja baltialaiset fysioterapian opiskelijat tekivät kansainvälistä yhteistyötä. Yhteistyökumppanimme olivat Lahden ammattikorkeakoulusta ja Tarton yliopistosta.

Harjoitusohjelma toteutettiin kahdeksan viikkoa kestävänä interventiona, jossa osallistujat harjoittelivat ohjatusti tunnin ajan kaksi kertaa viikossa. Osallistujat olivat 69–79-vuotiaita naisia ja miehiä, ja heitä oli yhteensä 24. Tasapainoa ja kaatumisen pelkoa mitattiin ennen ja jälkeen intervention. Tasapainoa mitattiin Bergin tasapainotestillä (BBS) ja Timed Up and Go –testillä (TUG) ja kaatumisen pelkoa Kaatumispelkokyselyllä (FES-I). Tulokset analysoitiin SPSS19-ohjelmalla käyttäen parametritonta testausmenetelmää. Merkitsevyystasona oli $p \leq 0,05$.

Tasapainoharjoitusohjelma vähensi kaatumisen pelkoa tilastollisesti merkitsevästi ($p \leq 0,05$). BBS- ja TUG-testien tulokset olivat ristiriitaisia: BBS osoitti tilastollisesti merkitsevää muutosta ($p \leq 0,001$), kun taas TUG-testin tulokset eivät olleet tilastollisesti merkitseviä ($p > 0,05$).

Avainsanat: ikääntyneet, tasapaino, kaatuminen, pelko, harjoittelu

CONTENTS

Figures and Tables

Used Terms and Abbreviations

ADL	Activities of Daily Living
BBS	Berg Balance Scale
BOS	Base of Support
COG	Centre of Gravity
COM	Centre of Mass
FES-I	Falls Efficacy Scale-International
IADL	Instrumental Activities of Daily Living
SPSS	Statistical Package for Social Sciences
TUG	Timed Up and Go

1 INTRODUCTION

The Finnish population is rapidly aging. According to the latest population forecast of the Central Statistical Office of Finland from 2009 the number of Finnish citizens over 65 years of age will almost double by 2060. In 2009 the amount was 905 000 and it is estimated to grow up to 1,79 million by 2060. At the same time the number of citizens over 85 years of age is estimated to grow from 108 000 to 463 000 (from 2 percent to 7 percent). (Väestöennuste 2009-2060 2009.)

In Finland, falls and slips make up 80 percent of the accidents of the elderly aged 65 years and over. Falls are also a major public health and economic burden. (Pajala 2012, 7–8.) During the last 25 years these accidents have quadrupled and they are about to increase as the amount of elderly people increases. Annually 100 000 falling accidents occur to Finns over 65 years of age, most of them indoors or outdoors in the home environment. (Iäkkäiden tapaturmat, [ref. 26.9.2011].) Falling down is also the most common cause of accidental death in the same age group (Kaatumisten aiheuttamat vammat 2011). Falling is closely related to fear of falling. It is estimated that approximately half of the elderly people living at home experience fear of falling. (Zijlstra et al. 2007, 603.)

The foregoing facts show that elderly people's balance and fear of falling are very current and important topics. The prevention of falls and injuries caused by falls needs to be enhanced. By preventing falls through balance training it is possible to prolong the elderly people's independent ability to function as well as influence the economic burden that falls inflict on society. (Sihvonen 2006; Mänty, Sihvonen, Hulkko, Lounamaa 2007, 4, 7.) As the amount of elderly people grows it also increases the amount of elderly clients and patients in the field of physiotherapy. This Bachelor thesis can be beneficial in the context of working life by offering a tool for balance training.

This Bachelor thesis has been realized as a part of the Joint Physiotherapy Education in Bachelor Thesis Module, which was funded by the Nordplus Programme. During 2011–2012 the Nordplus Joint Physiotherapy Education in Bachelor Thesis Module included nine partner universities and three work-life partners from the Nordic and Baltic countries. Participating students formed Bachelor thesis groups

based on joint topics. Finnish and Estonian physiotherapy students formed a Bachelor thesis group around the topic elderly people. In the course of the working year there were three week-long meetings for all project members. Between these meetings Bachelor thesis groups met individually. We met with our own Bachelor thesis group twice and otherwise kept contact via internet.

The cooperation of Finnish and Estonian physiotherapy students resulted in three individual Bachelor theses. Two theses were realized in Finland, in Seinäjoki and Lahti Universities of Applied Sciences, and one in Tartu University, Estonia. In all three institutes students were also cooperating with work-life partners. Under the topic elderly people Seinäjoki concentrated on elderly people's balance and fear of falling, Lahti concentrated on body awareness and Tartu on psychosocial characteristics.

The three theses were based on an intervention. Similar intervention groups were chosen to train in Seinäjoki, Lahti and Estonia. Measurements concerning balance, fear of falling, body awareness and psychosocial characteristics were carried out prior and post intervention. A key element of our cooperation was conducting each other's measurements and sharing received data. This enabled gaining a larger amount of data than was received from each individual group.

2 BALANCE AND AGING

Postural balance refers to a state where the segments of the body are aligned in a way that enables the body to function in movement and react to both anticipated and unanticipated disturbances in balance. Three input systems are used to gather information concerning the foregoing variables: the vestibular system, the visual system and the somatosensory systems. (Kell & van Deursen 2005, 232, 244.) These input systems give us information about the surrounding environment and our individual actions. Unique information from each input system is required for the central nervous system to determine our position in space. (Rose 2010, 7–8.) Aging affects all these systems (Morgenthal 2001, 54). This sets conditions for training balance (Karvinen et al. 2009, 25).

2.1 Postural balance

Posture means aligning body segments in a way that enables functional tasks. There are two postural functions: maintaining body alignment (balance) and movement from one stable body alignment to another (righting). Postural control consists mainly of anticipatory actions, actions that are already planned prior to the movement (anticipatory postural control). This can be seen in situations where sensory feedback makes us plan for example our gait on varying surfaces. In situations of sudden perturbation for example being bumped, postural control reacts automatically (reactive postural control). (Morgenthal 2001, 45–46; Rose 2010, 4–5.)

Balance is also called postural equilibrium and it is a state where the relation of the center of mass (COM) of the body to its base of support (BOS) is controlled. This is achieved when all the forces acting on the body are balanced. Achieving balance is a complex process requiring continuous muscle activity and joint positioning aiming at keeping the COM over the BOS. Balance can be static or dynamic, where static refers to maintaining an achieved posture and dynamic refers to maintaining balance in action. Control of balance can be proactive or reactive,

where proactive refers destabilizing forces created by the body's own movements and reactive refers to external, destabilizing forces. (Morgenthal 2001, 46.)

2.2 Balance control

Balance control in standing and moving in varying environments is a result of the contribution of multiple systems. The central nervous system can be called the control center, which processes feedback and directs coordinated reactions. When controlling balance the central nervous system requires constant feedback from movement. This information is provided by different sensory systems, which are the vestibular system, the visual system, and the somatosensory system. (Haas 2005, 76–81; Rose 2010, 7.) In addition to the feedback system, a feed-forward system is used to modify movement. The feed-forward system is an anticipatory control system used during most of our daily routines in a familiar environment. The feed-forward system is a result of motor learning, which means that an individual has learned the optimal coordination of movements for a task as well as the optimal amount of muscle work necessary. (Haas 2005, 76–81; Kell & van Deursen 2005, 246; Phillips 2005, 131.)

Based on this information the central nervous system designs appropriate movements and sends commands to the muscles through the peripheral nervous system. These commands result in muscle contractions, which can be seen as postural functions and/or movement functions executed to correct and maintain balance. (Haas 2005, 76–81; Rose 2010, 7–8.)

The vestibular system. The vestibular system is located in the inner ear and it reacts to changes in orientations of the head with respect to gravity as well as changes in velocity (Kell & van Deursen 2005, 244). The vestibular system consists of three semicircular canals filled with liquid, which responds to movements of the head. The moving liquid stimulates hair cells, which sends the information to the central nervous system. (Sand, Sjaastad, Haug, Bjålie & Toverud 2011, 164–165.)

The visual system. The visual system is also an essential part of balance, because it gives us information about our body positions in relation to space. With the help of vision we can easily perceive the relations between different body parts and motions of our body. With the help of visual input the brain is able to distinguish whether the sensed movement is created by head movement, eye movement or a moving object one is watching. (Kell & van Deursen 2005, 244.)

The somatosensory system. The somatosensory system gives information about the location and movement of the body in relation to our support surface and the relation of different body segments to one another. The former refers to the sense of touch and pressure, which are felt at the soles of the feet. This offers information about how weight is distributed in different positions. The latter refers to the proprioceptors of joints and muscles, which offers information about the alignment of body segments. (Kell & van Deursen 2005, 244; Rose 2010, 8.) Muscle spindles and the Golgi tendon organs transmit information about the status of the muscles. Muscle spindles observe the change of length of the muscle and the Golgi tendon organs observe changes in the level of tension. (Haas 2005, 76–81; Rose 2010, 7–8.)

Balance control is not run by reflexes, it is a functional motor skill which evolves through experience and can also be trained. The central nervous system learns to use different, generalized patterns to maintain balance in varied contexts. There are different corrective responses or strategies for controlling balance in the upright posture. The ankle strategy controls body sway with the muscles enabling ankle movements. It is used for correcting small perturbations when standing on a firm surface. When using the ankle strategy the upper and lower body move in the same direction in phase. The hip strategy uses the larger muscles of the hip and it is used when the COM needs to be moved quickly, for example when standing on a surface smaller than the feet. When using the hip strategy the upper and lower body move in opposite directions. The stepping strategy is used when other strategies are inadequate. It means taking a step or several steps into the direction of balance loss in order to quickly gain a new BOS. (Morgenthal 2001, 48; Kell & van Deursen 2005, 247; Rose 2010, 5–6.) Other corrective responses are the stiffen-

ing strategy, arm movements, and lowering the center of gravity (COG) (Morgenthal 2001, 48; Kell & van Deursen 2005, 245.)

2.3 Age-related changes in balance

Aging affects all systems involved with maintaining balance and posture. Firstly, muscle strength decreases, especially in the lower extremities. Structural changes include decreased muscle mass, decreased size and number of type II (fast-twitch) muscle fibers and loss of motor units. (Morgenthal 2001, 54, 57.) Functional changes include decrease in maximal-force production as well as rapid force production (Granacher et al 2011, 392–393; Morgenthal 2001, 57). This means for example that the ability to generate muscle tension for reflex responses is inadequate (Morgenthal 2001, 54, 57). In addition, muscle endurance declines with age (Rose 2010, 15). These changes can be accelerated if the elderly person is physically inactive, which is common. Long immobilization and/or malnutrition is an even more serious threat. (Morgenthal 2001, 58.)

Secondly, aging also affects the central nervous system, for example through cellular loss, especially in the cerebellum, and through decline in neurotransmitter levels. These have an impact on central nervous system processing, which is needed in performing motor tasks. Information integration and/or response preparation processes slow down, which means that motor skills slow down, especially during decision points. When moving faster than their ability to move accurately allows, elderly persons make more errors. This is problematic, because both speed and accuracy are requirements for postural responses. The main age-related change in the peripheral nervous system is the delayed velocity of motor and sensory nerve conduction. This can be seen especially in the lower extremities, where weakening in muscle spindle activity, joint receptor activity and cutaneous receptors affect postural control. (Morgenthal 2001, 55–56.)

With age the somatosensory feedback declines, which results in increasing reliance on vision. This can lead to problems in balance, because vision is also affected by age. Acuity, depth perception and contrast sensitivity are reduced with age and the visual field narrows. The age-related changes on the vestibular sys-

tem also affect vision through the vestibulo-ocular reflex. The weakening of the vestibulo-ocular reflex is the result of hair cell loss in the structures of the inner ear. When an elderly person relies more on vision in maintaining balance, the joint effect of these changes can cause unsteadiness especially in motion-rich visual environments for example a busy shopping mall. Hair cell loss also leads decreased sensitivity to head movements, which leads to increased body sway. (Morgenthal 2001, 52–53; Rose 2010, 13.)

Also cognitive skills affect balance. For example for elderly persons with balance problems the addition of a cognitive task can further diminish balance skills. For elderly persons maintaining balance requires more attention, which can be seen for example in the need to stop walking when talking. (Sihvonen 2004, 17.)

2.4 Principles of balance training for the elderly

Balance training is based on training the different control systems involved in postural control. The principles guiding balance training of the elderly are based on the earlier mentioned facts about age-related changes in balance. (Rose 2010, 31; Pajala 2012, 24.) Balance can be improved by training visual, somatosensory and vestibular feedback, by body awareness exercises, and by motor training (Karvinen et al. 2009, 25).

The visual feedback system is trained by disturbing the somatosensory system. This can be done by using soft and lumpy or unstable surfaces, which block a direct contact to the stable base distracting somatosensory feedback through the feet. Feedback gained through vision is emphasized and strengthened. (Karvinen et al. 2009, 25.)

The somatosensory system is trained by disturbing the visual system. The visual system is distracted when training with eyes closed or in the dark. It can also be distracted by using an object, for example a ball, which is followed with the eyes. More somatosensory feedback is thus required for postural control. (Karvinen et al. 2009, 25.)

The vestibular system is trained by disturbing both visual and somatosensory feedback. An example for this is walking on mattresses with eyes closed, where somatosensory feedback is disturbed and visual feedback is blocked. Visual feedback can also be disturbed by following an object with the eyes. (Karvinen et al. 2009, 25.)

Body awareness exercises aim at giving sensations of one's own body and recognizing the possibilities and limits of one's balance. The sensations are acquired by moving the COG and executing movements at varying speeds. (Karvinen et al. 2009, 25.) By training body awareness it is possible to enhance an elderly person's confidence of controlling one's movements. During exercises an elderly person can have the experience that a minor sway doesn't necessarily lead to falling. On the contrary, they may notice that when needed, the body is able to perform the proper corrective movements. (Pajala 2012, 22.) Training balance skills also includes motor training, which can be strength training of the lower extremities and pelvis, mobility training of the ankles, and step and reaction exercises (Karvinen et al. 2009, 25).

All balance training must be conducted in a way that the participant feels safe. Exercises must challenge balance but at the same time they shouldn't increase the risk of falls. (Jacobson, Thompson, Wallace, Brown & Rial 2011, 550; Kaatumisten ja kaatumisvammojen 2011, 18; Sherrington et al. 2011, 81.) This means that exercises must be designed in a way that enables achieving results, but is at the same time highly safe (Jacobson et al. 2011, 550). This also includes designing exercises individually. An individual's level of condition and possible restrictions define the suitable exercises. (Pajala 2012, 22.) When the participant feels safe, he/she has the courage to perform the given exercises and perform them correctly in a way that challenges balance (Jacobson et al. 2011, 554).

2.5 Recommendations in recent studies

Granacher, Muehlbauer, Zahner, Gollhofer and Kressig (2011, 377–378, 380, 395) have compared traditional and recent approaches in the promotion of balance and strength in older adults in their review. According to Granacher et al. traditional balance training consists mainly of static and dynamic exercises on stable and unstable surfaces. These exercises can be performed with eyes open or closed and standing on either one or both legs. There is evidence that traditional balance training has an effect on postural control, physical functions, strength, and fall rate in older adults. The contents, duration and intensity of balance training vary widely (Granacher et al. 2011, 380; Jacobson et al. 2011, 555).

Granacher et al. (2011, 377–378, 387, 389–390) suggest that compared to traditional balance and resistance training programs perturbation-based or multitask balance training and power/high-velocity resistance training programs are more specific in inducing abilities needed in balance-threatening situations (balance recovery and explosive force). Perturbation-based balance training concentrates on practicing different movement strategies. In practice this is done for example by the instructor applying perturbation to the patient, who then reacts with ankle, hip or step strategy according to the force of perturbation. Another recent approach is multitask or dual-task balance training, which means that a patient is for example given a cognitive and/or motor task to perform while walking. These tasks can imitate functions of daily living (Kaatumisten ja kaatumisvammojen 2011, 18).

There are recent recommendations on falls prevention (Kaatumisten ja kaatumisvammojen 2011; Sherrington et al. 2011). A recent systematic review (Sherrington et al. 2011, 78), which included 54 randomized controlled trials, provides clear evidence that falls in elderly people can be prevented by appropriately designed intervention programs. According to the recommendations, when training balance, exercises must provide a moderate or high challenge to balance in three ways, which include reducing the base of support, movement of the COG, and reducing the need for upper limb support. (Kaatumisten ja kaatumisvammojen 2011, 17; Sherrington et al. 2011, 81.) There is evidence that including functional exercises in the training program apparently reduces the amount of falls in elderly people living at home (Kaatumisten ja kaatumisvammojen 2011, 17). The intensity and

duration of training must be sufficient. It is suggested that a sufficient amount of training would be two hours per week for a six-month period. (Kaatumisten ja kaatumisvammojen 2011, 18; Sherrington et al. 2011, 81.)

Both group- and home-based exercises or a combination of them can prevent falls. Instructed group exercise, which includes at least balance and strength training, diminishes the amount of fallers and falls in elderly people living at home. (Kaatumisten ja kaatumisvammojen 2011,17; Sherrington et al. 2011, 81.) Exercises are beneficial for the general community as well as those at high risk for falls. Walking training and strength training may be included in addition to balance training. Walking training should not be done at the expense of balance training. (Sherrington et al. 2011, 81.) Even though strength training is beneficial, it's not crucial in preventing falls (Alfieri et al. 2010, 185; Sherrington et al. 2011, 82).

3 FEAR OF FALLING IN THE ELDERLY

Studies show that approximately half of the elderly people living at home experience fear of falling. There is not sufficient evidence to show the exact causes of this fear. It is known that a recent fall can cause fear of falling, but nonfallers also experience fear of falling. (Zijlstra et al. 2007, 603.) Fear of falling can actually become an even greater threat for the health of the elderly than falls themselves (Fletcher, Guthrie, Berg, Hirdes 2010, 187). With aging, the same risk factors that cause falls, for example physical frailty, also have an effect on fear of falling. Fear of falling is therefore not only a consequence of a fall, but rather a realization of being at risk. (Friedman, Munoz, West, Rubin & Fried 2002, 1333; Zijlstra et al. 2007, 603.)

Fear of falling can be a response to realistic threats, but it can also grow out of proportion. This means that an individual may start limiting activities he/she would still be able to perform. This in turn can lead to a vicious cycle, where fear of falling causes loss of confidence, restriction of physical activities, and social participation, which further lead to physical frailty, balance deterioration, falls and finally loss of independence. (Friedman et al. 2002, 1333; Zijlstra et al. 2007, 603, 607; Fletcher et al. 2010, 187.) Even without actual falls, fear of falling is very likely to persist once it has developed and once the individual has started limiting his/her activities (Friedman et al. 2002, 1333).

There are factors that predict restricting activities due to fear of falling. These are previous history of falls, compromises in performing IADL functions, lowered cognitive functions (for example Alzheimer disease), impairment in gait and pain. Female sex has also been shown to be a predictor of both fear of falling and restriction of activity. (Fletcher et al. 2010, 187, 190.)

Delbaere, Crombez, Vanderstraeten, Willems & Cambier (2004, 371) were among the first to study the relation between fear related avoidance of activities and physical performance and the incidence of falls. Their results suggested that elderly with fear of falling avoid walking and tasks, which included reaching. They also found out that restricting activities due to fear of falling correlates with physical performance and an individual’s maximum reaching distance. In addition it was shown

that within one year, fear of falling and restriction of ADL predict falls. The results supported the theory that fear of falling and avoidance of activities are important factors connected to physical frailty i. e. diminished muscle strength and lowered reaching abilities. Because they lead to physical inactivity, they immensely accelerate the process of becoming physically frail.

Fear of falling can be reduced by exercising. A systematic review (Zijlstra et al. 2007, 605–606) showed that home-based exercise interventions and fall-related multifactorial interventions, as well as community-based tai chi were effective in reducing fear of falling.

4 PURPOSE, AIM AND RESEARCH QUESTIONS

We were viewing elderly people's balance from the perspective of a balance training program. Our purpose was to produce a group-based balance training program, which can be a beneficial tool for physiotherapists in the context of working-life. This training program can contribute to elderly people's independent ability to function. Our aim was to find out the effect of a group-based balance training program on the balance and fear of falling of independently living elderly people.

Our research questions were:

What is the effect of an eight-week group-based balance training program on the balance of independently living elderly people?

What is the effect of an eight-week group-based balance training program on the fear of falling of independently living elderly people?

5 METHODS AND EXECUTION

As a research method we have used the quantitative research method. The quantitative research method describes matters in numbers and also aims in finding out dependencies and / or changes between phenomena. Results can be demonstrated by using tables and diagrams. (Heikkilä 2008, 16.) The practical part of our Bachelor thesis was carried out as an intervention. An intervention is used when the aim is to determine the effect of for example a treatment or a therapeutic regimen on a specific target group (Everitt 1995, 47, 127).

5.1 Execution

This Bachelor thesis was realized in cooperation with Nordplus partners in Seinäjoki, Lahti and Tartu. In practice this meant, that simultaneously similar interventions were carried out in Seinäjoki, Lahti and Tartu. Our plan was to have 10 participants in Seinäjoki, 10 in Lahti, and 10 in Tartu. The participants were gathered with the help of work-life partners using an advertising letter (Appendix 1). The work-life partner in Seinäjoki was Kivipuro Rehabilitation Centre, in Lahti Harjula Settlement Association, and in Tartu Haapsalu Neurological Rehabilitation Centre. An information letter and a contract were sent to the participants in advance (Appendix 2; Appendix 3).

Included were independently living men and women aged 69–79, whose cognitive skills needed to be at a level where instructions could be followed. The age range was chosen based on the fact that the life expectancy in our partner country Estonia is at the moment 79 for females and 69 for males (Maamägi 2005, 83-84). Excluded were persons who use a walking aid indoors or who have a doctor’s prohibition to exercise. The chosen participants filled a health questionnaire included in the ALPHA-FIT Test Battery for Adults Aged 18-69 by the Finnish UKK Institute (Centre for Health Promotion Research). There is a separate questionnaire available for the elderly by the UKK Institute, but it has not been translated into English. We, however, chose the first mentioned questionnaire, because we preferred official translations in our cooperation, and since the questionnaires are almost identi-

cal. The questionnaire included questions about basic personal information, level of physical activity, health, and possible illnesses, which we needed to be aware of in order to make sure, that exercises are safe. The questionnaire was also a means of monitoring our exclusion criteria. (Appendix 4.)

The level of physical activity in itself was not under examination. For us it was relevant to control major changes in physical activity. In addition, major changes in health, mood and social contacts were monitored for use of our partners. This was done by using an enquiry, which the participants filled once a week during the group meeting (Appendix 5).

A total of 32 participants began the intervention, 12 in Seinäjoki, 9 in Lahti, and 11 in Tartu. The description of participants can be seen in Table 1. After drop-outs (5) and excluded persons (3) the three intervention groups consisted of 24 participants. Missing more than four times of training, was considered as dropping out. There was one drop-out and two excluded in Seinäjoki, in Lahti there was one drop-out and one excluded, and in Tartu there were three drop-outs. One of the drop-outs had hip pain and decided not to continue, one was in line for surgery and got an appointment sooner than expected, and the remaining three missed more than four times of training. Two of the excluded persons were out of the upper age limit, and one used a walking aid during initial measurements. Of the 24 participants 5 were male and 19 female. The mean age was 74 years, the youngest participant was 69 years, and the oldest was 78 years.

Table 1. Description of participants.

Participants	Seinäjoki	Lahti	Tartu	Total
Started	12	9	11	32
Drop-outs	1	1	3	5
Excluded	2	1	-	3
Included	9	7	8	**24**
Male	2	4	-	6
Female	7	3	8	18
Mean age	74	73	76	74

Balance groups trained twice a week for eight weeks, one hour at a time. The intervention exercise program was planned in cooperation with our Nordplus partners. It consisted of a 10-minute warm-up, which had four different variations, an approximately 30-minute balance training section realized in the form of circuit training, including 10 tasks, 1,5 minutes per task. The program ended with a 15-minute body awareness part, which was compiled by our partners in Lahti. We designed the circuit training sections based on principles of balance training for the elderly. The tasks mimicked situations in everyday life, which require balance. We preferred multitask exercises to add challenge to the tasks. There were different versions for all tasks according to the challenge level. This way each participant could train at his/her own level. Warm-ups were designed in co-operation with Lahti. (Appendix 6; Appendix 7.) The Borg RPE scale was used as a self-monitoring tool to control exertion.

5.2 Measurement methods

As measurement methods for balance we chose the Berg Balance Scale (BBS) version 2, and the Timed Up and Go test (TUG). As a measurement method for fear of falling we used the Falls Efficacy Scale-International (FES-I). As a self-monitoring tool for the participants we used the Borg RPE Scale (Rate of Perceived Exertion). The same rater carried out initial and final measurements for a participant.

Berg Balance Scale. The BBS evaluates balance of the elderly through a 14-step test, which is comprised of movements needed in everyday life. The BBS is a simple test and it is easy to carry out. It is also safe to perform on elderly clients and patients. The test has been proven valid and reliable. In our case it is especially important that the test is inter-rater reliable, because our partners also performed it and shared the results with us. (Berg, Wood-Dauphinée, Williams & Gayton 1989, 304, 307-308, 310.)

The BBS tests a person's ability to maintain and alter position. The test measures four different sections of balance skills: a) balance control when the BOS is reduced (tasks 2, 3, 7, 13 and 14), b) balance control whilst altering positions (tasks 1, 4, 5, 9 and 11), c) balance control when the COG moves to edge of the BOS (forward: task 8, sideways: tasks 10 and 12) and d) balance control with vision excluded (task 6). (Paltamaa & Peurala 2011.)

The tasks become more challenging as the test proceeds. Each task is evaluated on a scale from 0 to 4, with 0 as the weakest performance and 4 the highest. There are criteria for each score, which means that if the required time or length is not achieved, or if the participant's performance requires supervision or support, the points reduce. The maximum score from the 14 tasks is 56 points. (Paltamaa & Peurala 2011.) (Appendix 8.)

Timed up and Go. The TUG test is a modified version of the Get-up and go –test (Podsiadlo & Richardson 1991). It tests basic functional mobility and dynamic balance in elderly persons (Bennie et al. 2003, 97). It seems to indicate a patient's ability to go outside safely and independently. The test consists of the patient getting up from an armchair, walking three meters, turning and returning to sit. This performance is timed. The test is quick and easy to perform. The test has been proven valid and reliable. (Podsiadlo & Richardson 1991.) It has also been shown to correlate well with the BBS as a simple measure of balance (Podsiadlo & Richardson 1991; Bennie et al. 2003, 93). (Appendix 9.)

Falls Efficacy Scale-International. The FES-I has been developed to measure fear of falling. It includes 16 questions monitoring a person's subjective fear of falling in different every-day life situations both indoors and outdoors. Points are given on a scale from 1 (not at all concerned) to 4 (very concerned) and the result is the sum of these points. The best possible score is 16 points (least fear of falling) and the bottom score is 64 points (most fear of falling). (Kaatumisten ja kaatumisvammojen 2011, 14.) The FES-I has been proven valid and reliable (Yardley etc. 2005, 614; Delbaere etc. 2010, 210). (Appendix 10.)

Borg RPE Scale. The Borg RPE (Rating of perceived exertion) is a scale ranging from 6 to 20, designed to measure subjective exercise training intensity. Ratings between 12 to 14 are considered appropriate for a moderate level of intensity. (Perceived Exertion (Borg Rating of Perceived Exertion Scale) 2011.) The RPE scale has been proven to be a valid and reliable method for monitoring exercise training intensity. (Borg 1998, 28–39; Herman, Foster, Maher, Mikat, Porcari 2006, 14).

We shared measurement results with our partners in cooperation. All of us had chosen frequently used tests that were available in English. Most of them were already translated into Finnish and Estonian, but some translations needed to be done. In addition to the above mentioned measurements (BBS, TUG & FES-I) we also performed tests for Lahti (Body awareness: Body awareness questionnaire & Modified body awareness scale) and Tartu (Psychosocial characteristics: General self-efficacy scale, Geriatric depression scale 15 & Three-item loneliness scale). In return Lahti and Tartu performed our measurements (BBS, TUG & FES-I) and submitted the results for us to analyze. This way we all received data of all three intervention groups. The measurement results were recorded into Excel-file form and shared via e-mail. The participants were referred to by code number.

5.3 Research method for analyzing results

Our sample group consists of the results of 24 participants, which should be considered a small amount of data. This amount of data cannot be assumed to follow a specific distribution with certain parameters. In this case the nonparametric method is the only option to receive reliable results. The nonparametric method does not include as many assumptions as the parametric method, which is used for larger amounts of data. (Metsämuuronen 2004, 9, 14.)

As a nonparametric method we have used the Wilcoxon signed rank test. It compares the difference between two groups in paired samples and its equivalent in the parametric method is the paired sample *t* test. (Colton 1974, 219; Metsämuuronen 2004, 20.) The Wilcoxon signed rank test is applicable in settings

comparing results from initial and final measurements (Metsämuuronen 2004, 20). The Wilcoxon signed rank test is based on comparing medians. The results get positive or negative signs for their ranks, based on if they have negative or positive differences. The sum of positive or negative ranks is the test statistic, which is compared to the null hypothesis. To be statistically significant, the result has to be 0,05 or lower to reject the null hypothesis. (Colton 1974, 219–220; Everitt 1995, 272.) We have analyzed our data using the Statistical Package for Social Sciences (SPSS) –program, which is designed specifically for analyzing quantitative data (Metsämuuronen 2000, 3).

5.4 Schedule

April 2011. Nordplus opening seminar in Hilleröd, Denmark. Forming of BT-group.

September 2011. Group meeting in Tartu, Estonia. Making decisions concerning execution.

October 2011. Nordplus seminar in Seinäjoki, Finland. Presenting BT-plan. Practicing training program.

October-November 2011. Sending advertising letter on balance group to work-life partner Kivipuro Rehabilitation Center to gather participants.

November 2011. Contacting 12 possible participants via telephone.

December 2011. Mailing contracts and information letters, including suggestion for initial measurement appointment, to 12 participants. Contacting participants to confirm appointments.

January 2012. Group meeting in Lahti, practicing measurements and training program. Initial measurements for participants (week 2).

January-March 2012. Training program (week 3-10) Mon and Thu 15.30-16.30.

March 2012. Final measurements for participants (week 11).

April 2012. Sharing and analyzing results. Nordplus ending seminar in Haapsalu, Estonia. Presenting BT.

May 2012. Writing and sending individual results and feedback to participants.

September 2012. Finalizing BT.

October 2012. Presenting BT in Seinäjoki.

6 RESULTS

We have analyzed the results of the three intervention groups on behalf of balance and fear of falling. Lahti analyzed results on behalf of body awareness and Tartu on behalf of psychosocial characteristics. These results can be viewed in detail in these separate Bachelor theses (Järvinen & Karplund 2012, 24–28; Kütt 2012, 30–31).

6.1 Results for balance and fear of falling

Berg Balance Scale. 19/24 (79 percent) improved score, 2/24 (8 percent) maintained score, and 3/24 (13 percent) weakened score. This is illustrated in Figure 1. The itemized results for BBS are presented below in Table 2. In the initial measurements the median was 52,50 points, the mean was 52,17 points, and the standard deviation was 2,90 (sd ± 2,90). The best score was 56/56 points, scored by three persons, and the lowest score 46/56 points. In the final measurements the median was 55 points, the mean was 54,63 points (sd ± 1,35). The best score was 56/56, scored by eight persons and the lowest score 52/56 points. When comparing initial and final measurements, the median improved by 2,50 points, the mean improved by 2,46 points, and the standard deviation reduced 1,55. The improvement was statistically significant ($p = 0{,}000 \leq 0{,}001$).

Table 2. Results for BBS.

BBS	Initial measurements	Final measurements	Change
Highest score (points)	56/56	56/56	-
Lowest score (points)	46/56	52/56	+6
Median (points)	52,50	55,00	+2,50
Mean (points)	52,17	54,63	+2,46

Standard deviation	2,90	1,35	-1,55

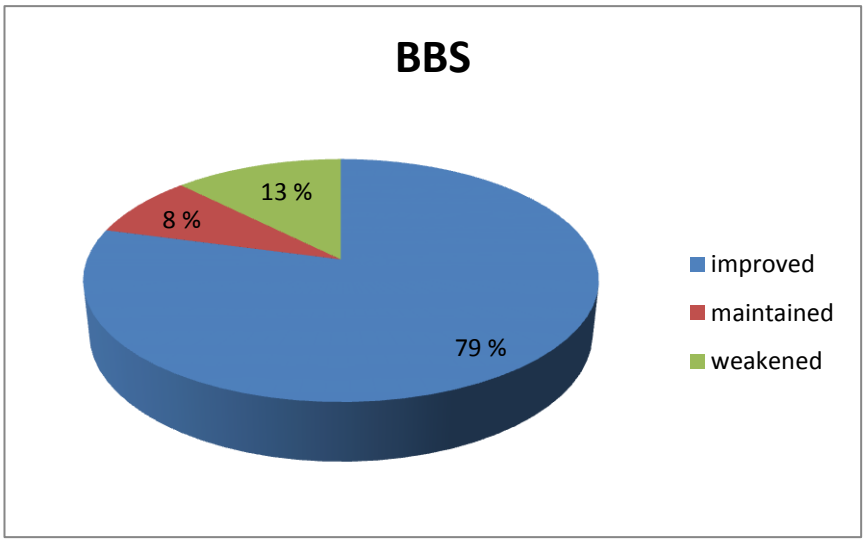

Figure 1. BBS percentual score.

Timed up and Go. 15/24 (63 percent) improved time, 1/24 (4 percent) maintained time, and 8/24 (33 percent) slowed time. This is illustrated in Figure 2. The itemized results for TUG are presented below in Table 3. In the initial measurements the median was 8,10 seconds, the mean was 8,54 seconds, and the standard deviation was 1,94 (sd ± 1,94). The fastest time was 3,70 seconds and the slowest time was 12,70 seconds. In the final measurements the median was 8,05 seconds, the mean was 8,37 seconds (sd ± 1,81). The fastest time was 5,60 seconds and the slowest time was 13,40 seconds. When comparing initial and final measurements, the median reduced by 0,05 seconds, the mean reduced by 0,17 seconds, and the standard deviation reduced 0,13. There was no statistically significant improvement ($p = 0,420 > 0,05$).

Table 3. Results for TUG test.

TUG	Initial measurements	Final measurements	Change
Fastest time (seconds)	3,70	5,60	+1,90
Slowest time (seconds)	12,70	13,40	+0,70
Median (seconds)	8,10	8,05	-0,05
Mean (seconds)	8,54	8,37	-0,17

Standard deviation	1,94	1,81	-0,13

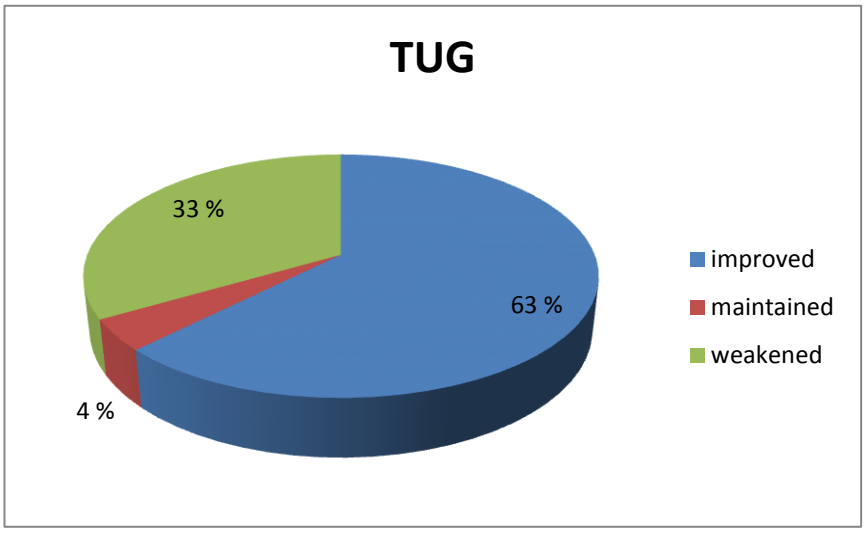

Figure 2. TUG percentual score.

Falls Efficacy Scale-International. In 14 cases out of 24 (58 percent) fear of falling reduced, in 5 cases out of 24 (21 percent) fear of falling remained the same, and in 5 cases out of 24 (21 percent) fear of falling increased. This is illustrated in Figure 3. The itemized results for FES-I are presented below in Table 4. In the initial measurements the median was 25 points, the mean was 26,54 points, and the standard deviation was 7,03 (sd ± 7,03). The lowest score was 16/64 (least fear of falling) and the highest score was 39/64 (most fear of falling). In the final measurements the median was 22 points, the mean was 23,67 points (sd ± 6,86). The lowest score was 16/64 and the highest score was 43/64. When comparing initial and final measurements, the median reduced by 3 points, the mean reduced by 2,88 points, and the standard deviation reduced 0,17. The reduction of fear of falling was statistically significant ($p = 0,018 \leq 0,05$).

Table 4. Results for FES-I.

FES-I	Initial measurements	Final measurements	Change
Lowest score (points)	16/64	16/64	-
Highest score (points)	39/64	43/64	+4
Median (points)	25,00	22,00	-3,00

Mean (points)	26,54	23,67	-2,88
Standard deviation	7,03	6,86	-0,17

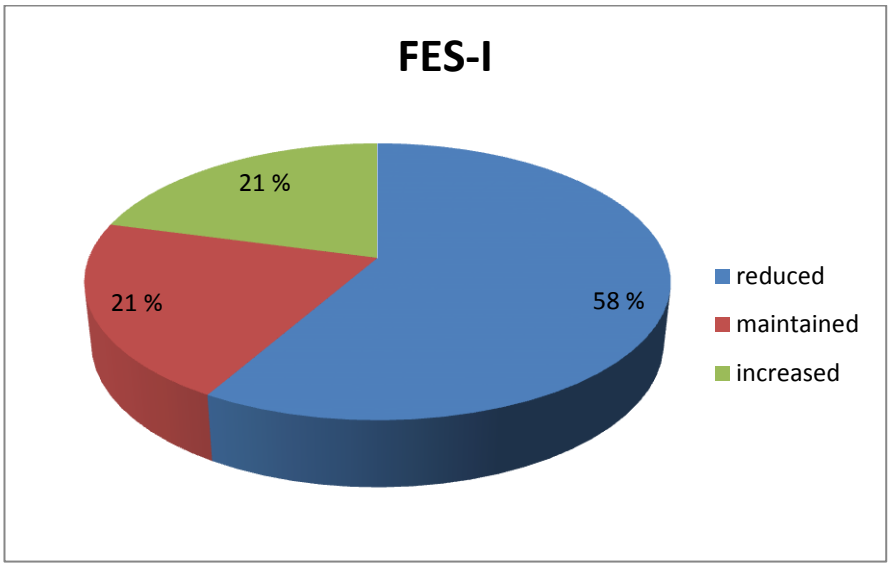

Figure 3. FES-I percentual score.

6.2 Results for body awareness and psychosocial characteristics

Since the cooperation resulted in three independent Bachelor theses, the methods for analyzing results differ in each work. We will, however, briefly present the results of our partners.

Our partners from Lahti University of Applied Sciences measured body awareness using a modified version of the Body Awareness Scale and the Body Awareness Questionnaire. Their results showed that body awareness seemed to improve. The average results of the Body Awareness Scale improved by 43,3 percent and the average results of the Body Awareness Questionnaire by 5,1 percent. (Järvinen & Karplund 2012, 28.)

Our partner from Tartu University measured psychosocial characteristics using three questionnaires: the Geriatric Depression Scale 15, the General Self-Efficacy Scale, and the Three-Item Loneliness Scale. In the Geriatric Depression Scale 15, 40 percent improved (depression declined), 24 percent maintained, and 36 per-

cent weakened their score (depression increased). In the General Self-Efficacy Scale 48 percent improved, 24 percent maintained, and 28 percent weakened their score. In the Three-Item Loneliness Scale 16 percent improved (loneliness declined), 52 percent maintained and 32 percent weakened their score (loneliness increased). (Kütt 2012, 30–31.)

7 CONCLUSION AND DISCUSSION

Our aim was to find out the effect of an eight-week intervention on the balance and fear of falling of independently living elderly people aged 69–79 years. The results were gathered from 24 participants using the BBS, the TUG test, and the FES-I as measurement methods. There was statistically significant improvement in the results of the BBS and the FES-I. The TUG test showed no statistically significant improvement. In their weekly enquiry, the participants reported no major changes in physical activity, health, mood or social contacts, which might have affected the test results. Our results showed that an eight-week, group-based balance training program may have positive effects on the balance and fear of falling of independently living elderly people.

In the field of physiotherapy, balance, accidental falls, and fear of falling have been studied widely. Our results supported previous studies (Granacher et al. 2011, 377–378, 380, 395; Jacobson et al. 2011, 555; Sherrington et al. 2011, 81). We managed to design a balance training program, which was both challenging and safe. It was based on the principles of balance training for the elderly and emphasis was put on multitask exercises. This explains the similar results with previous studies concerning balance (Granacher et al. 2011, 377–378, 380, 395; Jacobson et al. 2011, 555; Sherrington et al. 2011, 81).

Our group-based balance training program also had positive effects on fear of falling. Previously there has been strong evidence that home-based interventions are effective in reducing fear of falling (Zijlstra et al. 2007, 605–606). Our results showed that fear of falling can also be reduced in a group-based setting.

The sensitivity of the BBS was under discussion when choosing measurement methods. Would the BBS be sensitive enough to measure the balance of subjects who are independent in daily functions? There was a risk that many of the participants could score full points already in the initial measurements. This, however, proved to be the case only with three persons and otherwise we were able to see significant changes in the BBS scores. On the other hand the TUG test did not show significant changes and did not correlate with the BBS as expected. We had chosen the TUG test to support the BBS. Additionally we expected TUG to widen

the results concerning dynamic balance, because the BBS doesn't include a walking task. We expected the TUG results to confirm the results of the BBS, because TUG has been shown to correlate well with the BBS (Bennie et al. 2003, 93). In our case, however, this didn't happen. This could be due to the reason that the participants already had good dynamic balance in the initial measurements.

In an ideal setting there would have been a control group in addition to the intervention group, and we would have piloted the training program. The measurements would also have been conducted by an objective outsider whereas now the instructors conducted the measurements. A longer duration of the intervention as well as a larger amount of participants might have improved the quality of this intervention. Studies show that interventions lasting six months give the best results (Kaatumisten ja kaatumisvammojen 2011, 18; Sherrington et al. 2011, 81). We, however, had to operate in a limited timeframe. A larger amount of participants, on the other hand, could have been too risky given the limited number of instructors, since balance training requires supervision and at times assistance from instructors. By limiting age and sex distribution we might have gotten different results. In our opinion the heterogeneity of the group made the results more generalized.

Along with our individual results the form of execution in an international setting should be emphasized. Regarding the outcome of all three Bachelor theses, the results suggest that this kind of training program might have positive effects on balance, fear of falling, body awareness and psychosocial characteristics of independently living elderly people in Finland and Estonia. Psychosocial characteristics did not show as much improvement as balance and body awareness. Further research is needed in all fields.

This form of cooperation was unique within the Nordplus project, because the cooperation went deeper into the practical level than before. The results of cooperation suggest that producing Bachelor theses in an international setting can be beneficial for furthering physiotherapy education. Realizing this Bachelor thesis in cooperation with two partners provided both benefits and challenges. The greatest benefit was getting a greater number of results due to three intervention groups. Challenges were presented in inter-rater reliability and in evaluating the effects of the training program in three different aspects. Even though we practiced the exe-

cution of the measurements and the training program together to ensure that we all perform them exactly the same way, there might have been variations in execution. Variations were also created by different surroundings of the three intervention groups. The number of instructors also varied. In Tartu there was only one instructor whereas in Seinäjoki and Lahti there were two. Regarding results we cannot certainly tell which part or parts of the training program affected balance and fear of falling. Therefore we had to view the training program as a whole.

The participants filled the enquiry of changes in life. Since the changes were evaluated subjectively we cannot know for sure, weather all the changes we would have considered worth mentioning were actually mentioned. Considering initial and final measurements we don´t know how other factors outside the training program might have affected the results. For example one participant had slipped and fallen a few days prior to final measurements and was under medication. We received feedback from the participants, partly in written form and mainly by word of mouth. In the feedback participants told that the social interaction between participants was natural. Participants felt that they were more energetic and in a better mood thanks to the intervention. Some experienced pain relief, a more relaxed feeling and better concentration abilities. Participants also felt that their balance had improved which in turn lead to higher motivation and courage to exercise and to move outdoors during winter time.

For further research in this field, we suggest having a control group, a larger amount of participants, and a longer duration for the intervention. We also suggest piloting the training program and using an objective outsider as a conductor of measurements. In addition more sensitive measurement methods for this type of sample group could give more accurate results. Concerning the cooperation within this process, even more emphasis would be put on practicing the performing of measurements and the training program to ensure that all parties operate exactly the same way.

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APPENDICES

APPENDIX 1 Advertising letter

TASAPAINORYHMÄ

HEI!

Olemme kolmannen vuoden fysioterapian opiskelijoita Seinäjoen ammattikorkeakoulusta. Teemme opinnäytetyötä ikääntyneiden tasapainosta. Etsimme kymmentä vähintään 70-vuotiasta kotona asuvaa henkilöä tasapainoryhmään. Aloitamme alkutestauksilla viikolla 2 (9.-13.1.2012), minkä jälkeen kokoonnumme tasapainoilemaan kaksi kertaa viikossa kahdeksan viikon ajan. Tämän jälkeen teemme lopputestauksia viikolla 11 (12.-16.3.2012).

Yhden harjoittelukerran kesto on noin tunti, sisältäen alkulämmittelyn ja tasapainoharjoittelun lisäksi myös kehotietoisuuteen liittyvän loppurentoutusosion. Harjoittelupaikaksi olemme kaavailleet koulumme liikuntasalia (Koskenalantie 17). Harjoittelemaan kokoontuisimme maanantaisin ja torstaisin kello 15.30. Olemme mukana kansainvälisessä opinnäytetyöprojektissa, ja samanlaiseen tasapainoharjoitteluryhmään osallistuu ikäihmisiä myös Lahdessa ja Virossa.

Tiedustelisimmekin, olisiko teillä kiinnostusta lähteä mukaan harjoitusohjelmaan, ja olisitteko valmiita tulemaan koulunmäelle kaksi kertaa viikossa tuona aikana. Mikäli kiinnostusta osallistua olisi, mutta paikka ja aika tuottavat vaikeuksia, toivoisimme myös siinä tapauksessa ilmoitettavan meille ja voimme vielä harkita eri vaihtoehtoja toteutukseen liittyen.

Yhteyshenkilömme Kivipurossa on Liisa Mäki. Hänelle voit ilmoittaa kiinnostuksesi ja jättää yhteystietosi.

Iloisin terveisin Miina Jokela ja Sonja Mäenpää

APPENDIX 2 Information letter

Hyvä tasapainoryhmän osallistuja!

Olemme Seinäjoen ammattikorkeakoulun fysioterapian koulutusohjelman kolmannen vuosikurssin opiskelijat Sonja Mäenpää ja Miina Jokela. Toteutamme opinnäytetyöhömme liittyvän ikääntyvien tasapainoharjoitusryhmän alkuvuodesta 2012. Toteutamme opinnäytetyömme kansainvälisen NordPlus-hankkeen puitteissa. Yhteistyökumppaneinamme on kaksi opiskelijaa Lahden ammattikorkeakoulusta sekä yksi opiskelija Tarton yliopistosta Virosta. Seinäjoen lisäksi sekä Lahdessa että Virossa kokoontuu samansisältöinen tasapainoharjoitusryhmä. Luovutamme yhteistyökumppaneillemme heidän osa-alueitaan koskevat testitulokset.

Harjoitusryhmä on tarkoitettu 69-79-vuotiaille, kotona asuville ikäihmisille. Harjoitusohjelmaan kuuluu alkulämmittely, kiertoharjoitteluna toteutettu tasapainoharjoittelu sekä loppurentoutus, joka sisältää kehotietoisuusharjoituksia. Harjoituskerran kesto on n. 1 tunti. Osallistuminen on maksutonta.

Paikka: Seinäjoen ammattikorkeakoulun Sosiaali- ja terveysalan yksikön Koskenalantien toimipisteen **liikuntasali, os. Koskenalantie 17.**

Aika: 2 kertaa viikossa, maanantaisin ja torstaisin klo 15.30-16.30 ajalla 16.1.-8.3.2012

Alkumittaukset järjestetään ennen harjoitusryhmän alkamista **viikolla 2**. Oma aikasi sovitaan henkilökohtaisesti.

OMA AIKANI: _____

APPENDIX 3 Contract

Olen tietoinen seuraavasta:

Osallistun vapaaehtoisesti Seinäjoen ammattikorkeakoulun fysioterapian opiskelijoiden laatimaan ja toteuttamaan opinnäytetyön tasapainoharjoitusryhmään ajalla 9.1.-16.3.2012.

Kyseinen opinnäytetyö tehdään kansainvälisen Nordplus-hankkeen puitteissa, jolloin Seinäjoen ammattikorkeakoulun lisäksi mukana on yhteistyökumppanit Lahden ammattikorkeakoulusta (2 opiskelijaa) sekä Tarton yliopistosta (Viro,1 opiskelija).

Ryhmään osallistuminen sisältää alku- ja loppumittaukset, joihin sisältyvät tasapainotestit, kyselylomakkeet ja kehotietoisuuteen liittyvät testaukset.

Kehotietoisuuteen liittyvät testitulokset luovutetaan Lahden ammattikorkeakoulun yhteistyökumppaneille ja kyselylomakkeiden tiedot Tarton yliopiston yhteistyökumppanille.

Edellä mainituissa luovutetuissa tiedoissa minuun viitataan numerolla, jolloin minua ei voida tiedoista tunnistaa.

Minua koskevia tietoja tullaan käyttämään ainoastaan kolmen yhteistyökumppanin opinnäytetöissä, eikä tietoja luovuteta muille osapuolille.

Minua koskevat tiedot tullaan hävittämään kolmen yhteistyökumppanin opinnäytetöiden valmistuttua.

Ryhmää ohjaavat opiskelijat noudattavat salassapitovelvollisuutta.

Tasapainoharjoitusohjelmaan sisältyy alkulämmittely, tasapainoharjoittelu kiertoharjoitteluna sekä kehotietoisuusharjoitteista koostuva loppurentoutus.

Tasapainoharjoitusryhmä kokoontuu kaksi kertaa viikossa, maanantaisin ja torstaisin klo 15.30-16.30 Seinäjoen ammattikorkeakoulun Sosiaali- ja terveysalan yksikössä, Koskenalantien toimipisteen liikuntasalissa osoitteessa Koskenalantie 17.

Saan keskeyttää osallistumiseni harjoitusryhmään milloin tahansa niin halutessani.

Olen lukenut sopimuksen ja hyväksyn sen sisällön

Paikka ja aika

_____

Allekirjoitus ja nimenselvennys

APPENDIX 4 Health Questionnaire for Adults Aged 18-69

Fitness for Health:
The ALPHA-FIT Test Battery
for Adults Aged 18-69
Pre-test Health Screening
Assessing Levels of Physical Activity

PHYSICAL ACTIVITY QUESTIONNAIRE

1. The physical load of my job is
light 1
medium heavy 2
heavy 3
I am not employed 4

2. To what leisure time physical activity group do you belong?
Please take into consideration all leisure time physical effort that lasted at least 20 minutes at a time within the last three months.
1 practically no physical activity weekly
2 light or relaxed physical activity one or more times a week energetic and brisk physical activity:
3 about once a week
4 twice a week
5 three times a week
6 at least four times a week
Physical activity is energetic and brisk when it causes at least some sweating and intensified breathing.

3. What have been your most common modes of physical activity or sports recently?
1 most typical mode of sport or other physical activity
_____
2 second most typical mode of sport or other physical activity
_____
3 third most typical mode of sport or other physical activity
_____

4. Has your leisure time physical activity changed during the last three months in comparison with earlier?
1 it has increased
2 there has been no notable change
3 it has decreased

5. How are your possibilities (time, money, facilities, instruction) and interest in being regularly physically active in your current life situation?

1 good possibilities	1 very interested
2 considerable possibilities	2 somewhat interested
3 poor possibilities	3 not interested whatsoever

HEALTH QUESTIONNAIRE

Circle the most suitable alternative in response to the following questions.

6. How do you estimate your own health status?
1 very poor
2 poor
3 average
4 good
5 very good

7. How do you estimate your physical fitness in comparison with that of other persons of the same age?
1 clearly poorer
2 somewhat poorer
3 just as good
4 somewhat better
5 considerably better

Read the following questions carefully and respond by circling either yes or no

8. Do you have a heart disease, circulation disorder or lung disease that has been diagnosed by a doctor? yes no
What? _____

9. Do you ever experience chest pain or breathlessness
a) while resting? yes no
b) while physically active? yes no

10. Has a doctor ever stated that your blood pressure is permanently increased (do you suffer from "hypertension")? yes no

11. Have you smoked regularly during the last six months? yes no

12. Do you often feel faint or have dizzy spells? yes no

13. Have you ever been diagnosed by a doctor as having an inflammatory disease of the joints? yes no

14. Do you have low back problems or any other chronic or recurring musculo-skeletal disorder? yes no
What? _____

15. Do you have any other health-related reason (that is not mentioned above) that would limit your participation in physical activity, even though you want to participate? yes no
What?_____

16. Are you currently taking any medication? yes no
What? _____

17. Have you had the flu or a fever during the last two weeks? yes no

18. Have you imbibed a substantial amount of alcohol within the last 24 hours (more than 2 restaurant-size drinks)? yes no

http://www.ukkinstituutti.fi/filebank/500-ALPHA_FIT_Testers_Manual.pdf

APPENDIX 5 Enquiry of changes in life

TASAPAINORYHMÄ

LIIKUNTA- JA TERVEYSPÄIVÄKIRJA

Onko kuluneen viikon aikana tapahtunut <u>merkittävää muutosta</u>

1.) Fyysisessä aktiivisuudessa?

2.) Muissa harrastuksissa?

3.) Terveydentilassa?

4.) Mielialassa?

APPENDIX 6 Training Program

GROUP-BASED BALANCE TRAINING PROGRAM FOR INDEPENDENTLY LIVING ELDERLY PEOPLE

WARM-UP

- 10 minutes (8 minutes aerobic 2 minutes stretching)
- Four different variations, each used four times, one after another
- Music in parts 1 and 3

Warm-up 1: chair dancing

- Sit on the chair; keep good posture during the exercises.
- Marching. Hands come along.
- Lift you heels off the ground.
- Reach forward, to opposite side, with arms, rotate your whole upper body.
- Reach and tap the floor with your heels.
- Swing your hands from side to side along the music, rotate your body.
- Touch your knee with your opposite elbow.
  Rotate your middle body properly.
- Reach upwards with your hands.
- Rotate your ankles to both directions.
- Rotate your wrists to both directions.
- Abduct and adduct your thighs.
- Rotate the shoulders to both directions. End the warm-up with a good posture, shoulders back.

Warm-up 2: pairs

- Standing towards a partner ball under one foot, clapping hands with pair.
- Back to back, passing ball through rotations to both sides.
- Back to back, passing ball over head, lower arms between passes.
- Back to back, passing ball between legs, raise body between passes.
- Ball between backs, moving in varied directions.
- Ball between hips, moving in varied directions.
- Ball between upper arms, moving in varied directions.

Warm-up 3: dance

- March in one place, lift shoulders, roll shoulders (also with hands on shoulders and long arm), comb hair, boxing
- Touch the opposite knee with hands
- Steps from side to side, flex elbows, pump fingers into fist and open hands to side one by one, both hands down and around.
- Stand in one place, flex knees, add reciprocal arm swings and rotations of upper body
- March in one place, reciprocal arms
- March to the front (4), clap at the count of four, march backwards (4), clap at the count of four
- Around in circle both ways (circle big enough, not just around self) (8), clap at the count of eight
- Taps to the front / heels to the front
- Taps to the sides
- Side steps both ways, hands waving in the air
- Pony jumps back and forth
- Circle everyone together around both ways
- In circles with pairs facing each other, going round arm-in- arm, changing pairs left-right-left-right
- Stomp feet in one place 1-2-3, 1-2-3, add claps



Warm-up 4: small groups (3-4), REQUIREMENTS 3 BALLS

- Throw ball & march at the same time, squat in between throws, touch shoulders (arms crossed), touch hips, touch knees (arms crossed)
- Roll ball, when catching ball, rise up, then squat and roll
- Throw ball up in air, catch, bounce to next one
- For entire group: standing one after the other in circle, three balls are passed on, reached from behind, rotation from opposite sides

Stretching after each warm-up

- round back, open chest, first pumps, then leave open chest, with possibility for support: iliopsoas, triceps surae, hamstrings, sides

CIRCUIT TRAINING

- 1,5 min per exercise, 10 exercises, RPE as measurement of strain, REQUIREMENT: STOP WATCH, BENCH TO REST, WATER, CUPS

1. **Getting up from chair** (trains lower extremity strength) REQUIREMENTS: CHAIR WITH BACKREST BUT WITHOUT ARMRESTS
- Can begin with support from chair, but later move on to getting up without support (arms across chest)
- Extra challenge: In standing position, lift knee up

2. **Hanging clothespins on towel hem from varied places** (Upper body rotation trains vestibular system by distracting vision. Uneven base adds challenge by distracting also proprioception.) REQUIREMENTS: WALL BARS, TWO HAND-TOWELS 50X70 cm, 20 CLOTHESPINS, TWO CONTAINERS, 1-2 MATTRESSES, 1 DYNAIR BALANCE CUSHION OR AIREX BALANCE BEAM/PAD
- Towels are located on wall bars on appropriate height for participant (need to reach, but not stand on toes)
- Clothespins in jars on both sides of participant
- Movement: Reach a clothespin from your left and hang it on to the hem of the towel on the right. Continue by reaching clothespin from your right and hanging it on the left. Pause if you feel dizziness.
- Challenge: uneven base with 1-2 mattresses or Dynair balance cushion under one foot, vary feet

3. **Ankle-hip-step-strategy on floor or foam surface** (Trains vision and vestibular system by distracting proprioception, trains different balancing strategies) REQUIREMENTS: TOWEL ROLL AND BALANCE BOARD, SUPPORT FROM STURDY RAIL (2 CHAIRS)

- Participant stands on uneven surface (towel roll/ balance board) and swings forward to toes and backward to heal, using different strategies to correct posture
- Challenge: Reduce support from chairs. Balance board instead of towel roll

4. **Getting up from floor** REQUIREMENTS: MATTRESS (THICKNESS 1,5-2 cm), STURDY CHAIR

- Lie on the floor in supine or prone position with one arm extended and the opposite knee flexed. Turn to a side-lying position, push with arms into side-sitting position, knees flexed. Rotate body until kneeling with hands on the floor. Vary rotation side.
- Easy: Walk on all fours to an external support (for example chair) and get up. Vary location of chair for challenge.
- Medium challenge (upper body strength): From kneeling position start walking up using arms.
- More challenge (lower body strength, good range of motion in hips): From kneeling position move to a half-kneeling position, get up using legs.
- Most challenge (very good lower body strength): Move from lying position to a symmetrical sitting position. Move from a squat to leg reliance to standing up.

5. **Weight shifting,** standing on support leg, other leg taps 12, 3, 6, 10, 2 o'clock marked on to floor with tape (Trains step strategy (and strength of support leg, if challenged version)) REQUIREMENTS: 8 PIECES OF COLOURED TAPE, BEAN BAG

- Participant stands with legs apart or together (more challenge), tapping spots marked with tape, on leg at a time, vary order of tapped spots, vary speed and weight put on to tapping leg
- Challenge: train strength of support leg by placing bean bag under tapping legs place in the middle, so that weight is on the support leg most of the time (tapping leg only lightly returns on to the bean bag)
- Challenge: hands behind back

6. **Square walk multitasking** 2,5x2,5 m (walk the line forward and backward + grapevine) (Trains all three parts of the balance system distracting sensomotor feedback by diminishing base of support, distracting vision and cognition by multitasking, distracting vestibular system by head movements) REQUIREMENTS: TAPE TO DRAW LINE AND / OR OBJECTS TO MARK DISTANCES, 2-3 DIFFERENT OBJECTS TO LIFT FOR EXAMPLE COMB & SCARF AND BALL (TWO HANDS REQUIRED)

- Participant walks straight line, lifts object from end of trail, takes "grapevine"-sidesteps carrying object, puts object down, walks straight line backwards, lifts other object, takes "grapevine"-sidesteps carrying object, puts object down.
- First object ball, which needs to be carried with both hands
- Second objects comb (difficult to grab) and scarf, while walking, wave scarf
- More challenge: one object is a paper or book, which needs to be read while walking

7. **Step-board and reaching**, touching the wall with hand (Trains muscle strength of legs, gluteus-muscles, vestibular system, distracts vision and proprioception) REQUIREMENTS: STEP BOARD FACING WALL, 6-10 PICTURES OF HANDS, TAPE

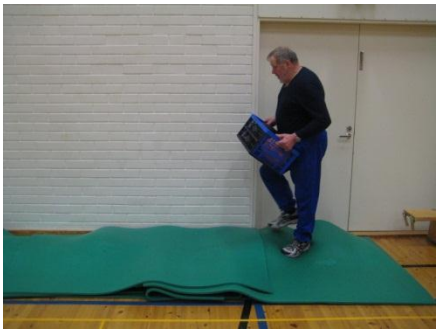
- Participant steps on board (both feet), reaches to touch pictures of hands according to location of pictures, one hand at a time.
- Challenge: Stand on one foot on step board and at the same time reach forward to the wall with opposite hand.

8. **Sitting on physioball** + moving ball from one hand to other, looking up, rolling ball under foot (Trains core muscles, vestibular system by distracting vision and proprioception) REQUIREMENTS: LOCATION IN CORNER FOR SUPPORT, MATTRESS UNDER BALL, BIG PHYSIOBALL, 2 SMALLER BALLS

- Participant sits on physioball, lifts smaller ball off the ground, moving ball from one hand to other.
- Challenge: Lift arms up and look up while moving ball from one hand to other.
- More challenge: Participant puts ball under foot while moving ball from one hand to other.

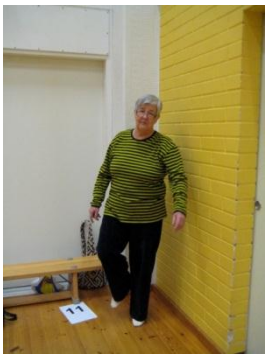
9. **Slalom walking + different surfaces** (Trains agility and vision by distracting proprioception and vestibular system) REQUIREMENTS: 6 CONES (by shortening distance of cones, challenge grows), 4 MATTRESSES, ROLLED TOWELS, PILLOWS, BALANCE PADS, GROCERY BAGS OR PAILS, LAUNDRY BASKET OR PLASTIC BOX, WEIGHTS IN BAGS/BASKET

- Participant walks slalom walk between cones to the mattresses
- Two mattresses have been placed on top of each other, with varied "fillings", participant walks on mattresses, quick turn around cone, returns to beginning through track.
- More challenge: Carry grocery bags / pails or laundry basket through track, vary weight



10. **One leg-stance with variations** (Trains all three parts of the balance system and strength of core muscles, support leg, especially gluteus-muscles, muscles supporting the ankle and small muscles of foot.) REQUIREMENTS: LOCATION IN CORNER, WALL ON BOTH SIDES FOR SAFETY

- Participant stands on either leg for one minute / only toes touching floor / semi tandem / tandem
- Challenge: look over shoulder on both sides, while balancing / close eyes (vision distracted)



Consent to photograph, see Appendix 11.

APPENDIX 7 Body Awareness exercises

Kehotietoisuusharjoitukset –
Body awareness exercises

1.

a. Seiso mukavassa asennossa. Etsi kehon keskilinjaa. Siirrä painoa jalalta toiselle. Anna vapaan jalan nousta rennosti ilmaan. Älä kadota liikkeen aikana vertikaalilinjaa. Pienennä liikettä pikkuhiljaa etsien kehon keskilinjaa. Toista 10 kertaa. ’’Find a position where your knees are free, open and flexible. Let your arms hang loose by your side. Move sideways shifting weight from the left to the right foot without losing contact with the vertical line. Search for lightness and freedom in the movement’’ (Skatteboe, 2005, 114.)

b. Etsi optimaalinen asento polvillesi. Koukista polvia nostamatta kantapäitä lattiasta. Liiku alas ilman ponnistelua jalkalihaksilla ja taivuttamatta vartaloa eteen. Säilytä keskilinja liikkuessasi alas. Palaa alkuasentoon. Pienennä liikettä pikkuhiljaa ja etsi kehon keskilinjaa. Toista n. 10 kertaa. ‘’When you have found a balanced position, flex your knees without lifting your heels from the ground. Move down, without any effort in your legs and without flexing your body. Maintain contact with the midline while moving downwards. Return to the starting position.’’ Make movement gradually smaller and find the movement’s midline. Repeat about ten times. (Modified from Skatteboe 2005, 114.)

c. Nosta hartioita kohti korvia, rentouta ne nopeasti antaen niiden pudota alas omalla painollaan. Toista 10 kertaa. Hae hartioille lopuksi mukava, luonnollinen asento. ”Lift your shoulders upwards, relax then quickly and let them fall with their own gravity. Repeat about ten times. Finally find a nice, natural position for your shoulders.”

2. Aloita mukavasta seisoma-asennosta. Anna hengitykselle aikaa rytmin löytämiseen. Anna käsien roikkua rennosti vartalon vierellä. Aloita kääntämään vartaloa puolelta toiselle. Koko vartalo yhtyy liikkeeseen. Yritä löytää liikkeeseen rytmi ja joustavuus. Pysäytä liike pikkuhiljaa kehon keskilinjalle. Toista 10 kertaa.
   ''Search for your vertical axis, where your joints are free. Give the breathing time to find its rhythm. Let the arms hang loosely from the shoulders along the sides of the body. Start turning from the centre, to the left and to the right around the vertical axis. The whole body takes part in the movement from your feet to the top of your head.'' (Skatteboe 2005, 120.)

3. Etsi hyvä seisoma-asento. Polvet ovat pienessä koukussa ja kädet rentoina. Lähde nostamaan kantapäitä hieman irti lattiasta ja liiku kehon keskilinjan suuntaisesti ylös alas. Nopeuta liikettä. Lopputuloksena on rento tömistysliike.
   ''Find a good standing position, with open knees and loose arms. Lift your heels a little, and move up and down the midline. Increase the tempo to produce a rapidly bouncing movement.''

4. Aloita selinmakuulla. Venytä hitaasti pituutta vartaloosi. Kuvittele olevasi pitkä kuminauha. Aloita ensin pienellä liikkeellä ja suurenna sitten venytyksen määrää. Venytyksen tulee kuitenkin tuntua hyvältä. Rentouta vartalosi hitaasti takaisin alkuasentoon. Toista 10 kertaa.''Stretch the arms and legs slowly from the centre of the body in opposite directions, like one long rubber band. Stretch as a whole from toes to fingertips, comfortably and at ease without pushing yourself. Start with small movements and increase the intensity if possible. Release the stretching suddenly, or alternatively doing the stretch smoothly to invite an awareness of melting. Repeat the sequence of stretch-release about ten times. Stretch long, long, long and release etc. At the end of each exercise, invite yawn reflex.'' (Skatteboe 2005, 102.)

5. Ota mukava asento selinmakuulla. Laske kätesi vatsan päälle pallean kohdalle, laita sormet lomittain ja anna kyynärpäiden levätä lattiaa vasten. Kiinnitä huomiota siihen mitä sormiesi alla tapahtuu. Kuuntele liikettä. Pyri vapauttamaan hengityksesi ja anna hengityksen kulkea niin kuin se luonnollisesti kulkee. Etsi rauhassa sopivaa rytmiä. Harjoittele muutaman minuutin ajan. ’’Rest your fingers on your abdomen above the navel and below the ribs at the angle of the breastbone. Fingers apart, the pads resting on the soft part of the abdomen. Let the elbows rest on the floor. First notice what happens under your fingers without judging it right or wrong. Allow time to find the rhythm and to adjust to the situation’’ (Skatteboe 2005, 97.)

Skatteboe, U-B. 2005. 96-120. Basic Body Awareness Therapy and movement harmony, Development of the Assessment Method Body Awareness Rating Scale, BARS – movement harmony. HiO-report. Oslo: Oslo University College.

APPENDIX 8 Berg Balance Scale

Berg Balance Scale

The Berg Balance Scale (BBS) was developed to measure balance among older people with impairment in balance function by assessing the performance of functional tasks. It is a valid instrument used for evaluation of the effectiveness of interventions and for quantitative descriptions of function in clinical practice and research. The BBS has been evaluated in several reliability studies. A recent study of the BBS, which was completed in Finland, indicates that a change of eight (8) BBS points is required to reveal a genuine change in function between two assessments among older people who are dependent in ADL and living in residential care facilities.

Description:
14-item scale designed to measure balance of the older adult in a clinical setting.

Equipment needed:
Ruler, two standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft walkway

Completion:
Time: 15-20 minutes

Scoring: A five-point scale, ranging from 0-4. “0” indicates the lowest level of function and “4” the highest level of function. Total Score = 56
Interpretation: 41-56 = low fall risk
21-40 = medium fall risk
0 –20 = high fall risk
A change of 8 points is required to reveal a genuine change in function between 2 assessments.

Berg Balance Scale
Name: _____ Date: _____
Location: _____ Rater: _____

ITEM DESCRIPTION SCORE (0-4)
Sitting to standing _____
Standing unsupported _____
Sitting unsupported _____
Standing to sitting _____
Transfers _____
Standing with eyes closed _____
Standing with feet together _____
Reaching forward with outstretched arm _____
Retrieving object from floor _____
Turning to look behind _____
Turning 360 degrees _____
Placing alternate foot on stool _____

Standing with one foot in front _____
Standing on one foot _____
Total _____

GENERAL INSTRUCTIONS
Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item. In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:
□□the time or distance requirements are not met
□□the subject's performance warrants supervision
□□the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring. Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

Berg Balance Scale

1. SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hand for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or stabilize
( ) 0 needs moderate or maximal assist to stand

2. STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding on.
( ) 4 able to stand safely for 2 minutes
( ) 3 able to stand 2 minutes with supervision
( ) 2 able to stand 30 seconds unsupported
( ) 1 needs several tries to stand 30 seconds unsupported
( ) 0 unable to stand 30 seconds unsupported
If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
( ) 4 able to sit safely and securely for 2 minutes
( ) 3 able to sit 2 minutes under supervision
( ) 2 able to able to sit 30 seconds
( ) 1 able to sit 10 seconds
( ) 0 unable to sit without support 10 seconds

4. STANDING TO SITTING
INSTRUCTIONS: Please sit down.
( ) 4 sits safely with minimal use of hands
( ) 3 controls descent by using hands
( ) 2 uses back of legs against chair to control descent
( ) 1 sits independently but has uncontrolled descent
( ) 0 needs assist to sit

5. TRANSFERS
INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way
toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 4 able to transfer safely with minor use of hands
( ) 3 able to transfer safely definite need of hands
( ) 2 able to transfer with verbal cuing and/or supervision
( ) 1 needs one person to assist
( ) 0 needs two people to assist or supervise to be safe

6. STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
( ) 4 able to stand 10 seconds safely
( ) 3 able to stand 10 seconds with supervision
( ) 2 able to stand 3 seconds
( ) 1 unable to keep eyes closed 3 seconds but stays safely
( ) 0 needs help to keep from falling

7. STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding on.
( ) 4 able to place feet together independently and stand 1 minute safely
( ) 3 able to place feet together independently and stand 1 minute with supervision
( ) 2 able to place feet together independently but unable to hold for 30 seconds
( ) 1 needs help to attain position but able to stand 15 seconds feet together
( ) 0 needs help to attain position and unable to hold for 15 seconds

8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at
the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is
the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use
both arms when reaching to avoid rotation of the trunk.)
( ) 4 can reach forward confidently 25 cm (10 inches)
( ) 3 can reach forward 12 cm (5 inches)
( ) 2 can reach forward 5 cm (2 inches)
( ) 1 reaches forward but needs supervision
( ) 0 loses balance while trying/requires external support

9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.
( ) 4 able to pick up slipper safely and easily
( ) 3 able to pick up slipper but needs supervision
( ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
( ) 1 unable to pick up and needs supervision while trying
( ) 0 unable to try/needs assist to keep from losing balance or falling

10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. (Examiner may pick an object
to look at directly behind the subject to encourage a better twist turn.)
( ) 4 looks behind from both sides and weight shifts well
( ) 3 looks behind one side only other side shows less weight shift
( ) 2 turns sideways only but maintains balance
( ) 1 needs supervision when turning
( ) 0 needs assist to keep from losing balance or falling

11. TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

13. STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place
your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To
score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the
subject’s normal stride width.)
( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds

( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

14. STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding on.
( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold L 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

http://www.aahf.info/pdf/Berg_Balance_Scale.pdf

APPENDIX 9 Timed Up and Go

Timed Up and Go (TUG) Test [1,2]

1. Equipment: arm chair, tape measure, tape, stop watch.

2. Begin the test with the subject sitting correctly in a chair with arms, the subject's back should resting on the back of the chair. The chair should be stable and positioned such that it will not move when the subject moves from sitting to standing.

3. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject.

4. Instructions : "On the word *GO* you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.

5. Start timing on the word "*GO*" and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

6. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

7. Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more.

8. The subject should be given a practice trial that is not timed before testing.

9. Results correlate with gait speed, balance, functional level,the ability to go out, and can follow change over time.

10. Interpretation
< 10 seconds = normal
< 20 seconds = good mobility, can go out alone, mobile without a gait aid.
< 30 seconds = problems, cannot go outside alone, requires a gait aid.

A score of more than or equal to fourteen seconds has been shown to indicate high riskof falls.

1. Podsiadlo D, Richardson S. *The Time "Up & Go": A Test of Basic Functional Mobility for Frail Elderly Persons.* Journal of the American Geriatrics Society 1991; 39(2): 142148

2. Shumway Cook A, Brauer S, Woollacott M. *Predicting the Probability for Falls in CommunityDwelling Older Adults Using the Timed Up & Go Test. Physical Therapy 2000 Vol 80(9): 896903. Saskatoon Falls Prevention Consortium, Falls Screening and Referral Algorithm, TUG, Saskatoon Falls Prevention consortium, June, 2005*

http://www.saskatoonhealthregion.ca/pdf/03_Timed%20Up%20and%20Go%20proproced.pdf

APPENDIX 10 Falls Efficacy Scale-International

FES-I Now we would like to ask some questions about how concerned you are about the possibility of falling. Please reply thinking about how you usually do the activity. If you currently don't do the activity (e.g. if someone does your shopping for you), please answer to show whether you think you would be concerned about falling IF you did the activity. For each of the following activities, please tick the box which is closest to your own opinion to show how concerned you are that you might fall if you did this activity.					
Not at all concerned 1		*Somewhat concerned 2*		*Fairly concerned 3*	*Very concerned 4*
1	Cleaning the house (e.g. sweep, vacuum or dust)	*1* □	*2* □	*3* □	*4* □
2	Getting dressed or undressed	*1* □	*2* □	*3* □	*4* □
3	Preparing simple meals	*1* □	*2* □	*3* □	*4* □
4	Taking a bath or shower	*1* □	*2* □	*3* □	*4* □
5	Going to the shop	*1* □	*2* □	*3* □	*4* □
6	Getting in or out of a chair	*1* □	*2* □	*3* □	*4* □
7	Going up or down stairs	*1* □	*2* □	*3* □	*4* □
8	Walking around in the neighbourhood	*1* □	*2* □	*3* □	*4* □
9	Reaching for something above your head or on the ground	*1* □	*2* □	*3* □	*4* □
10	Going to answer the telephone before it stops ringing	*1* □	*2* □	*3* □	*4* □
11	Walking on a slippery surface (e.g. wet or icy)	*1* □	*2* □	*3* □	*4* □
12	Visiting a friend or relative	*1* □	*2* □	*3* □	*4* □
13	Walking in a place with crowds	*1* □	*2* □	*3* □	*4* □
14	Walking on an uneven surface (e.g. rocky ground, poorly maintained pavement)	*1* □	*2* □	*3* □	*4* □
15	Walking up or down a slope	*1* □	*2* □	*3* □	*4* □

16	Going out to a social event (e.g. religious service, family gathering or club meeting)	*1* □	*2* □	*3* □	*4* □

FES-I: Prof Lucy Yardley and Prof Chris Todd
http://www.profane.eu.org/documents/FES-I/FES-I_English.pdf

APPENDIX 11 Consent to photograph

Hyvä tasapainoryhmään osallistuja

Toteutamme tasapainoryhmää osana opinnäytetyötämme, ja sitä varten haluaisimme ottaa havainnollistavia kuvia harjoitteista teidän ryhmäläisten itsenne suorittamina. Kuvia tulemme käyttämään vain opinnäytetyössämme, ja niitä emme jaa yhteistyökumppaneillemme. Kuvatuksi tuleminen on vapaaehtoista, ja siksi toivomme, että täytätte ja allekirjoitatte suostumuksen valokuvaukseen liittyen.

☐ Annan luvan itseni valokuvaamiseen tasapainoharjoitusten aikana ja kuvien käyttämiseen opinnäytetyössä.

☐ En anna lupaa itseni valokuvaamiseen tasapainoharjoitusten aikana.

Paikka ja aika

_____

Allekirjoitus

_____

Nimenselvennys

_____