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# Preventive break exercise program for cleaners in Lassila & Tikanoja

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The aim of this thesis is to provide knowledge of how to prevent cleaner's most common musculoskeletal problems among Lassila&Tikanoja's cleaners. The objective is to create a preventive break exercise program leaflet for cleaners working for Lassila&Tikanoja.

Occupational cleaning is physically demanding and contains repetitive movements and awkward postures during the day. To compensate the demands of the job cleaners should pay attention to their physical capacity to prevent musculoskeletal disorders since physically demanding jobs have not been found to increase physical capacity. If the demands of the job, physical capacity and rest periods are not in balance it can lead to overuse musculoskeletal disorders which causes decrease in workability. Physically demanding jobs have found to be linked with early retirements.

The theoretical background in this thesis was a literature search of cleaner's most common musculoskeletal disorders, postures during work day and preventive break exercises. The scientific articles used in this thesis were found from online databases PubMed and EBSCO. Other literature were found through SAMK library, Finna and Google scholar.

Theoretical background is used to make an exercise program leaflet to prevent most common musculoskeletal disorders among occupational cleaners. The exercises are planned so that they can be conducted in every work environment and uses equipments that cleaners have. The leaflet is send to the company for distribution.

CONTENTS

# 1 INTRODUCTION

Cleaner's work is repetitive and can vary from light to highly physically loading work depending on the work environment and tasks. Cleaners have found to work in static and awkward positions which increases the risk of musculoskeletal disorders (MSDs).(Kalkis, Roja & Kalkis 2014; Woods, Buckle & Haisman 1999; Pekkarinen 2009). Some of these problems are dealt with developing better equipment and providing guidance in equipment handling ergonomics. Better cleaning equipment and solutions mean less water needed to use while cleaning, accumulating less physical strain. Ergonomic equipment handling methods can include for example adjusting the equipment properly, moving near the target to clean instead of reaching from far to clean, squatting instead of bending back, using both hands and supporting with body for example with hip during mopping (Pekkarinen 2009; Vileda Professional website 2019). Even though ergonomic interventions are invented and taught to cleaners, MSD are still prevalence due to the repetitive nature and physical demands of the work. High physical demands at work demand better physical capacity from a cleaner and that is why break exercise could be one of the solutions to address cleaners most common MSDs and physical strain during the work day.

At the beginning this thesis explains basics of break exercise and workability. The cleaner's most common musculoskeletal problems and their origins in occupational cleaning and related anatomical structures to them are gone through to create a leaflet. At the end of this thesis there is a break exercise leaflet for Lassila & Tikanoja cleaners and explain how a break exercise can be used to prevent most common musculoskeletal problems among cleaners.

# 2 THE AIM AND OBJECTIVES

The aim of this thesis is to provide knowledge of how to prevent cleaner's most common musculoskeletal problems among Lassila&Tikanoja's cleaners. The objective is

to create a preventive break exercise program leaflet for cleaners working for Lassila&Tikanoja. The exercise program will be based on the literature.

# 3 WORKABILITY

Workability is the amount of functional capacity that a person needs during their workday. Functional capacity consists of all the potential that a person has to survive their everyday life. Functional capacity can be further divided in to mental, social and physical capacity (Kukkonen 2001, 46-48).

Mental capacity consists of the means that one has to execute intellectual and other tasks during everyday life and in changing situations such as crisis. Through aging some parts of the psychological capacity decrease such as accuracy and speed of observations. Some aspects of psychological capacity can also be increased through aging for example language skills and skill of handle complex tasks. (Kukkonen 2001, 46-48)

Social capacity consists of all the social interaction person acts in their social support system, in work environment and in societal level. Also taking and coping between different roles in those social environments is part of social capacity capacity (Kukkonen 2001, 46-48; website of Finnish national institute for health and welfare 2019).

Physical capacity consists of aerobic capacity, muscle strength, endurance and flexibility. Aerobic capacity gives information of the capacity of our cardiopulmonary system. Muscle strength, endurance and flexibility are aspects of musculoskeletal functioning. Physical capacity includes also motoric control that can be further divided in to motoric skills. These skills are coordination, reaction and balance. All of these different factors of physical capacity vary between age, sex and individuals. (Kukkonen 2001, 46-48)

Variation and changes in physical capacity between sexes and age groups can be seen in a study by Westerståhl, Jansson, Barnekow-Bergkvist & Aasa, (2018). Longitudinal changes in physical capacity from adolescence to middle age in men and women they found that between 16 to 34 years of age the performance increased in all tests in both genders but men had larger increase in muscular strength and endurance than women. In absolute maximal oxygen intake (VO2 max), body's maximal oxygen intake capacity ml/min, the increase was similar in both genders. In relative maximal oxygen intake (VO2max), maximal oxygen intake relative to body weight ml/kg/min, increase was larger in women. From 34 to 52 years of age the physical performance decrease was similar in men and women except for the curl-ups test where there was not significant decrease and in back endurance test where men had bigger decrease than women. All of the test scores were higher in men than in women.

In theory the biggest health benefits and increase in workability can be obtained in a work environment where the population is aging, has rather low education rate and includes high rates of physically loading tasks. They have bigger occurrence of decrease in physical capacity, increased risk factors of diseases such as overweight, high blood pressure, musculoskeletal symptoms, depression and chronic diseases. Physically demanding jobs has not been found to affect physical capacity positively but rather negatively (Aalto 2006, 56).

Ilmarinen (2006) describes dimensions of workability as a house (figure 1). At the first floor there is health and aspects of functional capacity. Functional capacity is divided to physical, psychological and social capacity. These aspects create the base for the rest next levels of workability. Second floor is competence, skills and knowledge needed for work. Also working in changing work communities are considered to be part of the competence. All of the aspects of second floor can be developed. The third floor is values, attitudes and motivation. The third floor also includes ability balance between work and personal life. The fourth floor contains all work related factors such as work environment, content and demands, community and organization, management and leadership. This floor is the biggest one and is mainly influenced by supervisors and management. Good communication between employer and employee and shared responsibilities are important for promoting workability.

Other factors outside of the workability house can affect parts of it. Family, relatives and other immediate social relationships can affect the workability through life. Occupational safety and health care support help to maintain workability and prevent possible risks for workability (Ilmarinen 2006).

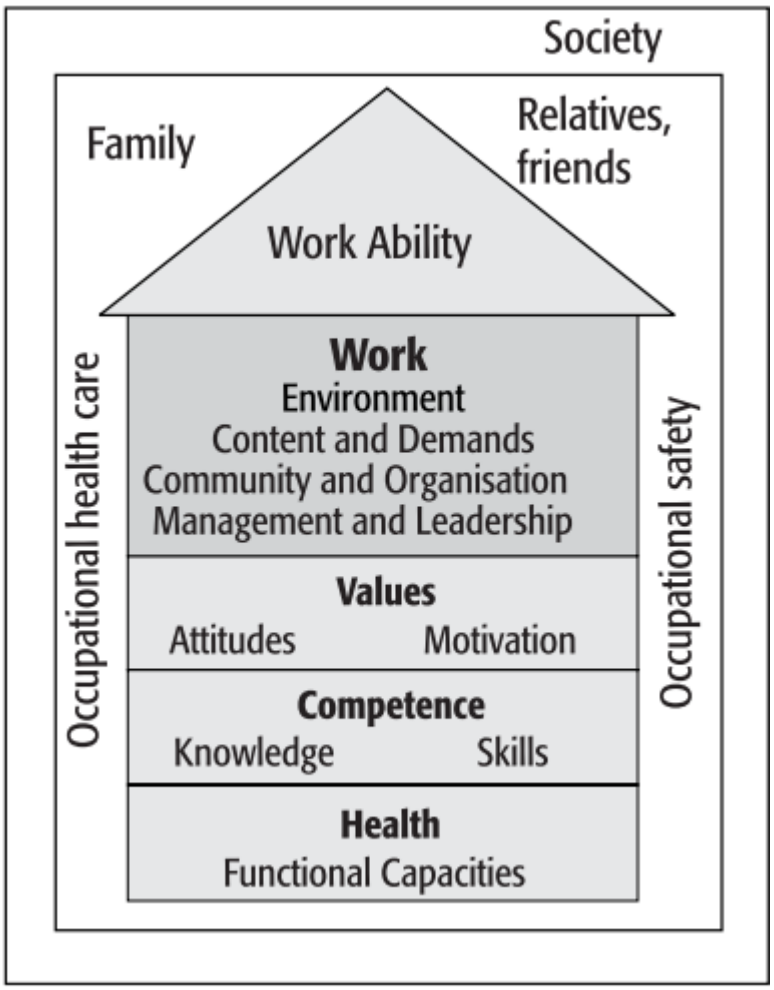



Fig.1. Dimensions of workability (Ilmarinen 2006).

# 4 BREAK EXERCISE

The purpose of break exercise is to prevent muscle tension and fatigue caused by monotonous and static working postures during the day. Essential in the break exercise is to have dynamic muscle work to increase the blood flow and metabolism in the muscle. When waste products are taken out of the muscle and blood flow increases the muscle is able to relax after static muscle work. Easy and light exercises decrease the pressure from the joints and increase recovery in the muscle (Aalto 2006, 75).

Physical activity is necessary for maintaining and increasing muscle mass, strength and endurance. Lack in these has been found to be a major problem among middle aged workers in for example nursing and cleaning industry. Loss of muscle mass, sarcopenia, due to aging or other reasons, can decrease the muscle performance and affect activities of daily living, workability and mobility (Aura & Sahi 2006, 47-48).

Even brief daily physical exercises can decrease MSD symptoms. Andersen et al. (2013) study conducted a 10 week intervention for office workers with chronic neck and shoulder pain. After 10 weeks the training group had a significant 40% decrease in neck and shoulder pain intensity compared to the control group. The training groups had a significant 6% improvement in muscular strength compared to the control group. The training consisted of daily two minutes of shoulder abductions in the scapular plane, also called lateral raise, with added resistance of thera-band. Participants performed a single set with as many repetitions as possible in two minutes.

To get health benefits and increase physical functioning it is advised to have extra loading at least twice per week. The loading should be more than the basic loading during the day. For joints to function normally the needed loading and movement can be obtained through daily weight bearing physical activity and other physical activity. To maintain the full range of motion of the joints and decreasing of stiffness, clumsiness and musculoskeletal problems it is important to include stretching to exercising routine. (Aura & Sahi 2006, 47-48)

## 4.1 Types of muscle work

Muscle work can be divided in to dynamic and static muscle work. Dynamic muscle work means contraction-relaxation pattern in the muscle. During dynamic muscle work muscle's blood circulation is efficient and the muscle works properly. The blood circulation gives muscle oxygen, energy and nutrients and carries out waste products to maximize muscle function. This type of muscle work increases blood circulation in the muscle and maintains cardiovascular health (Aalto 2006, 53).

Static muscle work has no proper relaxation part of the muscle work and includes only contraction of the muscle. Even a short static muscle work is enough to decrease the blood flow in the muscle. This way the waste products of the muscle work, such as lactic acid, aren't taken out of the muscle. The buildup of the waste products in the muscle decreases the muscle performance and causes muscle fatigue which increases the force needed for the same amount of loading. Dynamic muscle work can be used to balance out the waste build up inside the muscle caused by static muscle work (Aalto 2006, 53; Tortora & Derrickson 2017, 273).

## 4.2 Strength and endurance training

Functional strength means capacity to control forces needed during a functional action. Insufficient or decrease in functional strength can affect basic activities of daily living (ADL). Strength training is an exercise done by controlling heavy loads for a relatively short period of time or few repetitions typically 10 repetitions for 2-3 sets. Significant increase in strength can be achieved with using loads of 70-80% of one repetition maximum with 6-12 repetitions. This type of training results in increase of muscles ability to produce force by neural adaptation and increase in size of muscle fibers, hypertrophy (Kisner & Colby 2012, 158-159, 173; Kraemer & Ratamess, 2004).

Muscle endurance means muscle's ability to contract many times against load or hold contraction for a relatively long time. This type of muscle work is needed by postural muscles to maintain posture. Endurance training is an exercise done by controlling light loads during multiple repetitions and long period of time. Loads of 12-15 repetition maximum (RM) or lighter increase local muscle endurance but even as many as over 40 repetitions can be used. This increases the metabolic abilities of the muscle and makes oxygen delivery and intake more efficient. Because of the light resistance endurance training produces less possible irritation to soft tissues and joints (Kisner & Colby 2012, 158-159, 173; Kraemer & Ratamess, 2004).

Systematic analysis by Nestler et al. (2017) of the relevant literature indicates that even slight to moderate amounts of exercise can increase women's strength significantly in

just a few months. Both women in sedentary and physically loading occupations benefit from regular functional strength training. Positive effects were found on musculoskeletal pain, body composition and wellbeing. According to the review these positive effects could be an unspecific reactions to regular exercise (Nestler et al. 2017).

### 4.3 Stretching in break exercise

According to Costa & Vieira (2008) stretching seems to have a beneficial trend in preventing work related musculoskeletal disorders. Stretching has analgesic (pain relieving) properties, so it can be used to relieve stiffness and discomfort caused by awkward positions, continuous or repetitive muscle work during work day. The analgesic properties can be also give workers a false sensation of safety and lower worker's capacity to correct harmful postures which may lead to more injuries. This highlights the need for other intervention mechanisms such as good ergonomics. It is also been found that men who have hyper mobile backs have increased risk of back pain, which makes stretching without proper justification contradictory. It is also not known whether the gain of range of motion is due to decreased muscle stiffness or decreased stability in passive elements of the joint such as capsule and ligaments. If the increase in ROM would be due to less passive stability in joint it could increase the risk of injury with a person with joint instability.

Out of three different types of stretching static stretching seems to be the best one to use in work. Static stretching is safer than ballistic stretching, that includes fast movements, and takes less time than proprioceptive neuromuscular facilitation (PNF). The stretching should be planned so that it doesn't add to the loading of the tissues but rather compensates the loading of the work. Static stretching for a 30 to 60 second duration per repetition is considered the safest type of stretching for a self-stretching program. The intensity of the stretch should be low to prevent any potential injury. (Costa & Vieira 2008, 326; Kisner & Colby 2012, 87-89, 91).

# 5 CLEANERS MOST COMMON MUSCULOSKELETAL PROBLEMS

Musculoskeletal problems (MSD) are the most common work related health problems in Finland and they cause a big portion of sick leaves. Most work related musculoskeletal problems are caused and provoked by unilateral working, too high physical loading, working in awkward position and too small recovery time. Also too small loading can cause musculoskeletal system to weaken and degenerative changes in joints. (Website of Finnish institute of occupational health 2019). Highest rate of new applications for early retirement because of medical reasons was with people working in kitchen, cleaning and logistics. Physically highly loading work was linked with higher incidence of early retirements. (Harkonmäki, Lahelma, Rahkonen & Väänänen 2006)

According to Försti (2007) out of all the occupational diseases among cleaners over use syndromes were in Finland 30% and in Norway 25% in 2003. Out of all occupational diseases caused by physical loading 100% were over use syndrome. Out of the over use syndromes 61% were ligament insertion disorders (entesopathy), 16% carpal tunnel syndrome or other syndromes involving one nerve, 8% tenosynovitis and 5% bursitis in shoulder. Other occupational disorders were osteoarthritis, arthritis in carpometacarpal (CMC) joint and tendon injuries in shoulder area. In a survey conducted by The Occupational Safety & Health Council OSHC (2003) it was reported that in the last year cleaners had suffered from upper limb pain (48%), back pain (42,8%), lower limb pain 35,5%, dizziness 28,9%, neck pain 19,1%.

In Woods, Buckle and Haisman (1999) study 74% of cleaners had experienced muscular aches, pains and discomfort during the last 12 months previous to the study. During the last 7 days 53% of the cleaners reported having had muscular discomfort resulting in 52% of them having consulted medical services. Within the cleaners with musculoskeletal pain the prevalence of neck problems was 33%, right shoulder 23%, left shoulder 19%, right elbow 13%, left elbow 9%, right wrist 22%, left wrist 17%, upper back 14, lower back 46%, hips/thighs 17%, knees 24% and ankle/feet 18%. According to the research there is some to strong evidence that these musculoskeletal pains are linked to awkward position of back, neck, head and arms, moving furniture,

lifting and carrying loads, needed force to use equipment, vibration of equipment, repetitive work, difficulty to keep up, needed mental concentration and poor work environment.

In Woods, Buckle, Haisman (1999) study they observed cleaners postures during different tasks and correlated those with pain occurrence. The postures observed were buffing, mopping vacuuming and cleaning bathrooms. In buffing and mopping they observed deviated wrists and a need to move furniture. During buffing also wrist flexion, static loading of finger, hand and arm vibration, a need to pull the machine and anticipate sudden changes in direction were observed. At mopping they observed back rotation and flexion, frequent arm abduction, mopping under the tables and wrist flexion and extension through out the task. At vacuuming they observed for example flexion and rotation of back and wrist extension and flexion. At cleaning bathrooms they observed trunk flexion and rotation, repetitive hand movements and deviated and flexed wrists. Neck flexion was observed through out all of the tasks.

## 5.1 Neck and shoulder

Cervical spine consists of seven cervical vertebrae. Vertebrae create vertebral column or spinal column that protects spinal cord and supports the head. Between these vertebrae there are intervertebral discs that work by absorbing shocks and enabling movements of the spine. The intervertebral discs don’t have their own vascular system so the metabolism of the discs is taken care of by the surfaces of the vertebrae (Tortora & Derrickson 2017, 186, 188).

The shoulder joint is a formed by the head of the humerus and the glenoid cavity of the scapula, creating ball-and-socket joint. Due to the ball-and-socket nature of the joint and head of the humerus being large in comparison to the glenoid cavity and looseness of the articular capsule and other ligaments it has a big range of motion (ROM) to multiple direction (Picture 1). This looseness of the joint can be affected through strengthening the surrounding muscles, especially rotator cuff muscles (su-

praspinatus, infraspinatus, teres minor and subscapularis). Rotator cuff muscles surround and pull the head of humerus in the glenoid cavity. (Tortora & Derrickson 2017, 241, 244)

### 5.1.1 Risk factors at work for neck and shoulder

Higher risk of degenerative changes in cervical spine has been found in people who work in a physically loading work that includes for example flexed cervical spine and static loading of upper body that changes the biomechanical loading in the shoulder and neck area. Also tension neck syndrome has been found to be linked to work that includes long periods of staying still, flexed position of neck and back and working hands elevated. Even 30° abduction in shoulder increases supraspinatus muscles pressure and decreasing blood flow to the muscle. Also repetitive movements and loading increase the loading during work day. Optimally the work shouldn't contain the same postures or static periods for a long time. Other risk factors for neck and shoulder symptoms are higher age, sex, physical inactivity, smoking, psychological factors and previous injuries. (Kukkonen 2001, 62, 147-149)

### 5.1.2 Physiological problem at work for neck and shoulder

Change in position of scapulae in posture to the abduction lengthens the muscles between scapulae and spine causing static overload to rotator cuff muscles. These muscles support the head of humerus to optimal position. Static overloading in these muscles is partly caused by changes in their length and changes in loading when upper limb is further away. Overloading can lead to over use syndrome that can cause chronic inflammation. These inflammations can change the resistance in ligaments and tendons that can change range of motion (Aalto 2006, 60-62).

Rounding of thoracic spine, kyphosis, and rounding of shoulders forward can cause pectoral muscles to shorten causing them to maintain the position. This posture can cause changes in blood circulation and cause nerve impingement. Kyphosis in thoracic spine can change cervical spine to move forward. This posture can lead to upper neck muscles to shorten which can cause headaches and dizziness. This posture affects

greatly mobility of the spine. It decreases mobility in upper thoracic spine and lower cervical spine increasing the loading in middle of cervical spine. These changes cause the overall mobility of neck and head to decrease (Aalto 2006, 60-62).

## 5.2 Upper limb

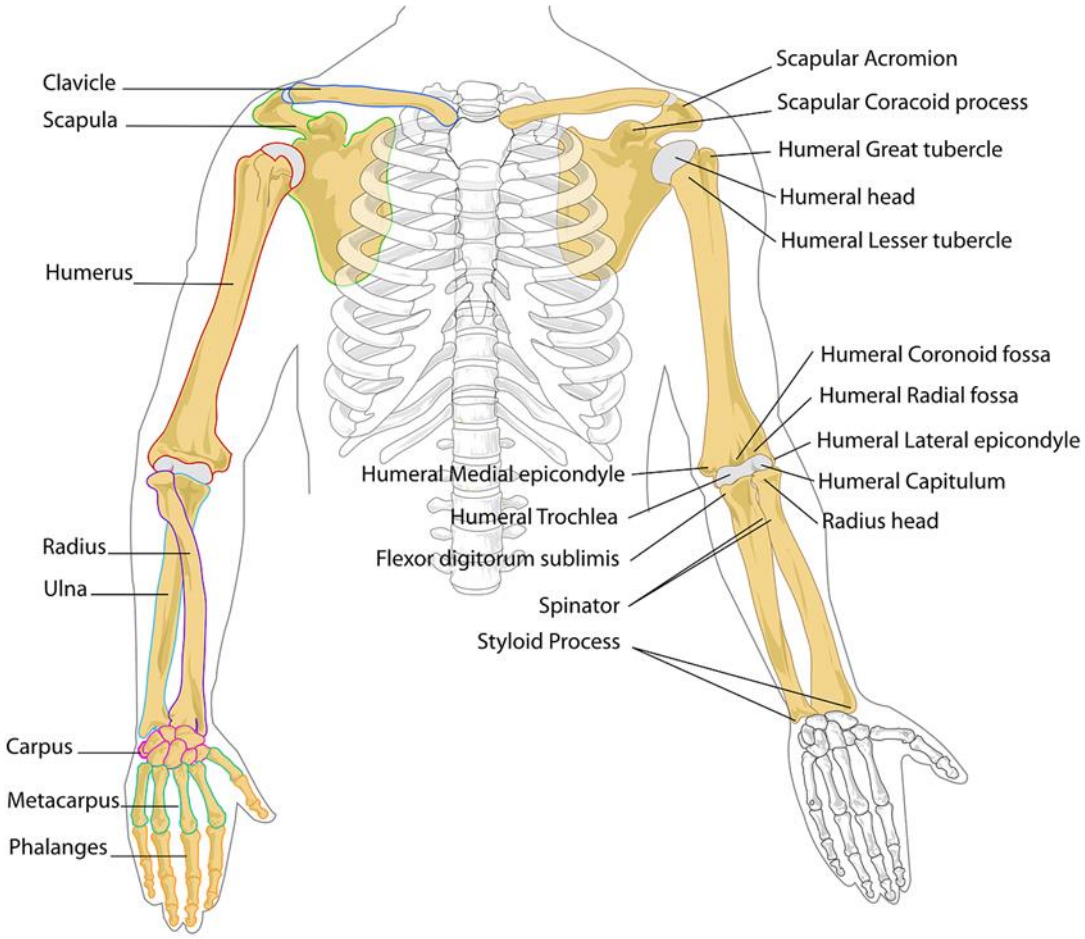
The elbow joint is a hinge joint formed by humerus, ulna and radius. Movements in fore arm are flexion, extension, pronation and supination. Wrist joint is where ulna and radius form a joint with eight carpals: scaphoid, lunate, triquetrum, pisiform, trapezium, trapezoid, capitae and hamate (Picture 1). The concave space formed by the pisiform and hamate and the scaphoid and trapezium with a roof like covering of the flexor retinaculum is the carpal tunnel. The long flexor tendons of the digits and thumb and the medial nerve pass through the carpal tunnel. (Tortora & Derrickson 2017, 224, 321, 208-209)

### 5.2.1 Risk factors at work for upper limb

Woods, Buckle, Haisman (1999) study show strong evidence between elbow and wrist pain with moving furniture, awkward positions of spine and arms, repetition, vibrating tools and difficulty keeping up with the work phase. Another indication for elbow pain was the usage of vibrating tools. There was shown strong evidence between wrist pain and repetitive movements, lifting and carrying loads and needed force to use equipment.

### 5.2.2 Physiological problem at work for upper limb

According to Försti (2007) out of the over use syndromes in the upper limb 61% were ligament insertion disorders and 16% carpal tunnel syndrome or other syndromes involving one nerve. Narrowing of the carpal tunnel due to for example inflammation is called carpal tunnel syndrome.(Tortora & Derrickson 2017, 209)




Picture 1. Anatomy of shoulder and upper limb (Pixbay web bage).

## 5.3 Back

The back consists of seven cervical vertebrae, twelve thoracic vertebrae and five lumbar vertebrae. These areas of the spine have their own normal curvatures by cervical and lumbar spine curving anteriorly and thoracic spine posteriorly (Picture 1 and 2). In between the vertebrae there is vertebral discs that enable movements such as flexion, extension, lateral flexion and rotation. In addition to protecting spinal cord vertebral column connects and gives attachment points to skull, upper limb, ribs, pelvic girdle and many muscles (Tortora & Derrickson, 2017, 187-189).

### 5.3.1 Risk factors at work for back

Occupational risk factors for back problems are physically loading work, handling heavy objects, injuries, working while back rotated or flexed, static sitting and driving vehicles. Different forces, such as pressure, rotation and lever force, affect the structures of the back. This causes the constant flexion and rotation to increase the risk of back problems. These forces are the most neutral in the middle position of the joint. Physically loading work increases degenerative changes in lumbar spine and increases the risk of sciatica symptoms. Also too little, unilateral or monotonous physical loading like sitting can increase degeneration in back. It is important to load back properly because without proper loading of the muscles, ligaments and intervertebral discs degeneration takes place and the surrounding structures adapt to the decreased loading. Injuries can occur if loading changes suddenly and the tissues have not had proper adaptation to the new demands. When slowly increasing loading the surrounding can adapt to the new loading. Some factors can affect adaptation time: age, health, physical capacity and structural features (Kukkonen 2001,132-133).

### 5.3.2 Physiological problems at work for back

Low back pain is one of the most frequent work related musculoskeletal disorder among people working in physically demanding job. The symptoms can vary as acute or chronic pain in lumbar to buttock area, lumbago, or in the hip and thigh region, sciatica. Low back pain can be caused by strain in muscle or ligaments, deterioration of the joints or discs of the spine, which can cause also pressure to the nerve roots. (OSCH E-fact cleaners and musculoskeletal disorders)

Picture 2. Anatomy and curvature of the spine (Pixbay web page).

## 5.4 Lower limb and pelvic girdle

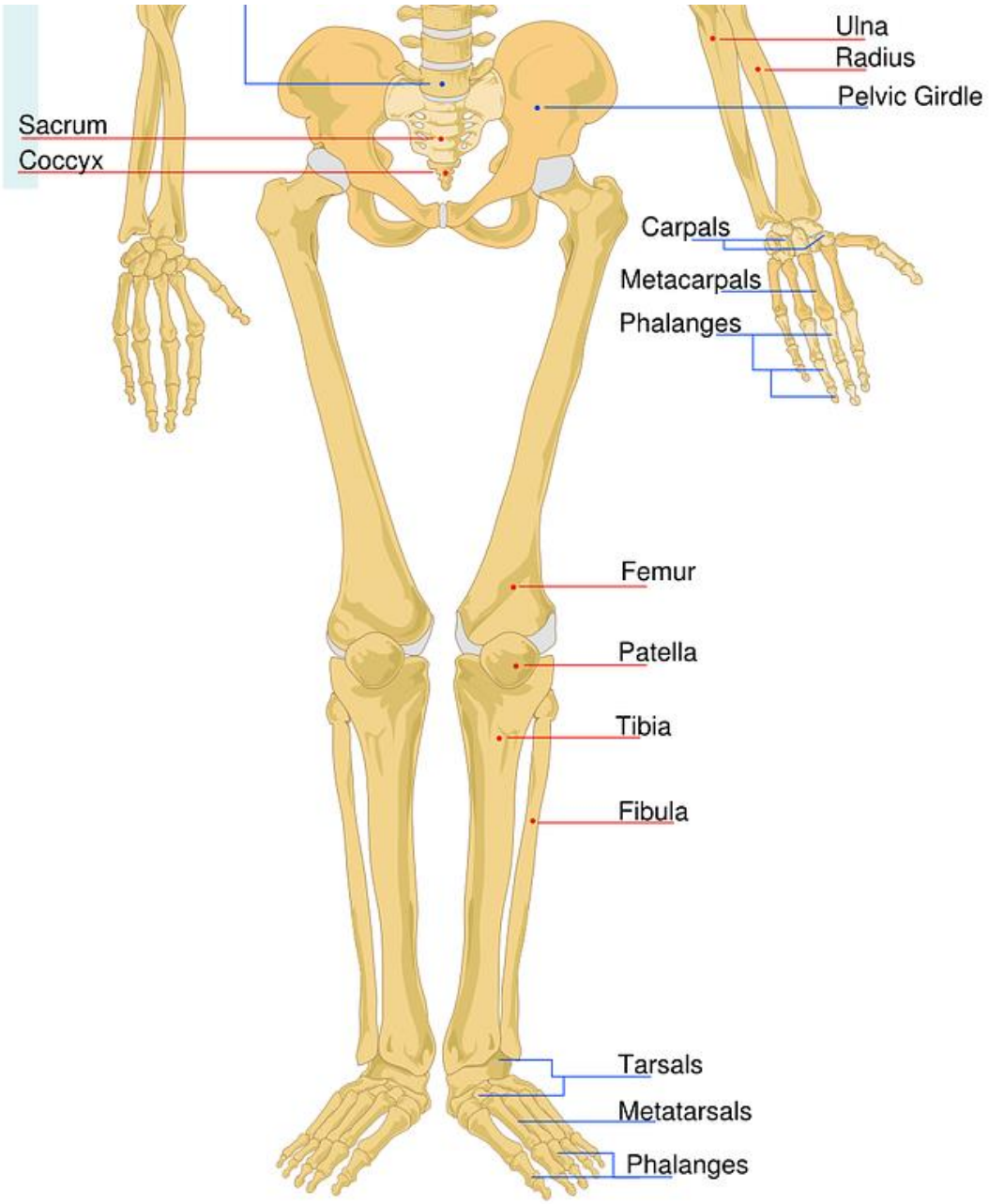
The pelvic girdle consists two pelvic bones (coxa) that join in front in pubic symphysis and at the back with sacrum at the sacroiliac joints. The thigh bone, Femur, is attached by its rounded head to the cup like acetabulum creating a ball-and-socket like hip joint. Patella, the knee cap, works as a leverage between femur and tibia, shin bone, creating a knee joint. Knee joint is a hinge like joint with a modification of leverage of patella. The knee joint is supported by cartilage and many ligaments. Tibia and fibula forms ankle joint with tarsal joint talus. Foot consists of tarsal bones, metatarsal bones and phalanges (Picture 3) (Tortora & Derrickson, 2017, 209-210, 213-19, 248).

### 5.4.1 Risk factors at work for lower limb and pelvic girdle

Cleaning work includes typically a lot of walking and standing which causes high demands on the lower limb. Occupation that has high loading on the lower limb is found to be a risk factor for osteoarthritis of the hip. When standing still knees have the loading of 40% of body weight. When walking normally the pressure in the knee is two to four times larger than when standing and the pressure can be even six times larger when walking up the stairs. When kneeling the pressure of 70% of body weight is placed on a small surface in tibia and patella. Working while kneeling is considered to be harmful if done often. (Kukkonen 2001, 158, 160). According to the website of Finnish institute of occupational health (2019) risks for arthritis and degeneration of the knee are for example working while kneeling, handling heavy objects, frequent stair walking and walking for a long time.

### 5.4.2 Physiological problem at work for lower limb and pelvic girdle

Osteoarthritis is the most common arthritic disease of the hip, knee and ankle joint. It can be caused by aging, joint trauma, repetitive abnormal stresses, obesity, hip developmental disorders and disease. The degenerative changes include articular cartilage break down and loss, capsular fibrosis, and osteophyte formation at the joint. Osteoarthritis can cause pain, muscle impairment and loss of ROM. (Kisner & Colby 2012, 718, 770)




Picture 3. Anatomy of pelvis and lower limb (Pixbay web bage).

## 6 BREACK EXERCISE LEAFLET

The chosen exercises are mini squat plus knee lift for lower limb strength, low back and pelvic control. Core exercises are combined with other exercises since a systematic review suggests that there is strong evidence that core stabilization exercises are not more effective than any other physical exercise in the long term in treating non-specific

back pain (Smith, Littlewood & May 2014). For shoulder girdle and upper limb strength the chosen exercises are pushup plus, standing shoulder flexion, rotation and abduction. According to a systematic literature review by Ganderton and Pizzari (2013) rotator cuff muscles supraspinatus, infraspinatus and subscapularis activated most at an exercise called pushup plus. Teres minor had most activation in standing shoulder flexion and some activation at external rotation exercises. In Andersen et al. (2013) shoulder abduction and lateral raise had a pain decreasing effect in chronic neck and shoulder pain. Stretch exercise for pectoralis minor is chosen to reverse possible flexed posture of upper body and rounded shoulders. For elbow and wrist were chosen stretches for wrist flexors (lateral epicondyle) and extensors (medial epicondyle) (Kisner & Colby, 2012, 642).

Picture 4. Mini squat low phase, lateral.

Picture 5. Mini squat low phase, anterior.

Picture 5. Mini squat and knee lift, stand phase.

Picture 6. Knee lift lateral view.

The mini squat is conducted in a controlled manner to about 45 degrees of knee flexion and back to standing position. Legs are positioned hip width apart, toes and knees pointing forward and lower back held straight during the whole movement (Picture 4 and 5). After the mini squat one knee is lifted to the level of the hip while hips are

controlled, avoiding tilting or rotation movements of the hip. Knee is hold up for a short while until balance on one foot is found (Picture 5 and 6). Depth of the mini squat and height of the knee raise are modifiable to an individual's capabilities. The exercise is conducted reciprocally.

Picture 7. Scapular glide neutral position.  Picture 8. Scapular glide retraction phase.

Picture 9. Scapular glide protraction phase.

Scapular retraction and protraction glide works as a waking exercise for scapular muscles and proprioception for more demanding exercises (Picture 7, 8 and 9).

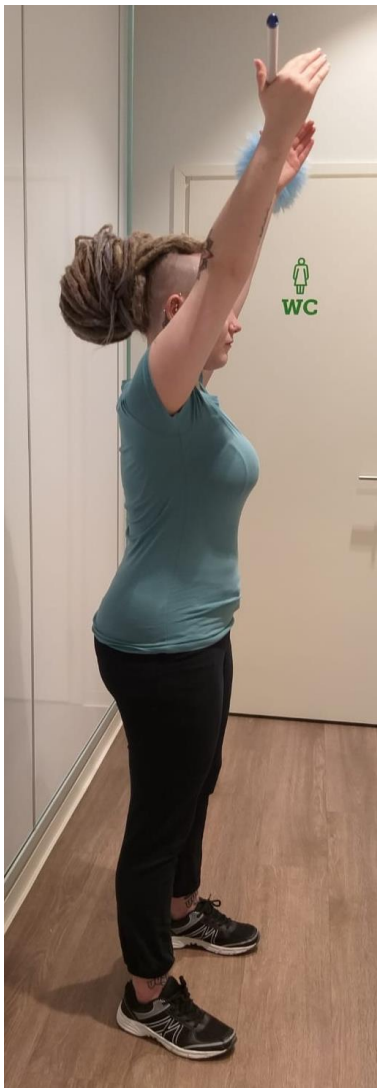

Picture.10. Push up plus starting position. Picture 11. Push up plus low phase.

Picture 12. Push up plus scapular glide.

Push up plus is conducted against a wall hands at shoulder level. Back is held straight while shoulders are extended and elbows flexed to lower the chest near the wall (Picture 10). Upper limb muscles are used to flex shoulders and extend elbows to return to the starting position (Picture 11). After this protraction of scapulae and slight rounding of upper back is conducted in a controlled manner and returned to a starting position (Picture 12).

Picture 13. Shoulder flexion starting position.

Picture 14. Shoulder flexion middle.




Picture 15. Shoulder flexion exercise high phase.

In shoulder flexion a stick kind of equipment is used. The grip is shoulder width and thumbs pointing up (Picture 13). Shoulder flexion is used to bring the stick up to the full shoulder flexion. Shoulders kept in neutral position and back is controlled during the movement to avoid increase in lumbar lordosis, challenging the core control in extension (Picture 14 and 15). When familiar with the movement, muscle activation rhythm of scapulae can be focused.

Picture 16. Shoulder abduction starting position.

Picture 17. Shoulder abduction middle phase.

Picture 18. Shoulder abduction exercise high phase.

The shoulder abduction is conducted while standing in neutral manner. The shoulder abduction is conducted on both simultaneously with both hands, thumbs pointing up (Picture 16, 17 and 18). At the beginning of the movement scapulae are retracted slightly to keep shoulders down at the beginning of the movement to enhance correct muscle activation rhythm. Added weight can be used to challenge the stability of the wrist.

Picture 19. Shoulder external rotation starting position, lateral view.

Picture 20.Shoulder external rotation starting position,anterior view.

Picture 21. Shoulder external rotation with one hand.

In shoulder external rotation starting position hips and knees are bent and straight back tilted forward. Legs are hip width apart and glutes can be supported against the wall (Picture 19). This position engages more core muscles and adds slightly the resistance of weights used. Shoulder external rotation starts with slight retraction of scapulae to keep a good position of the shoulders. Elbows are bent to 90 degrees and held close to body (Picture 20 and 21).

External rotation is conducted through the full range of motion.

Picture 22. Pectoralis minor stretch.

Pectoralis minor stretch is conducted palm and forearm against a wall or a door elbow above shoulder line (Picture 22). Stretch is kept for 30 seconds.

Picture 23. Wrist flexor stretch.

Picture 24. Wrist extensor stretch.

Wrist flexor stretch is conduced arm straight and palm facing upwards. Other hand is used to pull fingers towards the body (Picture 23). In wrist extensor stretch palm is facing down and other hand is used to pull from the back of the hand and slightly internally rotate the shoulder (Picture 24).

# 7 THESIS PROCESS AND METHODS

The thesis process started with choosing the subject and creating a study plan in January 2018. After this the topic and was discussed and agreed with the client Lassila&Tikanoja and contract was signed in October 2018. Searching for information for theoretical background started already in spring 2018 but most of the work was done between November 2018 and February 2019. The leaflet was done in during March 2019 when pictures were taken in Satakunta university of applied sciences Pori

campus and leaflet made. Thesis and the leaflet are presented in the beginning of April 2019. (Figure 2).

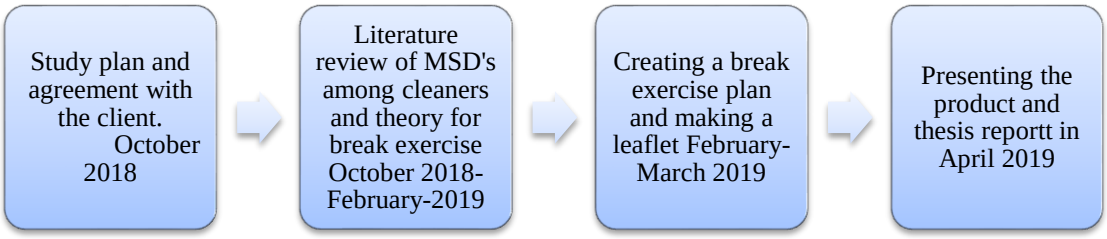



Figure 2. Thesis process

# 8 DISCUSSION

Even though equipment handling ergonomics are taught and more ergonomic equipment and cleaning methods are invented it doesn't seem to be enough to counter the risks for MSDs caused by repetitiveness and physical loading of the work. In a predominantly female industry with fairly high physical demands and strict time schedule a physical exercise intervention could be effective in decreasing the risk for MSDs.

Various work environments and tight time schedule gives restrictions for designing a break exercise plan. The equipment needed should be at hand in every work environment that a cleaner works in during the day. The exercise program shouldn't be too long to execute since the breaks are not long. Most of the studies of break exercises or physical intervention programs at work was found to take even 20-40 min daily or multiple days a week so they wouldn't be suitable for this kind of work place. Also the exercises are most probably done alone so they should be straight forward and easy to understand. The program for exercise leaflet takes approximately 10 minutes and could

be separated in to smaller sections. For exercise equipment I ended up choosing the tools that cleaners work with daily and focused on standing exercises since those can be executed everywhere. Most of the exercises can be modified for seated exercises if needed.

When taking in to consideration the increase in muscle recovery after dynamic exercises and analgesic properties of stretching exercises it seems that the best timing for executing the break exercise is at the beginning of the lunch break (Aalto 2006; Costa & Vieira 2008). This way the recovery could continue through the whole break before continuing with cleaning tasks.

The end product is sent to the client and it is suggested to be distributed for to employees through e-mail to employee's work mobile phones so that employees would have easy access to it. The exercises could also be used as a part of educational meetings to make employees more familiar with the exercises. Since this thesis doesn't include promotion or practical implementation of the program with cleaners, the main responsibility of promotion and implementation of the leaflet is left on work management or for example regional sport clubs of Lassila & Tikanoja.

Prevalence of MSD among cleaners is high and many similar kind of statistics were found, upper limb problems rising as one of the most prevalence with back and lower limb problems. Since so many different parts of body had MSD the break exercise program had to address every one of these areas. Even though one of the studies were quite old (Woods, Buckle & Haisman 1999), it had similar results with the newer studies and gave information of relation between pain occurrence and working postures. Some newer studies of the similar topics were made, but they were not free for access.

It would be interesting to know if these kind of shorter exercise programs would have an effect in preventing msd, enhancing postural control or have positive measurable effects in workability in people with physically demanding jobs. It would also be interesting to follow up how this leaflet will be distributed, used and received by the client.

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# SIIVOOJIEN YLEISIMPIÄ TUKI-JA LIIKUNTAELIN ONGELMIA EHKÄISEVÄ TAUKOJUMPPA

## Miksi taukojumppa hyödyttää juuri sinua?

Työhösi kuuluu paljon erilaisia toistoliikkeitä ja etukumaria asentoja pitkin päivää. Tarvitset myös ylävartalon ja käsien voimaa työtehtävissäsi. Vaikka hyvä työergonomia ja erilaiset käytössä olevat siivousmenetelmät pyrkivät vähentämään siivoojan fyysistä kuormitusta, on taukojumppa hyvä lisä ehkäisemään tuki-ja liikuntaelimien vaivoja.

Taukojumppa voi parantaa työkykyäsi lisäämällä fyysistä kapasiteettia. Fyysinen kapasiteetti sisältää kaiken sen fyysisen kuormituksen, jonka henkilö jaksaa tehdä päivän aikana. Taukojumpan tarkoitus on lisätä fyysistä kapasiteettia, jolloin jaksamista jää enemmän myös työn ulkopuolelle.

Taukojumpan tarkoitus on myös nopeuttaa lihasten palautumista. Työn sisältämät erilaiset staattiset asennot vähentävät aineenvaihduntaa lihaksissa, jolloin kuona-aineet pääsevät kerääntymään lihakseen ja lihakset eivät palaudu ja kuormitus lisääntyy nivelissä. Siksi taukojumppa sisältää dynaamisia, isoja liikkeitä jotka lisäävät aineenvaihduntaa lihaksessa ja pumppaavat kuona-aineita pois, jolloin lihasten palautuminen tehostuu. Tästä syystä taukojumppa olisikin hyvä tehdä esimerkiksi heti ruokatauon alkuun ennen ruokailua, jolloin siitä saisi parhaan hyödyn.

Harjoitteet on valittu perustuen siivoojien yleisimpiin tule-ongelmiin ja niiden ehkäisemiseksi.

## MINIKYYKKY JA POLVEN NOSTO – SELÄN JA JALKOJEN HYVINVOINTIIN

1. Seiso jalat lantion levyisesti polvet ja varpaat eteenpäin osoittaen.
2. Koukista polvista ja lonkasta ja vie takapuolta taaksepäin kunnes polvi on n. 45 asteen kulmassa.
3. Pidä selkä suorana ja polvet, sekä varpaat eteenpäin osoittaen koko liikkeen ajan.
4. Nouse alkuasentoon pakaralihaksia käyttäen.
5. Nosta toinen polvi ilmaan n.lantion tasolle, etsi tasapaino ja laske jalka takaisin alas.
6. Pidä lantio vaakatasossa ja eteenpäin osoittaen koko liikkeen ajan.
7. Toista vuoropuolin.

Tee 15 toistoa ja 1-2 sarjaa.

Huom! Kyykyn syvyydellä määrittelet itse harjoitteen haastavuutta. Voit tunnustella lantion asentoa pitämällä kädet lantiolla.

## Lapojen apuharjoite

Vedä lapaluita kevyesti yhteen ja alas. Rentouta hartiat.

Työnnä lapaluita ja hartioita kevyesti eteen. Rentouta hartiat.

Huom! Tämä on apuharjoite seuraavia harjoitteita varten.

Jos lapojen liike onnistuu, voit siiryä seuraavaan harjoitteeseen.

## Punnerrus plus - Lisää voimaa käsille!


1. Ota punnerrusasento seinää vasten. Jalat lantion leveydellä, vartalo suorana ja kädet olkapäiden kanssa samalla linjalla.
2. Koukista käsiä ja vie rintaa lähelle seinää.
3. Pidä selkä suorana.
4. Työnnä käsillä seinästä itesi alkuasentoon.
5. Vie hartioita ja lapaluita eteenpäin ja pyöristä yläselkää kevyesti taaksepäin.
6. Palauta hartiat ja selkä alkuasentoon.

Toista 15 kertaa ja 1-2 sarjaa.

Huom! Viemällä jalat kauemmas seinästä lisäät harjoitteen haastavuutta. Kun liike tuntuu tutulta, voit yhdistää punnerruksen ja lapojen liikkeen yhtenäiseksi sulavaksi liikkeeksi.

## Suorien käsien nosto etukautta - Ryhti ja olkapäät kuntoon

1. Seiso selkä suorana.
2. Ota "kepiksi" esim. pieni moppitaulu tai teräväkuivain.
3. Ota ote kepistä hartioiden leveydeltä niin että peukalot osoittavat ylöspäin.
4. Vedä lapaluita kevyesti yhteen ja alas.
5. Pidä hartiat alhaalla koko liikkeen ajan.
6. Tuo kädet suorina hitaasti lantion tasolta etukautta mahdollisimman korkealle, niin että selkä ei pääse notkistumaan.
7. Tuo kädet hitaasti takaisin alas.

Tee 15 toistoa ja 1-2 sarjaa.

Helppoa? Tunnustele lapojen liikettä ja yritä pitää ne samanaikaisina.

## Suorien käsien nosto sivukautta - Ryhti ja olkapäät kuntoon

1. Ota sopivan kokoinen ja painoinen esine käteen esim. korkillinen vesipullo.
2. Vedä lapoja kevyesti yhteen ja pidä hartiat alhaalla koko liikkeen ajan.
3. Tuo kädet hallitusti sivukautta mahdollisimman ylös ja alas.
4. Pidä ranteet suorina koko liikkeen ajan.

Tee 15 toistoa ja 1-2 sarjaa.

Helppoa? Tunnustele lapaluiden liikettä ja yritä pitää ne samanaikaisina. Lisähaastetta saat lisäämällä pullon sisältämän veden määrää.

Huom! Tarkista, että korkki on kiinni. Käytä pullon sisällä painona vain vettä. Jos käytössäsi on vain yksi sopiva pullo, voit vaihtaa pullon kädestä toiseen liikkeen ylä- tai ala-asennossa.

## Olkapään ulkokierto - Olkapäiden ja selän hyvinvointiin

1. Koukista hieman polvista ja lonkasta ja kallista selkää suorana eteenpäin. Voit tarvittaessa tukea takapuolen seinää vasten.

2. Ota sopivan kokoinen ja painoinen esine esim. liuospullo käteen.

3. Vedä lapaluita kevyesti yhteen ja alas.

4. Pidä kyynärpäät 90° kulmassa ja lähellä vartaloa koko liikkeen ajan.

5. Kierrä kättä hitaasti sivulle ja tuo takaisin eteen.

6. Voit tehdä liikkeen joko vuoropuolin tai kummatkin puolet samanaikaisesti.

7. Muista pitää ranteet suorina.

Tee 15 toistoa ja 1-2 sarjaa.

Huom! Pullojen sisällön määrällä voit lisätä tai vähentää harjoituksen vastusta.

## Pienen rintalihaksen venytys - Ryhti suoraksi

1. Nosta kyynärpää seinää tai oven karmia vasten hartialinjan yläpuolelle.
2. Pidä venytys 30s ajan.
3. Tee venytys kummallekin puolelle.

## Ranteen koukistajien venytys - Vetreät kädet

1. Käännä kämmen kattoa kohti.
2. Ota toisella kädellä kiinni sormista ja vedä kevyesti itseäsi kohti.
3. Pidä venytys 30s ajan.
4. Tee venytys kummallekin puolelle.

## Ranteen ojentajien venytys - Vetreät kädet

1. Käännä kämmen lattiaa kohti.
2. Vedä toisella kädellä kevyesti kämmenselästä itseäsi kohti.
3. Käännä kämmentä niin että sormet osoittavat hieman sivulle päin.
4. Pidä venytys 30s ajan.
5. Tee venytys kummallekin puolelle.