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OCCUPATIONAL PHYSIOTHERAPY FOR SHIFT WORKERS WHO PERFORM REPETITIVE UPPER BODY MOVEMENTS

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The aim of this thesis was to create an informational pamphlet for shift workers who perform repetitive upper body movements. The information in the pamphlet is evidence-based knowledge that derives from the material in the literature review section of this thesis.

The objective of this pamphlet was to give employers and employees evidence-based information on work related physical and psychosocial loading factors. This information relates to workability, health promotion and prevention.

The theoretical section of this thesis was a literature review of the effects of loading factors on workers. The loading factors investigated are both physical and psychosocial. Examples of these are shift work, excessive workloads, repetitive movements, sitting for prolonged periods and lifting heavy loads. The literature review also investigate scientific articles on the prevention of symptoms that arise from these loading factors. These scientific articles were freely available from search engines, Medline/Pubmed, Google Scholar and SAMK Finna. Articles that were not freely available were obtained from the authors themselves.

The qualitative section of this thesis was done by doing interviews of blackjack croupiers in Finland. Questions were based off of the theoretical section, including subjects such as workability, shift work, sitting and standing, repetitive movements, and workplace prevention.

Contents

1 INTRODUCTION

The thesis will use interviews of croupiers to find out what the most important and prevalent musculoskeletal and occupational issues are. Questions included were about the work related loading factors of being a croupier, ergonomics, musculoskeletal pain, and sleep. The literature review investigates the most effective methods of prevention and heath promotion.

In 2011, United States companies spent around 50 billion dollars on direct costs of musculoskeletal disorders (www.ergo-plus.gov 2018) Swedish insurance statistics from 1994 showed that 18% of all paid sick leave for musculoskeletal disorders came from neck-shoulder problems. At that period of time it was almost equal to low back pain (Nygren A, Berglund A, Von Koch M. 1995). In the United Kingdom in 2016/2017 8.9 million working days were lost due to work-related musculoskeletal disorders. 45% of all musculoskeletal disorder cases involved the upper limbs or neck. Cases involving the neck or shoulder were approximately 15% of all cases. (www.hse.gov.uk 2018.)

Croupiers are shift workers who perform repetitive movements with their upper body. These loading factors include different physical, psychosocial issues. Questions will be asked to croupiers to find out what they feel their workload and workability is and what they feel impacts their own occupation the most. This includes a wide variety of possibilities due to the nature of the occupation. The occupation is a night job that requires hundreds of repetitive external rotation movements of the right arm. Card dealing can be performed standing but is usually performed while sitting.

2 AIM AND OBJECTIVES

The aim of this thesis is to create a pamphlet for shift workers who perform repetitive upper body movements.

The objective of the pamphlet is to give information on work related musculoskeletal and psychosocial loading factors, and prevention concerning musculoskeletal and psychosocial symptoms. This will allow these workers and employers to have more information to maintain work ability pertaining to these musculoskeletal and psychosocial loading factors.

The information for this thesis was obtained by literature review and interviews. For this thesis I interviewed croupiers who deal Blackjack in Finland.

3 CROUPIER

A croupier or card dealer is an attendant that assists at a table that hosts, rakes in bets and pays winnings out and officiates the game. In Blackjack, croupiers deal the cards and control the flow of the game between the players. While the game is going on, the croupier will deal cards to the customers' wishes within the ruleset and also engage in friendly conversation. (Website of Veikkaus 2018.)

Blackjack or 21 is a random-chance card game where the point of the game is for the player to beat the house. To win, the player's cards must equal higher than the house's cards without exceeding 21 or have the dealer draw cards that exceed 21. Players do not play against each other but have their own individual games against the house. (Website of Veikkaus 2018.)

While the length of night shifts vary between cities in Finland, ranging from five hours to eight hours, the typical evening is similar. There are also morning shifts that may start at 7:30am or 9am that go until 3-6pm. It is also possible to do two shifts in a row

which may make the workday 10-12 hours long. (personal communication on 23.4.2018.) A croupier's job is to deal cards to customers. The amount of customers at the table per game varies from one customer to seven customers. This means that in just starting one round of Blackjack the dealer may deal up to 15 cards including his or her own (personal communication on 23.4.2018). Some shifts end at 4 a.m. in the morning which means that the croupier may be going to sleep anywhere between 4:30 a.m. or 6 a.m. The job goes throughout the night so the croupier's sleeping rhythm will change each week or they have this sleeping rhythm throughout the year while they work full-time. (personal communication on 25.4.2018.)

4 LOADING FACTORS

4.1 Definitions

Loading factors can be defined as an exposure that may decrease a person's physical or psychological well-being and workability. The most common physical loading factors include lifting heavy items, repetitive movements, working in awkward or static postures, and sitting down for prolonged periods of time. (Website of Finnish Institute of Occupational Health 2018.) Excessive workloads, lack of involvement, lack of support and high job pressure are the most common psychosocial loading factors (Website of Finnish Institute of Occupational Health 2018).

The biggest musculoskeletal issues coming from these loading factors are low back pain and neck and shoulder pain. 35% of cases are low back pain, 30% are neck pain and 20% are shoulder pain. (Website of Finnish Institute of Occupational Health 2018.)

4.2 Shift Work

The term shift work is used to cover a work shifts that can change according to a set schedule. These shifts can include morning, evening or night shifts. In occupations

with work shifts, workers are able to work in any of the different times of shifts thus having a changing work schedule. (Website of Canadian Centre for Occupational Health and Safety 2018.)

There are several possible consequences of shift work. Drake et al (2004) found that approximately 10% of shift or rotation workers suffer from shift work sleep disorder. People suffering from shift work sleep disorder are also at a higher risk for behavioral and health-related morbidity that are associated with sleep-wake symptoms. (Drake et al. 2004, 1453-1462.)

Chronic pain can come from sleep disturbance. A follow-up study conducted by Lundberg (2008) tackled this issue. The study looked at 2520 men and 2140 women. The follow up questionnaire was responded to by 2225 men and 1915 women. The aim of the study was to investigate the role of sleeping issues and job strain. (Lundberg 2008, 253.) The one-year risks were for shoulder, neck and lumbar back pain. Excluding factors for the study where persons over the age of 65, people who worked for less than 30 hours per week, people who were on a sick leave longer than one year and people who in the past one year have had shoulder, neck or lumbar pain as defined in the study. All persons with medical conditions that may have interfered with sleep quality were also excluded. From these people it was found that 1 in every 15-20 new cases of musculoskeletal chronic pain could be attributed to sleeping problems. A high mechanical exposure, as defined by the authors of the study as maintaining the same body posture, repetitive movements or force, was associated with pain throughout the analysis. (Lundberg 2008, 253.)

Kecklund and Axelsson (2016) showed that shift work can led to the loss of sleep, in a review of 38 meta-analyses and 24 systematic reviews. It also included narrative reviews and articles. Sleep loss is mainly associated with early morning shifts and night shifts. They found a link between shift work and accidents, type 2 diabetes, weight gain, coronary heart disease, stroke and even cancer. They also found that laboratory studies indicate that shift work increases stress and cognitive impairments. (Kecklund and Axelsson 2016, 1.)

4.3 Sedentary Work

Sedentary work also has issues. Card dealers have the choice between working while sitting and working while standing (personal communication on 23.4.2018). A cohort study by Ariën et al (2001) of 1334 workers found that sitting for 95% of working time was a significant risk for neck pain (Arien et al 2001, 203).

More sitting down at work means less standing time in general. The relationship between standing and mortality has been an interest in research for years. There was an idea that standing may be sedentary behavior and therefore may be hazardous to an individual's health. (Katzmarzyk 2014, 940-941.) In a study of 16,586 Canadian adults aged 18-90, researchers studied the relationship between sitting/standing and mortality. After the age, sex and additional covariates were adjusted, they found there was a negative relationship between standing and mortality. (Katzmarzyk 2014, 940.) This meant that the more standing someone did during the day, the less mortality there was in that group (Katzmarzyk 2014, 941-942). In occupations like being a cashier or croupier, there could be adjustments made to increase standing during the day (Katzmarzyk 2014, 945).

A review by Helajärvi et al. (2013) shows the health risks of sedentary behavior. They describe how in the 1950's there was knowledge about the health risks of sedentary behavior. London's double decker bus drivers and other drivers had a higher risk of heart disease than for example, walking postmen. (Helajärvi et al. 2013, 51.) In the review they found that there are connections between sedentary behavior and type 2 diabetes, mortality, high BMI and heart disease (Helajärvi et al. 2013, 51). When a healthy group of men reduced their daily steps taken from ~10000 to ~1300 per day there were consequences. This decrease in standing and walking time increased the amount of internal fat in the abdominal cavity, decreased cardiovascular conditioning and decreased insulin sensitivity. (Helajärvi et al. 2013, 51-52.)

Hallman et al. (2015) created a cross-sectional design study which investigated the relationship between objective sitting time at work of blue collar workers and neck

and shoulder pain. The subjects were measured using triaxial accelerometers that were placed on the thigh and on the trunk. The subjects were then filtered into three different categories of sitting time, low, moderate and high. (Hallman et al. 2015, 1031-1033.) The subjects then rated their neck and shoulder pain intensity from the past month on a numerical scale of 0 to 9. 0 to 4 on the numerical scale was categorized as low intensity pain and >4 was rated as high intensity pain. (Hallman et al. 2015, 1031-1032.) Workers who were in the category of high sitting time were more likely to have high intensity pain than workers in the lower pain intensity categories. The researchers found that there is an association between sitting time at work, and total sitting time per day, and neck and shoulder intensity. (Hallman et al. 2015, 1031.)

Hallman et al. (2016) created another study on the connection between sitting time and shoulder and neck pain in blue-collar working counting objective sitting time with accelerometers. In this study they attached accelerometers to the thigh, hip, trunk and upper dominant arm to measure the sitting time of 659 Danish blue-collar workers. (Hallman et al. 2016, 823-825.) They calculated the sitting time over a period of four consecutive days. The sitting times were separated into work and leisure sitting, and proportion of time spent sitting in brief bursts (0-5 min), moderate (>5-20 min) and prolonged (>20 min) periods. They then measured the neck and shoulder pain intensity on a scale of 0-10. Again, they broke up the pain scale into a lower score of less than 4 and a higher score of higher than 4. (Hallman et al. 2016, 824-826.) In this study they found a positive association of neck and shoulder pain with moderate periods of occupational sitting. Brief bursts were negatively associated with neck and shoulder pain and prolonged occupational sitting had no association with neck and shoulder pain. When including sitting period of leisure, they did not find any association with brief, moderate or prolonged periods of sitting time. (Hallman et al. 2016, 828-832.)

Using data from the Danish Physical ACTivity cohort with Objective measurements cohort study, Hallman et al. (2016) conducted another study trying to determine the relationship between objectively measured sitting time and neck and shoulder pain. The pain was measured in 625 blue-collar workers for a period of 1 year, where the pain registered was sent via text messages. (Hallman et al. 2016, 1-2.) There were a total of 14 text messages sent during the 1 year period and the pain was measured in a numerical rating of 0 to 10 (Hallman et al. 2016, 3). The objective sitting time was

gathered with an accelerometer and the workers wore the accelerometer for 4-5 days for 24 hours a day (Hallman et al. 2016, 2). On average the total amount of sitting time at work was 31% at work and 53% during leisure and only 29% of the population was completely free of pain. In the past year 75% of people reported at least one day of pain, 25% reported more than 30 days with pain and 17% reported over 90 days of pain. In general throughout the year general pain intensity decreased. A higher sitting time at work showed a significant association with higher pain intensity but also was associated with a faster decline in pain intensity over the whole 12 months. (Hallman et al. 2016, 4-8.)

As the percentage of overweight and obese people increase over time, it is important to study the relationship between sitting and overweight/obesity. Health problems of overweight and obesity include cardiovascular diseases, which were the leading cause of death in 2012, musculoskeletal diseases, diabetes and some cancers. (Website of the World Health Organization, 2017.) If workers are sitting during work hours this means they are sitting for most of their hours being awake when including sitting time at home. A sedentary work life includes many health risks and there should be health promotion for employees in sedentary occupations. A sedentary work life may lead to overweight and obesity. (Website of the World Health Organization, 2017.)

A longitudinal study was conducted in the United States of America on the occupational sitting times of 5,285 adults aged 38-45 years old. The researchers we looking at whether or not there is a relationship between occupational sitting time and BMI (body mass index). The study was done by self-reported height and weight over a period of 8 years from 2002 to 2010. (Lin et al. 2015, 117.) The study found that there was a positive correlation between higher occupational sitting time and BMI. After controlling for education, work hours, age, and hours of vigorous and light/moderate physical activities the results showed that longer sitting time was associated with higher BMI for the whole sample and for men. The results did not show a statistically significant association between sitting hours and BMI for women. The conclusion of this study was that it supports the idea that sitting time at work should be lowered to decrease health risks associated with higher BMI. (Lin et al. 2015, 119-122.)

Another study conducted by Eriksen et al. (2015) corroborated the findings in the Lin et al. study. This was an analysis of the Danish Work Environment cohort of 3,482 Danish working adults. This study looked at the relationship between the increase or decrease of occupational sitting time and BMI over 5 years from 2005 to 2010. (Eriksen et al. 2015, 1.) At a baseline level, 43% of men and 36.1% of women had high occupational sitting time (>25 hours per week). The proportion of people who at the end of the study were counted as obese (>30 BMI) increased by 3% in both men and women. (Eriksen et al. 2015, 1-2.) The people were categorized into groups based off of whether they increased or decreased the amount of sitting time at work (Eriksen et al. 2015, 2). The difference in this study compared to the Lin et al. study was that the results in this study showed an increase in BMI for women. This means that there may be a correlation between sitting time and BMI not only for men, but also for women. Not only did this study show an increase in BMI for women but there was an average increase of BMI of 0.13 whether or not they decreased or increased their amount of sitting time. In this study men did not have this increase in BMI when they decreased their sitting time. (Eriksen et al 2015, 3-4.)

4.4 Repetitive Movements

Being a card dealer or cashier requires thousands of repetitive external rotation and horizontal abduction movements of the right arm in a single work shift (personal communication on 25.4.2018). A study conducted by Moore, Ranney and Wells (1995) showed that 54% of workers in a physical assessment of 146 female workers in highly repetitive jobs had some musculoskeletal disorder relating to the upper limb. Furthermore, the study found that 33% of workers had a combination of problems that may have included muscle pain and tenderness in the neck and shoulder area or forearm and hand area. (Moore, Ranney, Wells 2015, 1408.)

Andersen et al. (2002) performed a study that was looking to evaluate the effect of individual characteristics and physical and psychosocial workplace factors on neck/shoulder pain including pressure tenderness in the muscles. They had 3,123 study participants. (Andersen et al 2002, 660-661.) The physical risk factors were analyzed

and evaluated by video observations. The researchers used the job content questionnaire to assess psychosocial risk factors. (Andersen et al 2002, 662.) The researchers found that 7% of participants who performed repetitive work had neck/shoulder pain with pressure tenderness. They found an association between neck/shoulder pain and high repetitiveness and high force. The researchers found that neck/shoulder pain has a multifactorial nature and that work-related physical and psychosocial factors are important in understanding neck/shoulder pain. (Andersen et al 2002, 663-665.)

A systematic review study found similar results. Van der Windt et al. (2000) did a systematic review on 29 studies. They were trying to evaluate the available evidence on occupational risk factors of shoulder pain and used the study populations for results for the association between risk factor variables and shoulder pain. (Van der Windt et al 2000, 433.) The risk factors related to physical load were a heavy work load, awkward postures, repetitive movements, vibration and duration of employment. There were consistent findings between repetitive movements, vibration and duration of employment. (Van der Windt et al 2000, 437.) For the psychosocial findings they found that at least one study showed findings between shoulder pain and the following factors: high psychological demands, poor control at work, poor social support and job satisfaction but that there were no consistent findings. (Van der Windt et al. 2000, 437-438.) The researchers concluded that shoulder pain is likely the result of many factors, including physical load and the psychosocial work environment (Van der Windt et al. 2000, 441).

Pope et al. (1997) shows similar findings in a random sample study conducted in the Greater Manchester area of the United Kingdom. The information was collected by a questionnaire with specific questions about symptoms in the shoulder region and related disability. (Pope et al. 1997, 316.) The researchers also obtained a lifetime occupational history which included physical exposures, working conditions and psychosocial aspects of each workplace. They analyzed occupational exposures at the time of onset of symptoms. (Pope et al. 1997, 317.) For men, there was a high increase in risk when carrying weights over one shoulder. Men who reported having to take rests due to aching muscles or joints or having pain at the end of a shift had an increased risk of shoulder pain. In the group of men who reported that they worked with their hands above shoulder level, using their arms or wrists in a repetitive way or stretching down

to reach below knee level had twice the risk of shoulder pain than those men who did not report these factors. (Pope et al. 1997, 318-320.) The most common symptoms of the men with shoulder pain were “having to change position often in bed” (80%), “difficulty carrying things” (59%) and “sleeping less well” (58%) (Pope et al. 1997, 318). This meant that over half of men who reported shoulder pain had more difficulty sleeping and the quality of the sleep was not good (Pope et al. 1997, 318). The women only had an increase in risk of shoulder pain when they used their wrists in a repetitive way. People who reported that their work cause a lot of stress or worry “most of the time” or “always” more often had shoulder pain. A job that was reported as stressful had double the risk of shoulder pain, and a job that was reported as monotonous had three times the risk of shoulder pain. (Pope et al. 1997, 319-320.)

Another study conducted by Pope et al. (2001) showed similar results but also found a correlation between physical risk factors and women. This was a cross sectional survey of 775 workers at five manual occupational setting in Manchester, United Kingdom. The prevalence of pain was similar in all five occupational settings (post office, supermarket, department store, packaging factory, hospital). A higher proportion of older employees had disabling shoulder pain. (Pope et al. 2001, 852.) The physical risk factors observed were: working above shoulder level, lifting with one or both hands, carrying on one shoulder, lifting above shoulder level, pushing or pulling weights and repetitive use of the wrists and arms (Pope et al. 2001, 852). Repetitive movements of the wrists and arms for continuous periods of 10 minutes or more was a significant risk for shoulder pain and there was almost a doubling of risk at these durations. Again, they found that reporting shoulder pain was higher in both men and women when they reported high stress levels or that their work was very monotonous. (Pope et al. 2001, 853-855.)

In an epidemiological research study conducted by Sarquis et al. in 2016, it was found that there were differences between subcategories of neck pain. This study included a questionnaire that was responded to by 12,195 workers in 47 occupational groups in 18 different countries. These occupational groups mostly included office workers, nurses and manual laborers. After an interval of 14 months there was a follow-up questionnaire that was responded to by 9,150 of the workers from 45 occupational groups. (Sarquis et al. 2016, 1028.) The findings showed that most neck and shoulder pain had

come after there was pain at another anatomical site or during pain at another anatomical site (generalized pain). This type of neck and shoulder pain was also more disabling than pain that was only localized in the neck and shoulder area. They also found that this type of pain may have a stronger association with a tendency to somatize the pain. People whose pain was limited to the neck and shoulder area tended to be younger than people with generalized pain. In this study they also found that neck and shoulder pain is more prevalent among women than men and also at older ages. They found a correlation between localized neck and a prolonged use of a keyboard and also shoulder pain and a prolonged elevation of the arms at work. (Sarquis et al. 2016, 1032-1036.)

There has been evidence shown for the connection between neck and shoulder pain and manual material handling and trunk flexion or rotation. A systematic literature research on longitudinal studies was done by Mayer, Kraus and Ochsmann in 2011. This study was able to find strong evidence for a connection between shoulder complaints and manual material handling, vibration, trunk flexion or rotation and working with hands above shoulder level. (Mayer, Kraus, Ochsmann 2011, 587.) The inclusion criteria was met by 21 longitudinal studies from the years 1975 to 2009, of which 19 were indicated as high-quality studies. All of the studies were looked through by at least two researchers who followed a strict inclusion criteria. (Mayer, Kraus, Ochsmann 2011, 587-560.) In conclusion the researchers analyzed that these longitudinal studies allowed for new evidence when reviewing for these four cause-effect chains between the different physical exposures and neck or shoulder pain (Mayer, Kraus, Ochsmann, 2011, 601-603).

Work related physical findings relating to chronic neck pain was studied by Palmer & Smedley (2007) in a systematic review. They used 21 reports including four prospective reports that incorporated physical examination. Most of the studies included neck pain and palpation tenderness or neck-shoulder disorder. Out of all of the studies only two were considered as excellent. (Palmer, Smedley 2007, 170-171.) Physical loading factors included in the studies were repetitive work, static loading, neck flexion and force. Two of the studies that were rated as excellent both had a positive relationship between repetition and neck pain, the next two highest rated studies also showed a positive relationship. When considering all of the studies, the researchers concluded

that there is moderate evidence between repetitions at the shoulder. (Palmer, Smedley 2007, 184-185.) They found there was an almost as good causal relationship with neck flexion with repetition as with repetition alone (Palmer, Smedley 2007, 184). The other loading factors showed less of a causal relationship with neck pain than repetition, ranging from moderate, limited or insufficient evidence (Palmer, Smedley 2007, 185).

A systematic review was conducted by McLean et al. (2010) and it incorporated 14 independent cohort studies to investigate risk factors of non-specific neck pain. 13 of the studies included in the systematic review were assessed as high quality. All of the studies included had at least a 1 year follow-up. (McLean et al. 2010, 565.) The main findings of this study were that female gender, low social or work support, older age, high job demands, a history of low back or neck disorders were all linked to non-specific neck pain (McLean et al. 2010, 571-572).

A systematic review of 18 prospective longitudinal studies by Kraatz et al. (2013) looked at the evidence for psychosocial risk factors on the development of neck and shoulder disorders. The assessment of the quality of the studies was done by two independent reviewers using a standardized checklist. The psychosocial loading factors were based off of a model by Karasek (1998) which included psychological demands, decision latitude, social support, physical demands and job insecurity. (Kraatz et al. 2013, 375-376.) Within those categories, the study found strong evidence for an incremental effect of job demands, job control, social support and job strain on the development of neck and shoulder disorders (Kraatz et al. 2013, 390). The researchers conclude that the results must be carefully interpreted in order to support the idea that independent psychosocial loading factors may have a causal influence on developing musculoskeletal disorders. While they say that, they stress the importance for the need to develop preventative strategies to handle both physical and psychosocial factors. (Kraatz et al. 2013, 390-395.)

5 WORK ABILITY MAINTENANCE

5.1 Definitions

Work ability is a workers ability to be healthy and productive in the work place. The ability for a worker to be productive is tied to their health and to their functional capacity. (Website of Työterveyslaitos, 2018.) There are many variables that affect work ability. Unique physical and psychosocial demands of a specific occupation affect work ability as does the individual characteristics of a worker. (Website of Työterveyslaitos, 2018.)

The workplace affects all of us in society. It affects an individual's physical, psychosocial and economic well-being which in turn affects the individual's family, community, and thus society as a whole. (Website of World Health Organization, 2018.) Any activity which maintains work ability or promotes workers' health is work health promotion. Health promotion is also teaching to avoid negative lifestyle factors and occupational exposures. (Website of World Health Organization, 2018.)

Work ability maintenance is the culmination of long term planning between the employee, employer and occupational health care professionals. Maintaining work ability is to have the energy and motivation to be able to safely perform duties at work and to prevent any physical or psychosocial symptoms. (Website of the Ministry of Social Affairs and Health, 2018.) It is the job of the employer to create a work environment that does not endanger the employee. The employee complies with the safe working methods and the instructions that have been given. Health and safety professionals at work help to promote work ability and health in the workplace with their own expertise. The employee is responsible for his or her own work ability. The maintenance of work ability is especially important if a worker works in an occupation that have physical or psychosocial loading factors. (Website of the Ministry of Social Affairs and Health, 2018.) The Finnish Occupational Health Care Act 1383/2001 describes work ability maintenance as any systematic or purposeful activity that helps support and

promote the work ability and functional capacity of an employee. This is done in co-operation of the employee, employer and occupational health care professionals. (Website of Finlex, 2018.)

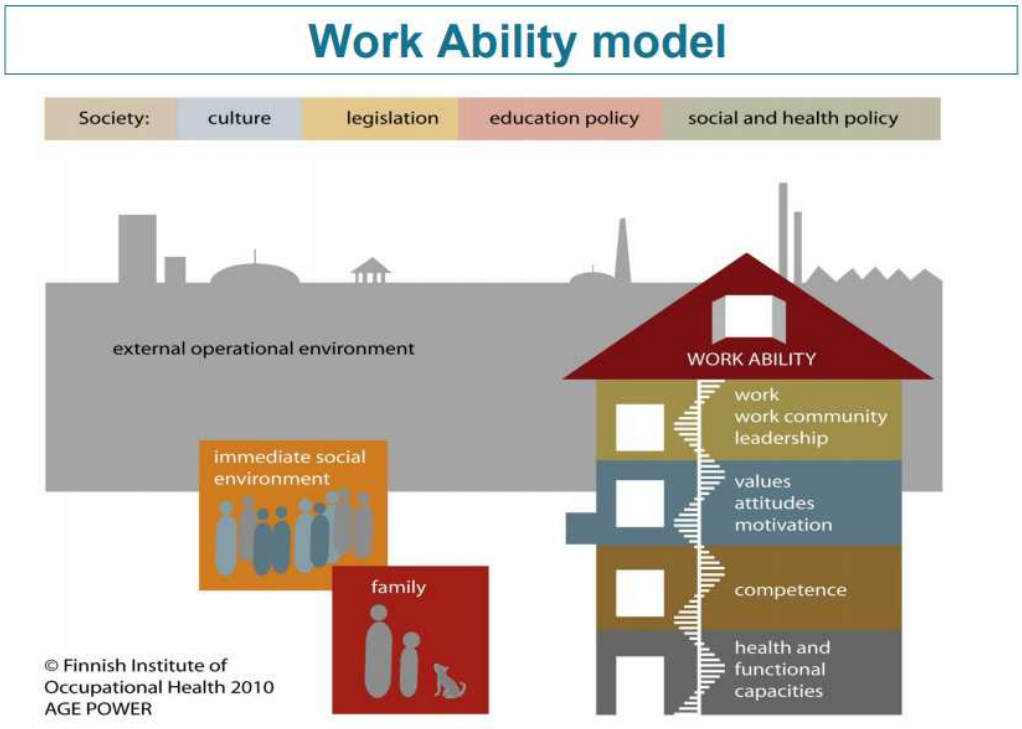

FIGURE 1. Work Ability Model

The figure 1 above is the Work Ability House Model by Juhani Ilmarinen (2006). In this model balance is key between all components. The curved staircase in the house represents the idea that all four floors of the house are intertwined. (Ilmarinen & Vainio, 2012, 5.)

The first floor, health and functional capacities, represents the individual's physical and psychosocial well-being. The individual's way of living, the healthiness of the living environment and genetic heritability are important in this floor. A way of living that promotes health and performing activities that promote and individual's health are key to maintaining an individual's work ability. The stronger the bottom floor, the better ability there is to maintain a high work ability. (Ilmarinen & Vainio, 2012, 5.)

The second floor, competence, includes the individual's knowledge, skills and competence. Professional skills, continuing to learn and further education are also included in this floor. The ability to adapt to a changing work life and new challenges is a part of the idea of lifelong education and learning. A good job is able to provide opportunities to learn and improve. (Ilmarinen & Vainio, 2012, 5.)

Floor three is about the individual's values, attitudes and motives. An example of values is whether or not the individual agrees with the company's values and attitudes. Other examples include whether or not the individual feels appreciated, have they received recognition, can they trust their manager, are people treated fairly and do they receive support from their boss and co-workers. The motivation to work is directly tied to the individual's views their relationship with their own job. (Ilmarinen & Vainio, 2012, 5-6.)

The fourth floor, work, is the heaviest and widest floor of them all. This is because it incorporates work environment, work assignments, work loading, work atmosphere, employee and manager work. The job of a manager or a leader in a company means trying to make the work as efficient and productive as possible without risking the health of the employees. The fourth floor is also important for managerial work because managers have the responsibility and mandate to make any necessary improvements to the work process. (Ilmarinen & Vainio, 2012, 6.)

On the third floor there is a balcony. This balcony has a view to two other factors: family and immediate social environment. These factors affect the third floor. The lifestyle of the family has a direct effect on the individual's lifestyle, way of living, attitudes and values. The immediate social environment also affects the third floor. Extended family, friends and acquaintances are the immediate social environment. Different hobbies are also included in this category because many of these hobbies are practiced together with friends, family or acquaintances. That which is happening in the immediate social environment has the ability to either strengthen or weaken the individual's balance at work. (Ilmarinen & Vainio, 2012, 6.)

5.2 Legislation

In Finland, according to the Occupational Health Care Act 1383/2001, it is the employer's responsibility to provide employees with occupational health care services (Website of Finlex, 2018). The Act on Occupational Safety and Health Enforcement and Cooperation on Occupational Safety and Health at Workplaces Act 701/2006 has many provisions and objectives. An application of this Act is to provide a procedure for the monitoring of compliance with the provisions on occupational safety. The objective of this act is to secure compliance with occupational safety and health provisions. This also includes improving the work environment and working conditions by means of enforcement which are carried out by occupational safety and health authorities. (Website of Finlex, 2018.)

The European Framework Directive (1989/391/EEC) is a legally binding directive that laid out general health and safety principles for all European Union member countries. These principles include the responsibilities of the employer, the rights of the workers and using risk assessment to continuously improve company processes and workplace health and safety representation. The European Union sets a bare minimum for all member countries. Countries are allowed to apply stricter rules if the wish. (Website of the European Agency for Health and Safety, 2018.)

5.3 Benefits of Standing

Persons who live a more sedentary lifestyle, including sitting at work have a higher mortality rate. This has been shown in two large studies. (Katzmarzyk et al. 2007, 998, Katzmarzyk et al. 2014, 940.) The study conducted in 2007 by Katzmarzyk et al. included 17,013 Canadians aged 18-90. There was a follow-up period of 12.9 years. During that period there were 951 deaths in men and 881 deaths in women. (Katzmarzyk et al. 2007, 999.) Between the survivors and decedents, there were no statistically significant differences in the amount the groups smoked cigarettes or how much alcohol they were consuming (Katzmarzyk et al. 2007, 1000). The area which showed a statistically significant difference was in the amount of sitting time and there

was a clear correlation with mortality in all four of the different categories of sitting times. The people who were sitting down for much longer also had a higher average BMI, were older in age and were less physically active. Even within the physically active people there was a correlation between sitting and risk of mortality. (Katzmarzyk et al. 2007, 1000-1003.) The researchers found that sitting seems to have an independent association with mortality rates. Their results also showed that long amounts of sitting cannot be replaced by physical activity even if a person is exceeding minimum physical activity requirements. (Katzmarzyk et al. 2007, 1003.)

There have been large-scale studies done on the association between sedentary time and type 2 diabetes and/or metabolic syndrome. The Maastricht Study done by van den Berg et al. in 2016 was conducted with 2,497 participants. In this study they used accelerometers for 24 hours a day for a total of 8 consecutive days to determine the amount of time spent walking, standing or sitting. The participants did an oral glucose tolerance test to determine their glucose metabolism status. (Van den Berg et al. 2016, 710.) From this study they were able to determine that on average people with type 2 diabetes spend more of their time per day sitting (64.5% of waking time) than people with metabolic syndrome (57.6% of waking time) (Van den Berg et al. 2016, 711). Every extra hour spend sitting meant a 22% increase in the odds for type 2 diabetes. When participants with type 2 diabetes on insulin medication were taken out of the analysis, the results did not change and because of this the researchers suggest that an increased sitting time per day precedes type 2 diabetes. (Van den Berg et al. 2016, 711-714.)

A study by Bankoski et al in 2011 corroborates the findings from the Maastricht Study. 1,367 men and women aged above 60 were followed from 2003-2006. They used accelerometers to calculate how much time spent standing, walking or sitting. (Bankoski et al. 2011, 497.) People with metabolic syndrome spent more of their waking hours sitting (67.3%) than people who did not have metabolic syndrome (62.2%). The people with metabolic syndrome also had average longer sedentary bouts. (Bankoski et al. 2011, 499.) They found that the amount of sitting time was strongly related to the risk of metabolic syndrome, completely independent of physical activity level. The researchers recommend less sitting time and avoiding prolonged periods of sitting time. (Bankoski et al. 2011, 500-501.)

A meta-analysis of ten studies on sedentary behavior and type 2 diabetes by Hamilton M, Hamilton D. & Zderic T, 2014 shows a stronger correlation between sitting time and type 2 diabetes. Their study suggests that there is a 112% increase of risk for type 2 diabetes with high sedentary periods during waking hours. It also indicates a significantly stronger risk for metabolic syndrome. (Hamilton M., Hamilton D. & Zderic T., 2014, 19-20.)

Healy et al (2008) studied that total sedentary time is positively associated with obesity. 168 participants were used in this cross-sectional study from the 2004-2005 Australian Diabetes, Obesity and Lifestyle study. Sedentary time was measured by an accelerometer that was used during waking hours for seven consecutive days. (Healy et al. 2008, 661.) They found that breaks in sedentary time is beneficially associated with waist circumference and BMI. The researchers state that the study provides evidence for how important it is to avoid prolonged uninterrupted periods of sitting time. (Healy et al. 2008, 663-665.)

Based off of the research done by Dr. James A. Levine there is also evidence that too much sitting is a higher risk for different health concerns including obesity and cardiovascular diseases. He also states that higher sitting times have up to 50% increase in risk of mortality from any cause and 125% increase in risks of an event from cardiovascular disease. The findings show that sitting is an independent risk factor and that the only way to negate the effects is to spend less time sitting at work and at home even if you are engaged in vigorous physical activity for two hours a day. (Website of Mayo Clinic, 2018.)

Decreasing the amount of sitting also relieves pain. A study by Pronk et al. (2011) conducted a study trying to see whether decreasing the amount of sitting decreased pain levels. Over a 7 week period 34 people were studied, 24 in the intervention group and 10 in the control group. (Pronk et al. 2011, 1.) The intervention group received a sit-stand device to be used during work days while the control group did not (Pronk et al. 2011, 1). They were able to reduce sitting by an average of 66 minutes per day and based off of the survey responses they were able to decrease levels of pain by 54%. The pain was relieved in the upper back and neck. (Pronk et al. 2011, 5.)

Ognibene et al. (2016) also showed that standing can reduce pain. 46 university employees were randomized into intervention (sit-stand workstation) and control groups. They were followed for a three month period and responded to surveys in weeks 1, 6 and 12. The surveys were a modified brief pain inventory and the Roland Morris Disability Questionnaire. (Ognibene et al. 2016, 287.) Over the period of three months the people who were in the intervention group reported a significant reduction in current and worst pain over time (Ognibene et al. 2016, 290-293). The pain that was measured was low back pain (Ognibene et al. 2016, 287).

Standing is also a way of increasing energy expenditure throughout the workday. Standing increases energy expenditure by 4.1 kcal per hour when comparing to sitting in an office chair. The only issue with standing is that most adults would rather perform clerical work while sitting than standing because they simply like it more. (Beers et al. 2008, 353-354.)

5.4 Intervention Plans

It is possible to perform a short 10 minute exercise routine at work that will decrease pain and increase back muscle strength (Jakobsen et al. 2015, 158). A randomized control trial was able to show this. Over a 10 week period two groups of healthcare workers performed a 10 minute workout either at home or at work. This workout was performed five times per week. (Jakobsen et al. 2015, 155.) The work group's pain sensation decreased significantly compared to the home group (Jakobsen et al. 2015, 158). To replicate the results from this it would be necessary for a worker to consult a physiotherapist to show them how to do the exercises and how to increase the intensity. It would also be necessary for the worker or employer to purchase an elastic band to use. The patients in this study were also offered patient education courses on ergonomics. (Jakobsen et al. 2015, 155-156.) This study supports the idea that there would be a benefit for the employer to hire a physiotherapist to teach employees how to exercise at work or even at home (Jakobsen et al. 2015, 159-160).

Specific exercises for the scapular muscles like the lower trapezius and serratus anterior muscles have given good results in decreasing pain in the neck and shoulder area. 47 employees performed workout sessions three times per week for 20 minutes per session. (Andersen et al. 2013, 316.) Compared to the control group, the scapular muscle training group had a clinically relevant effect on chronic pain (Andersen et al. 2013, 321).

Only two minutes of exercise per day five times per week with an elastic band can reduce pain. When patients were put into exercise groups who either worked out for two minutes per day, 12 minutes per day or weekly information on general health, there were clear results. After ten weeks, when comparing to the information group, both groups of two minutes and 12 minutes had decreases in chronic pain levels. This shows that a progressive exercise program of even two minutes per day can decrease pain levels. (Andersen et al. 2011, 440-443.)

6 INTERVIEWS

6.1 General Information

For the purpose of this interview I interviewed five croupiers who work for Veikkaus Oy. The interviews were phone interviews. All of the croupiers have worked for over two years. The amount of work shifts per week varied among the croupiers. The amount of shifts varied from two to seven shifts per week.

6.2 Purpose

The purpose of the interviews was to find out what the croupiers feel are loading factors in their work. Questions revolved around the physicality of the work, the possible symptoms of shift work and attitudes towards possible workplace interventions. The physical loading factors identified by the croupiers as being loading were repetitive

movements and sitting down. I also asked if they ever felt pain during the work. For the subjective evaluation of pain, I used the Visual analogue scale (VAS). None of the croupiers reported any history of chronic neck or shoulder pain, or pain lasting longer than 24 hours.

6.3 Sleep

None of the croupiers have had any difficulty sleeping in the past year. Four of the croupiers said that their sleeping rhythm changed especially if they worked night shifts and that sometimes this can affect their ability to recover from work. Also for four of the croupiers, after a night shift it would take them a few hours until they would be able to sleep. This means that they would go to sleep at around six o'clock in the morning and it would be hard for them to wake up on the following Monday. If they would work mostly morning shifts and sometimes an evening shift, it was easy for them to keep a normal sleeping rhythm.

All of the croupiers said that they would only sometimes feel tired before work. They also all felt tired during work only if there were a lot of players playing for a long time, or if there were only a few people playing during a whole work shift. During night shifts the croupiers said they usually felt tired because it was four o'clock in the morning.

6.4 Repetitive Upper Body Movements

Repetitive movements was one of the loading factors identified by the croupiers. All of the croupiers estimated that they perform from 3000 to 4000 repetitive upper body movements during one shift. A reason given for why it can be loading is because there are so many of the movements and they are performed all the way from the left of the table to the right of the table. The movements are also all performed only with the right arm.

The reported pain by croupiers who had pain, was similar. This pain was either three or four on the VAS and was described as stiffness and/or muscle strain. The croupiers who had this pain all said that this pain was felt after they have been dealing cards standing for approximately 60 minutes straight. They all said that the muscle strain would go away after they have had a break but would come back if they would deal cards for another 30 to 60 minutes straight. Only one of the croupiers reported that they had pain after a work shift, but even then it happened very rarely and went away quite quickly after work had ended.

Out of these croupiers who had pain, they all felt that when they were in worse physical condition they had this muscle strain pain more often during work and at a higher intensity. All of the croupiers said that they currently exercise at least three times per week.

Those who felt pain in their neck or shoulders said that it was always good to have a break. During this break they are able to walk around and stretch their neck and arms which they said relieves the pain.

6.5 Sitting and Standing

There was a big variety in how the croupiers deal cards. At least one croupier stood during most work shifts (80% of a shift), at least one croupier sat down during work shifts (80%), and some said that it always changes.

The croupiers who stated that their pain probably came from sitting said that it came when they had been sitting for between 30 to 60 minutes. Just like those who felt that repetitive movements were causing symptoms, the people who felt pain from sitting said that having a break made the pain go away. The pain would then come back if they continued to work down while sitting.

There was no clear theme for whether the croupiers either sat or stood during their work breaks. Usually the croupiers said that they would want to do the opposite of how

they were dealing cards. This is not always possible because it depends on where they are working. If a croupier was standing for the whole time dealing cards and they wanted to sit down for their break, it might not be possible because the bar may be full and there might not be any places to sit outside or in the back room of the bar or night-club.

The variety in answers shows that getting pain during work shifts is individual. Those who sat down for most of the work shift and did not have shoulder or neck pain said that it could possibly be because they are in good physical shape.

6.6 Workplace intervention

The workplace intervention I asked about was performing exercises for five to 15 minutes at work during a break. When asked about this workplace intervention, all of the croupiers said that it would be a beneficial idea to have some workplace intervention in place. They said that it would be important that they learned the exercises correctly before they started some sort of workplace intervention. Even those who said they personally did not need it said that it would definitely be helpful to people who do have pain, because most croupiers know a croupier who does have neck or shoulder pain.

7 DISCUSSION

This study investigated shift workers who perform repetitive upper body movements. The main findings from the interviews were that after long periods of time (20 minutes) repetitive upper body movements were viewed by croupiers as a loading factor. Several of the interviewees said that they felt muscle strain in the upper back and shoulder areas after a session of continuous repetitive upper body movements. This is in line with results from studies in the literature review of this thesis that show that repetitive movements are a physical loading factor (Van der Windt et al 2000, 437).

While the literature review showed that sitting down was a loading factor, there was no obvious findings from the interviews. There were both croupiers who sat down for most of their work shifts who did not have any physical symptoms and there were croupiers who did feel physical symptoms. In general most of the croupiers had a combination of both sitting and standing during a work shift. It depended on different variables for example the amount of people playing or how tired they were. The connection between sitting down at work and how tired a worker is could be investigated in a future study.

None of the croupiers felt that shift work had a great effect on their sleep quality. Everyone slept at least seven hours per night and said they have not had any sleeping problems in the past year. The croupiers did say that shift work did change their sleeping rhythm and that it is sometimes hard to get back into a normal sleeping rhythm during week days. A study showed that 10% of shift workers have shift work sleep disorder, but for this to be seen in croupiers, a larger interview pool would be necessary (Drake et al. 2004, 1453-1462).

The methods selected for the aim and purpose of this thesis were applicable. Using interviews to find out a more qualitative view of repetitive movements and shiftwork seemed a suitable choice as it gave a deeper insight into the motivations of workers. The main shortcoming of this study was the lack of data that was gathered and the amount of information that could be generalized to workers in these positions. The findings from the interviews and literature review done for this thesis can be used to maintain workability in professions where repetitive upper body movements are done. The loading factors found from the literature review to possibly cause pain were mentioned by some of the interviewees. These loading factors, for example time spent sitting, or repetitive movements without having breaks in between, can be identified in work places. Through the identification of these loading factors it is then possible to plan an intervention method (Jakobsen et al. 2015, 159-160). The interviewees said that an intervention plan like a short five to ten minute exercise program would be beneficial to workers. An interviewee also said that they would be interested in this idea as long as they were properly taught how to perform the exercises.

In the future a questionnaire could be designed to get responses from a higher number of workers in order to get a more general view of the questions proposed in this thesis. The use of such a questionnaire would allow for a quantitative method to be used in researching this topic. The topic should also be specified to one profession to be more accurate. Delimiting the topic was not possible in this case due to contractual reasons. As was notified by many of the studies performed on loading factors that were referred in this thesis, there needs to be more research done in the field (Andersen et al 2002, 665).

Based on the literature review, there is evidence that exercise decreases pain and maintains workability (Andersen et al. 2011, 440-443). An important topic to be investigated in this field is that what specific exercises or routines are the best for these purposes. After performing a study on different exercises, an exercise pamphlet could be made to be given to employees and employers.

According to the findings of this study, people grouped themselves into two groups based on their fitness level: those who by their own assumptions are physically fit, and those who are not. Those who were physically fit said they did not feel any pain after longer periods of repetitive arm movements or sitting. The ones who in the past were not physically fit in the past said they were more likely to feel these symptoms than when they are physically fit. Some previous studies have shown that the symptoms of these loading factors affect both physically fit and unfit people (Katzmarzyk et al. 2007, 1003). The fact that all of the interviewees at the time of the interviews exercised at least three times per week is another reason why there should be a larger questionnaire made for croupiers so there is variety in how much interviewees exercise.

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