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## **Assessing children's posture and overview of increasing their physical activity**

A systematized literature review and guidebook for  
physiotherapy students

DEGREE PROGRAMME IN PHYSIOTHERAPY  
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Assessing children's posture and overview of increasing their physical activity		
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<p>Abstract</p> <p>School physiotherapy and it possibly being a clinical practice placement for physiotherapy students is still in the future. This thesis was made to provide for the future physiotherapists and students an information package about the possible topics that the job might entail. Topic of posture assessment and promotion of movement were chosen from the Fysioterapeutit Kouluille – project and an interview made with the Etelä-Karjala healthcare services school physiotherapy project leader.</p> <p>Theory part of this thesis includes basics of posture and common postural abnormalities. Second part is focusing on promotion of movement, because being more physically active is associated with better posture.</p> <p>For the systematized review part two randomized control trials were selected. Studies were evaluated to be fair level of evidence with using PEDro scale criteria. According to the review, interventions done in the schools didn't have significant effect on increasing children's physical activity levels or reducing back pain. Any huge conclusions cannot be made based on the results of this thesis. Further research is needed on increasing children's physical activity and maybe the interventions should be targeted to other sectors than schools.</p> <p>Part of this thesis was to provide learning material, guidebook, for physiotherapy students who would in the future have their clinical practices in schools. Guidebook would be based on theory part and systematized literature review. The information that guidebook will offer is how to assess posture and scoliosis, what to do with common postural abnormalities, benefits of physical activity, and tools and ideas to increase it.</p>		
Keywords Children, physical activity, posture, school, physiotherapy		

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## 1 INTRODUCTION

In Finland assessment and following of the child's growth development belongs to Maternity and child health clinic between age of 0-6. Afterwards the follow up is responsibility of school healthcare. That is usually done by school nurse but in the future feasibly done by a physiotherapist.

According to law act (VNA 338/2011), school aged children are meant to have their health checks in each grade of their primary school, from first grade to ninth. Wider check-ups are performed by medical doctor in first, fifth and ninth grade. Concerning posture assessment, the growth spurt of the spine is happening during the age of 12 with girls and age 14 with boys. During that spurt deformities of spine are starting to occur, and the most important factor for health professionals is to screen the idiopathic scoliosis. It is occurring with two out of one thousand adolescents. Earlier notice and intervention might be lowering the need for surgery. This is the reasoning why posture is assessed from every child at the grade of 4-5 and again during grade 7-8 (at age 10-11 and 13-14). (Mäki, Wikström, Hakulinen & Laatikainen 2017, 33-37.)

Now these health check-ups are performed by the school nurse, but there is discussion and plans to implement physiotherapist to the school to lower the workload of healthcare centres and get the physiotherapy work closer to schools. School physiotherapy project has Fysioterapeutit kouluille - workgroup which has project that would combine physiotherapists and school healthcare, but it is still in progress and not ready yet (Webpages of Suomen Fysioterapeutit ry 2020). The aim of the physiotherapists' work in the schools would be to prevent physical and functional problems at earlier stages and provide health promotion guidance, counselling and activities to students. The main competencies include, especially, promotion, restoring and maintenance of health, movement, physical activity and ability. (Webpage of Suomen Fysioterapeutit ry 2017.)

The aim set for school physiotherapist by Suomen Fysioterapeutit and the authors' own phone interview with Etelä Karjalan healthcare service's project leader about school physiotherapists, led the authors to these topics. From there the authors found out that to school physiotherapist job description would probably concern assessing children's posture but the main emphasize would be promotion of movement and increase physical activity in schools and everyday life. Other reason for these topics is, that at least in Satakunta University of Applied Sciences (SAMK) the course for paediatrics is scheduled quite late in the third year, so students' who might have their paediatric clinical practice earlier would have an information source beforehand.

This thesis is going to be a guidebook about children's posture assessment and promotion of movement. These will be targeted more towards for physiotherapists and physiotherapy students that might work or do their clinical practice in school environment. The thesis consists of well-rounded theory part about assessing children's posture and importance of physical activity. Lastly, systematized literature review is conducted about the topic. These together give framework for the guidebook.

Content of the guidebook is providing basic information about assessing child's posture and screening common problems. Guidebook will give information about how to proceed in more severe scoliosis cases as a physiotherapist, but otherwise the emphasize of guidebook is increasing overall physical activity of the children. That is an issue that is growing. In the guidebook, there will be more practical solutions and ideas to promote movement and increase physical activity.

## 2 THE AIM AND OBJECTIVES

The aim of this thesis is to increase knowledge of physiotherapy students about children's posture and sedentary behaviour by offering solutions to increase daily activity and promoting movement. Main objective is to provide well rounded theory about the topics and execute a systemized literature review, both of which contain relevant and evidence-based information about set aim. From this thesis a guidebook will be made as Powerpoint.

### 3 BASICS OF POSTURE

Spine is divided to five parts which are, cervical spine, thoracic spine, lumbar spine, sacrum and coccyx. Cervical spine consists of seven (7) vertebrae, thoracic spine has twelve (12) vertebrae, lumbar spine is formed by five (5), sacrum has five (5) fused vertebrae and coccyx is defined as one. In lateral view spine has four (4) normal curves. (Tortora & Derrickson 2014, 213.) Posture is defined to be body state in different positions, that is reached with muscles, tendons, bones and joints. When posture is optimal, lumbar spine and cervical spine has lordosis (curved forward) and thoracic spine has kyphosis (curve backward). (Sandström & Ahonen 2011, 175.) Ideal static posture from the side is defined as imaginary straight line (of gravity) that passes through the earlobe, the bodies of cervical vertebrae, the tip of the shoulder, midway through the thorax, through the bodies of lumbar vertebrae, slightly posterior through the hip joint, slightly anterior to the axis of the knee joint, and just anterior to lateral malleolus. Maintaining correct posture minimal muscle work is needed and minimum stress is applied to each joint. (Magee 2014, 1017-1053.)

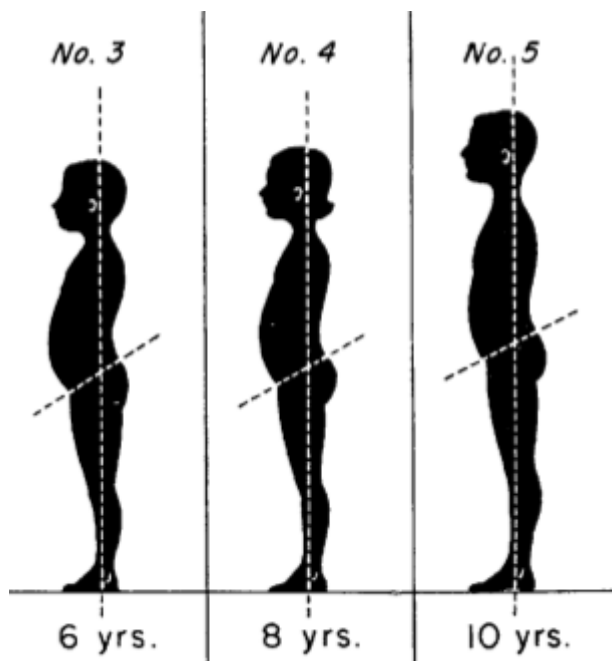
Humans move with only two legs; body weight must spread equally on both of them. Aim should be that body parts stays in top of each with as less energy consumption as possible. Disturbances in postural kinetic chains are shown as posture abnormalities, for example head pushing forward direction. That causes exaggerated thoracic kyphosis. Musculoskeletal problems can be caused by these weight distribution misalignments in the kinetic chain. (Sandström & Ahonen 2011, 185-187.)

#### 3.1 Development of posture in children

Children has higher centre of gravity, and it affects to their balance by reducing it. Centre of gravity is at the level of twelfth vertebra in children and it goes as low as second sacral vertebra in adults. (Magee 2014, 1017.) Due to development the percentage of limbs of the whole body's length goes higher and it reduces relative role of the head. (Terveurheilija 2014.) Puberty comes earlier and is shorter for female than male. In female puberty last about 3 years and males' puberty last about 5 years.



Puberty starts in male between ages 9 and half, and 16 when in female it starts between ages 8 and 14. (Magee 2014 1021-1022.) Children's postural development changes thorough the whole period of elementary school. Cross section of lines marks the centre of gravity. (Picture 1.)



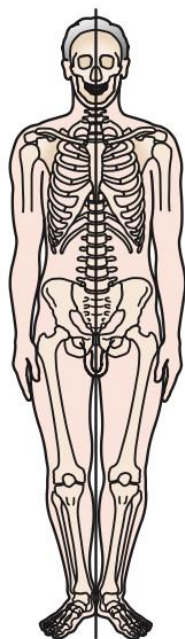
Picture 1. Posture development. (Modified from Magee 2014 , 1021)

### 3.2 Observation of posture

Observation is part of assessment which is done in standing position. From observation professional gains subjective information about person's body symmetries, abnormalities and dysfunction in the body alignments. Professional needs to determine if the presented findings are related to the patient's pathology. (Magee 2014, 17.) Inspection of child starts as soon as professional sees the child. Limping, reaching for toys on the floor, getting up from the floor, pain in movement and child's activeness are important things to observe without telling observed person. (Helenius 2019)

### 3.2.1 Frontal view

Head is straight in the imaginary midline compared to rest of the body. When observing head posture is to assess if head is tilted or rotated to either side or direction. In head, the jaw can be observed separately, and jaw line should be symmetrical in both sides. Shoulder line should be on the same line, but it is normal to have shoulder the dominant side slightly lower compared to other side. Clavicles are symmetrical and on the same level. There shouldn't be any noticeable differences in sternum, ribs or costal cartilage when comparing sides. Arms has two main things to observe, their hanging distance from the body should be equal, in relaxed standing position hands should be facing to the body, any difference might indicate medial or lateral rotation of upper limb. Observation of iliac crests consist of assessing symmetry and them being on the same level. Possibility of rotation in the hips or plausible difference in height of lower limbs, can be assessed by observing anterior superior iliac spines and their difference in height. Knee observation consists of assessing alignment of lower limb and patellar symmetry and position. Knee alignment should be straight, but varus or valgus posture should be mentioned. Both malleoli should be on the same level compared to another lower limb. Feet should point forward, and observer should be able to see medial longitudinal arch. Feet pronation, supination other abnormalities should be observed. When observing these other points, asses constantly the size and equality of muscles and bony structures and compare the sides of the body together. (Magee 2014, 1017–1053; Picture 2)



Picture 2. Frontal view posture (Magee 2014, 1033).

### 3.2.2 Posterior view

Head should be straight and shoulders in the same level. Same rotation and tilt are observed from posterior view as well as it was from frontal view. Scapula spines and inferior angles are in the same level and in neutral position. Distance from the spine to scapula are equal on both sides. Spine is straight and lateral curves are signs of scoliosis. Ribcages and waist angles are symmetrical and on the same level. Distance and rotations of arms and from the body are equal and symmetrical. Pelvis is straight and posterior spina iliac spines are on the same level, compare the result to anterior assessment. Gluteus muscles form a fold and those should be on the same level. Knees are on the same level and medial and lateral condyles are symmetrical and, on the level, compared to other leg. Line of the Achilles tendon is straight in line with calcaneus bone. (Magee 2014, 1017-1053; Picture 3)



### 3.2.3 Lateral view

From the side the imaginary line runs from earlobe to shoulder and to the iliac crest. Spinal segments should have normal curve from the lateral view. Chin and shoulders should not be too forward from the midline. Assessing pelvic posture, the posterior superior iliac spine should be slightly higher than anterior superior iliac spine. Knees should be equally straight but in relaxed standing posture it is normal to have slight flexion in knee joints. (Magee 2014, 1017-1053; Picture 4)



Picture 4. Side view of posture (Magee 2014, 1033).

## 4 COMMON POSTURAL ABNORMALITIES OF CHILDREN

Musculoskeletal system is made of bones, joints, tendons and muscles. The purpose of musculoskeletal system is to protect and support other organs and make moving possible in standing posture (Terveyskirjasto 2011).

### 4.1 Neck and shoulder problems

According to the questionnaire Finnish children aged 10-12 answered that 8.1% have often neck or shoulder pain. (Terveyden ja hyvinvoinninlaitos. 2019 kouluterveyskysely.) Neck has a lot of potential pain starters and rarely pain comes only from one structure. Neck and shoulder pain can come from any body part that has pain-sensing nerve-end (Kujala, Taimela & Vuori 2017, 320). Most of the pain localizes to soft tissue, bodies of muscles and origins and insertions of muscles. (Kauranen 2017, 65).

### 4.2 Back problems

Healthy children's back is straight and pain free. Back pain is rare reason for under ten-year old's children's visit to doctor (Helenius 2009). Acute passing back pain is mostly caused by soft tissue but under 10 years old repeating back pain is serious and reason behind it should always be found. Also, if back pain lasts longer than two weeks the reason should be found. The most common back abnormality in children is scoliosis (Terveyskylä 2019).

### 4.3 Scoliosis

Scoliosis is condition of where persons back is rotated and curved sideways. (Helenius 2018) Definition of scoliosis is more than 10 degrees of curve measured by Codd's method. (Helenius 2009) Medical diagnosis is always done by X-ray of the spine and there can be defined the difficulty level. Scoliosis is divided to three main categories,

which are idiopathic, congenital and related to other diseases including neurological and musculoskeletal disorders. (Helenius 2020)

For physical examination physiotherapist could perform Adam's forward bend test. Clients stand feet together and on the same level also, palms are together. Knees should stay straight, and flexion happens from hips and spine can curve naturally to flexion. Assessment is done from anterior and posterior view in this position. Test is positive if there is lateral bending of the spine and at the end rib hump is visible. Examiner can also assess other ribcage asymmetries, difference in spinal muscle bulk or any pathological differences like kyphosis. Lumbar spine flexion and extension is normal. Restrictions can be sign for example of tight hamstrings. (Magee 2014, 1017-1053; Horne, Flannery & Usman 2014)

Adam's forward bend test can easily be combined with measurement with scoliometer. With scoliometer physiotherapist can measure the seen curve of the spine. Scoliometer is a great tool to assess if the patient would need X-ray. Less than five-degree curve may not need follow up. Measurement of between 5-9 degrees needs a six month follow up. Over 10 degrees is indication that X-ray, and Cobb angle is needed. Scoliometer alone is not enough to diagnose scoliosis. (Horne, Flannery & Usman 2014) Combination of Adam's forward bend test and measurement with scoliometer is demonstrated below (see Picture 5).

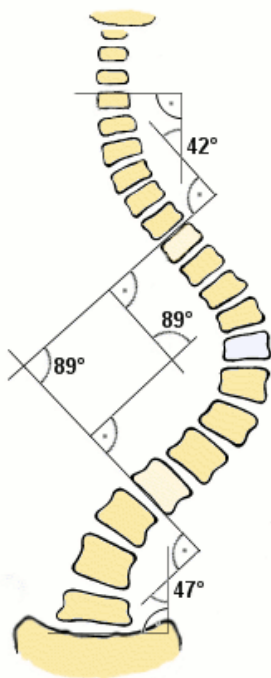


Picture 5. Picture by Sakari Savimäki.

Cobb angle is standard way to measure scoliosis and it is invented by Dr John Cobb in 1948. Measurement is done by drawing parallel lines from upper vertebra's upper border and lowest structurally curved vertebra's lower border. The angle is measured from the point where the lines meet and that's called the angle of curvatures. Normal value is under 10 degrees and if Cobb angle is higher it is recommended to go see physiotherapist or orthopedic doctor. In Cobb angle interobservers variation is 5-10 degrees. (Physiopedia 2020; Picture 6)

Children's idiopathic scoliosis origin is unknown, and it can start already in early childhood but usually it starts during growth spurt in puberty. Spinal structures like vertebrae and discs are normal. Genetics have strong effect on developing idiopathic scoliosis. (Helenius 2020) Congenital scoliosis happens if fetus's vertebral structure development is deranged. Usually, these patients have other organ system disorders. (Helenius 2018)





Picture 6. Cobb angle measurement (Physiopedia, Cobb angle, 2020).

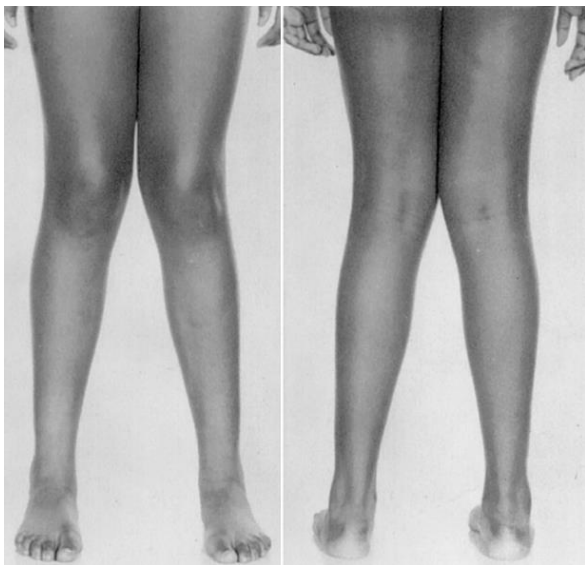
#### 4.4 Knee and hip problems

Children who have lower extremity problems have normal findings of rotation and angular things. Children growing resolves abnormalities in lower extremities that are in normal measurements. Usually, radiologic studies are not required but exclusion is pathologic conditions. (Rerucha CM, Dickison C, Baird DC. 2017)

##### 4.4.1 Varus and valgus knees

Children have normally varus knees until age of three but if condition stays further it is suggested to get professional opinion. Children's knees changes from varus to valgus, and the biggest valgus is usually present in age of three. Normally knees straighten when child grows but if there is significant valgus at the age of ten, it is good to go see professional for opinion if its normal. Significant malalignment is treated with surgery before puberty. (Duodecim. Jalanko. 2021) Genu varum and genu valgum are angular problems. Most children have normal rotational and angular

findings, but surgery is usually not needed even when they have lower extremity problems (Rerucha CM, Dickison C, Baird DC. 2017; Picture 7).



Picture 7. Genu valgus knees. (Magee 2014. 1036)

#### 4.4.2 Knee pain

Children have unspecific knee pain after trauma or exercise. If knee looks and feels normal and child can load weight on it, adult can monitor the situation for few days. Usually, knee heals by itself and there is no need for treatment of professional. Child can also load the knee normally.

Adolescents can have anterior knee pain, which is caused by cartilage damage. Sometimes the reason is trauma but commonly the reason is unknown. Usually, pain goes away with time but if it stays for longer time it is suggested to go see professional for assessment.

Especially school aged boys can have Osgood-Schlatter disease which is long lasting knee pain in the area where quadriceps muscles insert to top part of tibial bone. The reason is unknown, but it usually comes to boys who exercise a lot during growth spurt. Treatment is limiting exercising but the time and use of knee support is assessed by professional on case-by-case basis.

There can be pain in the knee, caused by osteochondritis dissecans, where knee pain comes on flexing, and it can even swell. The reason is part of bone in knee joint which can be seen in x-ray imaging. Usually, the disorder is so small that special treatment is not needed.

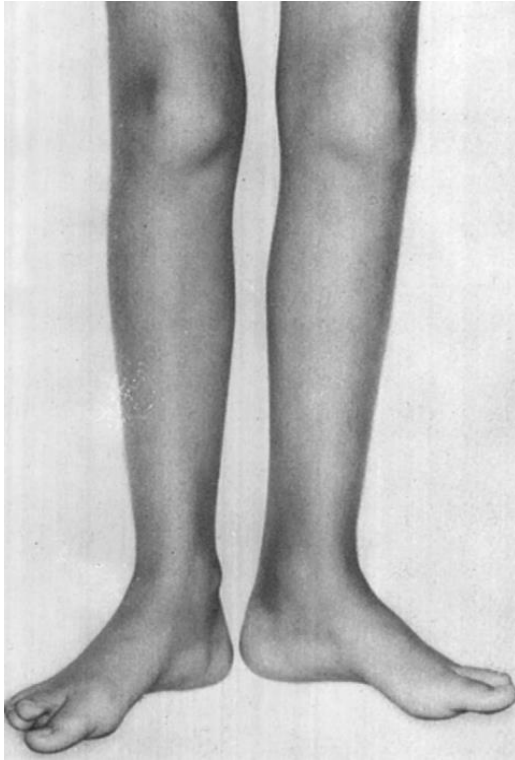
Girls who hit puberty can have unspecific knee pain which is believed to be caused by growth spurt. Pain can last from few seconds to few hours. In this case assessment usually don't find anything concerning and pain goes away in few weeks or months. (Duodecim. Jalanko. 2021)

#### 4.5 Ankle and feet problems

When assessing ankles, it is important to assess that line of gravity's distance is the same from each medial malleolus. Healthy ankles have symmetrical malleoli and feet are parallel compared to each other. (Magee 2014, 1017-1053.) Orthotics are not beneficial in children when treating ankle and foot problems. Over 8 years old children rarely need surgery to treat severe deformities. (Rerucha CM, Dickison C, Baird DC. 2017)

#### 4.6 In- and out-toeing

In-toeing is more common in younger children, and it is caused by metatarsus adductus, internal tibial torsion, and femoral anteversion. Out-toeing is more common in older children. Causing of out-toeing is external tibial torsion and femoral retroversion. (Rerucha CM, Dickison C, Baird DC. 2017; Picture 8) In- and Out-toeing usually corrects through normal development and rarely when correction doesn't happen the child gets any symptoms, and they can participate in sports normally. Risk of hip or knee pain is higher with in- or out-toeing but it occurs in 1 of 100 children. (Orthokids 2021)



Picture 8. External tibial torsion (Magee 2014, 1036).

## 5 PROMOTION OF MOVEMENT AND PHYSICAL ACTIVITY

Effects of physical activity on children's and adolescents' physical, psychological, and social well-being have adequate evidence to conclude its' importance (Strong et al 2005). Nevertheless, the level of physical activity has been decreasing, especially in secondary school, in Finland and other European countries. (Yli-Piipari 2011, 20-24) Adolescents spontaneous physical activity has been decreasing over the years (Broberg, Hynynen, Iltanen, Kyttä & Paronen 2011). The children's physical activity recommendations aren't fulfilled and screen time while sitting is exceeding the recommendations. Finnish physical activity report shows the children's physical activity behavior in nine different fields and have graded them to a five-point scale according to the Canadian model. Letter A means the criteria is fulfilled almost perfectly and F means the criteria is met with fifth or less of the population. This is giving indication about children's physical activity and this data was later compared with 15 other countries in Canada 2014. In Toronto Finland was seen as a typical developed western country. (Aira et al 2014; Figure 1)

1. Overall physical activity	D
2. Organized exercise and sports	C
3. Independent physical activity	D
4. School commute	B
5. Sitting and screentime	D
6. Physical activity with family and friends	C
7. Physical activity in school	B
8. Municipal level measures and environmental factors	B
9. National level measures on movement promotion	B

A 81-100%	B 61-80%	C 41-60%	D 21-40%	F 0-20%
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Figure 1. Finnish children's and adolescents' different physical activity fields. (Aira et al 2014, 5)

In a long-term study following participants physical activity showed that active lifestyle starts to form already quite early in the childhood. For instance, mother's estimation of 3-year-old children's physical activity correlated positively to child's own evaluation of their physical activity at the age of 15 for boys and age of 21 for girls. Furthermore, activity at the age of six predicted physical activity at the age of 18 for boys and age of 27 for girls. Other positive result implied and predicted that children that walk or cycle their school commutes have more active lifestyle later in life. Those children who walk or cycle instead of using motor vehicle seem to be more physically active as adults. (Telama, Hirvensalo & Yang 2014) This give reasoning why promotion of movement should be started as early as possible.

### 5.1 Physical activity recommendations for children

The physical activity recommendation to 7–17-year-old children are shown in picture 9. It contains sixty minutes per day of moderate- to -vigorous intensity of physical activity that is concerning the children age. (WHO webpage 2020; UKK instituutti 2021; Strong et al 2005) In Finland the recommendation is same. UKK institution is stating that staying put for a long period of time should be avoided and there should be brakes where child moves his or her body. Daily physical activity does not have to be done in one time but can be divided in shorter sections during the day. Physically active children have higher change to create long lasting habits where exercising and active daily living is normal part of the day and when growing up the habits stay in adult life also. (UKK instituutti 2021)

Recommendations of UKK institute says that children should improve their endurance three times per week. Perform activities that makes heartbeat raise and exhausted for example swimming, biking or vigorous walking. Children should participate activities that build muscles and loads bones three times per week. These kinds of activities are ball games and activities with high intensity and jumping. In these activities you can also improve flexibility, balance, and agility but those can also be separate activities. UKK has started to take attention to sedentary behavior. A lot of focus has put into pausing sitting for long periods of time. UKK states that sitting should be paused often and person should stay active whenever possible. Sleeping is important for children

and any movement can lose its benefits if sleeping is bad. (UKK instituutti 2021; Picture 9)



Picture 9. Promotion of movement recommendations by UKK. (UKK instituutti 2021)

UKK institute states in Daily movement recommendation that we should move more through daily activities and change our posture when working in static positions for longer than 45 minutes. (UKK instituutti 2021) This applies to school aged children who are sitting in class for one long period. This UKK movement promoting is especially important when considering child's who are less active both in school and home setting. Thus, it is crucial for physiotherapists/teachers working in the school to promote movement and help children to develop habit to move to break inactivity regularly.

## 5.2 Risks of sedentary lifestyle

Physical inactivity is shown to increase risk of mortality. Insufficiently physical active people have 20% to 30% higher risk of death when comparing to those who are sufficiently active. Inactivity is one of the most prominent risk factors as a cause of death. (WHO webpage 2020)

In children and adolescents, physical inactivity is increasing risk for weight gain and increasing adiposity. Sedentary behavior in children is associated with poorer cardiometabolic health and fitness. Inactivity can mean poorer behavioral conduct and it may reduce sleep duration. (WHO webpage 2020)

Sedentary behavior, like excessive screen time can have effects on school grades and learning. Children who spend more than three hours per day sitting in front of television, computer, or consoles, score worse in school than children whose screentime is less than two hours per day. (Kantomaa, Syväoja, & Tammelin 2013)

## 5.3 Benefits of physical activity

Movement can promote wellbeing in many ways. Physical wellbeing is one and it makes body work better by strengthening heart, lungs, bones and muscles. Also, movement reduces risks of cardiovascular diseases, depression and type 2 diabetes. Mental wellbeing is promoted by movement, and it increases the stress hold of hurry and gives human more positive mindset. Movement has social aspect by teaching to take better consideration of others and following the rules. Also, interactions skills develop when moving together. Movement helps with learning by giving better ability to concentrate and increasing memory. (Tervekoululainen 2021; WHO webpage 2020)

There is a correlation with school success and higher self-set academic goals with children who are physically more active. Especially physical activity during the school day like during recess and lectures, considerable physical activity and good endurance condition has been connected to good grades and standardized subject-specific test results. (Kantomaa, Syväoja, & Tammelin 2013)



There isn't clear answer how movement and which type of exercise increases learning, but the overall physical activity indirectly seems to improve that learning capabilities of children. For example, physical activity improves physiologically the whole body but it additionally improves brains blood circulation, oxygen uptake and neurological functions of the brain. Regular physical activity creates more braincells, especially in the hippocampus area, which is the centre of learning and memory. Exercise improves connections in the brain and its structures. All these physiological factors raise the learning potential: develop alertness and concentration as well as data processing and memory functions. (Kantomaa, Syväoja, & Tammelin 2013)

Normal motor development and learning new motor skills through physical activity could have effect on overall learning skills. New motor skills allow the children to move in new ways that gives them challenges that requires critical thinking and problem solving from the children. (Kantomaa, Syväoja, & Tammelin 2013)

Social interactions in sports and physical activity are probably one of the most important things of that affects on learning. Learning is always connected to situations that has some form of social interactions and active participation. Learning based on interactions basic principles consist for example working in groups, ability to take responsibility of your own actions, taking initiative, being active and self-reflection skills. Sports and physical activity improve children's ability listen, follow instructions, wait for his/hers turn and choose the best method of action for the situation. Physical activity offers children chance to let out and deal with different emotions. In best case scenario physical activity gives children possibility to learn co-operation skills, independence and skills to work with different kinds of people. (Kantomaa, Syväoja, & Tammelin 2013)

Physical activity's physiological, motor developmental, social and situational factors seem to effect on the bigger picture of physical activity in improving school success and learning. (Kantomaa, Syväoja, & Tammelin 2013)

#### 5.4 Physical activity and posture

More physically active children with lower levels of adipose tissue and higher content of muscle tissue have less misalignments concerning typical body posture (Wyszyńska et al 2016). Comparing children that indulge moderate to vigorous physical activity were more physically capable and had better spinal posture than compared to children who had low levels of physical activity (Šidlauskienė, Strukcinskiene, Raistenskis, Stukas, Strukčinskaitė & Buckus 2019). Certain postural abnormalities, including cervical spine posture and thoracic kyphosis were associated with physical activity and psychological problems like depression (Asadi-Melerdi, Rajabi-Shamli, Sheikhhoseini & Piri 2020). Children who had physical activity one or less times per week had bigger risk for bad posture. Another factor for bad posture was three or more hours per day watching TV or PC screen. Better posture was associated with 3 or more times physical activity per week. As an intervention to reduce postural problems is to reduce sitting time in school and implementing more physical activity in children's leisure time. (Balkó, Balkó, Valter & Jelínek 2017)

#### 5.5 Solutions and ideas for increasing physical activity

Increasing physical activity and teaching its benefits should be considered in all educational facilities concerning children and adolescents. Schoolground and facilities should be redesigned to be more approachable, that they could be easily used in recreational and leisure purposes as well. (Aira et al 2014) Schools could increase hours spend for physical activity since the increase of physical activity doesn't seem to lower the school grades even when part of the teaching time for normal subjects is moved to physical activity (Kantomaa, Syväoja, & Tammelin 2013). Physical educational classes should be made more friendly and accessible to everyone. Activities that support autonomy, competence and cohesion of the children increases their inner motivation to physical activity (Aira et al 2014). From societal perspective schools and physical education classes are cost effective way to influence on larger group of children's behaviors towards more physically active life (Yli-Piipari 2011, 20-24).

School and school physiotherapists should increase movement during school commutes, classes and recesses. Children should be encouraged to travel school commutes by walking or by bike. (Aira et al 2014) The routes to schools should be safe and be easily accessible. During recess children should be encouraged to go outside and schoolgrounds should offer them equipment, ideas and freedom to perform their favored activities. (Aira et al 2014; Aira, Kannas, Tynjälä, Villberg & Kokko 2013, 24-29) During classes children should be allowed to move around or work in standing position to reduce sitting time. Functional teaching methods should be preferred for the same reasons. (Aira et al 2014) In Finland the webpage Terve Koululainen offers learning material and movement promotional ideas that are simple to apply to school life (Webpage of Tervekoululainen Opetusmateriaali). Product of this thesis offers some tools school physiotherapist could use in their work in the school.

In the Finnish children's physical activity report, physical activity with family and friends was given grade C, which means 41-60% population reports taking part to that activity. Parents could be offered information about benefits of physical activity and simple ideas how to increase children's activity together or with friends. Parents have important duty to set boundaries to children's screen time and encourage them to move. Parents could travel simple everyday trips by walking or with bike together with their children instead of using the car. (Aira et al 2014)

Independent physical activity of children and adolescents should be increased in every age group. Children should learn about possibilities that their environment offers to be physically active from school or parents. Sport club activity influences approximately half of the Finnish children and adolescents. Sport clubs need support to attract those children who aren't attending any activities. Clubs should offer groups that are continuing activities more in pastime reasoning as well as the usual more competitive approach. This approach could maybe decrease the drop off – phenomenon, meaning that children reaching puberty is an age when they are more like to quit their sport hobbies. (Aira et al 2014) Even children and adolescents who are participating to sport club activity are having scoring low overall physical activity level. Coaches in sport clubs should also encourage and educate children to be active in their free time. (Julin & Risto 2014, 40-45; Aira et al 2014) The costs of sport clubs should be kept in

reasonable prices, that children and adolescents from different economical standpoints wouldn't have restrictions of joining because of high prices (Aira et al 2014).

Municipalities should aim to improve and implement plans to improve physical activity in cooperation with health, education and other sectors. Factors that are restricting independent physical activity should be mapped and then remodelled. Facilities that are improving independent physical activity should be made and they should be free for the clubs to use for sport activities with children. (Aira et al 2014) For most thriving factor for children to meet and go outside were friends. That's why emphasize should be put to building places that children can meet. (Broberg, Hynynen, Iltanen, Kyttä & Paronen 2011) Municipalities should maybe offer different kinds of activities for the whole family to participate to increase children's physical activity (Aira et al 2014).

## 6 RESEARCH PROCESS AND METHODS

### 6.1 Systemized literature review

One part of this thesis was done as systematized literature review. Systematized review is trying to mimic research criteria of systematic review. Difference is that systematized review can only fulfill one or more aspects from systematic review. It doesn't require extensive research from every database or for example two researchers. Therefore, systematized review suites as postgraduate student assignment. Well executed systemized review still allows author to collect and analyze results in a systematic manner, which shows authors understanding of the whole research process. Of course, the lack of comprehensiveness decreases the reliability and competence of systematized review compared to systematic one. These kinds of reviews can be base of more extensive reviews or study projects. (Grant & Booth 2009)

### 6.2 Research questions

In this thesis research questions were formed using PICO model. PICO, which is an acronym for patient/population, intervention, control/comparison, and outcome. This model is widely used to form clinical research questions. Well-formed questions facilitate the data searching process and narrows the review to answer identified problem or outcome. (Eriksen & Frandsen 2018) Our research questions are:

- “How to assess children aged 6-12 posture and common postural abnormalities, and what intervention can help to ease those problems?”
- “How does promotion of movement effect children aged 6-12?”

	Question 1	Question 2
<b>Population</b>	Children aged 6-12	Children aged 6-12
<b>Intervention</b>	How to assess posture and screen common postural abnormalities	Promotion of movement and breaking inactivity
<b>Control</b>	-	Other interventions or sedentary behavior
<b>Outcome</b>	Assessment of posture and common postural abnormalities and intervention methods to use to ease	Is promotion of movement and breaking inactivity beneficial

### 6.3 Search of literature

In this thesis online databases that were used were PudMed and Pedro. In PudMed the search terms used were “child”, “posture” and “sedentary behavior”. These are also mesh terms but to add additional search terms we used “body posture” and “physical activity” which were options for previous terms. They helped to both widen the search and to get better results. For both narrowing and widening the search, Boolean operators (AND and OR) were used. They help to combine and separate certain search terms. (see Table 1) Lastly filters that were applied were: studies published during 2011-2021, Child: 6-12 years and RCT. The PubMed search was done and evaluated in September 2021.

In PEDro search terms used were “postural assessment”, “sedentary behaviour” and “physical activity”. For widening the search and to get answer for both research questions, two searches had to be done. Combining these terms narrowed the search too harshly or didn’t give any search results. (see Table 1) PEDro doesn’t use mesh terms. Age group of the search was narrowed by using filters from PEDro. For both searches same filters were added. These filters were: paediatrics and published since 2011. The PEDro search was done and evaluated in September 2021.

For identifying duplicate studies, all found studies were exported through Zotero Google Chrome extension and uploaded to Zotero software.

Database	Search	Search Results	Results after filters
PubMed	<i>child[mesh] AND ("body posture" OR posture[mesh]) AND ("physical activit*" OR "sedentary behavior"[mesh])</i>	153	19
PEDro	<i>Posture assessment</i>	-	11
PEDro	<i>sedentary behavior physical activity</i>	-	33

Table 1. Database search

#### 6.4 Inclusion criteria

There were certain inclusion and exclusion criteria set to select studies from the data search (see Table 2). These criteria tried to include studies that answered the research question as well as possible.

Inclusion criteria	Exclusion criteria
Age of the participants is 6–12-year-old	Participants are younger than 6 or older than 12-year-old
PEDro scale $\geq 4$	PEDro scale is below 4
Studies used the randomized control trial methodology	Studies weren't randomized control trials
Subjects of the studies are otherwise healthy individuals but might suffer from musculoskeletal problems (etc. scoliosis) or pain concerning posture.	Study focused on specific subjects that are for example diagnosed with neurological diseases, intellectual disabilities, other disabilities, or health issues or athletes.
Main intervention method is guiding exercises and promoting movement for example break the time spending sitting by standing etc.	Focus of the intervention was not promotion of movement or exercises.
Studies published between 2011-2021	Studies published earlier than 2011
Studies that are in English or Finnish	
Have access to whole text	

Table 2. Inclusion and exclusion criteria

## 6.5 Study selection

Study selection was performed using PRISMA flow diagram. Authors decided to modify 2009 flow diagram slightly to fit their study selection process better. This flow diagram shows how exclusion and inclusion went in each phase. In the end two randomized control trial was left to use (see Table 3). Selected studies were summarized to a table (see Table 4). It contains all the crucial information of both selected studies in this review.



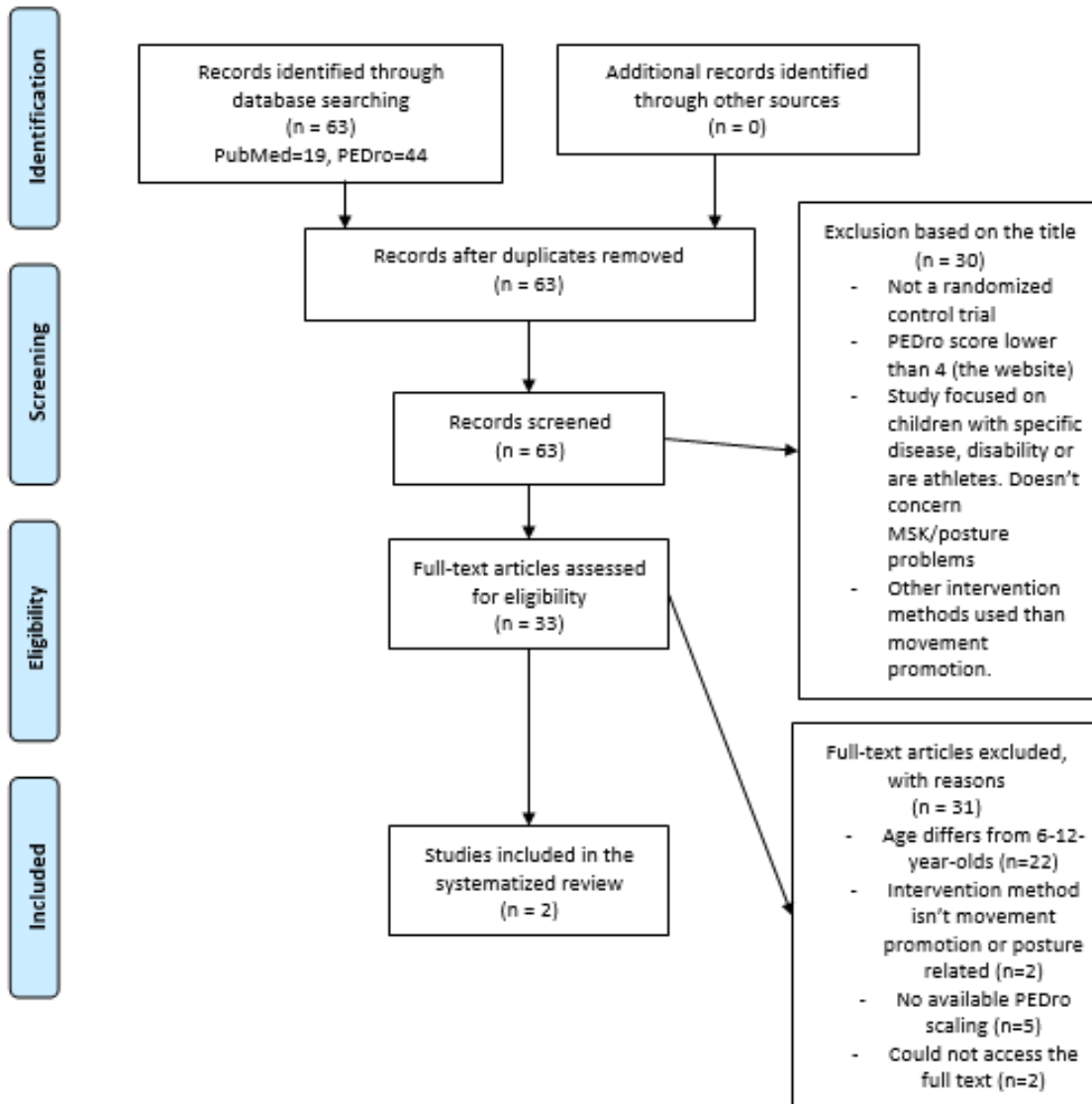


Table 3. Modified and modelled from PRISMA 2009 flow diagram. (PRISMA 2009)  
Study selection shown in this flow diagram.

Study	Subjects	Intervention	Control	Measure	Results
<b>Dullien, Grifka &amp; Jansen 2018</b>	N=176 (100 girls/76 boys) Students were at age of 10-12, 5th graders from two German schools	N=90 Three parts: 1. Five lessons to improve knowledge 2. Posture awareness training 3. Back and abdominal exercises performed each PE-lesson.	N=86	1. Clinical orthopaedic examination 2. Health questionnaire 3. Motor Tests 4. Back-behaviour Trial 5. Knowledge Test	Back care knowledge and parts of back-friendly behaviour could be significantly improved. Other test results showed improvement in both groups. Back pain could not be reduced.
<b>Elder, McKenzie, Arredondo, Crespo &amp; Ayala 2011</b>	13 elementary schools	6 schools were followed in this study. Study focused on more following the intervention group that had main emphasize on increasing children's physical activity for example by improving playgrounds and offering new activities during recess.	6 control schools	4 activity variables analysed in treatment-by-time interaction and treatment-by-time-by-gender interaction. Comparison from baseline to 1-year follow up both in control and intervention group.	No overall statistical difference between groups. Performed changes didn't increase PA or decrease sedentary behaviour in either gender.

Table 4. Summary of selected studies

## 6.6 Evaluation of selected studies

For evaluating the quality of selected studies in this systematized literature review, PEDro scale was used. The Physiotherapy Evidence database or PEDro has good scoring scale to evaluate if the trials are statistically sufficient and internally valid to guide clinical decision-making and in this case assesses the quality of selected studies in literature review. PEDro scale has been shown to give quite reliable rate for example for randomized controlled trials of physiotherapy interventions. PEDro scale consists of 11 evaluation criteria, which are simple yes-or-no-questions. The final score comes from criteria 2-11. A yes=1 and no=0 points. Criterion can be awarded with points if its clearly fulfilled. PEDro score of 0-3 is considered poor, 4-5 fair, 6-8 good, and 9-10 excellent quality. (Webpage of PEDro) Selected studies and how they are scored on the PEDro scale can be seen on the Table 5. Fulfilled criterion are marked with X. (see Table 5)

Study	1	2	3	4	5	6	7	8	9	10	11	PEDro score
Dullien, Grifka & Jansen 2018		X		X			X			X	X	5/10 (Graded by PEDro)
Elder, McKenzie, Arredondo, Crespo & Ayala 2011	X	X		X				X		X	X	5/10 (Graded by PEDro)

Table 5. Quality assessment of the selected studies evaluated by PEDro scale

## 7 SYNTHESIS OF THE SYSTEMISED REVIEW

### 7.1 Participants

In Dullien, Grifka and Jansen 2018 study they wanted to test school-based intervention to reduce back pain symptoms. They wanted to intervention be led by teachers, thus making it possible to be established in every school. They randomly divided German 5<sup>th</sup> graders (aged 10-12) to intervention group (N=90) and control group (N=86). Intervention group was guided to not talk about the content of the intervention with the control group. (Dullien, Grifka & Jansen 2018)

In Elder, McKenzie, Arredondo, Crespo and Ayala 2011 study target was to increase physical activity and decrease obesity risk in a Latin American-focused schools. Original study had 13 elementary schools which predominately had Mexican American children attending in them. This study focused more on the six intervention schools that had more emphasize on increasing and promoting physical activity. Comparison was done to six control schools. (Elder, McKenzie, Arredondo, Crespo & Ayala 2011)

### 7.2 Intervention and measurements

The intervention program had three parts. Firstly, children were given five lessons led by teachers and the goal was to increase knowledge for example of posture, lifting techniques and nutrition. Materials for these lessons were done by a group of different professionals. Secondly, in each class three posters about posture awareness training were added. Posters included instruction about dynamic sitting, exercises and stretches to perform during classes. As a minimum one of the exercises should be performed at the beginning and end of the school day. Thirdly, physical education teachers were given detailed exercise collection, that those could be performed at the beginning of each PE-lesson. (Dullien, Grifka & Jansen 2018)

In the second study the intervention schools got upgrades for their playgrounds and equipment's. Schools chose from existing staff or hired outside person to promote movement, games and activities for children for example during recess. (Elder, McKenzie, Arredondo, Crespo & Ayala 2011)

### 7.3 Results

Children were measured three times (pre-test, mid-term at 4-month mark and post-test). Five tests were used to measure the outcome of the intervention: Clinical orthopedic examination, health questionnaire, motor tests, back-behavior trial and knowledge test. Results reported back-pain rate didn't lower through intervention. Improvements could be seen in back-care knowledge and some back-friendly behavior. In both groups motor test results and orthopedic examination showed improvements. Authors of this study suggest that more research on the effectiveness of the program should be conducted. (Dullien, Grifka & Jansen 2018)

In the second study they measured different levels of physical activity (sedentary, walking, vigorous and walking+vigorous: MVPA) by gender. The result showed that all the structural changes didn't increase walking + vigorous physical activity or decrease sedentary behavior in either girls or boys. (Elder, McKenzie, Arredondo, Crespo & Ayala 2011)

### 7.4 Conclusion

In both studies the chosen intervention didn't have significant positive results. In the first study only the knowledge and behavior had improvements (Dullien, Grifka & Jansen 2018). In the second study structural changes didn't increase physical activity or decrease sedentary behavior (Elder, McKenzie, Arredondo, Crespo & Ayala 2011). In conclusion for this review, school-based interventions don't have significant benefits in increasing physical activity in elementary school aged children. This suggests that more research on the chosen intervention is needed or other methods to effect on these issues should be used.

## 8 GUIDEBOOK PROCESS

Part of this thesis was to provide learning material, guidebook, for physiotherapy students who would in the future have their clinical practices in schools. Guidebook would be based on theory part and systematized literature review. The information needed to offer in the guidebook, is based on the interview and hypothesis of what school physiotherapist might entail.

Guidebook offers basic knowledge about how to assess posture of the children aged 6-12-year-olds. Knowledge what to look for from frontal, side and posterior view when assessing posture. From common postural problems that can occur, guidebook will instruct about assessing scoliosis and in which cases physiotherapist should refer to medical doctor. Concerning about other deformities, guidebook won't offer in depth knowledge instead giving the idea when case is severe enough for need to intervene or refer medical doctor.

For the second and main part of the guidebook is the promotion of movement. Guidebook offers why increasing physical activity is beneficial concerning overall health of children and their posture. Authors wanted to include some more practical solutions to guidebook of how to increase physical activity. On top of that by offer webpage to search for more information, tools, and ideas.

Guidebook was finished using PowerPoint, in November 2021. Guidebook can be used as a learning material for SAMK students. The whole guidebook is included in Appendix of this thesis.

## 9 DISCUSSION

The aim of the thesis was to increase knowledge of children's posture and sedentary behavior. These topics were chosen because of school physiotherapy work may include posture and lifestyle assessment in the future. Assessment of posture and screening scoliosis could easily be transferred from school nurses' job to be carried out by physiotherapists. Physiotherapists might work in schools in the future and one of their works could be screening scoliosis. School physiotherapist's main objective is probably going to be reducing sedentary lifestyle and increasing physical activity among children. This literature review found out that the chosen interventions didn't significantly improve children's physical activity levels compared to control groups. The purpose of this thesis was to provide relevant and evidence-based theory and systemized literature review about those topics. Based on the thesis a guidebook was made for future school physiotherapists of physiotherapy students to use as an information package.

The idea for this thesis came from earlier done children posture guidebooks and news about decreasing activity levels of children. Topic further developed after interviewing the project leader of school physiotherapy in Etelä-Karjala healthcare services. From there school physiotherapists job description got clearer and the need of promoting movement and physical activity was mentioned to be the main goal of the project. The posture assessment wasn't discrete but the significance of it decreased. The topic was chosen in March of 2021 and the mainly the theory part was written between May and October 2021. Systemized literature review part was started in August 2021 and done mainly in September 2021. After the thesis was completed in November 2021, the guidebook was finalized by using PowerPoint, in the same month. The guidebook wasn't piloted due to time restrictions and changed protocol of needed research permit for piloting. The thesis was presented in 25.11.2021.

The systemized literature review of this thesis was carried out the way that the whole process could be replicated. The literature review process is described in detailed in section 6. There is described methodology, research questions using PICO model, the

database search, inclusion criteria, study selection flowchart and the evaluation of collected studies.

Search terms for literature review search we chosen together with the help of the SAMK's librarian staff members help. Afterwards the search terms were slightly modified to match both research questions and get wider search, but the "mesh"-terms staid the same after the meeting with librarian.

The validity of a study refers to trustworthiness of a study. The authors completed the search as neutral as possible and used all found relevant studies that matched the exclusion/inclusion criteria. Bias of the search is lower because there were two researchers agreeing and screening while doing the search. Of course, unconscious bias cannot be accounted for. Having two research questions and trying to answer both posture and promotion of movement as main topics, could be the reason why the review ended up with two studies, which answered more the promotion of movement part. One question trying to map postural issues and other trying to focus on more of the general population could have caused contradiction even that this was tried to take into consideration in inclusion criteria. It could be that the inclusion criteria preferred more of the studies that had physical activity as main intervention. From selected studies their evaluation seemed to score them only fair level of evidence. Furthermore, decreasing the evidence seems to be that in both studies, there were bias issues of control groups staying completely neutral and blind of the intervention. This is one reason why the evaluation scores were quite low.

For the posture part most of the studies excluded from the search because of the set aged restriction to be targeted children aged 6-12. This makes sense because for example the prevalence of scoliosis raises when the puberty starts. Only one of the selected studies considered assessing postural abnormalities and back pain. There could have been studies missed by the authors due to trying to combine two research questions.

The search could have used systemized reviews instead of only using randomized control trials but the sake of simplifying the evaluation of selected studies, authors



decided to include only studies of randomized control trials. This narrows the search and lowers the evidence of the search done.

Concerning about the guidebook authors feel like its usability at current moment is not that useful. There is very little to no usage for it because there isn't practice programs to school physiotherapy yet. On top of that school physiotherapist job description is kind of question mark, thus the information provided by the guidebook may render useless or change in overtime.

Overall authors feel the topic of increasing physical activity of the children is highly valuable topic. Maybe the connection of physical activity and posture isn't the most important. The definition of posture should change more towards being able to move in multiple different ways instead of looking for small "deformities" deviating from imaginary midline. More emphasize should be targeted towards physical activity and ways to increase it, that the daily physical activity goal is met and sedentary behavior decreases.

Prior of the review, authors thought that maybe school interventions could be effective way to increase activity and active lifestyle. After theory and review part, it seemed that the interventions as the way were produced were not the most effective way to increase physical activity of children. No definite conclusion can be made from this review. For better understanding of the interventions targeted to school, wider and more thorough search is needed. Authors suggest that maybe the studies could do other interventions in the school or even target other sectors than schools to get better outcomes. As seen in figure 1, there is more issues in physical activity levels outside of the school. From our review the interventions targeted to school didn't have significant benefits in increasing overall physical activity of the children. There is still issue of children going home and being sedentary for the rest of the day. Maybe interventions targeted to families, friends and club activities could have better overall effects on children's physical activity.

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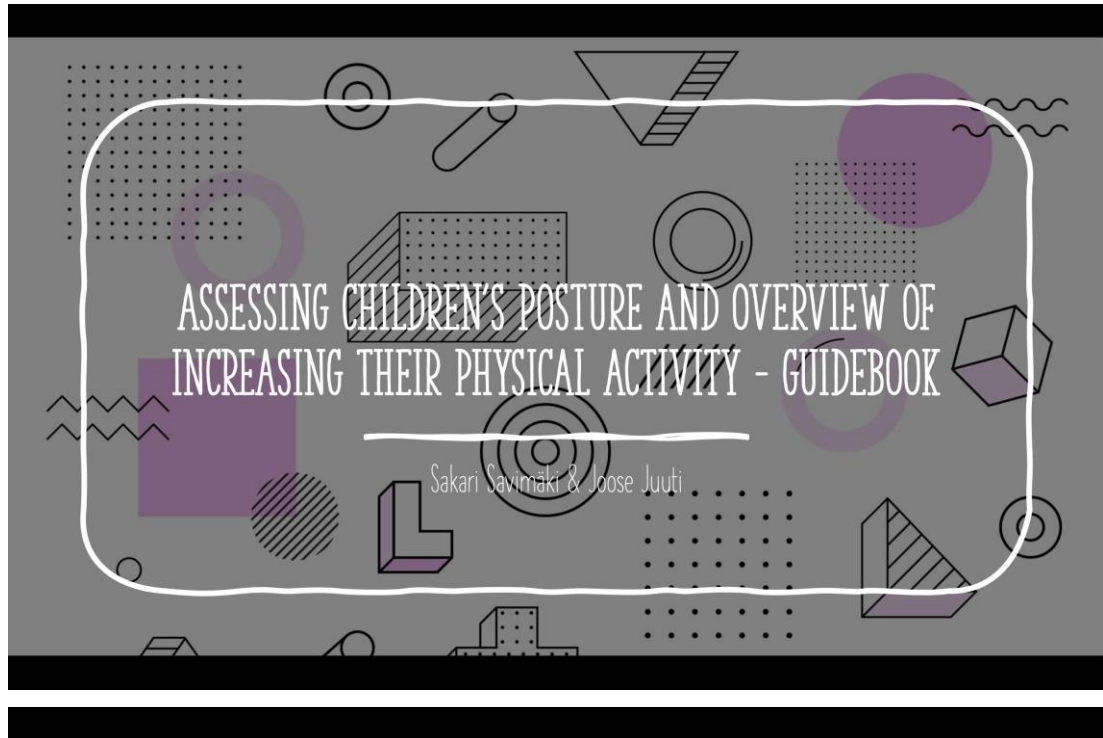
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Yli-Piipari, S. 2011. Nuoret Arvostavat Koululiikuntaa – Usko omiin kykyihin lisää liikunta-aktiivisuutta. Liikunta ja Tiede 48. 4/2011.

## Guidebook



## GUIDEBOOK FOR PHYSIOTHERAPY STUDENTS IN SCHOOLS

- Guidebook is made to students who go to schools to do physiotherapy clinical practice. Physiotherapists can help children in schools if they have problems, mostly musculoskeletal, but the main aim is to help them prevent those problems. Physiotherapists in school is not a clinic but they are wanted to participate in lessons and give advices there.

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## HOW TO INFLUENCE IN SCHOOL

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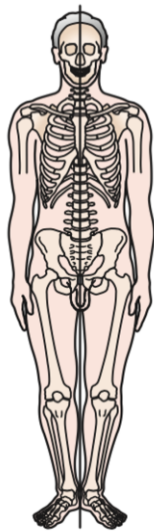
- The best way to influence children aged 6- to 12-year-olds is to promote movement and increase their physical activity. It has been recommended by UKK-institute that children should be more physically active and could prevent a lot of their musculoskeletal problems. Active lifestyle could easily continue till adulthood and could be beneficial for the overall health of the nation.



## BASICS OF POSTURE

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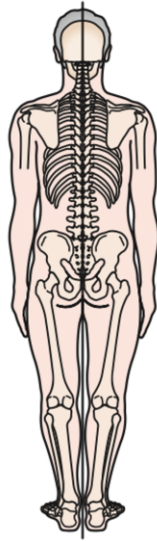
- Posture is defined to be body state in different positions, that is reached with muscles, tendons, bones and joints. When posture is optimal, lumbar spine and cervical spine has lordosis (curved forward) and thoracic spine has kyphosis (curve backward). (Sandström & Ahonen 2011, 175.)
- Ideal static posture from the side is defined as imaginary straight line (of gravity) that passes through the earlobe, the bodies of cervical vertebrae, the tip of the shoulder, midway through the thorax, through the bodies of lumbar vertebrae, slightly posterior through the hip joint, slightly anterior to the axis of the knee joint, and just anterior to lateral malleolus. Maintaining correct posture minimal muscle work is needed and minimum stress is applied to each joint. (Magee 2014, 1017-1053.)



## FRONTAL VIEW

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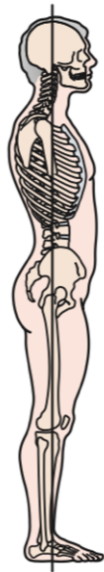
- Observing head posture is to assess if head is tilted or rotated to either side or direction
- Shoulder line should be on the same line
- Arms should hang on equal distance from the body while palms are facing towards body
- Iliac crests should be symmetrical and on the same level
  - Anterior superior iliac spines and their difference in height will tell about position of pelvis
- Observing alignment of lower limb and patellar symmetry and position



## POSTERIOR VIEW

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- Head straight (no tilt or rotations) and shoulders leveled.
- Scapula spines and inferior angles leveled and in neutral position. Distance from the spine to scapula equal on both sides.
- Spine and pelvis (gluteus muscles symmetrical) is straight and posterior spina iliac spines are leveled (lateral curves can be signs of scoliosis)
- Ribcages and waist angles are symmetrical
- Distance and rotations of arms and from the body are equal and symmetrical
- Line of the Achilles tendon is straight in line with calcaneus bone
- Compare the result to anterior assessment.



## LATERAL VIEW

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- Spinal segments should have normal curve from the lateral view
- Chin and shoulders should not be too forward from the midline
- the posterior superior iliac spine should be slightly higher than anterior superior iliac spine
- Knees should be equally straight

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## RESULTS OF ASSESSMENT

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- With smaller alterations there isn't nothing to worry about. Children are growing and the posture might change. Its good to keep follow ups.
- With bigger abnormalities seek for more information and refer to a medical doctor.
- This guidebook will explain the screening of the scoliosis and its assessment

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## SCOLIOSIS

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- Scoliosis is condition of where persons back is rotated and curved sideways. (Helenius 2018) Definition of scoliosis is more than 10 degrees of curve measured by Copp's method. (Helenius 2009) Medical diagnosis is always done by X-ray of the spine and there can be defined the difficulty level. Scoliosis is divided to three main categories, which are idiopathic, congenital and related to other diseases including neurological and musculoskeletal disorders. (Helenius 2020)
  - For physiotherapist Adam's forward bend test and combine that with measurement with scoliometer, is great tool to screen scoliosis after observation
  - Adam's forward bend test: patient bends forward and physiotherapist stands behind assessing. Test is positive when lateral bending of in the spine and/or rib hump is visible. (Horne, Flannery & Usman 2014)
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## SCOLIOMETER

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- Measurement is taken while the patient is forward bended
- Scoliometer is a great tool to assess if the patient would need X-ray.
- Less than five-degree curve may not need follow up.
- Measurement of between 5-9 degrees needs a six month follow up.
- Over 10 degrees is indication that X-ray, and Cobb angle is needed. Scoliometer alone is not enough to diagnose scoliosis.

(Horne, Flannery & Usman 2014)

Video link for instructed measurement with scoliometer

[https://www.youtube.com/watch?v=KKXDX\\_PLAbY](https://www.youtube.com/watch?v=KKXDX_PLAbY)

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## PROMOTION OF MOVEMENT

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- Children and adolescents' overall and spontaneous physical activity has been decreasing over the years (Broberg, Hynynen, Iltanen, Kyttä & Paronen 2011)
- The children's physical activity recommendations aren't fulfilled
- Screen time while sitting is exceeding the recommendations
- Children that walk or cycle their school commutes have more active lifestyle later in life (Telama, Hirvensalo & Yang 2014)
- The physical activity recommendation to 7-17-year-old children contains sixty minutes per day of moderate- to - vigorous intensity of physical activity that is concerning the children age. (WHO webpage 2020; UKK instituutti 2021; Strong et al 2005)

## PROMOTION OF MOVEMENT

- Staying put for a long period of time should be avoided
- Physical activity does not have to be done in one time but it can be divided
- Children should improve their endurance three times per week
  - For example swimming, biking or vigorous walking
- Children should participate activities that build muscles and loads bones three times per week
  - For example ball games and activities with high intensity and jumping
- Previous activities can include also improving flexibility, balance, and agility

## PHYSICAL ACTIVITY RECOMMENDATIONS OF UKK

- 1 hour / day of moderate to vigorous physical activity
- Stay active: break long-term sitting and inactivity
- Improve endurance 3 x week
- Strengthen muscles and bones 3 x week
- Move always when possible: cycle, walk, hobbies, etc.
- Recover: sleep enough
- You can combine endurance, strengthening and other physical activities together



## RISKS OF SEDENTARY LIFESTYLE

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- Insufficiently physical active people have 20% to 30% higher risk of death (WHO webpage 2020)
- Physical inactivity is increasing risk for weight gain and increasing adiposity (WHO webpage 2020)
- Inactivity can mean poorer behavioral conduct and it may reduce sleep duration (WHO webpage 2020)
- Children who spend more than three hours per day sitting in front of television, computer, or consoles, score worse in school than children whose screentime is less than two hours per day. (Kantomaa, Syväoja, & Tammelin 2013)

## BENEFITS OF PHYSICAL ACTIVITY

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- Physical wellbeing makes body work better by strengthening heart, lungs, bones and muscles
- Mental wellbeing is promoted by movement, and it increases the stress hold of hurry and gives human more positive mindset
- Interactions skills develop when moving together
  - Movement has social aspect by teaching to take better consideration of others and following the rules
- Movement helps to concentrate and it increases memory (Tervekoululainen 2021; WHO webpage 2020)

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## SCHOOL PHYSIOTHERAPIST TO PROMOTE PHYSICAL ACTIVITY

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### Main points:

- Increase knowledge of children, teachers and parents about the benefits of physical activity
- Give children, teachers and parents ideas and simple tools to be physically active
- Activity during the schools days
- Breaking inactivity and sitting by moving the body
  - Helps with physical health and increases concentration and memory

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## SOLUTIONS AND IDEAS

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- Creating information package or lesson for parents and their children about physical activity. There can be ideas what parents can do together with their children. Hobby options and places where to go be active. Emphasize that parents have big part on reducing screen time of children and encourage them to move (Aira et al 2014).
  - Educate teachers benefits of physical activity and encourage them to use more active teaching methods (for example kids going around "learning stations") and allow kids to stand or have exercise breaks during the class. (give teachers exercises and guide them)
  - Take part in recess time and try to offer kids activities/games to play during recess.
  - During class tell kids to change their sitting positions often and move around. (create posters for classes to remind children)
  - Encourage to travel school commutes by walking or with bikes if possible
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## SOLUTIONS AND IDEAS

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- After school activities would be great way of introducing hobbies and easy access physical activity for children.
  - Implementing "Morning exercise program" and it could be combined with morning assembly
  - Taking part in the PE classes to create environment that is challenging for everyone
  - Taking part in the class/school exercise - competitions
  - Involving parents and relatives by giving them information about risks of sedentary lifestyle and benefits of physical activity
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- Ideas can be simple, and we authors encourage you to try different approaches and ideas!

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## WEBPAGE OF TERVE KOULULAINEN

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<https://www.tervekoululainen.fi/>

- Offers basic information for example eating, physical activity and sleeping recommendations for elementary school children
- Has learning material that can be used for education purposes
- Fun activities and ideas to increase activity of children





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## REFERENCES

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Based on thesis of:

Savimäki, S. & Juuti, J. 2021. Assessing children's posture and overview of increasing their physical activity – A systematized literature review and guidebook for school physiotherapy.

Webpage of Terve Koululainen. <https://www.tervekoululainen.fi/>

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