

Lesley d'Apollonia & Meri Lehtinen

PROMOTING PHYSICAL ACTIVITY USING KICKCYCLES IN
THE ELDERLY POPULATION

Degree Programme in Physiotherapy

2018

PROMOTING PHYSICAL ACTIVITY USING KICKCYCLES IN THE ELDERLY POPULATION

d'Apollonia, Lesley & Lehtinen, Meri
Satakunnan ammattikorkeakoulu, Satakunta University of Applied Sciences
Degree Programme in Physiotherapy
November 2018
Number of pages: 56
Appendices: 5

Keywords: elderly, older adults, physical activity, Kickcycle, health promotion

The aim of this thesis was to research physical activity using Kickcycles in the elderly population. In order to achieve this aim, three objectives were set: to investigate and determine potential health benefits of the use of Kickcycles; to list biomechanical components of Kickcycles; and to create an information leaflet on Kickcycle safety and importance of physical activity in the elderly population. The research focused on investigating why individuals use Kickcycles and how it has affected their physical activity, habits, and quality of life. The authors wish to thank Kickcycle manufacturer, ESLA, for their help with this project.

The theoretical section of the thesis provides information on the effects of aging on physical, mental, and social aspects of health; current physical activity guidelines; and health benefits of cardiovascular and musculoskeletal health for the elderly population.

The qualitative section of the thesis includes an observational analysis on the biomechanics of a Kickcycle, and a survey implemented as either a self-administered questionnaire or a structured interview. The participants were selected using purposive convenience sampling. The inclusion criteria were that participants owned and used a Kickcycle. The sample size was six participants. The results indicate that the use of a Kickcycle might be beneficial in maintaining physical activity levels and improving quality of life, such as safety, independence, and life satisfaction. The leaflet will be created based on the theoretical and qualitative framework of this thesis and produced in November 2018. It will include current physical activity guidelines, benefits of physical activity with Kickcycles, and Kickcycle safety tips. Distribution of the leaflet will be provided by ESLA for new and current users.

CONTENTS

1	INTRODUCTION.....	4
2	AIM OF THE THESIS.....	6
3	AGING.....	7
3.1	Functional ability.....	7
3.2	Functional fitness.....	8
3.2.1	Cardiovascular fitness.....	9
3.2.2	Musculoskeletal fitness.....	10
3.2.3	Postural control.....	12
4	QUALITY OF LIFE.....	14
4.1	Mobility.....	14
4.1.1	Falls.....	15
4.2	Independence.....	17
4.3	Social interaction.....	18
5	PHYSICAL ACTIVITY GUIDELINES.....	20
5.1	World Health Organization guidelines.....	20
5.2	UKK- Institute Finnish National guidelines.....	21
6	PHYSICAL ACTIVITY HEALTH BENEFITS.....	22
6.1	Cardiovascular Benefits.....	22
6.2	Musculoskeletal benefits.....	23
7	KICKCYCLES.....	25
8	METHODS AND IMPLEMENTATION.....	27
8.1	Qualitative survey.....	27
8.1.1	Data collection.....	27
8.1.2	Sampling for questionnaire and interviews.....	30
8.2	Biomechanics of Kickcycles.....	31
8.2.1	Phases Swinging leg.....	32
8.2.2	Standing leg.....	35
8.3	Leaflet.....	36
9	THESIS PROCESS.....	37
10	RESULTS.....	38
11	CONCLUSION.....	41
12	DISCUSSION.....	43
	REFERENCES.....	45
	APPENDICES	

1 INTRODUCTION

During the last few decades, advancements in medicine and treatment are helping people live longer. The number of people over 60 years of age is expected to double by the year 2050. Finland has the fastest aging population in Europe and it is estimated that by 2040 there will be over 1 million people over the age of 75 years (Husu et al. 2018, 40). An increasing elderly population requires changes in society and the health care sector. Society must ensure that the additional years gained from improvements in health care mean that seniors remain healthy, and lead meaningful and dignified lives. Maintaining and improving the elderly population's quality of life is not only important for elderly people, but also for society. Governments must ensure policies enabling elderly people to continue participating in society and avoid unequal treatment of the elderly population. (World Health Organization 2015.)

Physical activity promotion programs for older adults have been deemed successful in Finland (World Health Organization 2018). The Strength in Old Age programme is an example of a nationwide project that ran from 2005 to 2014 which created strength and balance exercises for older adults with decreased mobility. During the first years of the project, it accounted for 1,000 new programs dedicated to older adults with over 10,000 people participating (Karvinen, Starck, Kalmari, Säpyskä-Nordberg & Salminen 2011). Despite the project's success rate, currently only 20% of older adults meet physical activity guidelines (World Health Organization 2018). For older adults, 60% of waking hours are spent in sedentary activities (Husu et al. 2018, 40).

Numerous health conditions are associated with physical inactivity. It is a major risk factor for obesity, hypertension, type II diabetes, cardiovascular disease, stroke, osteoporosis, breast and colon cancers, depression, and ultimately, premature mortality. An estimated 3.2 million deaths worldwide are attributed to physical inactivity. (World Health organization 2018.) Besides being a risk factor for various health conditions, physical inactivity is also a risk factor for falls. Falls are common among older adults; approximately 28-35% of the elderly population aged 65 years or over, and 32-42% of the elderly population aged 70 years or over, fall each year. Falls are a major cause of injuries, immobility, and disability among the elderly population.

(World Health Organization, 2007.) For instance, in Finland 6,000 hip fractures originate from falls each year. Treatment of a hip fracture patient costs approximately 30 000 Euros in the first year after the fracture. The cost of institutional care is even higher, which is why the health care sector should focus on fall prevention that not only prevents injuries, but saves health care resources. (Website of The Finnish National Institution of Health and Welfare.)

Physiotherapists play a key role in the prevention of falls, treating cardiovascular and musculoskeletal health conditions, as well as the overall treatment and rehabilitation of the elderly population. The International Classification of Functioning, Disability, and Health (ICF-model; figure 1) is used as a framework for this thesis. It is used among health care professionals to organise and describe information on an individual's or group's function and disability. According to the ICF-model an individual's characteristic body functions and structures – whether genetic or driven from a health condition – influence the individual's daily activity and community participation and vice versa. The model considers personal factors, such as motivation, and environmental factors, such as social interaction and living conditions. Body functions and structures, together with activity and participation, create a cycle of cause and effect emphasising the power of behaviour and lifestyle choices when working with the elderly population. All these factors interact with each other shaping an individual's health and functional ability. (Website of the World Health Organisation 2018.)

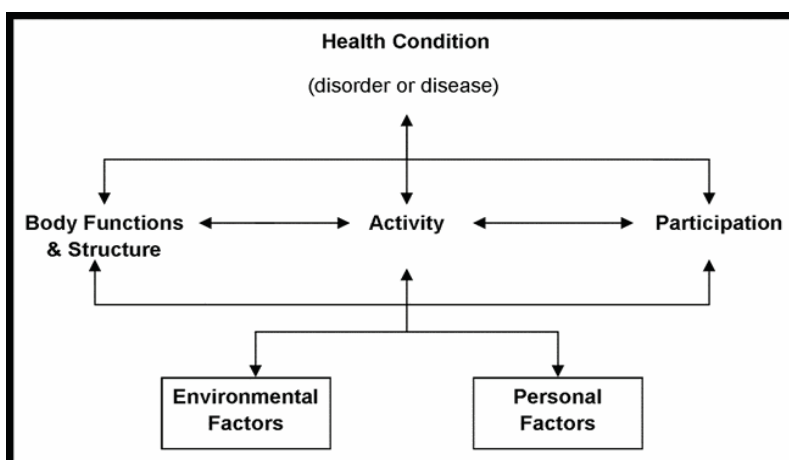


Figure 1. International Classification of Functioning, Disability and Health (ICF-model)

2 AIM AND OBJECTIVES OF THE THESIS

The aim of this thesis was to research physical activity using Kickcycles in the elderly population. To achieve this aim, three objectives were set. The first objective was to determine and highlight the potential health benefits of using Kickcycles through a qualitative survey. The qualitative survey investigated reasons behind using a Kickcycle and its effects on physical activity habits and quality of life such as safety, independence, social interaction, and general satisfaction towards life among elderly individuals. The second objective was to list biomechanical components of Kickcycles through an observational analysis. The third objective was to create an information leaflet to educate and promote Kickcycle users' on Kickcycle safety and importance of physical activity for elderly people.

3 AGING

Aging is defined as the process of an individual becoming older. The process of aging influences an individual's physical form referring to the physiological body and organ systems, an individual's mindset including the way of thinking, values, beliefs, and behaviour, and an individual's social relationships and roles in community. Age-associated changes in the physiological body and organ systems are referred to as biological aging. Biological aging is inevitable. It begins in early adulthood although the majority of age-associated changes happen gradually and do not influence an individual's function until they are excessive. In order to treat and rehabilitate as well as prevent major health complications among the elderly population, health care professionals must be familiar with and understand the process of aging, its influence on elderly people's lives, and risk factors of age-associated chronic conditions. (World Health Organization 2015, 25-27.)

Definitions of the aging population differ between countries as life expectancy differs. Many developed countries use the age of 65 years and above to define older persons. (United Nations Population Fund 2012, 20.) The United Nations and the World Health Organization use the terms "elderly" and "older persons" to describe a population of 65 years and above in most developed countries and define an adult as "older" at the age of 60 years (Website of the World Health Organization 2018).

3.1 Functional ability

Physical fitness is defined as an individual's capacity to perform activities from daily self-care tasks to competitive sports without excessive fatigue. In discussions about elderly people, the term is replaced with the term functional fitness. Functional fitness is defined as an individual's sufficient physical fitness level to perform activities of daily living safely and independently without excessive fatigue. (Tuna, Edeer, Malkoc & Aksakoglu 2009.) Functional performance threshold is the minimum criterion of physical capacity including endurance, strength, range of motion and balance required to perform activities of daily living. An individual must exceed the threshold to function safely and independently. In aging, physical capacity

deteriorates. Physical capacity falling below the threshold due to age-associated changes or an extended period of immobility or illness can result in the inability to perform activities of daily living thus increasing the risk of disability. (Guccione, Avers & Wong 2009, 31-33.)

Functional fitness describes solely physical capacity, while functional ability consists of physical, mental, and social capacities. Biological aging has a major influence on the elderly population's physical health, but issues with mental and social aspects, such as dementia, depression, and isolation are also common and should be considered. (World Health Organization 2015, 25-27.) Since biological aging is inevitable, treatment and rehabilitation of the elderly population should focus on maintaining and improving functional ability. This can be achieved by promoting physical activity, maintaining physical capacity above the functional performance threshold, and preventing chronic disorders and diseases - thus decreasing the risk of immobility, disability, depression and isolation. Aging and decreased level of physical activity are both associated with decline in functional ability. Whereas age-associated changes are inevitable, changes due to physical inactivity can be slowed down or avoided with lifestyle choices, which is why the importance of physical activity as a way of slowing down the biological aging process should be emphasised. (World Health Organization 2015, 70-71.)

3.2 Functional fitness

Three major components of functional fitness are the cardiovascular system, musculoskeletal system, and balance system. The three systems cooperate to enable and maintain mobility, the ability to perform basic movements and activities of daily living. All three components undergo biological age-associated changes. The decline in physical capacity of one or more systems can lead to activity and participation restrictions which decrease the level of independence and increase the risk of disability. (Tuna, Edeer, Malkoc & Aksakoglu 2009.)

3.2.1 Cardiovascular fitness

Cardiovascular fitness is the ability of the cardiovascular system, including the heart, blood cells, and lungs, to provide oxygenated blood to working muscle tissue, and the ability of the muscle tissue to use the oxygen to produce energy for movement. The function of the heart is to pump blood into the vessels. The vessels circulate the blood around the body exchanging carbon dioxide produced in the working muscle tissue to oxygen provided by the lungs and carried by the blood cells. The function of the cardiovascular system is enabled and sustained by stimulation from the autonomic nervous system. (Guccione, Avers & Wong 2009, 39-41.)

Heart rate is the number of contractions of the heart per minute. It is regulated by the heart's pacing system, the pacemaker, and autonomic nervous system. The parasympathetic nervous system decreases and the sympathetic nervous system increases the heart rate. Apart from the autonomic nervous system, resting heart rate is also influenced by cardiovascular fitness. Individuals with good cardiovascular fitness often represent low resting heart rate and high resting stroke volume. Stroke volume is the amount of blood pumped from the left ventricle to the aorta in one heartbeat. In aging, resting heart rate remains unaffected in supine lying but decreases in an upright position. Maximum heart rate, the heart rate achieved at the point where there is no increase in maximum oxygen consumption despite increase in the intensity of activity, also decreases with aging. The decrease in heart rate originates from structural changes in the pacemaker. (Guccione, Avers & Wong 2009, 39-41.)

Decreased maximum heart rate is a major factor for decreased cardiac output. Cardiac output is the amount of blood pumped by the heart in one minute. Resting cardiac output remains unaffected, but maximum cardiac output, the amount of blood pumped by the heart in one minute during activity, decreases with aging. Since stroke volume remains unaffected and heart rate decreases, the amount of blood pumped by the heart in one minute decreases as well. Besides slowing down resting heart rate, the structural changes in the pacemaker result in increased susceptibility to abnormal rhythms, such as atrial fibrillation, which can be fatal. Blood pressure indicates the amount of pressure of the circulating blood in the blood vessels. Resting blood pressure is not directly affected by aging. However, elderly people often have heightened blood

pressure due to chronic cardiovascular diseases such as hypertension. Systolic, the highest level of pressure, and diastolic, the lowest level of pressure, increase with aging. Systolic pressure increases gradually throughout the life, whereas diastolic pressure increases until the age of 60 years after which it stabilizes or even decreases. The main cause of heightened systolic pressure is increased arterial stiffness meaning that the walls of the heart and vessels are stiffer and must work harder to pump the blood forward. Ejection fraction representing the contractility of the left ventricle of the heart remains unaffected with aging, but there is a decline in the rate of the left ventricle filling in early diastole. The left ventricle's decreased rate of filling has no impact in rest, but during exercise the shortened diastole limits blood flow thus decreasing maximum cardiac output. Decreased maximum cardiac output together with high blood pressure indicates decreased cardiovascular fitness common among the elderly population. (Guccione, Avers & Wong 2009, 39-41.)

As the changes progress, the cardiovascular system is unable to meet the demands of working muscle tissue. The system's inability to provide sufficient amount of oxygen to the muscle tissue results in quick fatigue decreasing the amount and intensity of physical activity performed and increasing the amount of rest required to recover. Physical inactivity furthermore decreases physical capacity of the cardiovascular system, which is why the changes in the cardiovascular system can be slowed down with regular exercise. (Jakovljevic 2017.)

3.2.2 Musculoskeletal fitness

The musculoskeletal system enables movement. Besides movement, it provides form, support, and stability to the body. The basic components of the musculoskeletal system are bones, muscles, joints and other connective tissues that bind the system together. Bones create the form of the entire human body, protect vital inner organs, support muscles, and provide attachment surface for tendons. In aging, the form of the body changes due to degeneration of bone tissue. Changes in the mineral content of the tissue result in declined density and porous tissue. Extensive decline in the density results in osteopenia or osteoporosis, a common medical condition among the elderly population. In osteoporosis, the bones become weak and fragile. They are unable to

tolerate large forces and impact, which is why normally harmless hits and falls often result in fractures. The degeneration of bone tissue can be slowed down with changes in lifestyle choices. Besides genetics and other primary conditions such as rheumatoid arthritis, risk factors of osteoporosis include hormonal and medical treatment, smoking, a low level of calcium, a low supply of sunlight, being underweight, and being physically inactivity. Bones require stress and impact to improve and maintain the density of the tissue, which is why physical activity plays a significant role in osteoporosis prevention. Physical activity consisting of endurance, strength and balance training is shown to prevent falls and to slow down the degeneration of bone tissue. (Tilvis 2001, 252-255.)

The degeneration of bone tissue also influences other parts of the musculoskeletal system. Decreased density of subchondral bone, located directly below the joints' articular cartilage, influences joint mechanics (Yamada, Healey, Amiel & Coutts 2002, 360-369). Together with other connective tissues including tendons, ligaments, synovium, capsule, and cartilage, joints connect bones with various hinges allowing movement to different directions in various parts of the body. In aging, joint mobility changes due to biological age-associated changes in the connective tissue. For instance, the amount of lubricating fluid inside the joint decreases and the articular cartilage cushioning the joint surface degenerates, resulting in joint stiffness, pain, and restricted movement. Joint range of motion has a direct effect on posture and mobility, which is why changes in the joint and connected tissues can result in altered mobility, restricted function and disability. Passive and active range of motion decrease in aging, but active range of motion often decreases even more. Reduction in range of motion is not uniform; different joints have different degrees of movement restriction as well as different patterns of directional limitations. Restricted hip, knee, and ankle range of motion are common in the elderly population and have a significant effect on daily mobility, such as walking. (Freemont & Hoyland 2007, 252-259.)

Another major biological age-associated change in the musculoskeletal system is rearrangement of body composition. Body composition is used to describe the percentages of water, fat, muscle, and bone in the human body. In aging, bone density and lean muscle mass decrease while fat percentage increases. Sarcopenia is an age-related decrease in skeletal muscle mass. The human body loses on average 15 percent

of lean muscle mass between the third and eighth decades of life. Decrease in skeletal muscle mass results in a decrease in basal metabolic rate, defined as the rate of energy expenditure at rest. It also decreases muscle strength and power. As basal metabolic rate and muscle strength decrease, the amount and intensity of physical activity decline, furthermore decreasing the requirement of energy expenditure in activity. Even though the level of physical activity and energy requirements decline, energy intake is often maintained or even increased during the elderly years. Energy intake exceeding energy expenditure results in replacing the lost muscle mass with fat. Accumulation of fat especially around intestines is common among the elderly population. (Guccione, Avers & Wong 2009, 28-29.)

3.2.3 Postural control

Postural control is achieving, maintaining, and restoring balance during all postures and activities. In other words, the purpose of postural control is to maintain the centre of gravity within the base of support during static and dynamic movement. Maintaining balance requires detecting changes in the position of the centre of gravity whether it is voluntary, such as walking, or involuntary, such as slipping and responding to a fall accordingly. Incorrect timing or insufficient response set the body to an imbalanced state and can lead to further complications, such as falls. (Horak 2009, 3212.)

Postural control is achieved with cooperation of the central nervous system and sensory systems. The body constantly collects and processes information about its position and movement in relation to the environment. The information is collected through three sensory systems: visual, vestibular, and somatosensory. The visual system is responsible for collecting information about the body's sway and orientation in space in relation to the environment. It includes acuity, meaning the ability to detect differences in shapes; contrast sensitivity meaning the ability to detect differences in shades and patterns; peripheral vision meaning the ability to see from the side while looking straight ahead; and depth perception meaning the ability to distinguish distances. The vestibular system is responsible for providing information about head position and movement to assist in producing compensatory eye movements and postural responses to maintain upright body alignment.

The somatosensory system is responsible for providing proprioceptive information from the skin, joint, tendon, and muscle receptors, concerning contact and movement of the body, in relation to support surface and movement of different body parts in relation to each other (Horak 2009, 3215-3218). Impaired sensory systems are a major cause of declined balance and increased risk of falling in the elderly population. Age-associated changes in the sensory systems include worsening of acuity, contrast sensitivity, and depth perception, slowing down of compensatory eye movements and postural responses, and loss of proprioceptive and vibratory sense in the receptors of the somatosensory system. (Remaud, Thuong-Cong & Bilodeau 2015, 257.)

Besides information collected through sensory systems, the central nervous system determines suitable postural response based on biomechanical properties of the individual, as well as previously-used responses in similar situations. Automatic postural responses are involuntary movements aiming at maintaining or restoring balance (Studenski, Duncan & Chandler 1991). Three commonly used responses are ankle, hip, and step strategies. The ankle and hip strategies require activation of ankle and hip muscles opposite to the direction of disturbance to restore balance. The stepping strategy is used when the disturbance is large, and the ankle and hip strategies are insufficient. Although the strategies are widely used among the younger population, they become less effective in the elderly population due to decreased muscle strength, flexibility, and range of motion. Muscle strength declines progressively in aging and loss of lower extremity strength often results in functional inability, physical inactivity and an increased risk of falling. The ability to create a fast, forceful contraction of the muscles around the ankles and hips also declines (William et al. 2002), which is why in healthy elderly people the responses are delayed by 20 to 30 milliseconds, and even more in elderly people with a history of unexplained falls (Studenski, Duncan & Chandler 1991). Increased risk of falling is also associated with restricted range of motion and decreased flexibility. Statistical analysis shows that elderly people with a history of falls have a significantly decreased lower extremity range of motion compared to a non-faller group. (Chiacchiero, Dresely, Silva, DeLosReyes & Vorik 2010.)

4 QUALITY OF LIFE

Quality of life is a concept used to describe an individual's satisfaction towards life. It includes the individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is influenced by personal factors, such as the individual's physical health, mental state, personal beliefs and values, and social relationships. It also includes environmental factors, such as living conditions, and available assistance and aid from the surrounding community and society. Quality of life is a subjective measure and changes throughout the lifespan. It becomes increasingly important in aging, because elderly people are no longer able to influence all the aspects of life, such as the state of their physical health, which is why other aspects become increasingly more important. (Website of the World Health Organization 2018.)

4.1 Mobility

Biological aging has a significant effect on the elderly population's functional ability. Physiological age-associated changes in the cardiovascular, musculoskeletal, and sensory systems increase the elderly population's risk of developing severe chronic metabolic and vascular disorders such as hypercholesterolemia, atherosclerosis, hyperinsulinemia, insulin resistance, type II diabetes, hypertension, and osteoporosis. Physical inactivity is a major risk factor of developing one or more of these disorders, while pre-existing disorders in turn decrease the amount and intensity of physical activity elderly people are able to perform. (World Health Organisation 2015, 26-27.)

Mobility is defined as individual's capacity and ability to move, powered by the body (with or without an assistive aid) or a vehicle. It includes basic movements such as getting up from a chair, but also performing daily tasks, all forms of exercise, driving a car and using public transport. Mobility is a primary requirement for the elderly population to remain independent. It enables individuals to continue living in the community and participate in social and recreational activities, all of which are major

contributors to quality of life. However, these contributors to quality of life and mobility are often compromised in aging. (World Health Organization 2015, 179-180.)

Common difficulties with elderly mobility include unsteadiness when walking, difficulties getting in and out of a chair or bed, and falls. The difficulties are often a combination of several age-associated changes causing impairments. They can lead to loss of mobility, which can cause physical deconditioning and neglected social relationships. (Groessl, Kaplan, Rejeski, Katula, King, Frierson, Glynn, Hsu, Walkup & Pahor 2007; Metz 2000, Yeom, Fleury & Keller 2008.) Ultimately, loss of mobility is shown to predict physical disability, loss of independence, institutionalization, an increased risk of falling, and early mortality (Hirvensalo, Rantanen & Heikkinen 2000; Rubenstein, Powers & MacLean 2001; von Bonsdorff, Rantanen, Laukkanen & Heikkinen 2006).

Despite the known harms of immobility, elderly people tend to spend the majority of the day sitting (Matthews et al. 2008, 875-881). As time spent sitting increases, general mortality, morbidity, and risk of developing chronic metabolic and vascular disorders also increase (Elsawy & Higgins 2010, 55-59). In studies among elderly people, sitting time is also associated with higher weight and decreased muscle mass (Bann et al. 2010; Gianoudis, Bailey & Daly 2015, 571-579) resulting in declining muscle strength, balance, and mobility (Morley et al. 2011, 403-409). Physical deconditioning results in declined functional ability represented by the inability to perform basic movements such as walking, stair climbing and daily self-care tasks, as well as the inability to participate in the community (Guccione, Avers & Wong 2009, 28-29).

4.1.1 Falls

In the elderly population, falls represent fragility, acute and chronic health impairments, and declined functional ability. Falls are a major cause of injuries, functional impairments, and fear of falling again. In addition, the elderly population has significantly higher fall-related death rates than younger adults (Website of The Finnish National Institution of Health and Welfare 2018). Falls create a major public health and economic challenge. In aging, the frequency and severity of falls increases

as does the amount and intensity of care needed after a fall. In addition to high fall rates in the general elderly population, elderly people living in care institutions fall more frequently than those living in the community. (World Health Organization 2007, 1.)

Risk of falling increases with aging and the more risk factors an individual is exposed to, the higher the risk is. Falls often result from a combination of risk factors. Intrinsic factors, such as biological characteristics and lifestyle choices, contribute to falls directly, while extrinsic factors, such as environmental conditions, create hazardous situations. While biological characteristics, such as age, are non-modifiable, individuals have power over their lifestyle choices. (World Health Organisation 2007, 4-6) One major behavioural risk factor for falls is fear of falling which is often caused by a previous fall. 40% of elderly people, who have not fallen, and 70% of elderly people, who have fallen recently, reported fear of falling (Lawson et al. 2014). Fear of falling is associated with decreased performance-based physical function (Deshpande, Metter, Lauretani, Bandinelli & Ferrucci 2009, 91-96) and participation in outdoor physical activity (Bruce, Devine & Prince 2002, 84-89; Wijlhuizen, Chorus & Hopman-Rock 2007, 260-264), which in turn decreases physical capacity.

Other common risk factors are related to declined functional ability represented by decreased muscle strength, impaired gait, and weakened sensory systems. Individuals struggling to perform basic movements are more likely to fall. In elderly people over 75 years of age, who do not struggle to perform basic movements of daily living, approximately 25% fall at least once a year; whereas those who do struggle to perform basic movements, the percentage doubles. (Website of The Finnish National Institution of Health and Welfare 2014.) Physical inactivity is a major risk factor for declined functional ability, which in turn contributes to falls, hence the risk of falling can be decreased by engaging in regular physical activity. (Gardner, Robertson & Campbell 2000, 7-17).

4.2 Independence

Functional independence is managing daily self-care tasks without external assistance. Physical deconditioning causes the inability to perform daily self-care tasks, and the need for assistance from family members, friends, or institutions. Family members and friends play a significant role in maintaining the elderly population's quality of life. Besides providing assistance in daily self-care tasks, they also provide information, emotional support, and social interaction. Individuals, who are no longer able to manage daily self-care tasks independently, but lack a social network, are often placed in a care institution compromising their independence and quality of life. Individuals living in care institutions are shown to have lower mobility, independence, and quality of life compared to individuals living in the community (Turan, Yanardag & Aras 2012).

Besides being less mobile and independent, institutionalised elderly individuals are discovered to be more prone to depression than those living in the community. Depression is the leading mental illness among the elderly population. Its symptoms often mimic the symptoms of dementia, a common age-associated disorder showing declining cognitive ability, which is why it is often ignored by health care professionals and denied by the residents themselves. In a study about elderly people's experience of depression in a care institution, the causes of the disorder were related to leaving home and moving into an institution, loneliness, anxiety, physical and emotional pain, hopelessness, the will to die, memory loss, insomnia, and the loss of independence (Majander, 2005). Community-dwelling elderly individuals reporting a higher level of quality of life, compared to institutionalised individuals, is partly related to the level of physical activity they perform. Physical activity has numerous benefits to physical health and capacity, but it also influences mental health by improving mood, vitality, and sleep quality, as well as relieving symptoms of stress and depression (Website of Urho Kekkonen Institute 2012).

Mobility can be encouraged with the help of assistive aids and modifications in the living environment. Modifying the living environment focuses on facilitating functionally challenging tasks with the help of assistive aids. Benefits of mobility aids for individuals with mobility difficulties include reduced risk of falling, enhanced

confidence, and increased independence. Yet mobility aids often have a negative stigma; they are often associated with disability and dependence, which is why individuals who would benefit from using mobility aids, choose not to use them. (Resnik et al. 2009, 77-85.)

4.3 Social interaction

Social interaction, participation and support are strongly connected to good health and wellbeing throughout life. Participating in social, recreational, cultural, and spiritual activities allows elderly people to increase their competence, enjoy respect and esteem, and create and maintain meaningful relationships. (World Health Organization 2007, 38-50). Minimal loss of independence when living in the community with the assistance from social networks, improves the quality of life for the elderly. Aside from assistance in daily tasks, family members and friends are an important source of social interaction and information. While family members and friends are important to the elderly, other informal relationships with neighbours, colleagues and acquaintances, as well as formal relationships with community-service providers, such as health care professionals, are meaningful also. While social relationships create meaning in the lives of elderly people through shared interests, trust between individuals, and the feeling of belonging and contributing to community, they also increase enjoyment of other abilities, such as improved mobility. (World Health Organization 2015, 184-186.)

Whereas, some elderly individuals choose to maintain or even increase interaction with their social networks, others choose to disengage from the community. Voluntary disengagement from the community is associated with slowing down the pace of life to save resources for meaningful matters and to eliminate sources of stress. In other cases, declined functional ability results in involuntary disengagement and isolation from the community. Loneliness is a subjective, negative emotion associated with the individual's own experience of poor social relationships and interaction. It is often a result of either living alone, lack of close ties with family and friends, reduced connections with one's culture of origin, or restricted functional ability, resulting in the inability to actively participate in the community. Losing connection with family

members and close friends is inevitable; creating new friendships and belonging to new social circles becomes increasingly challenging in aging. (Singh & Misra 2009.) After retirement, aside of time required for self-care tasks, the elderly population's daily life consists primarily of leisure time. This is why the ability to participate in recreational activities in the community is a major contributor for happiness and satisfaction towards life. (World Health Organization 2007, 38-50.)

5 PHYSICAL ACTIVITY GUIDELINES

Guidelines are the basis for the most evidence-based practices available. They are used globally and provide standardized procedures, practices, and recommendations for all to use at every stage of life and at every level of health care. In order for guidelines to be published, they must enter a series of steps. The World Health Organization (WHO) guidelines are built from systematic reviews, and only high-quality, evidence-based research, which meet WHO requirements, are accepted. Once the publication of the WHO guidelines is made, each country sets their own version of physical activity guidelines which are based on the WHO guidelines. (World Health Organization 2012, 31.)

5.1 World Health Organization guidelines

The WHO states that individuals aged 65 years and above should engage in a minimum of 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity each week, or a combination of the two. It is the minimum requirement needed in order to receive any health benefits from physical activity and is categorized as aerobic or cardiovascular physical activity. The recommendations are also congruent with the recommendations for adults aged 18-64 years. Whereas these recommendations are the minimum requirement to see any health benefits, in order to improve physical capacity and gain additional health benefits, it is recommended to engage in 300 minutes of moderate intensity physical activity each week. (Website of the World Health Organization 2017.)

In addition to cardiovascular physical activity, muscular strengthening activities should be performed two times per week and include the major muscle groups (World Health Organization 2017). Depending on the source, muscle groups can be divided in five, six, or eleven groups. The American College of Sports Medicine (ACSM) uses the six major muscle groups: chest, back, abdomen, shoulders, hips, and legs when describing resistance training (ACSM 2014, 181).

Specifically, for adults aged 65 years and older, balance and proprioception training have their own guidelines. The WHO recommends that individuals with poor mobility should engage in balance activities at least three times per week to reduce the risk of falling. The balance activities can be included in the recommended 150 minutes of aerobic activities per week. (Website of the World Health Organization 2017.)

5.2 UKK- Institute Finnish National guidelines

The UKK-Institute offers physical activity guidelines for adults 65 years and older. The guidelines follow the WHO global guidelines: 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity or a combination of the two per week. The UKK guidelines also recommend resistance training to be done at least two times per week. Similarly to the WHO guidelines, for individuals 65 years and older with poor mobility, it is recommended that they perform balance training at least three times per week. Balance training can be incorporated with regular cardiovascular and muscular physical activity. The guidelines are neatly presented in a user-friendly manner so that individuals can quickly identify activities classified as moderate or vigorous aerobic activity. Examples of moderate and vigorous activities listed on the UKK Institute guidelines are berry picking, heavy house work, and fishing as well as cross country skiing and water aerobics. (Website of the UKK-Institute 2009.)

6 PHYSICAL ACTIVITY HEALTH BENEFITS

It has been known for decades that getting regular physical activity has a number of health benefits. Physical activity is the primary prevention for cardiovascular disease (CVD), hypertension, type II diabetes, stroke, obesity, and osteoporosis (ASCM 2014). Regular physical activity can also help reduce the risk of colon and breast cancer, depression, falls, cognitive disease, and premature mortality (ASCM 2014). It has a direct influence on improving functional fitness (cardiovascular fitness, musculoskeletal fitness, and balance), which are important components for staying strong, healthy, and agile especially as the aging process makes physiological and mental changes to the body and mind. (Website of the World Health Organization 2018.)

6.1 Cardiovascular Benefits

One of the main contributors of cardiovascular disease (CVD) is high amounts of low-density-lipoprotein cholesterol (LDL). LDL is considered the “bad” cholesterol because it usually deposits in coronary arteries, which could then restrict blood flow to the heart. The optimal value of LDL is <100mg/dL, but when values rise too high, LDL begins to bundle together, block arteries through plaque formation which could lead to angina pectoralis and potentially cause a myocardial infarction. (World Health Organization 2018.)

With regular aerobic physical activity, the heart muscle not only becomes stronger – thus improving stroke volume, cardiac output, and capillary network – but the liver begins to produce more high-density-lipoprotein cholesterol (HDL). This is considered the “good” cholesterol because it removes LDL from the arteries. Therefore, engaging in regular aerobic physical activity increases HDL which removes unwanted LDL built up in coronary arteries and lowers risk of CVD. (Bouchard, Blair & Haskell 2012, 88.)

Hypertension is also a major risk factor for CVD. A person is considered to have hypertension when blood pressure is 140/90mmHg at rest. Chronic, uncontrolled high blood pressure puts strain on the inner arterial walls, causing damage and weak blood

vessels. This can lead to other conditions such as atherosclerosis, stroke, cardiac arrest, and myocardial infarction (Website of the American Heart Association 2018). Strong evidence shows that regular aerobic physical activity reduces blood pressure values regardless of the age and initial level of physical fitness (Huang et al. 2013; Diaz & Shimbo 2013; ASCM 2014).

Cardiovascular fitness improves as an individual engages in aerobic activity- meaning activity where muscles require oxygen for energy. The ACSM divides aerobic activity into light, moderate, and vigorous. Using the WHO physical activity guidelines, moderate aerobic physical activity is needed to receive any health benefits. There are several ways to measure and monitor physical activity. A cost-effective and simple way is by calculating a percentage value range of maximal heart rate. Moderate physical activity is when the heart is working between 64-77% of maximal heart rate or between 3-6 METs (ACSM 2014). Different formulas can be used to calculate heart rate, however a simple one is taking the number 220 and subtracting the person's age (ACSM 2014, 82).

A prospective study determined that even small amounts of physical activity can reduce CVD among older adults. Researchers used data from the EPIC Norfolk prospective population study. Based on self-evaluation of physical activity, respondents were categorized into groups that were inactive, moderately inactive, moderately active, and active. The study found that older adults, who were moderately inactive, significantly reduced their risk of developing CVD by engaging in physical activity. The study limitation was that baseline physical activity was measured subjectively. (Lachman et al. 2017.)

6.2 Musculoskeletal benefits

Aging contributes to muscle mass loss, a term known as sarcopenia. This is problematic as a decrease in muscle mass results in loss of strength and increases the individual's risk for falls, fractures, and loss of mobility. Strong evidence shows that older adults who engage in regular strength training exercises have a significantly decreased risk of falls (Gardner, Robertson & Campbell 2000). Specifically, stronger

quadriceps' strength in old age is attributed to a decreased risk of falls (Ahmadiyahangar et al. 2018).

Muscular strength and endurance activities can slow down and prevent osteoporosis, a common condition among older adults (Tilvis, Hervonen, Jäntti, Lehtonen & Sulkava 2001; ACSM 2014, 94). Impact forces during physical activity help build bone mass by putting stress on bone tissue. The same concept occurs when muscular strength and endurance activities are performed; tendons, which attach muscles to bones, put stress forces on bones and build bone mass. Healthy bone density prevents bones from becoming frail which can lead to fractures. A healthy bone density T-score is classified as greater than or equal to -1.0. (Website of the National Osteoporosis Foundation 2018.)

Strong muscles can also have a positive effect on cognition. A recent and popular study looked at determining whether muscle strength in lower limbs can be used as a predictor for cognitive aging over a 10-year period. Researchers looked at 324 female twins aged 43-73 years and found that the twin with greater muscular fitness had improved cognitive features in aging. (Steves, Mehta, Jackson, & Spector 2016.)

7 KICKCYCLES

Kickcycles (Potkupyörä in Finnish), a popular mode of transportation for elderly individuals in Finland, are made by the Finnish company, ESLA. Based in Koura, Finland, the 90-year-old family business began making Kickcycles in 1990 and now has retailers in 10 different countries – primarily Northern countries including Sweden, Norway, Russia, Canada, and more. The main customers of Kickcycles are adults over the age of 65 years and based on an interview with the marketing manager of the company, customers seek out Kickcycles because of loss of mobility, fear of falling, and/or a recommendation from a friend or family member (Soukka, personal communication on 15.1.2018). The Kickcycle offers a stable support for users to ride in all seasons, even on icy roads, to be able to carry groceries and parcels, and travel distances which are otherwise too far to walk. (Website of ESLA 2018.)

The basic concept of the Kickcycle (Picture 1) is a double-panel push scooter powered by the strength of the user's legs. The user is in an upright position with one leg on a panel/foot board and the other leg in contact with the ground that "powers" the Kickcycle by swinging and pushing. Once momentum occurs, the user may "cruise" (Picture 2) by placing both legs on the panels and therefore not expend energy to push the device. The user can use either leg to stand or push. The Kickcycle has four wheels and two panels/foot boards between the left and right, back and front wheels. It is equipped with two brakes, a seat, a bell, a basket (not shown in picture 1), and reflectors. The design comes in 3 different models which vary in size and weight (APPENDIX 1). (Website of ESLA 2018.)



Picture 1. Kickcycle from anterior/side view and top view.



Picture 2. "Cruise" phase with both legs on panels/footboards.

8 METHODS AND IMPLEMENTATION

The aim of this thesis was to research physical activity among the elderly population through the use of Kickcycles. The first objective was to research and determine possible health benefits of using a Kickcycle through a qualitative survey. The second objective was to list biomechanical components of Kickcycle through an observational analysis. After determining and highlighting the benefits, the third objective was to create an information leaflet promoting physical activity and safety among Kickcycle users.

8.1 Qualitative survey

The purpose of the survey was to investigate potential health benefits of using a Kickcycle with the main hypothesis that using a Kickcycle increases the user's physical activity level. The survey was implemented as a combination of self-administered questionnaires and structured interviews. The self-administered questionnaire was available as an online questionnaire, and the structured interview was conducted either face-to-face or via phone call. The questions and order asked were identical in both research designs. The only difference was the presence of the interviewer in the structured interview. The reason why different options of participating in the survey were provided was that the study subjects were collected from a large area and conducting a face-to-face interview was inconvenient for both the researchers and the participants. The interview, whether face-to-face or via phone call, was the most desirable option, because it gave the participants an opportunity to extend the answers and explain their meaning in detail providing in-depth qualitative data. It also gives the researcher the opportunity to ask further questions again when the answer is not clear or understandable.

8.1.1 Data collection

The questionnaire used in the survey was pre-tested on a single person sample. The pre-test was implemented as an interview and the participant was asked to give

feedback on the length of the questionnaire, the relevance and ease of understanding the questions, and if the questionnaire was missing something. Based on the feedback received, minor modifications were made to specify certain questions. After the modification, the final version of the questionnaire was ready (APPENDIX 2).

The questionnaire form was a structured questionnaire, which consisted of a series of predetermined questions that all participants answered in the same order. Structured questionnaires ease data analysis, because the researcher can compare and contrast different answers to the same question to form conclusions. In order to make data analysis straightforward, the majority of the questions were close-ended questions. The questionnaire consisted of 19 questions, out of which two were open-ended and 17 were close-ended. Out of the 17 close-ended questions, five questions had an additional open-ended question. The purpose of the additional open-ended questions was to provide the participants an opportunity to explain their answers in detail and express their opinion without predetermined answers and influence from the researcher, thus providing more in-depth qualitative data. Fourteen of the close-ended questions were exclusive to ensure the participants had only one possible answer whereas in the remaining three close-ended questions, the participants had a chance to choose multiple answers if they found more than one to be suitable for them. Table 1. provides examples of all three types of questions used in the questionnaire.

Table 1. Examples of question types used in the questionnaire

Question type	Question	Answer
Open-ended question	<i>Do you have any health-related mobility restrictions?</i>	
Close-ended question (multiple choice)	<i>Why did you buy the device?</i>	<i>For doctor's, family member's, or friend's recommendation.</i> <i>To avoid falls</i> <i>For support when walking long distances</i> <i>For help when doing daily tasks</i>
Close-ended question (single choice)	<i>Have you fallen after buying the device?</i>	<i>Yes</i> <i>No</i>
Open-ended question (additional)	<i>If you answered yes to the previous question, why?</i>	

The online questionnaire was made with an E-form tool, an online-based questionnaire program available for the Satakunta University of Applied Sciences students. A link for the online questionnaire was shared on the Facebook page of ESLA, and sent to individuals who contacted the researchers via email or phone call and were willing to participate via the online questionnaire rather than an interview. Online questionnaires have a higher level of break-off – when a participant has begun answering the questionnaire but for some reason does not finish – compared to other forms of questionnaires. There are several reasons for break-offs, such as distractions. Not all of break-offs can be influenced by the researcher but some of them can be reduced through thoughtful questionnaire design. (de Leeuw, Hox & Dillman 2008, 41) To keep the participants engaged, the questionnaire should remain relatively short; when considering online questionnaire 10-15 minutes is considered long. (de Leeuw, Hox & Dillman 2008, 121.) Making a short online questionnaire for this survey was difficult, because the same questionnaire was used in the interviews. Even though the questionnaire consisted of 19 questions, the questions and answers were designed to be close-ended, concise and understandable to minimise break-offs.

8.1.2 Sampling for questionnaire and interviews

The participants were selected with purposive convenience sampling to engage any individual in the predetermined group. In convenience sampling, the ones who are either most accessible or most willing to take part, are chosen. The only inclusion criteria in the survey was the use of a Kickcycle. Participants of all ages were included in the survey because of the low participation rate. In addition, one of the objectives of this thesis is to change the image of assistive aids, especially Kickcycles, as devices only suitable for the elderly. The other objective was to promote their use among the entire population, which is why research data from any Kickcycle users was helpful in including various perspectives into the research.

Finding and engaging participants was the most challenging part of implementing the survey. Due to possible client privacy violations, collecting client data directly from ESLA was not possible. The method of gathering participants was to distribute flyers, attend public events popular with the elderly population, and to visit care institutions and public places, such as cafés and shopping malls, where elderly individuals frequent, to explain and inform individuals in the target population about the survey and its purpose. Two types of fliers were distributed. The first type was extensive, explaining the project in detail (APPENDIX 3). It was distributed to public places, e.g. noticeboards in stores, shopping malls, care institutions etc. A total of 20 flyers of this type were distributed. The second type of flyer was more concise including only necessary information (APPENDIX 4). It was distributed directly to everyone participating in one event organised by Porin Eläkeläiset. A total of 80 flyers of this type were distributed. The reason why distributing paper flyers was chosen as the main information channel is that the target population was elderly people who are more likely to browse noticeboards instead of other types of information channels, e.g. surfing the Internet. In addition to distributing flyers, ESLA, as well as the researchers, shared an online version of the extensive flyer on their Facebook page as a way of spreading the word. The third information channel used was in cooperation with a local organisation for elderly people called Satakunnan Vanhustuki Ry, who was emailed and asked to spread the word about the research (APPENDIX 5).

Even though many elderly individuals and some with the device were encountered and informed about the survey, the research did not seem meaningful enough for them to make the effort to make contact and participate. The expectation for the sample size was 10, but the final sample size was six. In total, eight individuals were approached via different channels. One individual contacted through Satakunnan Vanhustuki Ry, one through a flyer posted in a grocery store, two through the announcement on ESLA's Facebook page, and three through word-of-mouth. Two individuals withdraw their participation before answering the questionnaire. It can be concluded that the most efficient channel of gathering participants was word-of-mouth. Word-of-mouth is very coincidental, making it impossible to assess how many participants can be gathered in the end. From the seven participants, two participated via online questionnaire, three via phone call interview, and two via face-to-face interview. The phone call interviews were slightly shorter, approximately 10-15 minutes, than the face to face interviews, which were approximately 20-30 minutes; from the researchers' point of view the face-to-face interview was the best way to engage the participants and go in-depth on the topic. Names were not asked in the questionnaires to ensure privacy and confidentiality.

8.2 Biomechanics of Kickcycles

For this biomechanical observational analysis, the leg which is standing on the panel is referred to as "standing leg" and the leg which is swinging and pushing the device is referred to as "swinging leg". For simplicity, this observational analysis looks at movements of the right leg as a standing leg and a swinging leg. To simplify the observational analysis, one complete cycle follows the phases of the swinging leg similar to a gait analysis. Phases are divided in 5 segments: initial contact, flat foot, heel off, toe off, and mid-swing. The cycle ends just before initial contact of the swinging leg just as in a gait cycle. (Levine, Richards & Whittle 2012, 32-33.) The standing leg is observed during its point of maximal knee flexion and full extension. Velocity, electromyography, and true joint angles were not measured in this observational analysis. Analysis is solely based from visual observation from video footage, which was then divided into picture segments, and compared to

biomechanical muscle activation and phases of gait. The analysis focuses on muscle activation of joint movements and actions.

8.2.1 Phases Swinging leg

A gait analysis is divided into two phases: stance phase and swing phase with the stance phase accounting for 60% of the total, and cycle and the swing 40% (Levine, Richards & Whittle 2012, 33). The gait cycle initiates with a heel strike and ends just before the next heel strike of the same leg. This is one main difference that is observed when compared to the initial contact of the Kickcycle. Because the standing leg is on the foot board which is 6.8cm off the ground, the user must flex the standing knee and plantarflex the swinging ankle. This causes the initial contact to begin with toes rather than heel such as in normal gait. Another main difference which is observed is the amount of “stance” and “swing” of one cycle in a Kickcycle. The user’s swinging leg is in contact with the ground for a longer time when compared to a gait cycle. This is because the user must propel forward by exerting a downwards-backwards force. Picture 3. shows the different phases of the swinging leg and each phase is explained below:

Initial contact (Picture 3.A)

In this initial phase, the swinging leg must slow down and prepare for loading response. Eccentric muscle contraction is present at the level of hip, knee, and ankle with glutei muscles acting to control hip flexion and prepare for loading response; quadriceps muscles to flex the knee; and tibialis anterior to control the speed of plantarflexion and prepare for loading response.

Flat foot (Picture 3.B)

This phase begins when the full foot contacts the ground. At this point and as in a normal gait pattern at the “mid-stance” phase, the leg must withstand the force of the ground acting on the leg known as normal force (Levine, Richards & Whittle 2012, 19-21). In order for the leg not to collapse, glutei muscles contract concentrically and move the hip into extension; quadriceps contract eccentrically to stabilize knee in a flexed position; and the gastrocnemius and soleus act eccentrically as the ankle has

moved into dorsiflexion. The main difference between Kickcycle and normal gait in this phase is that the knee is not fully extended and therefore quadriceps would contract eccentrically and not concentrically.

Heel off (Picture 3.C)

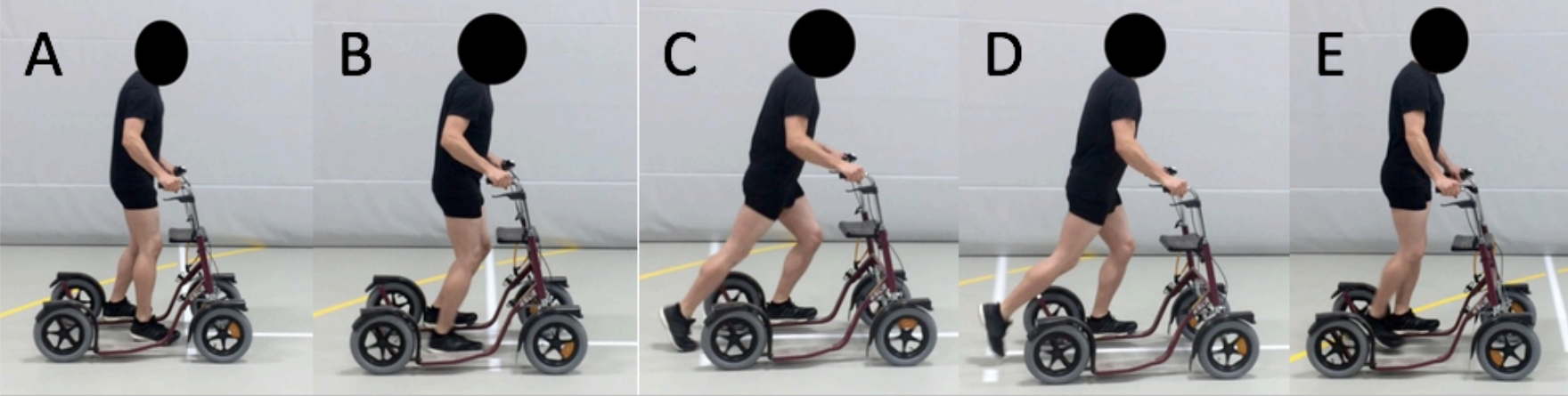
This phase begins as the heel lifts off the ground and ends just before the toes lift off the ground. This particular image shows the heel towards the end of “heel off phase”. The hip is fully extended with glutei muscles contracted concentrically. The knee has moved into extension and therefore quadriceps contract concentrically. The ankle has moved into plantar flexion and so gastrocnemius and soleus work concentrically to raise the heel.

Toe off (Picture 3.D)

As the toes come off the ground, the leg begins to move into a full swinging phase. The hip must move towards flexion in order to prepare for the next cycle. To do this, the iliopsoas contracts concentrically. At the knee, the hamstrings also contract concentrically to flex the knee joint in order to clear the toes off the ground. Similar to the toe off stage in normal gait, once there is no contact between the ground and limb, the soleus and gastrocnemius are inactive (Levine, Richards & Whittle 2012, 46).

Mid swing (Picture 3.E)

As the leg swings forward, the iliopsoas contracts concentrically in order to flex the hip. Hamstrings are still contracted concentrically as the knee is in a flexed position and not bearing weight. The tibialis anterior contracts concentrically to prevent the toes from brushing against the floor. Just before termination of the full leg swing and in preparation for the next initial contact phase, the leg must slow down which is controlled by an eccentric contraction of the quadriceps and glutei muscles.



A	B	C	D	E
Initial Contact	Flat Foot	Heel off	Toe off	Mid-swing
<i>Muscles involved</i>	<i>Muscles involved</i>	<i>Muscles involved</i>	<i>Muscles involved</i>	<i>Muscles involved</i>
Glutei (eccentric) Quadriceps (eccentric) Tibialis anterior (eccentric)	Glutei (concentric) Quadriceps (eccentric) Gastrocnemius/soleus (eccentric)	Glutei (concentric) Quadriceps (concentric) Gastrocnemius/soleus (concentric)	Iliopsoas (concentric) Hamstrings (concentric)	Iliopsoas (concentric) Hamstrings (concentric) Tibialis anterior (concentric)

Picture 3. Phases of swinging leg and expected muscle activation with Kickcycle.

8.2.2 Standing leg

An interesting point to make is the degree of flexion (Picture 4) and extension (Picture 5) the standing leg must perform while using a Kickcycle. Since the foot board/panel is 6.8 cm from the ground, the standing leg must flex so that the swinging leg can reach the ground. This is comparable to a mini-squat where multiple joint angles are active in a closed-loop kinetic chain system (Flanagan, Salem, Wang, Sanker, & Greendale 2003). The mini-squat or squat is also an important and functional movement among older adults as it activates glutei muscles, quadriceps muscles, challenges proprioceptive control and helps reduce the risk of falls (Ahmadiyahangar et al. 2018.)



Picture 4. Point of maximum knee flexion in standing leg.



Picture 5. Point of knee extension in standing leg.

8.3 Leaflet

Information on the leaflet will include the current WHO/ UKK physical activity guidelines for adults 65years and above, benefits of physical activity, and safety tips for Kickcycle users. The leaflet will be given to the ESLA company for future use and be provided in both English and Finnish. The format and style are expected to be an easy-to-read, 1-page information format, which includes pictures and attractive text. Anticipated use of the leaflet is for ESLA to upload a .pdf version on their website and Facebook page so that users and potential buyers can receive the information.

9 THESIS PROCESS

The work phases of the thesis process can be seen from Table 2. The thesis process begun in January 2018 by choosing a topic and determining a research question. After the research question had been determined, a possible cooperation partner and future clients were contacted to search for specific needs related to research towards Kickcycles and their use. After the meeting, a plan on how to implement the research was formed. The implementation of the research took approximately six months. During that time theoretical research was done by collecting information related to the topic. The thesis was completed in November 2018. A leaflet for the client was created in November 2018.

Table 2. Work phases of the thesis process

Work phases	Timeline
Determining idea for the thesis and contacting and meeting with client (ESLA)	January 2018
Accepted study plan and signed thesis agreement	February 2018
Administering pilot survey and survey	March – May 2018
Analysing data and concluding results from survey	June – August 2018
Theoretical research	June – October 2018
Biomechanical analysis	September 2018
Completion and presentation of thesis report	November 2018
Designing leaflet for the client	November 2018

10 RESULTS

Data analysis was done by manually comparing answers provided by participants to the survey questions. Age of participants was between 54 and 89 years, the average being 71 years. Two of the six participants were male and the remaining four participants were female. Some of the participants reported health-related issues, such as degenerative joint, cardiovascular, and neurological conditions, restricting mobility. The majority of the participants reported the amount of daily physical activity to be over 30 minutes. In some cases, the amount depends on the daily physical condition. The most popular types of physical activity were daily activities and outdoor walking.

Many participants had used a Kicksled – similar device to Kickcycle with skids instead of wheels – during their life. All the participants purchased the device over 12 months ago. The main reasons for purchasing the device were to avoid falls, have support when walking long distances, and help with daily tasks. All participants reported using the device more than once a week, the majority of them using it daily. In some cases, increased amount of use was related to sudden decline in physical condition. The majority of participants reported using the device 30-60 minutes at a time. Factors affecting on the time spent with the device included weather and daily physical condition. The main reasons to use the device were to move about outdoors and to perform daily tasks.

There was no significant change in fall rate before and after purchasing the device (Figure 2). The reasons for falls before purchasing the device were related to leisure activities, while the reasons for falls after purchasing the device were related to losing balance and environmental hazards. In one case, poor control of the device was the reason for the fall.

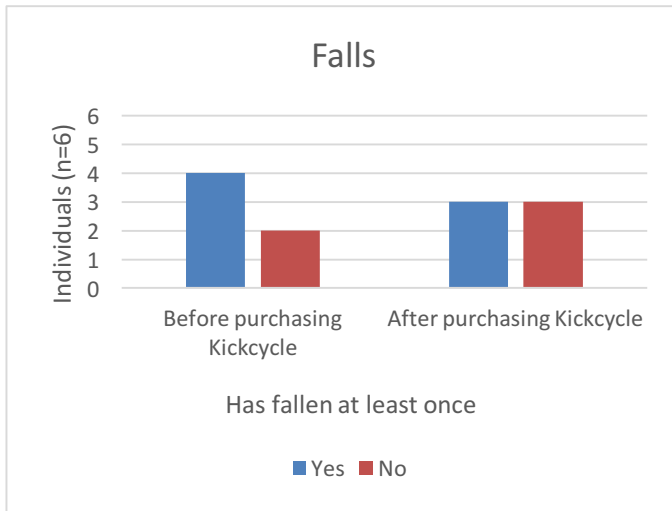


Figure 2. Fall rate before and after purchasing Kickcycle

Half of the participants reported no change in physical activity level after purchasing the device (Figure 3). Few participants reported decreased physical activity level related to physical deconditioning, which was also a reason to purchase the device.

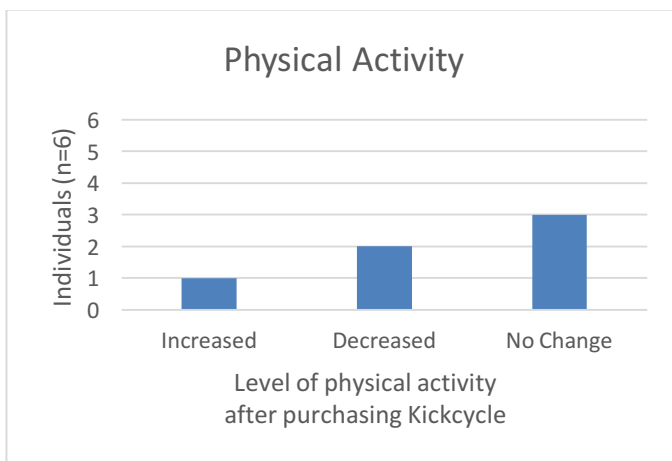


Figure 3. Change in physical activity level after purchasing Kickcycle

Figure 4. represents changes in quality of life for the participants after purchasing the Kickcycle. Few participants reported increased independence and one reported a positive change in social life after purchasing it because other elderly people approaching with comments and questions about the device. Half of the participants reported a positive change in mood related to increased mobility and independence after purchasing the device.

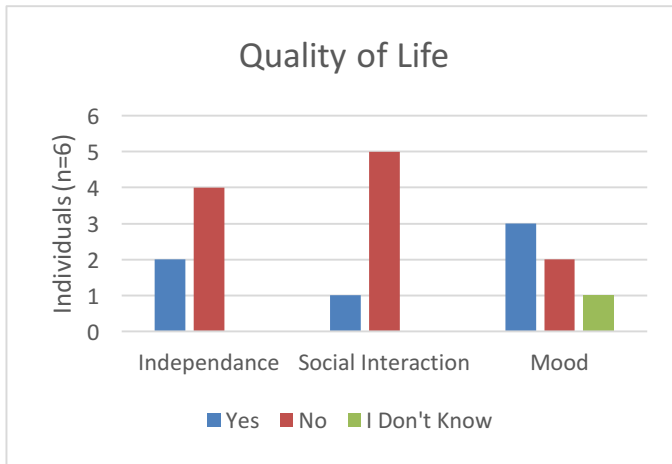


Figure 4. Change in quality of life measures after purchasing Kickcycle

All the participants were satisfied with the device. Popular comments included that the device makes moving easier and safer, as well as it enables daily activity and independence.

11 CONCLUSION

Making conclusions based on the results must be considered carefully. The sampling method used was purposive convenience sampling, which is often used in exploratory studies on topics that have not been previously researched, like in the case of this thesis. In convenience sampling, the individuals who are either most accessible or most willing to take part in the research are chosen to participate, which is why the sampling may be biased and unrepresentative of the target population (Anderson 2010, 141). This means that the results cannot directly be applied to any individual in the target population. The sample size of this thesis was exceptionally small, which is why only assumptions can be made. Determining whether the use of Kickcycles decreases fall rate in the elderly population cannot be based on the results of this thesis. This is because half of the sample fell after purchasing the device. Since some of the causes of the falls were related to the device itself, safety instructions and adequate manoeuvring practice is necessary in order to prevent hazardous falls related to the device.

The hypothesis behind the survey was that using Kickcycle improves the user's physical activity level. Factors that must be considered when assessing physical activity level after using the device include one's previous level of physical activity, as well as previous and current physical and functional condition. Based on the survey, it can be noted that one of the main reasons for using the device is to enable mobility that has decreased due to physical deconditioning. The use of Kickcycles can improve physical activity compared to the immediate past when the physical condition has already deteriorated. In comparison to the past, before physical deconditioning, the use of Kickcycles does not necessarily restore the physical activity level to the previous level, but can maintain the current level or slow down deconditioning.

Based on some answers it can be proposed that using a Kickcycle can improve one's independence and general mood. An individual, who struggles with walking to the grocery store and carrying groceries home, might benefit from using the device, whereas a person who struggles with fine motor skills might not find the device beneficial. When it comes to general mood and satisfaction towards life, individuals who find the device beneficial in other aspects, such as increased independence and

safety, are more likely to notice a positive change in general mood and satisfaction towards life.

From the observational biomechanics of a Kickcycle, it is clear that the standing leg must perform a ranging degree of flexion and extension. Quadricep strength plays a key role in this action and is also an important component when aiming to prevent falls among the elderly population. The relationship between quadricep strength and Kickcycle use could have a positive impact on daily activities and fall prevention. The amount of work required by the standing leg makes it important for the users to alternate the standing leg so that muscle imbalance and fatigue do not occur.

DISCUSSION

Aging is inevitable and the rapid increase of the aging population worldwide makes it critically important to preserve functional ability and independence in older adults. The aim of the thesis was to research physical activity in the elderly population through the use of Kickcycles. To do so, authors of this thesis conducted a qualitative questionnaire, listed the biomechanics of the Kickcycle device, and created an information leaflet which will be distributed via the Kickcycle manufacturer's website and Facebook page.

Several limitations are to be considered for this bachelor's thesis. In terms of the qualitative survey, the pre-test should have been done as an online version in addition to face-to-face interview to ensure that the questionnaire was understandable even without the presence of an interviewer, even though significant difficulties were not encountered. Gathering participants via paper leaflets seemed to be ineffective, which is why different information channels should have been considered. The biggest limitation of the qualitative survey was the small sample size. The results cannot be applied to a large population and only assumptions can be made. Another limitation in relation to the sample population was the age range. Since the sample ranged from 54-89 years, it meant that not all participants would be considered as elderly individuals. While the elderly population, individuals aged 65 years and above, was the focus of the background literature and elderly persons are the main customer of Kickcycles, low response rate meant that the age range had to be broadened. Even so, using a broader age range has some benefits. For example, positive comments from younger users of the Kickcycle can be used in marketing purposes to make the device approachable for general public.

While this thesis focused on measuring satisfaction and attitudes towards the device as well as changes in physical activity and quality of life, there is a need for further research to find more detailed information regarding the physiological effects of using a Kickcycle. For example, a case study or an intervention could be beneficial in finding out if using the device improves balance or increases muscle strength. Another interesting topic is transferability of the movement from a Kickcycle into walking. For

this type of research, there is a need for participants who have not used the device before but are willing to or have the need to use one.

Since Kickcycles has not been studied before, it was important to list biomechanical components of the device. This was done through an observational analysis on a healthy young male. Velocity and the age of the subject could alter biomechanics, which is why using electromyography would have been a reliable and accurate measurement tool to determine muscle activation. This, however, leaves an interesting opportunity to further investigate true biomechanics of Kickcycles on a targeted population. Another limitation for the biomechanics of Kickcycles was that it was primarily based on the stages of gait. A more appropriate comparison would have been skateboarding but due to the lack of free-available text of skateboarding biomechanics, gait was chosen as the comparing movement. While this biomechanical analysis focused on muscle activation, there are several other health components which could be researched for Kickcycle use. For example, the role of Kickcycles in flexibility, balance, agility, and cardiorespiratory fitness.

With regards to the leaflet, distribution has been left up to the manufacturing company. Since this step occurred at the end of the thesis project, actual effectiveness of health promotion has not been researched. Further research should determine effectiveness of the information leaflet in promoting physical activity among the elderly population and quantifiable physiological health benefits of using Kickcycles.

REFERENCES

ACSM. 2014. Guidelines for exercise testing and prescription. Baltimore: Lippincott Williams & Wilkins.

Ahmadihangar, A. et al. 2018. The role of quadriceps muscle strength in the development of falls in the elderly people, a cross-sectional study. *Chiropractic & Manual Therapies* 1, 1-6. Referred 25.9.2018. <https://doi.org/10.1186/s12998-018-0195-x>

Anderson C. 2010. Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education*, 141. Referred 12.10.2018

Bann D., Hire D., Manini T., Cooper R., Botosaneanu A., McDermott M., Pahor M., Glynn N., Fielding R., King A., Church T., Ambrosius W. & Gill T. 2015. Light intensity physical activity and sedentary behavior in relation to body mass index and grip strength in older adults: cross-sectional findings from the lifestyle interventions and independence for elders (LIFE) study. *Public Library of Science*. 10(2) Referred 4.6.2018

Bouchard, C., Blair, S., & Haskell, W. 2012. *Physical Activity and Health. Campaign: Human Kinetics.*

Bruce D., Devine A. & Prince R. 2002. Recreational physical activity levels in healthy older woman: the impact of fear of falling. *Journal of the American Geriatrics Society*, 84-89. Referred 13.10.2018

Chiacchiero M., Dresely B., Silva U., DeLosReyes R. & Vorik B. 2010. The relationship between range of movement, flexibility, and balance in the elderly. *Topics in Geriatric Rehabilitation*. Referred 2.7.2018

Deshpande N., Metter J., Lauretani F., Bandinelli S. & Ferrucci L. 2009. Interpreting fear of falling in the elderly: what do we need to consider?. *J Geriatr Phys Ther*, 32: 91-96. Referred 13.10.2018

de Leeuw, Hox & Dillman. 2008. *International Handbook of Survey Methodology*, 41, 121. Referred 12.10.2018

Diaz, K. & Shimbo, D. 2013. Physical Activity and the Prevention of Hypertension. *Current Hypertension Reports* 6, 659–668. Referred 10.10.2018. <http://doi.org/10.1007/s11906-013-0386-8>

Elsawy B. & Higgins K. 2010. Physical activity guidelines for older adults. *American Family Physician*, 55–59

Flanagan, S., Salem, G., Wang, M., Sanker, S. & Greendale, G. 2003. Squatting Exercises in Older Adults: Kinematic and Kinetic Comparisons. *Medicine and Science in Sports and Exercise* 4, 635–643. Referred 25.9.2018. <http://doi.org/10.1249/01.MSS.0000058364.47973.06>

- Freemont A. & Hoyland J. 2007. Morphology, mechanisms and pathology of musculoskeletal ageing. *Journal of Pathology*, 252-259. Referred 11.6.2018
- Freedman V., Hodgson N., Lynn J., Spillman B., Waidmann T., Wilkinson A. & Wolf D. 2006. Promoting declines in the prevalence of late-life disability: Comparisons of three potentially high-impact interventions. *Milbank Quarterly*, 493-520
- Gardner M., Robertson C. & Campbell J. 2000. Exercise in preventing falls and fall related injuries in older people: A review of randomized controlled trials. *British Journal of Sports Medicine*, 7-17. Referred 10.10.2018.
<http://dx.doi.org/10.1136/bjism.34.1.7>
- Gianoudis J., Bailey C. & Daly R. 2015. Associations between sedentary behaviour and body composition, muscle function and sarcopenia in community-dwelling older adults. *Osteoporos International*, 571-579. Referred 11.6.2018
- Groessl E., Kaplan R., Rejeski W., Katula J., King A., Frierson G., Glynn N., Hsu F., Walkup M. & Pahor M. 2007. Health-related quality of life in older adults at risk for disability. *American Journal of Preventive Medicine*, 214-218. Referred 30.7.2018
- Guccione A., Avers D. & Wong R. 2009. *Geriatric Physical Therapy*. 28-29, 31-33, 39-4. 4.6.2018
- Hirvensalo M., Rantanen T. & Heikkinen E. 2000. Mobility difficulties and physical activity as predictors of mortality and loss of independence in the community-living older population. *Journal of the American Geriatrics Society*, 493-498. Referred 6.8.2018
- Horak F. 2009. Postural control. *Brain inflammation: Biomedical Imaging*, 3212, 3215-3218. Referred 14.10.2018
- Huang, G. et al. 2013. Controlled aerobic exercise training reduces resting blood pressure in sedentary older adults. *Blood Pressure* 6, 386-394. Referred 10.10.2018. <https://doi.org/10.3109/08037051.2013.778003>
- Husu, P. et al. 2018. Suomalaisten objektiivisesti mitattu fyysinen aktiivisuus, paikallaanolo ja fyysinen kunto. Helsinki: UKK-Institute. Referred 14.10.2018.
http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161012/OKM_30_2018.pdf?sequence=4&isAllowed=y
- Jakolvjevik. 2017. Physical activity and cardiovascular aging: Physiological and molecular insights. *Experimental Gerontology*. Referred 22.10.2018
- Karvinen E, Starck, H, Kalmari P, Säpyskä-Nordberg M, & Salminen U. The Strength in Old Age programme promotes active ageing. Conference in Bologna, Italy 2011 17.4.2011.

Lachman, S. et al. 2017. Impact of physical activity on the risk of cardiovascular disease in middle-aged and older adults: EPIC Norfolk prospective population study. *European journal of preventive cardiology* 2, 200-208. Referred 10.10.2018. <https://doi.org/10.1177/2047487317737628>

Lawson et al. 2014. The impact of fear of falling on functional independence among older adults receiving home health services. *Open J Occupational Therapy*, 2: 4. Referred 15.10.2018

Levine, D., Richards, J. & Whittle, M. 2012. *Whittle's Gait Analysis*. Churchill: Elsevier.

Majander K. 2005. Vanhuksen masennuskokemus vanhainkodissa. Diakonia-ammattikoulu Referred 13.10.2018

Matthews E., George S., Moore S., Bowles H., Blair A., Park Y., Troiano R., Hollenbeck A. & Schtzkin A. 2008. Amount of time spent in sitting behaviors in the United States, 2003-2004. *American Journal of Epidemiology*, 875-881. Referred 1.10.2018

Metz D. 2000. Mobility of older people and their quality of life. *Transport Policy*, 149-152. Referred 1.10.2018

Morey M., Pieper C. & Coroni-Huntley J. 1998. Is there a threshold between peak oxygen uptake and self-reported physical functioning in older adults. *Medicine and Science in Sports and Exercise*, 1223-9. Referred 4.6.2018

Morley et al. 2011. Sarcopenia with limited mobility: an international consensus. *J Am Med Dir Assoc*, 12(6): 403-409. Referred 11.6.2018

Remaud A., Thuong-Cong C. & Bilodeau M. 2015. Age-related Changes in Dynamic Postural Control and Attentional Demands are Minimally Affected by Local Muscle Fatigue. *Frontiers in Aging Neuroscience*, 257. Referred 14.10.2018

Resnik et al. 2009. Perspectives on use of mobility aids in a diverse population of seniors: complications for interventions. *Disability Health Journal*. 1:2(2): 77-85. Referred 22.10.2018

Rose D. 2002. Promoting functional independence in older adults at risk for falls: The need for a multidimensional programming approach. *Journal of Aging and Physical Activity*, 1-19. Referred 3.9.2018

Rose D. 2003. Fallproof. A comprehensive balance and mobility program. Referred 2.9.2018

Rubenstein L., Powers C. & MacLean C. 2001. Quality indicators for the management and prevention of falls and mobility problems in vulnerable elders. *Annals of Internet Medicine*, 686-693. Referred 2.9.2018

Simonsick E., Maffeo C., Rogers S et al. 2005. Just get out the door! Importance of walking outside the home for maintaining mobility: findings from the women's health and aging study. *Journal of American Geriatrics Society*, 198-203. Referred 2.9.2018

Singh A. & Misra N. 2009. Loneliness, depression and sociability in old age. *Indian Psychiatry Journal*, 51-55. Referred 13.10.2018

Skelton B. & Beyer N. 2003. Exercise and injury prevention in older people. *Scandinavian Journal of Medicine & Science in Sports*, 77-85

Soukka, R. 2018. Marketing Manager, ESLA. Koura. Face-to-face interview 15.1.2018. Interviewer Lesley d'Apollonia and Meri Lehtinen.

Steves, C. J., Mehta, M. M., Jackson, S. H. D., & Spector, T. D. 2016. Kicking Back Cognitive Ageing: Leg Power Predicts Cognitive Ageing after Ten Years in Older Female Twins. *Gerontology* 2, 138–149. Referred 14.10.2018.
<http://doi.org/10.1159/000441029>

Studenski S., Duncan P. & Chandler J. 1991. Postural responses and effector factors in persons with unexplained falls: results and methodologic issues. *Journal of American Geriatrics Society*. Referred 30.7.2018

Tilvis R. 2001. *Geriatrics*, 252-255. Referred 25.6.2018

Tuna H., Edeer A., Malkoc M. & Aksakoglu G. 2009. Effect of age and physical activity level on functional fitness in older adults. *European Review of Aging and Physical Activity*. Referred 9.6.2018

Turan E., Yanardag M. & Aras O. 2012. Functional independence, quality of life, and level of mobility of elderly people living at home and nursing homes. *Topics in Geriatric Rehabilitation* Referred 9.6.2018

United Nations Population Fund. 2012. *Ageing in the Twenty-First Century: A Celebration and A Challenge*. New York: United Nations Population Fund. Referred 31.10.2018. <https://www.unfpa.org/sites/default/files/pub-pdf/Ageing%20report.pdf>

Von Bonsdorff M., Rantanen T., Laukkanen P. & Heikkinen E. 2006. Mobility limitations and cognitive deficits as predictors of institutionalization among community-dwelling older people. *Gerontology*, 359-365. Referred 2.9.2018

Website of the American Heart Association. Referred 12.8.2018.
<https://www.heart.org/en>

Website of ESLA. Referred 5.10.2018 <https://www.esla.fi/en/>

Website of the Finnish National Institution of Health and Welfare. 2014. *Regional Health and Welfare* publication. Referred 23.07.2018

Website of the Finnish National Institution of Health and Welfare. 2018. *Accidents among the elderly people*. Referred 23.07.2018 www.thl.fi

Website of the National Osteoporosis Foundation. Referred 28.10.2018.
<https://www.nof.org>

Website of the UKK-institute. Referred 14.4.2018. <http://www.ukkinstituutti.fi/en/>

Website of the World Health Organization. 2018. Referred 31.10.2018.
<http://www.who.int/>

Website of the World Health Organization. Referred 14.4.2018
http://www.who.int/dietphysicalactivity/factsheet_olderadults/en/

Website of the World Health Organization. 2018. Ageing and Health. Referred
19.10.2018; <http://www.who.int/en/news-room/fact-sheets/detail/ageing-and-health>

Website of the World Health Organization. Cardiovascular Diseases. Retrieved
5.10.2018. [http://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](http://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds))

Website of the World Health Organization. 2018. International Classification of
Functioning, Disability, and Health (ICF). Referred 13.10.2018;
<http://www.who.int/classifications/icf/en/>

Website of the World Health Organization. WHOQOL: Measuring Quality of Life.
Referred 13.10.2018; <http://www.who.int/healthinfo/survey/whoqol-qualityoflife/en/>

Website of Urho Kekkonen Institute. Effects of physical Activity. Referred
09.07.2018; Exercise in the treatment of depression. Referred
29.09.2018 www.ukkinstituutti.fi

Wijlhuizen G., Chorus A. & Hopman-Rock M. 2007. Older persons afraid of falling
reduce physical activity to prevent outdoor falls. *Prev Med*, 260-264. Referred
13.10.2018.

William et al. 2002. Aging skeletal muscle: physiological changes and the effects of
training. *Physical Therapy*, 62-68. Referred 25.6.2018

World Health Organization. 2007. Global Report on Falls Prevention in Older Age.
1, 4-6, 20. Referred 25.07.2018

World Health Organization. 2007. Global age-friendly cities: A guide. 38-50.
Referred 29.09.2018

World Health Organization. 2012. WHO handbook for guideline development.
Geneva: World Health Organization. Referred 10.4.2018.
http://apps.who.int/iris/bitstream/handle/10665/75146/9789241548441_eng.pdf;jsessionid=ED4C463EB4F00CF07B98007073819820?sequence=1

World Health Organization. 2015. World Report on Ageing and Health. 25-27, 52-
62, 69-70, 70-71. Referred 22.10.2018

Yamada K., Healey R., Amiel D. & Coutts R. 2002. Subchondral bone of the human knee joint in aging and osteoarthritis. *Osteoarthritis Cartilage*, 360-369. Referred 18.6.2018

Yeom H., Fleury J. & Keller C. 2008. Risk factors for mobility limitation in community-dwelling older adults: A social ecological perspective. *Geriatric Nursing*, 133-14. Referred 27.8.2018

Properties of ESLA Kickcycle, CityMAX and Cityspark

R201505

	ESLA Kickcycle 3300	ESLA CityMAX 3800	ESLA Cityspark 3600
Length	128 cm	112 cm	107 cm
Width	60 cm	59 cm	59 cm
Height	80 - 105 cm	80 - 100 cm	80 - 100 cm
Front wheels	310 x 50 mm	310 x 50 mm	310 x 50 mm
Rear wheels	310 x 50 mm	310 x 50 mm	200 x 50 mm
Turning Circle	R=85 cm	R=75 cm	R=75 cm
Brakes	Drum brakes	Band brakes	Band brakes
Parking brakes	Separate mechanism	Brake lever down	Brake lever down
Seat	20 x 30 cm	20 x 30 cm	20 x 30 cm
Foot boards	8,5 x 40 cm	10,4 x 37 cm	8,5 x 35 cm
Foot board height	7,5 cm	6,8 cm	6,8 cm
Basket	23 litres	16 litres	23 litres
Weight	16,9 kg	15,4 kg	13,9 kg
Bearing ability	150 kg	150 kg	140 kg
Colours	red, blue, pink, green	red, blue, silver	red, blue, silver, pink, white

<input checked="" type="checkbox"/> Property included	<input checked="" type="checkbox"/> Property not included
---	---

ESLA Conic frame	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Double Handlebar Control	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Wheel hub mounting	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dismountable into three parts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Front reflectors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rear reflectors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Spoke reflectors	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mud flaps in front	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pump, std accessory	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Bell, std accessory	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cable lock, std accessory	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Spare parts list	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CE-marking	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Warranty	3 years	3 years	3 years
Warranty card	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	registered design	registered design	registered design



QUESTIONNAIRE

Ikääntyneiden liikkuminen ja potkupyörä -kysely

Tämä kysely kartoittaa ikääntyneiden liikkumistottumuksia ja potkupyörän käyttöä. Se toimii pohjana epämääräisyytemme potkupyörän vaikutuksista ikääntyneiden terveyteen.

Taustatiedot	
Ikä	<input type="text"/>
Sukupuoli	<input type="checkbox"/> Nainen <input type="checkbox"/> Mies
Onko sinulla liikkumiseen vaikuttavia sairauksia tai muita terveyshaittoja?	<input type="text"/>
Fyysinen aktiivisuus	
Kuinka paljon liikut päivässä tällä hetkellä?	<input type="checkbox"/> Alle 30 minuuttia <input type="checkbox"/> 30-60 minuuttia <input type="checkbox"/> Yli 60 minuuttia
Minkälaisista liikuntau harrastat?	<input type="checkbox"/> Hyötyliikuntaa (esim. postin haku, kaupassa käynti) <input type="checkbox"/> Ulkona kävelyä <input type="checkbox"/> Vesiliikuntaa (esim. vesijumpaa, vesijuoksu, uinti) <input type="checkbox"/> Kuntosalijumpaa <input type="checkbox"/> Tuolijumpaa <input type="checkbox"/> Tanssia <input type="checkbox"/> Jotain muuta
Jos vastaat jotain muuta, mitä?	<input type="text"/>
Väline	
Onko sinulla aiempaa kokemusta potkukeikan käytöstä?	<input type="checkbox"/> Kyllä <input type="checkbox"/> Ei
Mikä on ostamasi välineen nimi ja malli?	<input type="checkbox"/> ESLA Potkupyörä <input type="checkbox"/> ESLA Citypotkuri <input type="checkbox"/> ESLA Citypotkuri Max <input type="checkbox"/> TupiaPotku Lyhyt <input type="checkbox"/> TupiaPotku Pitkä
Koska ostit välineen?	<input type="checkbox"/> Alle kuukausi sitten <input type="checkbox"/> 1-6 kuukautta sitten <input type="checkbox"/> 6-12 kuukautta sitten <input type="checkbox"/> Yli vuosi sitten
Miksi ostit välineen?	<input type="checkbox"/> Lääkärin, perheenjäsenen tai ystävän suosituksesta <input type="checkbox"/> Kestämisten vähittäiseksi <input type="checkbox"/> Arvoksi pidempää matkaa liikkeessä <input type="checkbox"/> Arvoksi päivittäisten asioiden holtoon (esim. ostosten kantamiseen)
Kuinka usein käytät välinettä?	<input type="checkbox"/> Vähemmän kuin kerran viikossa <input type="checkbox"/> 2-3 kertaa viikossa <input type="checkbox"/> Joka päivä
Kuinka kauan käytät välinettä kerralla?	<input type="checkbox"/> Alle 30 minuuttia <input type="checkbox"/> 30-60 minuuttia <input type="checkbox"/> Yli 60 minuuttia
Mihin käytät välinettä eniten?	<input type="checkbox"/> Asioiden holtoon (esim. kaupassa käynti) <input type="checkbox"/> Ulkona liikkumiseen <input type="checkbox"/> Johonkin muuhun
Jos vastaat johonkin muuhun, mihin?	<input type="text"/>
Välineen vaikutukset	
Oletko kaatunut ennen välineen ostamista?	<input type="checkbox"/> Kyllä <input type="checkbox"/> En
Oletko kaatunut välineen ostamisen jälkeen?	<input type="checkbox"/> Kyllä <input type="checkbox"/> En
Jos vastaat kyllä edellisessä kysymyksessä, mikä oli kaatumisen syy?	<input type="text"/>
Miten liikkumisesi on muuttunut välineen ostamisen jälkeen?	<input type="checkbox"/> Liikun enemmän kuin ennen <input type="checkbox"/> Liikun vähemmän kuin ennen <input type="checkbox"/> Liikkumiseni ei ole muuttunut <input type="checkbox"/> En osaa sanoa

Oletko tyytyväinen ostamaasi välineeseen?

- Kyllä
 En

Miksi?

Elämäntilaisuus

Oletko ollut itsenäisempi välineen ostamisen jälkeen?

- Kyllä.
 En.
 En osaa sanoa.

Onko potkupyörän käyttö vaikuttanut sosiaaliseen elämään?

- Kyllä
 Ei
 En tiedä

Onko potkupyörän käyttö vaikuttanut yleiseen mielialaasi?

- Kyllä
 Ei
 En tiedä

Jos vastasit edellisiin kysymyksiin kyllä, miten?

Tietojen lähetykset

Talenna

Kiitos vastauksestasi!

FIRST FLYER



Omistatko potkupyörän? Haluatko osallistua opinnäytetyö- tutkimukseen?

Keitä me olemme?

Olemme kaksi fysioterapeuttiopiskelijaa Satakunnan ammattikorkeakoulusta. Tarkoituksenamme on kerätä potkupyörän käyttäjiä haastateltaviksi opinnäytetyötutkimukseen. Tutkimuksen tavoitteena on kartoittaa potkupyörän vaikutuksia käyttäjien fyysiseen aktiivisuuteen, terveyteen, ja hyvinvointiin. Kaikki tiedot käsitellään luottamuksellisesti ja julkaistaan nimettöminä. Jos olet innokas osallistumaan, ota yhteyttä! **Haastatteluun vastanneiden kesken arvotaan 5 kpl potkupyörän suojahappuja!**



Tavoitteena
kartoittaa
potkupyörän
terveysvaikutuksia.

Voit osallistua
sähköpostitse
kyselylomakkeella,
puhelinhaastattelulla
tai haastattelulla
kasvokkain.

Tutkimuksen
toteuttavat Samkin
fysioterapeutti-
opiskelijat.

Opinnäytetyö
toteutetaan
yhteistyössä ESLAn
kanssa.

MERI LEHTINEN
puh. 050 5938176
meri.lehtinen@student.
samk.fi

LESLEY D'APOLLONIA
puh. +39 338 448 8483
lesley.dapollonia@
student.samk.fi

SECOND FLYER

Omistatko potkupyörän? Etsimme potkupyörien käyttäjiä haastateltaviksi opinnäytetyötutkimukseen potkupyörien vaikutuksista ikääntyneiden fyysiseen aktiivisuuteen, terveyteen ja hyvinvointiin.

Voit osallistua kasvokkain tai puhelimesta haastattelulla, tai sähköpostitse kyselylomakkeella. Olethan yhteydessä!

Meri Lehtinen, puh. 050 593 8176,
meri.lehtinen@student.samk.fi



APPENDIX 5

E-MAIL TO SATAKUNNAN VANHUSTUKI RY

Hei,

Olemme Meri ja Lesley, kaksi kolmannen vuoden fysioterapeuttipiskelijää Satakunnan Ammattikorkeakoulusta. Työstämme tällä hetkellä opinnäytetyötä potkupyörän vaikutuksista ikääntyneiden fyysiseen aktiivisuuteen, terveyteen ja yleiseen hyvinvointiin, minkä vuoksi olemme nyt teihin yhteydessä.

Olemme kehittäneet kyselyn, jolla pyrimme saamaan selville, miksi ja miten ikääntyneet käyttävät kyseistä välinettä, ja vaikuttaako se heidän hyvinvointiinsa. Onko joukossanne mahdollisia potkupyörän käyttäjiä, jotka olisivat halukkaita osallistumaan kyselyyn haastattelun merkeissä? Jos haastattelu ei ole mieluinen vaihtoehto, voimme myös lähettää kyselylomakkeita postissa.

Kyseessä oleva väline on tämän näköinen: <https://www.esla.fi/tuoteryhma/potkupyorat/>

Olisi hienoa, jos saisimme tutkimukseen mukaan paikallisia potkupyöräilijöitä!

Ystävällisin terveisin,
Meri Lehtinen & Lesley d'Appolonia
NPH15SP
Satakunnan Ammattikorkeakoulu



Potkupyörät - E.S.Lahtinen Oy

www.esla.fi

E. S. Lahtinen Oy Kouranasematie 46 61160 KOURA. Aito ja Alkuperäinen Esla Vuodesta 1928.
Ota yhteyttä. Puh. 06 429 9400 esla@esla.fi