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EDUCATING STUDENTS OF SAMK PORI CAMPUS IN CLASSROOM ERGONOMICS

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The aim of this thesis was to improve study ergonomics in the population of Satakunta University of Applied Sciences students.

The objective was to create a material giving suggestions for the target population on how they can counter the stressors of a university environment and how to improve their physical and cognitive ergonomics through intrinsic activity especially within the lecture situations and on breaks. The material is focused on prevention and risk-reduction of musculoskeletal disorders. The contents of this material are evidence-based and it derives from the theoretical background review on ergonomics and workability of student- and office worker populations.

The theoretical background in this thesis was a literature search of student and classroom ergonomics, student and office worker specific loading factors, common musculoskeletal disorders in student populations, ergonomical interventions in office work and breaks from work.

The scientific articles used in this thesis were found from online databases PubMed, ResearchGate and EBSCO, other literature references were found through SAMK Finna.

A manual counting of furniture available in theoretical lecture classrooms throughout the campus was conducted to attain an overview of the most prevalent types and characteristics of ergonomical equipment. The data was added to this thesis even though it is merely directional as the ergonomical equipment in classrooms is mainly freely movable.

CONTENTS

1 INTRODUCTION

Ergonomics is described by Launis et. al. (2011, 19) as “the study and development of the interaction between human and operating system to increase the human well-being and improve the performance of the operation system.” The International Ergonomics Association (IEA website, cited 21.10.2018) divides the scientific discipline of ergonomics into three specialty domains, physical, cognitive and organizational. These domains contain a myriad of topics, all of which aim to optimize human well-being in the context of work, tasks, products and environment, viewing from the perspective of human-system interaction. They state that “ergonomics is a systems-oriented discipline which now extends across all aspects of human activity” and that the domains mentioned earlier are ever evolving, new ones being created, and old ones viewed from new perspectives.

Classroom ergonomics itself has not been studied very much other than regarding the suitability of chairs and desks in relation to anthropometrics in student populations. Ergonomical aspects and loading factors of studying are similar to office work and working on a computer and so there are a lot of references to office ergonomics in this thesis. Odunaiya et al. (2014, 1) state that “classroom is similar to other work environments… hence, the ergonomic requirements for educational chairs are the same as for work chairs.”

The focus of this thesis was an operational one, the end product being an electronic material for the students of Satakunta University of Applied Sciences studying on Pori campus. In this thesis the viewpoint of ergonomics is more on activation, changing positions and counteracting loading factors rather than focusing on optimal working postures and adjustments of ergonomical equipment such as chairs.

2 THE AIM AND OBJECTIVES

Aim of this thesis was to improve ergonomics in the student population. The objectives were to educate SAMK students of Pori campus in studying ergonomics and how to make use of the ergonomical equipment within the classrooms by providing them with an electronic material.

3 ERGONOMICS AS A SCIENTIFIC DISCIPLINE

3.1 Physical ergonomics

Physical ergonomics as a short definition according to IEA is the design of physical work environment, working stations, tools and work methods (Launis et al. 2011, 20). Physical work environment ergonomics focuses on subjects such as space crampedness, logical placing according to process, lighting, noise- and temperature environments and design of pathways (Launis et al. 2011, 122, 129, 138, 226, 278, 283). Work station ergonomics focuses for example on working posture, height of work surfaces or objects and cockpit dimensions. (Launis et al. 2011, 149, 151, 164). Ergonomics regarding tools can consist of altering force needed by using lever arms, directing force, optimizing the amount of friction or the optimal measures of handles among other things (Launis et al. 2011, 209-213). Work method perspective might consist for example of reducing repetition, using breaks efficiently and education of intrinsic regulation combined with trying new approaches to the task when possible (Launis et al. 2011, 201-202).

3.2 Cognitive ergonomics

Cognitive ergonomics shortly defined by IEA is as follows, the design of systems and their user interfaces, design of displaying information (Launis et al. 2011, E 20). Designing an ergonomical system consists of design co-operation, understandable and informative user interfaces and lowering attention level required (Launis et al. 2011, 226, 307). An important aspect of cognitive ergonomics is to reduce the cognitive loading of the work, leading to improved wellbeing and reduced risk for errors caused by “human factor” (Launis et al. 2011, 29). The European standard ISO 10075-1:2017 sees mental stress, synonymous to work stress in this context, as the main umbrella term regarding cognitive ergonomical principles. Mental stress might lead to mental strain, which can lead to mental fatigue or fatigue-like states. The main difference between the two is that one can recover from fatigue-like states by changing the causing activity to another, whereas recovering from mental fatigue requires rest. (European committee for standardization, 2017)

3.3 Organizational ergonomics

Organizational ergonomics shortly defined by IEA is design of staff, work processes, sets of work and working design, added with the development of production, quality management and co-operation. (Launis et al. 2011, 20). These topics contain more concretely processes associated with working time planning, communication, availability of sufficient personnel and improved work paradigms (IEA website, cited 2.11.2018) Organizational ergonomics is also an important theme regarding group dynamics, motivation and need of organizational development which seem to be trends in today’s companies (Launis et al. 2011, 45). The standard for Human-centred organization ISO 27500:2016 identifies 7 key points in improving and maintaining good organizational ergonomics from the perspective of human-centredness. These are viewing individual differences as strengthening qualities of the organization, making usability and accessibility as business objectives, using a total system approach, ensurance that well-being, safety and health are priorities in the organization also business-wise, employees are valued and that they work in a meaningful environment, the management is trustworthy and open and finally that the organization acts in a socially responsible manner (International Organization for Standardization, 2016).

4 LOADING FACTORS IN UNIVERSITY SETTING

4.1 Musculoskeletal disorders in student populations

Hanvold et al. (2016, 82) studied musculoskeletal pain occurring in multiple sites in a technical school student population during their transition from student to work life. The prevalence of musculoskeletal pain in more than one site of the body was prevalent in 69% of the population on baseline and the prevalence was “quite stable” at the 6.5 year follow up. The strongest associations found between painful areas were low back and hip-, knee and leg-, shoulder/neck and low back pain. Gender specific risk factors were identified, but perceived muscle tension was a risk factor commonly associated with the male and female genders in relation to multiple pain sites.

Iliopsoas muscle group tightness was found out to have a possible association with dysfunctions of the lumbar spine (Jorgensson, 1993, 7) Ageing seems to be a prevalence increasing factor regarding low back pain in children and young adults. This might be associated with hamstring and quadriceps tightness caused by growth in adolescence (Fernandes et al. 2015 p. 237)

Hanvold et al. (2014, 605) studied the population mentioned above regarding neck and shoulder pain risk factors. Risk factors for the whole population regarding neck and shoulder pain was perceived muscle tension and parents’ non-western country ethnicity. During the follow-up period, any neck and shoulder pain seemed to decrease in the population but moderate to severe neck and shoulder pain had a growing trend over time. Gender specific results for males were that a higher level of muscle endurance was associated with less pain as for females a higher mechanical workload was associated with more pain.

4.2 Effects of static postures and sitting

Van Uffelen et al. (2010, 383-384) suggest in their systematic review that there seems to be a positive relationship between occupational sitting and health risks such as diabetes mellitus. In addition to type two diabetes, some cancers seem to be in correlation with prolonged sitting and premature death and obesity might be linked with sedentary behavior but the evidence on the latter two remains still unconcluded (Baker et al. 2018, 1).

Baker et al. (2018, 2) also state that while some studies suggest an association between musculoskeletal pain/discomfort and sitting, the mechanisms causing it are yet to be determined. There are also suggestions about sitting being linked to buttock pressure and discomfort as well as lower limb swelling. Launis et al. (2011, 178) suggest that static sitting can be bearable for as short as 20 minutes at the time and that the musculoskeletal system requires movement for the optimal function of circulation and tissue fluid movement.

The relationship between office work and upper limb disorders have been more extensively studied. Gerr et al. (2002, 226) found out that after starting a new job which required 15 hours or more of computer work per week, 50% of the study group reported musculoskeletal symptoms of the upper limb or neck within the first year. Waersted et al. (2010, 9) found out in their systematic review that there is limited evidence supporting a causal relationship between mouse/keyboard time and wrist tendonitis as well as mouse time and forearm disorders and tension neck syndrome.

4.3 Ergonomical restrictions and possibilities of lecture settings

A study conducted in Tabriz University Medical Science community by Baharampour et al. (2013, 170) concluded that there was a ”high mismatch percentage” between the students’ anthropometry and the classroom furniture. In the study, the aspects of ergonomics that fit most poorly for the subjects were desk height, which fitted only 16.2% of males and 7.5% of females, seat height which fitted 10.8% of males and 1.6% of females and backrest height which fitted 29.7% of males and 2.5% of females. Similar results were discovered by Odunaiya et al. (2014, 6) as they were studying the furniture of lecture theaters with a student population of 240 in University of Ibadan. In this study seat height fitted 19.6%, seat depth 23.3% and desk height 25.8% of the whole population.

” Being the workplace of future workers, classrooms must be equipped with furniture that safeguards the physical wellbeing of pupils through appropriate ergonomics and the ability to adjust to their individual physical needs.” (Gligorovic, Desnika & Palinkas, 2018, 6) Regarding the features of a good work station it is said that a person should be free to move around and change the basic work position between standing and sitting. (Launis et al. 2011, 25)

5 ERGONOMICAL TOOLS FOR STUDENTS

5.1 Activity and micro-breaks in relationship with learning and productivity

Literature shows that self-reported productivity increases while using sit-stand workstation, in the study referred to as electric height adjustable worksurface (Hedge & Ray, 2004, 24). Fedewa (2011, 530) found out in a meta-analysis that physical activity programs have a significant positive impact on children’s academic achievement and cognitive performance. Donnelly et al. (2016, 32-33) describe in their systematic review that physical activity enhancing learning in children has limited support. Evidence does suggest that physical activity has an effect on brain areas which are related with complex cognitive processes. They conclude that physical activity does have a positive influence on cognition and brain function, yet the evidence available currently has limitations in translating the findings from laboratory environment to school environment. Bhochhibhoya et al. (2014, 6) suggest in their study of college students that the level of physical activity is a predictor of how good the individuals’ emotional health is. They continue to state that emotional intelligence theoretically improves behavioral control which is associated with reduced risk of psychological disorders such as anxiety and depression.

Wilkinson & Demsky (2016, 2-3)) define micro-breaks as short resting periods between work-related events. According to their study micro-breaks can include, among other features, non-rigorous physical activity such as stretching. Rest periods as such are shown to have enhancing or not changing effect on productivity, but not reducing it. They suggest that adding strategies such as stretching or other short-duration physical activities might reduce physical discomfort and lead to an increase in vitality. Coleman Wood et al. (2017, 8-9) created and studied the effect of a microbreak activity intervention containing postural correction, conscious breathing and soft tissue mobilization through active movement for surgeons performing minimally invasive operations. This activity intervention lasted approximately 1 minute at the time in intervals of 20 to 40 minutes. The subjects in this study experienced significantly less discomfort and fatigue. Perceived mental focus and physical performance was increased without increasing the overall time of the procedures. Another source states regarding breaks, they should be regular during long sessions of sitting and the breaks should be spent standing and walking around. It is also beneficial to do a few exercises during these breaks to make them more efficient. (Kunttu et al. 2011, 258)

5.2 Changing positions

From a physiological point of view Launis et al. (2011, 178) describe changing the working positions to be essential for the intervertebral discs and their function. Sedentary habits are thought to be possibly related to premature degenerative changes in intervertebral discs. The discs consist mainly of fluid, yet they function passively in terms of fluid exchange via alternating pressures. For example, in standing posture the pressure on the discs is increased causing the flow of fluids to be away from the discus. Oppositely, a laid back or laying down posture decreases the pressure leading to the flow of fluids to be towards the discus. They continue to argument that even though a 90-degree angle sitting posture is not considered optimal for the neutral position of the spine, it does enable a wide range of changing between positions and seesawing, defined by Merriam-Webster dictionary (2017, mobile application) as “changing from one state to another and back again”.

5.3 Stretch and strengthening exercises

Stretching can be used as a counteractive measure for musculoskeletal stress caused by work, but with some limitations. Stretching has an analgesic (pain relieving) effect, so if stretching is used as a separate tool to improve ergonomics in work it might create a false sense of normal function, but the environmental stressors remain. This might increase the risk for a musculoskeletal disorder or injury. Literature has also shown that men who are prone to hypermobility in back are at an increased risk for low back pain, so stretching without proper justification might actually increase the risk further. Additionally, it is still unclear from which structure the gain regarding range of motion comes from. If the site is passive structures, ligaments and joint capsules opposed to decreased muscle stiffness, it is very controversial to use stretching as an ergonomical tool in individuals who have instability in joints. (da Costa & Vieira, 2008, 326)

The most appropriate stretching technique for a workplace intervention seems to be static stretching, as opposed to ballistic- and proprioceptive neuromuscular facilitation (PNF) techniques. PNF seems to be the most effective for gaining flexibility but it is time consuming. Ballistic stretching has a vigorous nature, and this might create safety concerns in terms of muscle soreness or injury, so it is not recommended. (da Costa & Vieira, 2008, 326)

Regardless of the limitations of stretching, da Costa & Vieira (2008, 326) conclude that there seems to be a beneficial trend of stretching decreasing work-related musculoskeletal disorders, when the stretching is justifiably used to compensate mechanical stress, not increasing mechanical loading.

Strengthening exercises for neck is a significantly pain reducing tool in office workers suffering from non-specific neck pain (Louw et al. 2017, 392). No studies were found that would be considered of low risk for bias support stretching exercises as an effective way to treat neck pain (Damgaard et al. 2013, 4). Kim et al. (2018, 378-379) conclude in their study regarding rounded shoulder posture interventions by strengthening and stretching exercises that stretching of pectoralis minor muscle has a positive impact on static and dynamic balance. Ascending in stairs was shown to activate quadriceps and hamstring muscles significantly more than brisk walking (Tikkanen et al. 2013, 4). Gabel et al. (2018, 9) found out that there is a correlation between being able to complete a set of five commonly back-related exercises the prevalence of back pain. They hypothesized that focusing on and training the correct completion of these exercises, repeated sit-ups, repeated squats, extension in lying, sustained squat and leg extension, it might be possible to reduce prevalence of low back pain.

5.4 Impact of ergonomical education

The impact of ergonomical education has been found to be an effective way of increasing workability. Kuoppala et al. (2008, 1220) state in their systematic review and meta-analysis that sick leaves were reduced by promoting ergonomics and a healthy lifestyle. A study by Amick et al. (2003, 2709) concludes that a study group who received a highly adjustable chair with training on how to use the equipment reduced symptom growth in relation to a group receiving training only, yet the pain levels during the workdays were lowered on both intervention groups. Literature also suggests that a quick 10-minute office ergonomics intervention has a bigger impact on behavioral change than a 40-minute in-depth intervention in terms of cost effectiveness, practicality and the subjects' perception of work-time well spent (Madhwani & Nag, 2017, 80)

6 ACTIVITY FOCUSED SUGGESTIONS FOR STUDENTS TO IMPROVE ERGONOMICS

6.1 Overview of the ergonomical equipment available throughout the campus in spaces and classrooms suitable for theoretical lectures

To gain a view on the characteristics and prevalence of ergonomical equipment on the campus, all classrooms suitable for theoretical teaching were analyzed in terms the equipment currently inside these rooms. The equipment was counted manually between the period of 1.10.2018 to 6.10.2018 so at the time of publishing this thesis, these numbers are mostly directional, the furniture more often than not being freely movable. 20 different types of furniture that can be used for sitting or as a worksurface was counted (Table 1), these types containing more models fitting the rough characteristics such as: height adjustability, backrest availability, sturdy versus unstable design. The four most prevalent types of furniture in the classrooms were a fixed-height desk, Picture 1 (923), height-adjustable chair with backrest, Picture 2 (674), fixed-height chair with backrest, Picture 3 (557) and height-adjustable saddle chair without backrest and other adjustability, Picture 4 (111). It is important to take notice at this point, that the description of the classrooms only extends to equipment that can be considered as furniture, no analyzing of other aspects of ergonomics was conducted that would contain factors such as lighting, acoustics, background noise and possible cognitive interference through glass walls present in some classrooms.

Table 1. The amount of different types of furniture found in theoretical lecture spaces on the campus

Type of furniture	Part A	Part B	Part C	Total
Fixed height table	631	35	257	923
Height adjustable chair with backrest	466	0	208	674
Non-adjustable chair with backrest	298	60	199	557
Height adjustable saddle chair without backrest	111	0	0	111
Stool	71	0	0	71
Height adjustable rocking stool	50	1	8	59
Armchair	52	0	0	52
Non-adjustable chair with a writing platform	47	0	0	47
Plinth	41	0	0	41
Height adjustable desk	36	0	0	36
Exercise matt	29	0	0	29
Height adjustable chair with backrest and writing platform	14	0	0	14
High desk	10	0	0	10
High chair	4	0	5	9
Fatboy bagchair	9	0	0	9
Therapy ball	7	0	0	7
Bottom weighted therapy ball	4	0	0	4
Shin-supported rocking chair without backrest	2	0	0	2
Rocking chair	1	0	0	1
Footstool	0	0	1	1

Picture 1. Fixed height desk.

Picture 2. Height adjustable chair with backrest.

Picture 3. Non-adjustable chair.

Picture 4. Height adjustable saddle chair.

6.2 Innovative working postures

Launis et al. (2011, 178) suggest that static sitting can be bearable for as short as 20 minutes at the time and that the musculoskeletal system requires movement for the optimal function of circulation and tissue fluid movement. In a classroom setting the options for movement varies greatly. For example, when seated in the middle of a row of non-adjustable desks, the movement options are limited to seated motions. While placed in the end of a row or the last row, there are more options regarding standing, one knee standing, squatting and walking around lightly.

6.3 Stretches, exercises and physical activity encouragement

The following activities were chosen to be advised for the student population, based on the literature references shown earlier under headline 4. The stretches chosen were for m. iliopsoas, hamstring muscles (m. semitendinosus and m. semimembranosus), m. pectoralis major and m. pectoralis minor. The exercises chosen were two types of squat exercises: repetitive and a sustained one and finally a standing mobility exercise which focuses on posture correction, deep breathing and rotation on the cervical- and thoracical spines. Suggesting using the stairs instead of an elevator and using the breaks between lectures for walking is aimed to increase the overall time of physical activity during the days.

7 THESIS PROCESS

The thesis process, see Figure 1, started with choosing the subject and creating a study plan in October 2017. After this, the subject of the thesis was discussed and agreed on with the client, Satakunta University of Applied Sciences, Degree programme in Physiotherapy. Signing of the contract took place in January 2018. Searching for material regarding the theoretical background started already on spring 2018 but the work on this was mainly done between August and October 2018. The manual counting and brief analysis of the ergonomical equipment available in theoretical lecture spaces was conducted in early October 2018. This part of the process started with agreeing with the security staff of the campus to sign for a key to be able to conduct the counting independently and after that visiting all the classrooms suitable for theory lectures. The product based on the theoretical background was manufactured late October 2018. The final layout of the thesis and discussion part was completed early November 2018 and the thesis and product presented mid-November 2018.

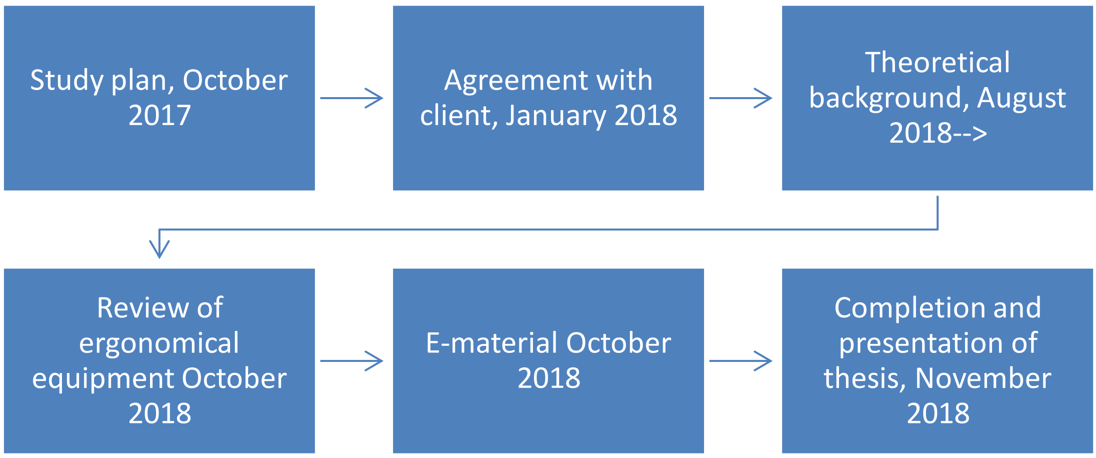
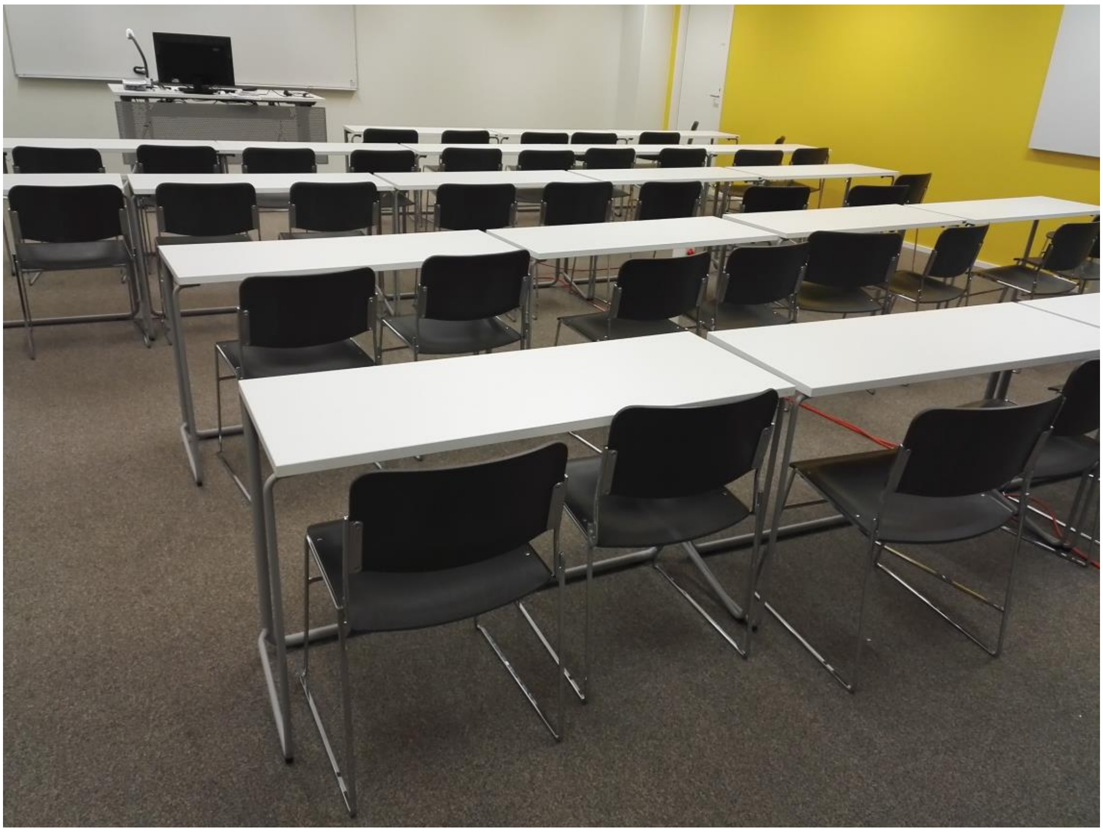


Figure 1. Thesis process timeline

8 CONCLUSION

There was a big variation between classrooms on how adjustable the equipment is. Some spaces designed for theoretical lectures contained very versatile ergonomical equipment in terms of sitting position, seat height adjustability and table height adjustability whereas some spaces contained only fixed height tables and chairs with no possibility for adjustments. An interesting finding regarding the differences between furniture between parts of the campus, was that part C held greatly less adjustable furniture than part A. Also, from the 20 different types of furniture found on the campus, part A had a variation of 19 types, but part C only 6 different types. A demonstration of the possible differences between part A and part C in Pictures 5 and 6. For future studies it could be beneficial to examine how the users of these spaces perceive them in terms of ergonomics and learning. From this kind of research might arise a need to distribute e.g. the height adjustable tables more evenly through the campus. It would be also important to study how students and staff perceive other ergonomical factors such as glass walls that are present in some classrooms on campus and whether they cause similar problems than those of open-plan offices.

Picture 5. Classroom A501b. The user is able to choose between a Fatboy chair, saddle chair, height adjustable chair with backrest or standing. Height adjustable tables are available in addition to fixed height tables.



Picture 6. Classroom C211c. All of the furniture is unadjustable and only one option for both, chair and working surface are present.

9 DISCUSSION

Ergonomics as a scientifical discipline is very wide. A concise definition is described in this thesis but it is important to understand that everything regarding work can be viewed from an ergonomical perspective, be it physical, cognitive or organizational ergonomics. It is also important to notice that from an organizational viewpoint, ergonomics can be used as a means of marketing for universities. Even though the need for student and lecture ergonomics has been clearly recognized on the field of research, there seems to be no studies suggesting ergonomical tools or intervention possibilities aimed for this population. The conundrum is highlighted as the viewpoint of this thesis is an activity based one, not focusing on passive solutions such as adjusting chairs optimally. As shown earlier, there are several studies with similar results showing that the traditional auditorium and lecture theater settings have severe needs in terms of user ergonomics and overall comfortability. Also, there was evidence available of the most common musculoskeletal disorders in population similar to a university student population. As some studies recognize, office work and studying have a lot in common in terms of ergonomics, yet this does not solve the problem mentioned earlier, since hardly any articles studying office work ergonomical interventions have the actual intervention they have studied as an appendix, or even a description of the intervention other than a vague definition such as “stretching”, “break exercises” or “physical activity intervention”.

The prevalence of musculoskeletal symptoms and disorders was quite as expected. A quite contradictory finding in this thesis is that perceived neck muscle tightness was a risk factor for neck pain in a student population, yet there is no high-class evidence on stretching being a useful tool to treat neck pain. Regarding the relationship of physical activity and cognitive functions such as vigilance, concentration and perceived efficiency, there is quite a lot of studies with children where the physical activity intervention is described, but these were often non-applicable in the university setting, at least from the perspective of ergonomics in the individual. The diseases and adverse events such as premature death linked with prolonged sitting might seem very far away from the current life situation of a university student, but the topics are important because bad ergonomical habits learned in the early career or during studies will most likely transfer to the working life. A surprising finding was also that the possible relationship between prolonged sitting or other ergonomical risks and lower limb dysfunction have not been studied very much, at least to the extent of upper limb and trunk, mostly spine in the latter.

The ergonomical tools described in this thesis proved to be quite tricky to find or create, because of the need to counteract risks on ergonomics not actually seeing or assessing the individual end-product user. As physiotherapy is firmly founded on the concepts of clinical reasoning, individual assessing and individual guidance and exercising, there is a need to carefully justify the risks versus benefits of some tools used in an ergonomical intervention aimed for a large subject group. There was also no source to find out which would be a good ratio between stretching, exercising and overall activation in the intervention.

There is a number of evidence regarding changing the working positions and this seems to have a positive effect on ergonomics. This presented yet another problem because the literature is focused on changing the position between sitting and standing, but the campus to which this intervention is aimed for holds very limited opportunities for changing the working position between sitting and standing. From here surfaced a need to come up with possible strategies for changing positions when the table height remains the same. The material distributed for the student population is a short PowerPoint presentation which is concise and visual, using short descriptions and pictures. As the population it is aimed for mainly speaks Finnish and those who do not, have Finnish language studies in their curriculum, the presentation is in Finnish. In the future, it might be worthwhile to study if there is difference regarding perceived and measured cognitive functions or physiological functions, between applying the posture and exercise strategies presented in this thesis and the material or studying in a more traditional sitting posture.

Keeping in mind that the most prevalent type of furniture was a fixed-height desk with no adjustability and the third most prevalent type of furniture was a non-adjustable chair with backrest, this seems to be somewhat in line with the problems found out in earlier studies which have focused on the suitability of ergonomical equipment in a university setting. This cannot however be verified, since this thesis does not contain any anthropometrical data of the population of students using the equipment, nor the exact measures of the types of furniture, just the rough characteristics.

Finally, as it was found out, increased physical activity level has a relationship with improved emotional health. Here is an opportunity for improvement of cognitive and organizational ergonomics for example through a deeper interaction between the university and sports tutors working under student union, or adding physical activity service delivery aimed for other students into already existing courses of the degree programmes in physiotherapy or creating new free elective studies.

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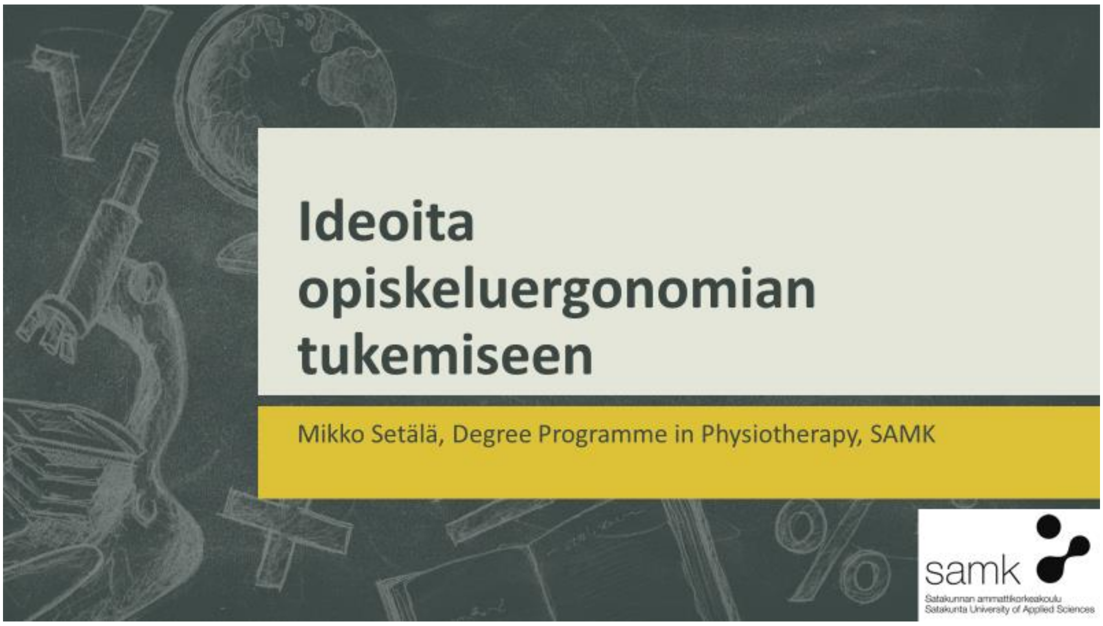
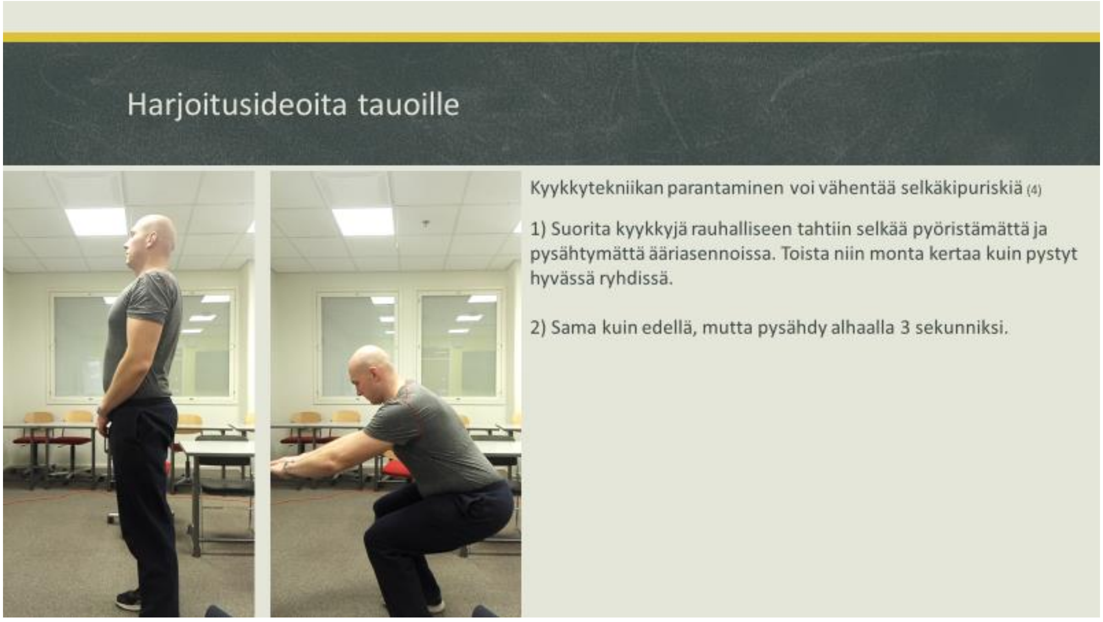
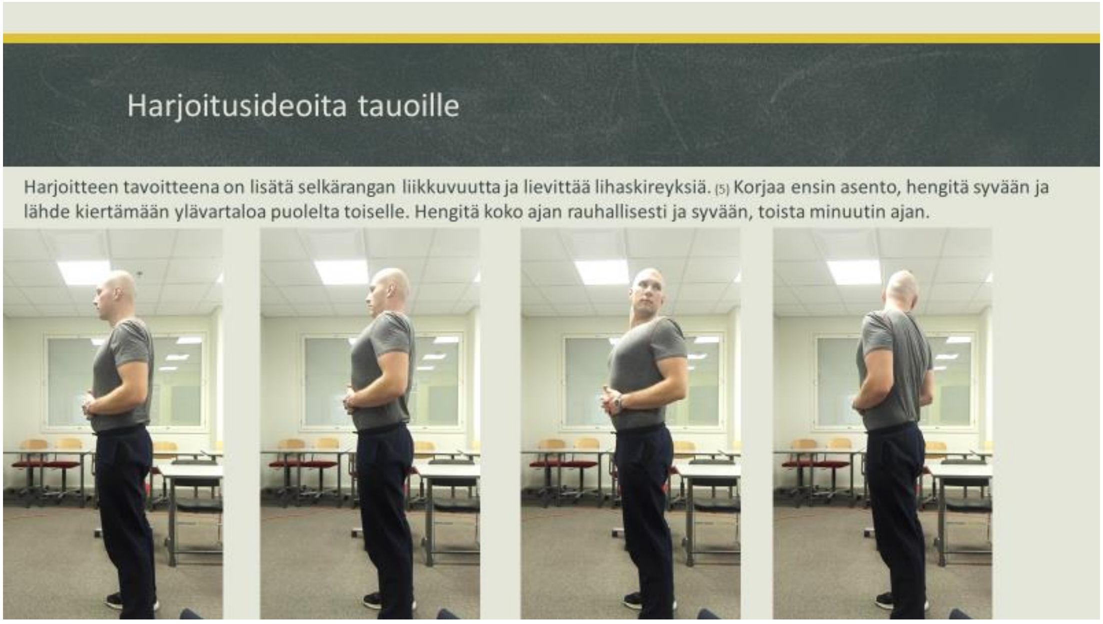
Appendix 1. The e-material




Älä jämähdä paikalleen
Istuma ja seisoma-asennon vaih-
telu on hyväksi tuottavuudelle. (2)


Venytysideoita tauoille
Venyttelystä voi olla hyötyä työperäisten tuki-
Ja liikuntaelinvaivojen vähentämisessä. Pidä
lihas venytyksessä 30 sekuntia, toista
muutamaan kertaan (3)


Harjoitusideoita tauoille
Kyykkytekniikan parantaminen voi vähentää selkäkipuriskiä (4)
1) Suorita kyykkyjä rauhalliseen tahtiin selkää pyöristämättä ja pysähtymättä ääriasennoissa. Toista niin monta kertaa kuin pystyt hyvässä ryhdissä.
2) Sama kuin edellä, mutta pysähdy alhaalla 3 sekunniksi.


Harjoitusideoita tauoille
Harjoitteen tavoitteena on lisätä selkärangan liikkuvuutta ja lievittää lihaskireyksiä. (5) Korjaa ensin asento, hengitä syvään ja lähde kiertämään ylävartaloa puolelta toiselle. Hengitä koko ajan rauhallisesti ja syvään, toista minuutin ajan.

Muista portaat!

Portaiden nousu on tehokkaampaa kuin reipas kävely. (6) Käytä portaita mahdollisimman usein hissin sijasta, saat näin helposti lisättyä päivittäistä aktiivisuuttasi.

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