

Bachelor's thesis
Degree programme
Nursing
2011

Suheng Shi

NECK AND SHOULDER PAIN RELATED TO COMPUTER USE

– Terveysnetti



TURUN AMMATTIKORKEAKOULU
TURKU UNIVERSITY OF APPLIED SCIENCES

Suheng Shi

TURUN AMMATTIKORKEAKOULU THESIS

With development of science and technology, people who are engaged in computer work largely increased. Computer work requires long time sitting in front of the screen, typing the keyboard drag the mouse and manage with files etc, therefore, it easily cause pressure on upper limb muscle and joints. Hence, the tendency of getting the symptoms of neck and shoulder pain, stiffness, wrist pain rises enormously.

The aim of the bachelor thesis is to acquire the information which includes causes, symptoms, diagnosis, prevention and treatment of neck and shoulder pain related to people involved in computer works, and to provide that information to the public.

The methods of collecting data here are applied systematic review. There are 8 articles chosen by searching from CHINAL . Among the articles, 2 of them concentrate on treatment, and 2 are compositively discussed about the disease, the left four targets on the prevention and risk factors.

The result suggests that ergonomical setting in the office plays a significant role of prevention. Only change improper working style and behavior will reduce the risk of getting the disease. According to the result, the public may need to pay more attention on the specific group

KEYWORDS:

musculoskeletal disease, upper limb disorder, back pain, neck pain, computer workers, office work , ergonomics.

CONTENTS

LIST OF ABBREVIATIONS	4
1 INTRODUCTION	6
2 LITERATURE REVIEW	6
2.1 Risk factors and causes	6
2.2 Signs and symptoms	8
2.3 Diagnosis	9
2.4 Prevention	11
2.4.1 Questionnaire of proper body posture and workstation	13
2.4.2 Questionnaire of ergonomic posture-self reported	14
2.4.3 Questionnaire of sufficient break-self reported	14
2.5 Treatment	15
2.6 Synthesis of current researches	16
3 HEALTH PROMOTION	21
4 THE PURPOSE AND AIM	23
5 IMPLICATION OF THE PROJECT	24
6 RELIABILITY OF WEBPAGES	25
7 ETHICAL CONSIDERATIONS ABOUT WEBPAGES	25
8 ESTABLISH WEBPAGES	26
9 DISCUSSION	27
10 REFERENCES	28
11 APPENDIX	37

LIST OF ABBREVIATIONS

Mbf	Myofeedback training
EC	Ergonomic counseling
VDU	Video Display Unit
MRI	Magnetic resonance imaging
EMG	Electromyography
BIT	Business Information Technology

1 INTRODUCTION

With the development of the high technology, it seems almost impossible to live without computers and internet nowadays, especially for young generations. Some professions such as software engineer or some office workers which need to use computer at least 5 hours per day. In USA, approximately half of employed adults used computer 1999 in their jobs and it shows rising trend continually. Also, in Finland, 2001, it is about 65.0% of population use internet and online and service. However, this group of people easily develops to disease of upper musculoskeletal system or having frequently neck and shoulder pain.(Nina and Zhiyong 2003, 155.)

Musculoskeletal system comprise by joints and those soft tissues- muscle, tendons, and nerves. Ceaselessly repeat same movement, like drag-drag the computer mouse can result damage to soft tissues and joints. (Occupational disease 2008). The data from Swedish insurance showed that about 18 % of disability payments expend for musculoskeletal disorders especially spend on neck and shoulder complains already 10 years ago(Nygren et al.1995, 5). In Denmark, in the year 2002, it is about 28% employees of general working tortured by pain or stiffness in the neck, shoulder, arm, hands, or wrists. Furthermore, it shows that work-related neck and shoulder pain take up 25%, arm pain occupies 15% in 15 European countries. (Claire et al 2008, 87.)

Due to the complaints of the employees who had signs and symptoms of upper limb musculoskeletal disease from computer use, therefore, it seems necessarily to pay more attention to the potential risks which effect computer users, and for those who had injured from the long-term use of computer to find out the way of relieving their pain and sorrow is the objective of this paper.

The purpose of the study is to provide knowledge and information of computer related disease for the public and people who involved in intensive computer working fields, the study will be transform to webpages and can be used by Terveysnetti.

2 LITERATURE REVIEW

Computer related neck and shoulder pain is caused by repetitive behaviors by using computer daily, forceful exertions, or awkward positions mentioned by Nina and Zhiyong (2003, 155-160). Namely, the disease does not develop by a short term, but long time accumulated by improper work habits and uncomfortable or poor office setting. During the work, people easily ignore about their working style, typing the keyboard with raised wrist, drag-drag the mouse, if continue to be overworked, cumulative trauma happens. The muscles in the forearm that control the movement of fingers may become irritated and soft tissues become inflamed and swollen.(Hagberg 1996, 419-422.)

2.1 Risk factors and causes

The potential risk factors lead to neck and shoulder pain are mainly categorized as external factors and internal factors. External factors can be defined as working environmental factors. External factors contain office table setting, quality of the air, acoustic conditions, temperature and lighting in the room. (Aarås et al 1998, 2001.)The internal factor refers to personal behaviors which result neck and shoulder pain. The internal factors include gender, mental stress, obesity, although it is unclear connection between overweight and neck and shoulder pain; it has been suspected that the obesity brings difficulty to daily activity(Nathan et al 1992, 379-383).In the study of Tsuritani (2002, 23-30) and Webb (2003, 1195-1202), it has been found that overweight was a significant determinant of neck and shoulder pain, though it has not been found in others. Aside from that hormonal imbalance, systemic disease (e.g.diabetes) unhealthy personal lifestyle such as smoking, lack of exercises are also be considered as risk factors. (Makela 1991, 1356-1367; Hughes 1999, 651-657; Zhiyong 2003, 155-160.)

The study found from Aarås et al (1997, 1255-1268) and Korhonen et al (2003, 480) that poor placement of the keyboard and mouse is a predictor for neck pain, and hand or wrist disorders; on the contrary, with supporting for the forearms on the same level and in front of the desk can significantly reduce pressure on both side of trapezius. Apart from it, the computer screen height is particularly associated with neck pains, because higher monitor has been verified to extend neck by visual demands (Burgess 1999,9). Although an extreme low location leads to musculoskeletal stress caused by neck flexion(Turville1998,46; Fries 2001,6), it reduces the irritation of screen to the eyes (Sotoyama et al 1996, 877-884).

Furthermore, the study shows that the risk for neck pain are greatly higher in female gender than in male (Mäkelä 1991, 1356-1367; Karlqvist 1998, 3768-3771; Viikari-Juntura 2001, 345-352), it reflects on higher relative musculoskeletal load, for example, women shows greater range of movement when using mouse, the result showed U shaped association that female workers between 25-43 years old and age between 52-61 have higher incidence than age between 44-51. In male gender, there are trends of increasing neck pain who is over 40 years old. (Viikari-Juntura et al 2001, 345-352.)

In summary, the study has determined that daily continuation of computer work, lack of back, elbow, or hand support, staring at the screen and constantly keeping the same sitting position without getting any rest, individual conditions are the leading causes of the discomfort of the neck and shoulder (Juul and Jesen 2005,188). Besides, the mouse use may lead to musculoskeletal injury particularly on the neck and upper extremity. Namely, both keyboard and mouse users are exposed the same risks of getting computer related upper limb musculoskeletal disorders. (Catherine et al 1999,347-356 .)

2.2 Signs and symptoms

The common symptoms are pain and stiffness from neck and shoulder fatigue and dull pain, the pain may be more obvious during the movement of neck and shoulder, and it will increase step by step during work. Generally, the pain which is between neck and shoulder, located in cervical spine and angle does not radiate. Symptoms fluctuate by the temperature changes, the sense of pain is relieved if surrounding is warm; in reverse, it becomes worse in cold environment. (Hagberg 1996, 419-422; Buckle 1997, 1360-1363; Tittiranonda 1997, 17-38; Steven 2001, 1568-1570.)

Cumulative trauma happens when continuously using computer, and without treatment or ignore the symptoms which has been mentioned above. The muscles which control the movement of finger in the palm deteriorate to swollen and inflamed. (Hagberg 1996, 419-422.)

When it develops to Carpal tunnel syndrome, it is defined as numbness, tingling in hands and following weakness, function loss, abated coordination (American Association of Neurological Surgeons 2001). Moreover, the carpal tunnel syndrome is increasingly progressed in typical. The sensation of tingling and numbness particularly are in the thumb, index, middle and ring finger, but exclude the little finger. The pain becomes worsen when palpate and in cold environment and is extending or radiating along the wrist down with palm or fingers or up with arm and shoulder. In addition, the feeling of motor weakness appears in hand or difficult to handle objects. In the advanced stage, loss of feeling in some fingers can occur. (Hagberg 1996, 419-422; Nevala 2003, 1-10.)

DeQuervain's syndrome is also resulted by repetitive and intensive computer work. It is a painful tendonitis. It is described as pain and swelling by way of the back of the wrist on the thumb. (Wheless 1996.) Swelling appears over the thumb side of the wrist. The pain is aggravated during any movement with repetitive hand or wrist, for instance, cooking, lifting, and gardening. (Mayo Clinic 2010; American Academy of Orthopaedic Surgeons 2007.)

Pernilla et al (2009,307) in their prognostic factors for intervention effect on neck or shoulder symptom intensity and disability among female computer workers found that female may suffered from cervicalgia discomfort that the pain occurs in the cervical regions, it commonly relates to the sense of pain in the posterior or lateral areas of the neck. Besides, tension neck syndrome which involves persistently stiff and headache, pain with neck motion have been mentioned as well. (Larsson et al 2007, 447-463.)

2.3 Diagnosis

Neck and shoulder pain is caused by numerous factors. Concerning distinction of specific neck and shoulder pain or other disease such as carpal tunnel syndrome or DeQuervain's syndrome, the diagnosis involves multidisciplinary team, physician, neurologist, radiologist and so on, before the confirmation of Neck and shoulder pain related to computer, it is required to expel the other possible disease. Nevertheless, it can be confirmed, if pain in neck ad shoulder despite of any other cause but the background of using computer intensively. Usually, people with neck and shoulder pain need meticulously tested. With signs and symptoms of the neck and shoulder pain, and the background of repetitive computer works every day, the following evaluation should carry on. (Zhiyong and Nina 2003 158.)

Physical history checkup is the major diagnostic methods adopted recently, to ascertain the special location and radiation of the pain, the posture brings deterioration or relaxation; the symptoms such as weakness, numbness, tingling, and stiffness. Likewise, assessment of motion in joint rang and muscle spasm, hyperlaxity, muscle tenderness, strength and imbalance are in the checking-list. By assessment of physical history, it assists to debar possible infections or malignancy. What's more, it is imperative to know the medical history; if pain killer has been used for alleviation.(Pryse-Phillips 1984, 870-872; Arcy 2000, 1942-1925.)

Neurological examination, for instance, Finkelstein's test exclusively identify DeQuervain's syndrome. By fisting with the fingers compactly covered the thumb and then bent the wrist. It is quite painful for positive DeQuervain's tendinitis patients. (American Academy of Orthopaedic Surgeons 2007.) Both tinel's sign and phalen's sign are used to confirm Carpal tunnel syndrome. The conduction of tinel's sign requires tapping the median nerve along in the wrist, tingling in the fingers when the nerve is tapped refers to the positive result. In phalen's test, to put the back of the hand conjointly for one minute, the positive signal is the same as tinel's. Apart from the two tests has been mentioned for carpal tunnel syndrome, nerve conduction administered as well. (Orthopedics 2011; Arcy 2000, 3110-3117.)

X-ray is applied to exclude acute trauma, magnetic resonance imaging (MRI), and bone scan can be used to expose possible cervical disc herniation, spinal cord or nerve root compression and nerve dysfunction, at the same time it can exclude tumors or systemic disease (Metzger 1989, 234-237; Mimori 1999, 303-306; Siivola 2003, 15-28; Leppanen 2003, 174). Besides, the infrared thermograph can examine musculoskeletal pain and nerve dysfunction (Feldman 1984, 235-249; Uematsu 1988, 556-561; Pollock 1993, 847-852). Some muscular disease or motor neuron disease can be also distinguished by EMG (electromyography) test; furthermore, EMG helps to determinate other muscular disease or motor neuron disease. (Nathan 1995, 311-312; Stevens 1997, 1477-1486; Arcy 2000, 311-312; Fuller 2002.)

2.4 Prevention

Generally, by promoting the ergonomics during working or using ergonomic products, and providing ergonomic counseling can prevent neck and shoulder pain in some extents. To have regular physical exercises and change poor working habits can greatly reduce the symptoms.(Cailliet 1991, 51-57; Hagberg 1996, 419-422; Lintula et al 2001, 103-116.)

By using ergonomical equipment can help to reduce the stress of posture, load handling and motion. All the ergonomical equipment in the working place should be instructed properly by ergonomist (Hagberg 1996, 419-422). Ergonomic mouse, keyboard, desk and arm support can be used(Lintula 2001, 103-116; Linton 2002; 433-442; Pransky et al 2002, 443-455; Horwitz 2002). Be gently typing the keyboard, taking frequent break if it is possible, and slightly bend and stretch neck and whist (Sihvonen et al 1989, 229-233).

Keeping ergonomic position plays an important role in preventing neck and shoulder pain, to make sure there is not excessive pressure on the neck, and use documenting standard of screen height, and so on (Ketola et al 2002, 18-24). For example, the trunk thigh angle is about 135 degree, therefore the pressure in disks is approximate the same as when one standing; shoulder relaxed, elbow close to body and elbow, wrists and hands in-line with forearms; in spite of that, the computer screen have to be adjusted to 15 degree below the horizontal eye level. This could avoid eyes constantly looking up and down. Furthermore, the ergonomic equipment has mentioned such as ergonomic chair, desk, arm supports, keyboard, and mouse chair are very useful for protecting the discomfort related computer use. It shows that two arm supports can reduce discomfort of wrist extension. (Juul and Jensen 2004, 188; Lintula 2001, 103-116; Zhiyong 2004, 56).

Another way to prevent neck and shoulder pain is to change poor working habits. It has been mentioned to use ergonomic techniques in the previous paragraph. To relax the tension muscle by taking short breaks.It does help to circulate smoothly and relax tension of muscle as mentioned by Zhiyong et al

(2004, 55). Lastly, Nina and Zhiyong (2003, 157) also explain that one should keep hands warm, pains and stiffness from hands are easily become severe if one work in a cold environment. The suggestion is that if one cannot adjust the temperature around, gloves are the option. Smoking cessation program has been advocated by Velicer et al (2006, 1162-1172) and Riemsma et al (2003, 1175-1177), the program which is target on female computer workers who is over 30 years old, by means of it can decrease incidence and prevalence.

The preventing methods have been mentioned above are for those who have not developed to neck and shoulder pain. However for those who are asymptomatic, distinct strategies are adopted. The purpose of the following preventing means is to reduce the consequences of the disease. (Brownson et al 1998.) The only methods is to evaluate the computer workers with known pathology which has possibility lead to neck and shoulder pain, such as rheumatoid arthritis, osteoarthritis. Nevertheless, it is not clear if the diseases are connected with neck and shoulder pain directly, for example, no evidence implies to cervical degenerative disease is potential factor for neck pain. (Brownson 1998; Cote 2008, 60-74; Haldeman 2008, 5-7; Hogg-Johnson 2008, 39-51.)

For the group of people have been diagnosed positively, and have more or less symptoms, the main goal is preventing disease deteriorate or provide rehabilitation. In order to reduce morbidity related to the disorders, ergonomic counseling is highly recommended (Gerlienke et al 2007, 137-152). Exercise as a part of daily activity is referred previously (Ratzlaff 2007, 495-500), to train endurance and strength of neck muscles has be proved reduce pain and disability in female genders who suffered in chronic neck pain, therefore Ylinen et al (2003, 2509-2516) suggest to implement training in computer users.

In accordance with preventing strategies are discussed above, It seems significant for computer users to realize whether their working place and themselves adopted any ergonomic products or techniques or not; therefore the questionnaire from Claire and the colleagues (2008, 89) has been taken as a

measurement to assess proper body posture and workstation among computer users and use of sufficient breaks during work.

2.4.1 Questionnaire of proper body posture and workstation (Claire et al 2008, 88)

There are three questionnaires which the first one is to estimate condition of working environment. Usually it can be used for ergonomic training, and the aspects will be observed by training observer. In the first questionnaire, there are eleven points are required answer. In the beginning phase, the worker is asked to measure top height of screen to eyes, the result is classified as screen far beneath eye height, at eye height or above eye height. In the questionnaire, it is summarized as at eye level or not at eye level.

The second point is to monitor the shortest distance between the eyes and computer screen, be based on the size of the monitor, distance which from 50 to 105 was considered as sufficient distance, the monitor distance is divided to sufficient or not sufficient.

The third point is focus on rotation of keyboard compared to table edge, it is dichotomized in to rotated less than 10 degree or rotated equals or over 10 degrees. The fourth and fifth point are concentrated on whether both elbows supported while computer workers are typing or not; or whether they are supported while working with mouse or not.

The sixth point is the rotation of computer worker in relationship to the position of the computer screen, the choice is either not rotated less than 10 degrees or rotated equals or over 10 degrees. From point seven to eight, it is concerned about back position, if back is supported completely or if the worker's back is straight during work.

The ninth point is rotation of neck, if it is less than 20 degrees will be defined as not rotated; on the other hand, if it is over 20 degrees, will be defined as rotated.

The tenth and eleventh are required computer workers distinguish while they are typing the keyboard or when they are using the mouse, whether there exist ulnar deviation or not.

2.4.2 Questionnaire of ergonomic posture-self reported (Claire et al 2008, 88-89)

The second questionnaire contains only three questions. Because the following situations described in the questionnaire are difficult to observed, in the other words, because the agreement was very high between self-report and observation. Therefore aspects are self-reported instead of observer.

The computer workers are questioned about desk or keyboard height compared to elbow height. The choices are keyboard above elbow height; keyboard at or below elbow height. The second question is whether the keyboard commonly tilted or not. The last question is during working with the computer, whether they who use computer have the tendency to raise their shoulder or not.

2.4.3 Questionnaire of sufficient break-self reported (Claire et al 2008, 90)

The last questionnaire involves six questions which attend to whether computer users apply sufficient breaks while they were work. Firstly, the question is to ask about if the computer users take breaks or exercise normally. Secondly, the detailed break behavior is questioned; the answer can be the one has breaks and do exercises; or the one has breaks but no exercises; the one neglect all.

From question three to five, the frequency of having a break is asked. The choices are classified as never, sometimes or regularly. The third and fourth question is to question if the one constantly work more than one hour without getting a break of at least 5 minute or if the one work consistently more than one hour without any standing or walking. The fifth question is the frequency of

short breaks the one have. And the last question is the how many five minute breaks do the computer users have on working day averagely, lunch break is not counted.

The questionnaires or measurements above is to assess overwork and perceived work stress. Be based on Ostry et al(2003), it is called effort reward imbalance questionnaire. The theory expounds that if apprecerptive working achievement does not match with the obtaining reward, work stress occurs. Although the theory does not been used frequently in neck and shoulder pain field(Van et al. 2007), it obviously showed the low self-reported health status and chronic disease connected with the model (Hanson et al. 2000.)

2.5 Treatment

The main principle of treating strategy is to relieve pain, relax body and mental status of the patient. The most common treatments for upper limb musculoskeletal disorder related to computer users are categorized as medical options, ergonomic interventions. Normally, physiotherapy can help to reduce the pain. Despite of that, Massage, acupuncture are used for relieve the symptoms.(Nabeta and Kawakita 2002, 217-222; Zhu 2002, 13-28.)

Nevertheless, for people who receive physical interventions and still suffered by constant pain in more than one week can be treated by giving non-steroid of anti-inflammatory drugs such as aspirin, ibuprofen and Vitamin B6 (Hagberg 1996, 3; Nevala-Puranen 2003,10). Besides, active physical training, exercise for the neck, acupuncture, massage or inject to the inflammatory area with corticosteroids or cortisone group of medication can also help easing pain (Hawkins et al 1990, 142-6).

Recently, there is a new biofeedback training is used for treat neck and shoulder pain. Myofeedback is biofeedback based on electromyography; it is founded by Cinderellahypothesis.Cinderella hypothesis explains the process of development and persistence of pain in low intensity jobs such as computer

work. Lack of proper relaxation of muscle is critical reason in neck pain. (Visser 2006, 1-16.) It is mentioned by Sjøgaard and the group (2000, 99-105) that overuse of low threshold motor-units probably causes muscular pain. Myofeedback training promotes muscular relaxation, and returns signal if there is no sufficient muscle relaxation. From Pernilla et al (2009, 307) study, Myofeedback training is especially trustworthy for people who have myalgia, tension neck and cervicalgia. Myofeedback training as the intervention showed reliable effect on reducing neck and shoulder symptoms (Gerlienke 2007, 17; Pernilla et al 2009, 308).

If people are suffered from the carpal tunnel syndrome, the surgery is the last treatment option. In Zhiyong and Nina (2003, 156) research, mentioned that the carpal tunnel release surgery will cut volar carpal ligament away to avoid permanent damage of the nerves in the carpal tunnel. By means of that, the inflammation is relieved, and at the same time largely decrease risk of permanent injury of the nerves in the carpal tunnel. Whereas this situation is rare, it takes up less than 5 percent of patient .(Helwig 2000, 79-80; Okada 2000, 19-25.)

2.6 Synthesis of current researches

Related materials were searched through CHINAL database. The search was limited to specific words, valid year from 1980 to 2010. To combine all the search words, 12 relevant articles was the final option. There are 10 articles has available full text review, and most suitable 8 articles has been chosen. Two of them are systematic literature review; the left articles are using quantitative methods

The two researches from Zhiyong and Nina (2003, 155-160) and Zhiyong and the colleagues (2004, 51-56) reviewed recent 20 years research publications to figure out the etiology, pathophysiology, diagnosis, prevention and treatment of upper limb musculoskeletal disorder particularly with neck and shoulder pain.

Zhiyong and Nina (2003, 155-160) shortly describe the pathology of carpal tunnel syndrome and DeQuervain's syndrome, both of them can be caused by computer workers. In the research, non-steroidal types of anti-inflammatory drugs and vitamin B-6 have been pointed out as an option for people who cannot be treated by rest and ergonomic methods. Besides, for severe pain, corticosteroid, or cortisone type medication are recommended to inject in the inflammatory area. One of other research article from Zhiyong and the colleagues (2004, 51-56) submit the standard of ergonomic sitting position.

The risk factors which result in neck and shoulder pain are discussed by Korhonen et al (2003, 475-482) and Catherine et al (2000, 347-356). In the study from Korhonen and colleagues, questionnaire has been delivered to tree administrative unit in Finland, 515 workers whose job included VDU (video display Unit) work for more than 5 hours per week are engaged in; the potential risks are classified as physical work environment, poor placement of computer devices, female gender particularly affected by improper placement of keyboard. Other risk factor such as gender, smoking, mental distress are also mentioned. Besides, authors suggest to have physical exercise may help to prevent neck pain. From Catherine and the group's point of view, mouse users have greater chance to develop to musculoskeletal injury of neck and upper extremity. The questionnaires have been used for 431 employees from 15 workplaces in the research; both mouse users and non mouse users are questioned. In the result, age, posture, and psychosocial factors are closely connected with musculoskeletal disease, and female gender shows more easily to have symptoms on their upper back than male. (Catherine et al 1999, 347-356.)

Prevention methods exceptionally focus on ergonomics and have frequent break are mentioned by Claire et al (2008, 87-101) and Juul and Jensen (2005, 188-194). In Claire's research, computer users are divided in three groups; one group are the usual group without any intervention, another two groups are group with intervention, and the group with intervention at the same time have physical activities. It has been founded that the intervention improves status of computer users, especially their working styles; however, it seems not obviously

benefits on stress conditions. In Juul and Jensen's study, questionnaire was mailed and delivered to 5033 office worker in Danish company from 1999-2000. It is highly advocated that to avoid working with the computer during all the work time (Juul and Jensen 2005, 188-194)

There are two research concentrate on Myofeedback training which about 36 female computer users who are 45 years old or above received a clinical exam and questionnaire before the intervention from Pernilla et al (2009, 300-311). The result of the research showed that myofeedback training combined with ergonomics counseling greatly benefit for employees with moderate symptoms (Pernilla et al 2009, 300-311).

Another research about myofeedback from Gerlienke and the colleagues (2007, 137-152) showed the same result that pain intensity and disability had largely decreased directly. There are 79 female computer worker with neck and shoulder pain symptoms chosen randomly, all of them assigned Myofeedback training and ergonomic counseling for four weeks.

Basically, ergonomics, proper rest, and exercise during break are emphasized by all the articles. Hence, it seems necessary that not only change external environment, for example, distance between screen to the eyes, chair setting, even adjust appropriate temperature in the office; but also the internal factors, such as mental status, to avoid overload time using on computer, keep a good mood. Moreover, break during the work, neck exercises helps to prevent upper limb musculoskeletal disorder. In conclusion, the disease should arouse greater attention; beyond that employers should concern more about ergonomical working environment for the employees.

(see table 1)

Table 1

AUTHOR OF THE JOURNAL	TITLE	METHOD	SAMPLE N=	TARGET GROUP	FINDINGS
Claire.M. Bernaards Geertje A.M.Arie"ns Monique Simons Dirk L. Knol Vincent H.Hildebrandt	Improving work style behavior in computer workers with neck and upper limb symptoms	Computer workers with neck and upper limb symptoms were randomized into three work style group. Two group receive interventions.	152 work style group, 156 the work style and physical activity group, 158usual care group	Computer users	Intervention improves status of computer users especially their working styles.
Juul-Kristensen.B Jensen.C	Self-reported workplace related ergonomic conditions as prognostic factors for musculoskeletal symptoms: the "BIT" follow up study on office workers	Questionnaire was mailed and delivered for office workers in Danish company.	5033 office workers has been questionnaire from 1999 to 2000 in Denmark.	Computer workers in Danish companies	It has been advised by the article that to avoid working with the computer during all the work time. In addition, to consider the worker's own influence on the speed of work.
Pernilla.L Leif.S Roland.K Gerlienke.V Miriam.V.H Hermie.H	Prognostic factors for intervention effect on neck or shoulder symptom intensity and disability among female computer workers	A clinical exam and questionnaire survey was given before the	36 female computer users aged 45 or above	A randomized study among female computer users aged 45 or older.	Myofeedback training combined with ergonomics counseling greatly benefit for secondary prevention among employees with moderate symptoms.
Zhiyong.M Nina.Z	Computer use related upper limb musculoskeletal disorders	Review publication of recent 20 years.	20 years research publications	All computer users and office workers	The authors did not find very clear etiology, pathophysiology of the disease,
Zhiyong.M Matti.N Jouko.S	Neck and shoulder pain related to computer use	Review publication of recent 20 year	20 years research publications	Intensive computer users	Physical load and psychosocial work environment are results neck shoulder pain. procedure of prevention, diagnostics, and treatment option are discussed.

Korhonen .T Ketola .R Toivonen .R Luukkonen .R Häkkinen.M Viikari- Juntura.E	Work related and individual predictors for incident neck pain among office employees working with video display units	Questionnaire s has be delivered to three administrative units in Finland	515 workers whose job included VDU work for more than 4 hours per week	Office employees working with video display units	The risk of neck pain is increased by poor physical work environment .
Gerlienke E.Voerman Leif Sandsjö Miriam M.R Vollenbroek- Hutten Pernilla Larsman Roland Kadefors Hermie J. Hermens	Effects of ambulant Myofeedback training and ergonomic counselling in female computer workers with work-related neck –shoulder complaints:a randomized controlled trial	Female computer workers with neck-shoulder complains randomly assigned Mfb or EC and received four weeks of intervention	Seventy-nine female computer workers with neck-shoulder pain symptoms	Female computer workers reporting neck shoulder complaints	After four week intervention, pain intensity and disability had largely decreased directly.
Catherine Cook Robin Burgess- Limerick Sungwon Chang	The prevalence of neck and upper extremity musculoskeletal symptoms in computer mouse users	Questionnaire d mouse users and non mouse users of the company in Sydney, Australia	431 people, employed by 15 workplaces	Computer mouse users	The study shows agreement of hypothesis which mouse use may develop to musculoskeletal injury of neck and upper extremity. The result shows the same influence on keyboard users as well.

3 HEALTH PROMOTION

The main purpose of health promotion is to adopt preventive methods to avoid deteriorate the disease or to decrease the risk to get the disease. It seems the relevant workers are inevitably change their working style. It is significant to advocate to use corporate budgets for preventing injury and workplace can be upgrading such as ergonomic computer screen, keyboard, mouse; or elbow support and ergonomic chair. In order to actuate companies and organizations to implement change the situation, reversed inspection of health and safety is one of option. (Whysall 2004; 343-35.) Additionally, it is largely recommended that employees take frequent break during working time, and they should be encouraged to engaged in any physical activities as a part of daily life (Korhonen et al 2003,475-482).

For employees, promoting health or curing for musculoskeletal system by physical activities, because it can facilitate mechanical and metabolic process (Ratzlaff 2007, 495-500). Besides, computer users can exercises their eyes, neck, hands, elbow and back during work (Pamela2011).

Due to mental stress as one of the risk factor raise the possibility to developed neck and shoulder pain. As employers, to empowering employees to make collective decision, namely, to allow employees to chose job environment and be supportive. (Menzel 2007, 145-153.)

Moreover, ergonomic intervention or physiotherapy can be adopted in some specific group. In some companies, employees have right to chose relaxation or general sense of well being alternatively. This methods is target on those who feel muscular tension in the neck few times per week, though it can reduce neck and shoulder pain. (Bernaards 2006, 80.)

Besides, nowadays, internet is an unprecedented information media of freedom of speech, which obfuscate the boundary or limitation of nations and culture. To compare with traditional information media such as book, video, or other paper documents, those which can be reserved as a record; the advantage of using internet is that the information from internet is updated ceaselessly. According

to the characters, the latest information can be gained by needed group of people, such as those who involved in health care system, nurses, doctors and other medical members. Likewise, to compare with book or other paper documents, internet largely economized financial, human, timing resources.(Honcode 2011.)

Despite of that, by using internet, people who has health care problem of can be resolved by online questioning the relevant nurses and doctors; and by seeking for reliable and related information, extensive knowledge can be acquired. On the other hand, by using internet, patients are greatly encouraged to engaged in self health care discussion and education, by means of that easily attain progressively medical information. Although it is an inevitable tendency that it may change relationship between doctor and patient by using online medical service; it cannot be replace by internet. Nevertheless, it is considerably contributed to enrich knowledge for patient, doctor, nurses and other medical groups. (Honcode 2010.)

4 THE PURPOSE AND AIM

The purpose is to produce health education material about the causes and risk factors of neck and shoulder pain related to computer use, the related signs and symptoms, and the methods to identify or diagnose the disease, the efficient prevention and the proper treatment. The aim of this thesis is to create web page in Terveysnetti.

5 IMPLICATION OF THE PROJECT

The project is providing information for Terveystietä for the public health. Terveystietä is a website which cooperates with Turku University of Applied Science, health care system and hospital in Salo. The project has been founded since 2001. According to the website, the public can seek basic health care information from it.

The topic has been chosen is because of complaints from surrounding people. It has been showed in different levels of symptoms on them, neck pain, shoulder pain, hand weakness and so on. However, the working place and the workers seem to neglect the symptoms, and the majority of complainants are engaged in information technology occupation. Consequently, attention should be paid by more and more people, and to seek the reasons of the source of the symptoms is the major target of this article.

Based on their special working style- 8hours working time and sitting in front of the computer screen, typing on the keyboard, using mouse, it seems ergonomical setting plays a significant role in their daily working place. It is unexpected that the reason of developing the disease are numerous, from several researches it has been founded that, the causes of leading the disease related to computer users not only by external, for example environmental, excessive workload; but also internal, such as smoking, drinking, aging, and mental stress.(Korhonen et al 2003, 476.)

Be based on what have been discussed above, the information can be offered and used for the public, in order to arouse more people realizing the importance of prevention of this disease. It will bring serious consequences if it is ignored. What is more, it needs plenty of time and energy to treat the disease once it developed to worse condition.

6 RELIABILITY OF WEBPAGES

When consider about reliability and validity of website and health care education. It is necessary to provide information objectively and fairly, when introduce a product or a special treatment. Besides, the resources of the information should be indicated demonstrably, and the address which related should be offered as well. Whether the function is ineffective or effective should be clearly mentioned, especially, if the information is connected to special treatment. And it should be based on the scientific evidence, medical journals, reports or literatures. Additionally, the information provider of medical science should be detailed introduced by their background. (Honcode 2010)

It can be regarded as high reliable research in myofeedback training combined with ergonomics. Owing to gets the same result from questionnairing the plenty of targets, and the same methods of intervention by different observers.

7 ETHICAL CONSIDERATIONS ABOUT WEBPAGES

To consider about the ethical of medical net pages, first of all is the management of privacy. The web site should clarify the methods to deal with private information, for example, e-mail address, the contents have been talked,the telephone.Due to confidentiality, the personal information of website vistors is collected by the website, and for instance the information will be used as statistics or in some other purpose, the vistor need to be informed. Besides, it is necessary to indicate the uploaded date and modified date, and to classify the resource source. Additionally, information should be objectively introduced, and specify its targets and motivation.

Generally, the purpose of the good medical net page is to improve and promote the supplied information, instead of replace the relationship between patients and doctors. (Honcode 2010.)

8 ESTABLISH WEBPAGES

In order to improve the quality of medical and health information, and convenient to staff related to medical fields and patients search latest and trustworthy medical research results, proper information related to medical research is provided by an excellent website. It is able to prove effective study by which it strongly advocates (Honcode 2010).

An excellent website gives clear indication of sources of information, precisely mark motivation, objects and target population out. The responsibility of a trustworthy website also includes protecting patients' privacy, modify and establish the date of information publishing, introduce products objectively, and clarify if it contains any advertisement. Therefore, if one wants to publish any information should comply strictly with the all principles of the website. (Honcode 2010.)

Be based on the findings from literature review and school teachers guiding, webpage building is considered carefully by author. During the process, it is understood and relised by the author that all the information which provided on the internet should have specific purpose and reliable references that the website visitors ensure the reliability and accuracy. The language using should be clear and understandable. In addition, pictures usage, for instance illustrate can embellish webpages and be accepted competently. For the consideration of copyright by using picture from internet, it is determinated that self-taking picture are used in the webpage for this topic. (Terveysnetti 2011.)

9 DISCUSSION

People involved in the occupation who need to use computer daily have great risk to get upper limb musculoskeletal, the common symptoms like neck and shoulder pain. It is obvious that this disease is caused by many factors (environment, individual). However, the etiology and pathophysiology of this disease has not very clear yet. The available researches related to this field are not enough for my study. The prevention and treatment of upper limb musculoskeletal related to computer use should get more attention.

Although in the research of Catherine et al (2000, 347-356) shows that mouse use may injury neck and upper extremity, the research from Korhonen et al (2003, 475-482) doubt the placement of mouse associated with neck pain; due to their study, mouse use was not an essential factor.

In the research article, neck and shoulder pain related to computer use from Zhiyong et al (2004, 51-56), it is founded that female computer users has higher risk to have neck and shoulder pain than male workers. the result is impressive that owing to the design of most workplace are for men, hence, women expose to poor ergonomical environment. Another example is the keyboard use, it is mentioned by Zhiyong that the average keyboard design are forced women to stretch to type and drig the mouse.(Zhiyong and Nina 2003, 155.)

Therefore, to take preventing methods forward is imperative. The company should be advocated to evaluate the ergonomical setting in the office, and the working style. Beyond that, people who has neck and shoulder pain symptoms need to take it serious, take exercise or change working habit, if it becomes worse, getting treatment immediately, physiotherapy, massage, and acupuncture is helpful. Having exercise, keep away from bad life style is recommended. (Morten et al 2010, 9.)

10 REFERENCES

- Aarås,A.;Fostervold.K.; Thoresen,M. &Larsen,S.1997. Postural load during VDU work: a comparison between various work postures. *Ergonomics*, Vol.11No. 40/1997,1255-1268
- Aarås,A.;Horgen,G. &Bjorset,H.1998.Musculoskeletal, visual and psychosocial stress in VDU operators before and after multidisciplinary ergonomic interventions.*Applied ergonomics*, Vol.29, 335-354
- Aarås,A.; Horgen,G. &Bjorset,H. 2001. Musculoskeletal, visual and psychosocial stress in VDU operators before and after multidisciplinary ergonomic intervention-A 6 years prospective study-Part II. *Applied Ergonomics*, Vol. 32, 559-571
- American Association of Neurological Surgeons. 2001. Carpal tunnel syndrome: a common condition, with an easy treatment. Consulted 10.9.2011 http://www.medem.com/medlb/article_detailb.cfm?article_ID_/ZZZUCB9UE8C&sub_cat_/181
- American Association of Neurological Surgeons. 2007. De Quervain's Tendinitis. Consulted17.9.2011<http://orthoinfo.aaos.org/topic.cfm?topic=A00007>
- Arcy,C.A.D. &McGee,S.2000. The rational clinical examination-Does the patient have carpal tunnel syndrome. *The Journal of the American Medical Association*,Vol.283, 3110-3117
- Arcy,C.A.D. & McGee,S. 2000. Clinical diagnosis of carpal tunnel syndrome. *Journal of American Medicine Association*,Vol.284, 1942-1925
- Bernaards,C.M.;Ariëns,G.A. &Hildebrandt,V.H. 2006. The effectiveness of a lifestyle physical activity intervention in addition to work style intervention on the recovery from neck and upper limb symptoms in computer workers. *Bioformatics Musculoskeletal Disorder*, Vol.7, 80

Brownson,R.C.; Remington,P.L. & Davis, J.R. 1998. Chronic disease epidemiology and contrl. 2nd edition.Washington, DC. American Public Health Association

Buckle,R.A.; Franzblau,A.; Alber, J.W. &Aromstrong,T.J.1997. Influence of body mass index and work activity on the prevalence of median mononeuropathy at the wrist. Occupational and Environmental Medicine,Vol. 54, 268-271

Buckle,P.W. 1997. Fortnightly review: work factors and upper limb disorders. British Medical Journal, Vol.315, 1360-1363

Burgess,L.R.; Plooy,A. &Fraser.K. 1999. The influence of computer monitor height on head and neck posture. International Journal of Industrial Ergonomics, Vol.23, 171-9.

Cailliet,R.1991. Neck and arm pain.F.A.Davis Company. Philadelphia. 3rd edition,51-57

Catherine,C.; Robin,B.L. &Sungwon.C.1999. The prevalence of neck and upper extremity musculoskeletal symptoms in computer mouse users. International Journal of Industrial Ergonomics,Vol.26, 347-356

Claire,M.B.; Geertje,A.M.A.; Monique,S.; Dirk, L.K. &Vincent, H.H. 2008. Improving work style behavior in computer workers with neck and upper limb symptoms.The Journal of Occupational Rehabilitation, Vol.18,87-101

Cote,P.;Van,D.V.G.& Cassidy,J.D. 2008.The burden and determinants of neck pain in workers: results of the bone and joint decade 2000-2010 task force on neck pain and its associated disorders: executive summary. Spine,Vol. 33, 60-74

Feldman,F. &Nickoloff,E.L.1984. Normal thermographic standards for the cervical spine and upper extremities. The Journal of Skeletal Radiologyl, Vol.12, 235-249

Fries, S.H. & Svensson, O. 2000. The influence of the viewing angle on neck-load during work with video display units. *Journal of Rehabilitation Medicine*, Vol. 33, 133-136

Fuller, D.A. 2002. Carpal tunnel syndrome. Consulted 19.9.2011 <http://www.emedicine.com/orthoped/topic455.htm>

Gerlienke, E.V.; Sandsjö, L.; Miriam, M.R.; Vollenbroek, H.; Pernilla, L.; Roland, K. & Hermie, J. 2007. Effect of ambulant myofeedback training and ergonomic counselling in female computer workers with work-related neck-shoulder complaints: A randomized controlled trial. *Journal of Occupational Rehabilitation*, Vol. 27, 137-152

Hagberg, M. 1996. ABC of work related disorders: neck and arm disorders. *British Medical Journal*, Vol. 313, 419-422

Haldeman, S.; Carroll, L.; Cassidy, J.D.; Schubert, J. & Nygren, A. 2008. The bone and joint decade 2000-2010 task force on neck pain and its associated disorders: executive summary. *Spine*, Vol. 33, 5-7

Hanson, E.K.; Schaufeli, W.; Vrijkotte, T.; Plomp, N.H. & Godaert, G.L. 2000. The validity and reliability of the Dutch effort-reward imbalance questionnaire. *Journal of Occupational Health Psychology*, Vol. 5, 142-55

Hawkins, R.J.; Bilco, T. & Bonutti, P. 1990. Cervical spine and shoulder pain. *Clinical Orthopedic*, Vol. 258, 142-146

Health On the Net Foundation (HON) 2010. Consulted: 18.4.2011]. <http://www.hon.ch/HONcode/Patients/Conduct.html>

Helwig, A.L. 2000. Treating carpal tunnel syndrome. *The Journal of Family Practice*, Vol. 49, 79-80

Heuvel, V.S.G.; Beek, V.A.J.; Blatter, B.M. & Bongers, P.M. 2007. Workstyle and overcommitment in relation to neck and upper limb symptoms. *The International Journal of Behavioral Medicine*, Vol. 14, 12-20

Hogg-Johnson,S.; Van,D.V.G. & Carroll,L.J. 2008. The burden and determinants of neck pain in workers: results of the bone and joint decade 2000-2010 task force on neck pain and its associated disorders: executive summary. *Spine*, Vol. 33, 39-51

Horwitz, J.M. 1992. Crippled by computer. *Time*.October 12

Hughes,R.E. 1999. Age related changes in normal isometric shoulder strength. *The Americal Journal of Sports Medicine*. Vol.5 No. 2/1999, 651-657

Juul,K.B.; Jensen,C. 2005. Self-reported workplace related ergonomic conditions as prognostic factors for musculoskeletal symptoms: the 'BIT' follow-up study on office workers. *Journal of Occupational and Environmental Medicine*,Vol.62, 188–194

Karlqvist,L.1998. Avoid the mouse-trap! Musculoskeletal injuries can be reduced by placing the mouse within shoulder space.*Lakartidningen*, Vol. 95, 3768-3771

Karlqvist,L.; Bernmark,E. & Ejenvall, L. 1998. Computer mouse position as a determinant of posture, muscular load and perceived exertion. *Scandinavian Journal Work Environmental Health*, Vol.24, 62-73

Ketola,R.; Toivonen,R. & Hakkanen,M. 2002. Effects of ergonomic intervention in work with video display units. *Scandinavian Journal of working Environmental Health*, Vol. 28, 18-24

Korhonen,T.; Ketola-Toivonen,R.; Luukkonen,R.; Häkkänen,M. & Viikari,J.E. 2003. Work related and individual predictors for incident neck pain among office employees working with video display units.*Occupational and Environmental Medicine*, Vol.60 ,475-482

Larsson,B.; Søgaaard,K. & Rosendal,L. 2007. Work-related neck-shoulder pain: a review on magnitude, risk factors, biochemical characteristics, clinical picture and preventive interventions.*Journal of Clinical Research Best Practices*, Vol.21, 447-463

- Leppanen,R.E.; Nabeta,T. & Kawakita, K. 2003.From the electrodiagnostics Lab relief of chronic neck and shoulder pain by manual acupuncture to tender points—a sham-controlled randomized trial. *The Spine Journal*, Vol .3, 174
- Linton,S.J. 2002. Early identification and intervention in the prevention of musculoskeletal pain. *American Journal of Industrial Medicine*, Vol. 41, 433-442
- Lintula,M.; Nevala,P.N. & Louhevaara,V. 2001. Effects of ergorest arm supports on muscle strain and wrist positions during the use of the mouse and keyboard in work with visual display units: a work site intervention. *International Journal of Occupational Safety and Ergonomics*, Vol.1 No.7/2001, 103-116
- Makela,M. 1991. Prevalence, determinant, and consequences of chornoic neck pain in Finland. *American Journal of Epidemiology*, Vol. 11 No.134/1991 , 1356-1367
- Martyn,S. 2009. Systematic reviews. Consulted 10.2.2011<http://www.experiment-resources.com/systematic-reviews.html>
- Menzel,N.N. 2007. Psychosocail factors in musculoskeletal disorders. *Critical Care Nursing Clinics of North America*, Vol. 19, 145-153
- Metzger,C.S. 1989. Small central cervical disc syndrome: evaluation and treatment of chronic disabling neck pain. *Spinal Disorder*, Vol. 24, 234-237
- Mimori,K. 1999. Relation between the painful shoulder and the cervical spine with narrow canal in patients without obvious radiculopathy shoulder-hand syndrome in cervical spinal cord injury systemic malignancy presenting as neck and shoulder pain. *Journal of Shoulder and Elbow Surgery*,Vol. 8,303-306
- Morten,W.; Therese,N.H. & Kaj,B.V. 2010. Computer work and musculoskeletal disorders of the neck and upper extremity: A systematic review. *Bio Medical Central -Musculoskeletal Disorders*, Vol.11, 1-15
- Mayoclinic.com. 2010. De Quervain's tenosynovitis. Consulted: 18.9.2011 <http://www.mayoclinic.com/health/de-quervains-tenosynovitis/DS00692>

Mäkelä,M.; Heliövaara,M. & Sievers,K. 1991. Prevalence, determinants, and consequences of chronic neck pain in Finland. *American Journal of Epidemiology*, Vol. 134, 1356-1367

Nabeta,T. & Kawakita,K. 2002. Relief of chronic neck and shoulder pain by manual acupuncture to tender points- a sham-controlled randomized trial. *Complement Ther Med*, Vol.4 No.10/2002, 217-222

Nathan,P.A.; Keniston,R.C.; Meadows,K.D. & Lockwood,R.S.1995. Nerve conduction studies and carpal tunnel syndrome. *American Journal of industrial Medicines*, Vol.27, 311-312

Nathan,P.A.; Keniston,R.C.; Myers,L.D. & Meadows,K.D. 1992. Obesity as a risk factor for slowing of sensory conduction of the median nerve in industry: A cross-sectional and longitudinal study involving 429 workers. *Journal of Occupational Medicine*, Vol.34, 379- 383

Nevala,P.N.; Pakarinen,K. & Louhevaara,V.; 2003 Ergonomic intervention on neck, shoulder and arm symptoms of newspaper employees in work with visual display units. *International Journal of Industrial Ergonomics*, Vol.3,1-10

Nygren,A & Berglund,M.1995.Neck-and-shoulder pain- an increasing problem. Strategies for using insurance material to follow trends. *Scandinavian Journal of Rehabilitation Medicine – Supplement*,Vol.32, 107-112

Occupational health. 2008. Introduction to musculoskeletal disorders. Consulted 2.5.2011<https://fpmwww3.fpm.wisc.edu/safety/occupationalHealth/Ergonomics/MusculoskeletalDisorders/IntroductiontoMusculoskeletalDisorders/tabid/88/Default.aspx>

Okada,M.; Tsubata,O.; Yasumoto,S.; Toda,N. & Matsumoto,T. 2000. Clinical study of surgical treatment of carpal tunnel syndrome: open versus endoscopic technique. *Journal of Orthopaedic Surgery*, Vol. 8, 19-25

Ostry,A.S.; Kelly, S.; Demers,P.A.; Mustard,C. & Herzman,C.2003. A comparison between the effort- reward imbalance and demand control models. *Bioinformatics Public Health*, Vol. 3, 10.

Paul,J.M. & Rolf, H.W. 2008. Back posture and low back muscle activity in female computer workers: a field study. *Clinical Biomechanics*, Vol. 24 No.2/2008, 169-175

Pamela, A.D.C. 2011. Carpal tunnel begins in your neck,not your wrist. *Safe ComputingTips.com*Consulted:20.9.2011<http://www.safecomputingtips.com/articles/carpal-tunnel-begins.html>

Pernilla,L.; Leif,S.; Roland,K.; Gerlienke,V.; Miriam,V.H. & Hermie,H.2009. Prognostic factors for intervention effect on neck/shoulder symptom intensity and disability among female computer workers.*The Journal of Occupational Rehabilitation*, Vol.19, 300-311

Pollock,F.E. 1993. Patterns of microvascular response associated with reflex sympathetic dystrophy of the hand and wrist.*Journal of Hand Surgery*,Vol.18, 847-852

Pransky,G.M.M & Robertson,S.D.M. 2002. Stress and workrelated upper extremity disorders: implication for prevention and management. *American Journal of Industrial Medicine*,Vol.41, 443-455.

Pryse-Phillips, W.E.1984. Validation of a diagnostic sign in carpal tunnel syndrome. *Neurosurg Psychiatry*, Vol. 47, 870-872

Ratzlaff, C.R.; Gillies,J.H. & Koehoorn,M.W. 2007. Work-related repetitive strain injury and leisure-time physical activity. *Arthritis Rheum*, Vol.57, 495-500

Riemsma,R.P.;Pattenden,J.;Bridle,C.;Sowden,A.J.;Mather,L.; Watt,I.S. & Walker,A. 2003. A systematic review of the effectiveness of stage based interventions to promote smoking cessation. *Bio Medical Journal*, Vol.326, 1175-1177

- Sihvonen,T.; Baskin, K. & Hänninen,O. 1989. Neck-shoulder loading in wordprocessor use. Effect of learning, gymnastics and armsupports, International Archives of Occupational and Environmental Health, Vol. 61, 229-233
- Siivola,S. 2003. Neck and shoulder pain in a young population: Prevalence and etiological factors. Oulu University Press, 15-28
- Sotoyama,M.; Jonai,M.& Saito,S. 1996. Analysis of Ocular surface area for comfortable VDT workstation layout. Ergonomics, Vol.39, 877-884
- Stevens,J.C. 1997. The electrodiagnosis of carpal tunnel syndrome. American Association of Electrodiagnostic Medicine, Vol.20, 1477-1486
- Stevens,J.C.; Witt,J.C.; Smith,B.E. & Weaver, A.L. 2001. The frequency of carpal tunnel syndrome in computer users at a medical facility. Neurology, Vol. 56, 1568-1570
- Terveysnetti. 2011. AD/HD lapsi perheessä. Consulted: 4.10.2011 <http://terveysnetti.turkuamk.fi/perhenetti/ADHD/index.html>
- Tittiranonda,P.; Burastero,D. &Rempel,D. 1999. Risk factors for musculoskeletal disorders among computer users. Occupational Medicine, Vol.14, 17-38
- Tsuritani,I. 2002. Impact of obesity on musculoskeletal pain and difficulty of daily moverments in Japanese middle-aged women. Maturitas, Vol.1 No.42/2002, 23-30
- Turville,K.; Psihogios,J. & Ulmer,T. 2004. The effects of video display terminal height on the operator: a comparison of the 15 and 40 recommendations.Applied Ergonomics, Vol. 29, 239-46
- Uematsu,S. 1988. Quantification of thermal asymmetry. Part 2: Application in low-back pain and sciatica. Journal of Neurosurgery, Vol.69, 556-561

- Velicer,W.F.;Friedman,R.H.;Fava,J.L.;Gulliver,S.B.; Keller,S.; Sun,X.; Ramelson,H. &Prochaska,J.O. 2006. Evaluating nicotine replacement therapy and stage-based therapies in a population- based effectiveness trial. *Journal of Consulting Clinical psychology*, Vol.74, 1162-1172
- Viikari-Juntura,E.; Martikainen,R. & Luukkonen,P. 2001. Longitudinal study on work related and individual risk factors affecting radiating neck pain. *Occupational Environmental Medicine*, Vol. 58, 345-352
- Visser, B. & Van,D.J.H. 2006. Pathophysiology of upper extremity muscle disorders. *Journal of Electromyography and Kinesiology*, Vol.1 No.16/2006 , 1-16
- Wheless,C.R. 1996. Wheless' textbook of orthopaedics: DeQuervain's Disease. Consulted 9.9.2011<http://www.medmedia.com/ooa1/162.htm>
- Webb,R.2003. Prevalence and predictor of intense, chronic, and disabling neck and back pain in the UK general population. *Spine*, Vol.1 No.28/ 2003, 23-30
- Whysall,Z.J.; Haslam,R.A. & Haslam,C. 2004.Processes, barriers, and outcomes described by ergonomics consultants in preventing work-related musculoskeletal disorders. *Applied Ergonomics*, Vol. 35, 343-351
- Ylinen,J. 2003. Active neck muscle training in the treatment of chronic neck pain in women: a randomized controlled trail. *The Journal of Americal Medical Association*, Vol.289 No.19/2003, 2509-2516
- Zhiyong,M.; Matti,N. & Jouko,S .2004. Neck and shoulder pain related to computer use . *Pathophysiology*, Vol.11, 51-56
- Zhiyong,M. & Nina,Z. 2003. Computer use related upper limb musculoskeletal disorders. *Pathophysiology*, Vol.9, 155-160
- Zhu,X.M. & Polus,B. 2002. A controlled trial on acupuncture for chronic neck pain. *The American Journal of Chinese Medicine*, Vol.1 No.30/2002, 13-28

11 APPENDIX

Data base	Search word	Search terms	result
CINAHL	Musculoskeletal disease	S1	124
CINAHL	Upper limb disorder	S2	12
CINAHL	Back pain	S3	13476
CINAHL	Neck pain	S4	2846
CINAHL	S5	S1 or S2 or S3 or S4	16458
CINAHL	Computer workers	S6	29
CINAHL	Office work	S7	102
CINAHL	S8	S6 or S7	132
CINAHL	Treatment	S9	248136
CINAHL	Prevention	S10	231352
CINAHL	Ergonomics	S11	3257
CINAHL	S12	S9 or S10 or S11	459531
CINAHL	ALL(and)	S5 S8 S12	12