Amina Miloudi & Sanni Hirsikangas

How to Combine Shift Work, Sleep and Physical Activity?

- A Handbook for Nursing Staff

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KAJAANIN AMMATTIKORKEAKOULU
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THESIS

ABSTRACT

School Health and Sports	Degree Programme Sports and Leisure Management
Author(s) Miloudi Amina and Hirsikangas Sanni	
Title How to Combine Shift Work, Sleep and Physical Activity? – a handbook for nursing staff	
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25% of the workforce in Finland is doing shift work or is following very irregular working hours. Health risks of shift work have been researched a lot, and the result show that shift work can be considered as a health risk. The most common health disadvantages caused by shift work are tiredness and sleeping problems, but also depression and stomach discomfort are quite common. However, individual differences can be great. (Partinen 2012.)

The purpose of this thesis was to create a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, work wellbeing, sleep and physical activity, fitness programs and demonstrations of exercises for nursing staff. The aim of the thesis was to provide information about the health disadvantages of shift work, the importance and suitable amount of sleep and physical activity, and also fitness programs for nursing staff in order to improve their well-being.

The research tasks were the following: 1) How could shift work, sleep and physical activities be combined, 2) What would be the sufficient amount of sleep, 3) How could sleep be scheduled with different shifts, 4) How could physical activity be scheduled with different shifts, and 5) What kind of physical activities would be good for shift workers?

We created a handbook and two Tyky Days which were based on our handbook. Our handbook became more extensive than we first thought. The chosen theoretical background supports the handbook and its activities. Because our thesis was quite extensive we had the possibility to develop our professional skills in many areas such as planning, instructing, fitness testing and product development.

Language of Thesis	English
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PREFACE

In summer 2012 we started to think if we could find a common topic for the thesis. At first we had many ideas, but it was very difficult to make a decision, what would be the best idea. Then we started to think about our own lives and families. We noticed that shift work had been creating problems in our everyday lives. We noticed how difficult it was to sleep and be physically active enough and at the same time be enough with the family and go to work.

The purpose of this thesis was to create a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, work wellbwing, sleep and physical activity, fitness programs and demonstrations of exercises for nursing staff. The purpose of the handbook was to provide information about shift work, sleep and physical activity, and help our clients to combine them.

We would like to thank our Teacher Supervisor Katri Takala and our Working life coordinator Marja-Leena Forsberg from an excellent co-operation with us during our thesis process. We would like to also thank all of our family members and friends who believed in us.

CONTENTS

1 INTRODUCTION

25% of the workforce in Finland does shift work or follows very irregular working hours. Health risks of shift work have been researched a lot, and the results show that shift work can be considered as a health risk. The most common health disadvantages caused by shift work are tiredness and sleeping problems, but also depression and stomach discomfort are quite common. However, individual differences can be great. (Partinen 2012.)

The commissioner for this thesis was Kainuu Social and Health Care Joint Authority, the intensive care unit of the Central Hospital of Kainuu (KAKS). All the employees of the intensive care unit are doing shift work. In the intensive care unit, they take care of both adult and child patients, and work includes continuous monitoring of patients bodily functions and supporting them with medicating and nursing. After discussing with working life supervisor it came clear that the nursing staff of the intensive care unit is very interested in physical activity and work well-being.

The purpose of this thesis was to create a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, work wellbwing, sleep and physical activity, fitness programs and demonstrations of exercises for nursing staff.

The main aim of the thesis was to provide information about the health disadvantages of shift work, importance and suitable amount of sleep and physical activity, and also fitness programs for nursing staff in order to improve their well-being. The second aim of this thesis was to plan and instruct health enhancing physical activities for nursing staff in the intensive care unit in the KAKS. Thesis process included a handbook containing information and fitness programs, and two Tyky days where we implemented fitness programs. The third aim of this thesis was to provide information for the KUAS about shift work, sleep and physical activity, which employees and students can apply to their studies and work.

2 WORK WELLBEING

Working ability begins to deteriorate in the age of 45 years if a person does not pay attention to physical activities and ergonomics. Weak oxygen uptake, heavy physical work, depression and weak health condition are the highest risk factors for disability pension. (Aalto 2006a, 11.)

Work and experiences related to work are important things when talking about work well-being. Every person in workplace affects the workplace's atmosphere by their own behavior. It is important to remember that problems do not solve by themselves. People should have enough knowledge to talk about issues with their real names. It is unnecessary to hurt each other feelings so it is important that people know how to give feedback in a positive light. (Aalto 2006a, 13,17.) Work wellbeing can be enhanced by including employees in decision making, building the working environment where partnership is encouraged, and understanding that the workplace has an impact on employees and the impact is not always enhancing health (European network for workplace health promotion). Lack of work wellbeing can lead to work stress. Prolonged work stress can result in burn-out, which can lead to depression or even incapacity for work. (Työterveyslaitos 2012.) Suitable amount of stress seems to be beneficial but if a person has too much stress, it might be dangerous (Nykänen 2009, 48).

One concept related to work wellbeing is Tyky activities. Tyky activities mean activities that are aiming for enhancing and supporting working ability and working order of employees. Researchers suggest that correctly implemented Tyky activities can improve employees working ability and health, and motivation, functionality and working environment of working places. Tyky activities are a part of working places own operations, and they are implemented in co-operation with employers and employees. Main objectives for Tyky activities are (1) development of work and working environment, (2) improvement of working community's and working organizations functionality, and (3) enhancement of employees health and professional know-how. (Työterveyslaitos 2013.) Tyky Day means Tyky activities that are arranged during one day (Tyky-päivä).

That what people are talking to themselves in their mind has great importance to general well-being, but also to wellbeing at work. Many people are talking in dismissive tone of themselves to others. This feature has been viewed as a sign of humility and modesty. People talk a lot about themselves and others, thus words should be alert. (Nykänen 2007, 86.)

One study found that people have been identified to think about during the day up to more than 60 000 ideas. This is actually a call so we can talk about ourselves to the positive or negative tone. In fact,

calls will affect a person's perception of self-efficacy, self-image, self-confidence, and life management. Whenever a person thinks something, the one is talking to himself. Positive self- call confirms our motivation, direction of vigilance, and strengthens our sense of self-efficacy. Negative self call is critical and questioning one's self. It is distressing and feeds self-oriented concerns. (Nykänen 2007, 86-87.)

People often make interpretations of situations and become frustrated because of that. Thus, events do not seem that way to frustration, but it is the interpretation of the situation in which we do. For example, "What have I done because the boss did not greet me in the morning? " (Nykänen 2007, 87.)

3 SHIFT WORK

The term *shift work* often consists of work outside the typical day time: for example fixed evening and night work, ordinary three-shift work and roster work. However, the definition of shift work is not agreed in literature. (Bøggild & Knutsson 1999, 85). In this thesis shift work means three-shift work which includes morning, evening and night shifts.

25% of the workforce in Finland does shift work or follows very irregular working hours (Partinen 2012). Knowledge about health disadvantages caused by shift work has increased quickly in the last ten years. Nowadays, shift work is known to cause, for example, occupational accidents, cardiovascular diseases, breast cancer and problems in the digestive system. (Okkonen 2007, 32.) Research results also suggest a positive relationship between the duration of shift work and the body mass index and waist hip ratio for both males and females (van Amelsvoort, Schouten & Kok 1999, 975). The healthiest form of shift work seems to be regular shift work in which shift are circling clockwise (Härmä & Sallinen 2004, 51).

The disturbed circadian rhythm is a key issue when examining health disadvantages in shift workers. Changes in the circadian rhythm can lead to sleep/awake disturbances, increased susceptibility and internal desynchronization, which can lead to different diseases. Sleep/awake disturbances can also lead to behavioural changes such as smoking and nutrition, which can lead further to diseases. Stress and lifestyle are also possible mediators in diseases in shift work. (Knutsson 2003, 106-107.) Health disadvantages caused by shift work are individual, and one fifth of people do not adapt for shift work at all. Maladjustment to shift work is a probable result from hereditary ability to sleep in abnormal time of the day and individual differences to endure sleep deprivation and sleepiness. (Okkonen 2007, 33.)

Shift work increases the probability to start smoking (Okkonen 2007, 34). Researchers have shown that shift workers are more likely to be smokers or start smoking than daytime workers. However, it is assumed that smoking and shift work are not directly linked, but the correlation between smoking and shift work is a result of socioeconomic diversities between shift and daytime workers. (van Amelsvoort, Jansen & Kant 2006, 1110.) Likewise overweight and weight gain seems to be more common among shift workers than day workers. There is a correlation between the duration of sleep and hormones called leptin and ghrelin, referring that sleep and appetite has many physiological connections. Paucity of physical activity and alcohol consumption does not seem to be more common among shift workers

than among day workers, although in some night work occupations, such as track drivers, possibilities for regular physical activity can be limited. (Okkonen 2007, 34.)

Cardiovascular diseases have many occupational risk factors such as some chemicals, noise, tremor and psychosocial factors related to work such as organization of the work and shift work (Okkonen 2007, 34). Therefore, addressing the risk factors in the work place may have an effect on the prevalence of cardiovascular diseases. Even though twenty-four-hour blood pressure might be to some extent higher among night workers, it does not reach hypertension. However, many studies show the relationship between shift work and cardiovascular diseases, and that risk of cardiovascular diseases is increased by shift work by about 40% in both men and women. (Bøggild & Knutsson 1999, 85, 95).

A research has suggested that serum concentrations of glucose, uric acid, potassium cholesterol and total lipids increase during night work. However, the levels normalize after returning to day work. Few studies have also shown the relationship between diabetes and shift work. Although evidence is not certain, research results show that shift work could have an impact on metabolic variables and also increase the risk of diabetes. (Knutsson 2003, 105-106.)

Risk of some cancers may increase as a result of low levels of the hormone melatonin (Knutsson 2003, 105). Researches propose that risk of breast cancer is higher among people who do not sleep during the period of the night when nocturnal melatonin levels are usually at their peak (Davis, Mirick & Stevens 2001, 1557, 1560). However, researches do not show that night work *per se* increases the risk of cancer (Knutsson 2003, 105).

Shift work is researched quite a lot, and increased risk of many diseases can be associated with shift work. However, it is difficult to research long term effects of shift work since people who do not adapt well to shift work, usually stop doing it after few years. It is also difficult to clarify whether health disadvantages are result from shift work *per se,* or from other lifestyle changes caused by shift work.

4 SLEEP

Sleep plays an important role in people's well-being and health (Wells & Vaughn 2012). During sleep the brain and body recover from the day's load and stress. The brain fills energy stores when they get a needed rest period during sleep. Sleep also maintains healthiness widely. (Aalto, Antikainen & Tanskanen 2007, 31.) Sleep helps the progress of learning and plays an important role in memory function (Payne et. al 2012). According the research, sleep also has a positive impact for lungs and heart (Anafi, Pellegrino, Shockley, Romer, Tufik & Pack 2013, 1).

According to Nienstedt, Hänninen, Arstila and Björkqvist (2006, 570.) infants sleep the major part of the day; 10-year-old children sleep 9-10 hours and adults usually 7-8 hours per day. Elderly sleep approximately only a few minutes less than middle-aged adults but differences between individuals grow with age. The need of sleep with healthy elderly person might be only four hours but it might also be 11 hours per day.

Shift work seems to reduce the length of the sleep compared to day workers. Ohayon, Smolensky and Roth (2010, 585- 586.) discovered that shift workers often slept less than 6 hours during the main sleep period which is less than the typical 6, 5-7, 5 hours adults usually sleep. Even if napping time was taken into consideration, the total sleeping time was less than the day workers' sleeping time. Reduction in sleeping time might be due to person's inability to fall asleep and sleep during the day. Also factors like a lack of suitable environment to sleep at home or social pressure might reduce the sleeping time.

According to Åkerstedt & Gillberg (1982), people who works during the day and sleeps during the night normally experience peak sleepiness between 21.00 and 23.00. However, shift workers' circadian rhythm in sleepiness is different; the first sleepiness peak is experienced between 04.00 and 07.00 and second about at 16.00. (as sited by Ohayon et al. 2010, 586.) Sleepiness peaks can also be seen in traffic accidents in many countries; the risk of a sleep-related vehicle accident is 20 times higher at 06.00 than it is at 10.00 (Rajaratman & Arendt 2001, 999).

4.1 Sleep Deprivation

According to Härmä & Sallinen (2004, 48.) during sleep person's metabolism slows down while waking up and sleeplessness accelerates it. If a person does not sleep during two to three nights, person's amount of fatty acids in blood increases and the ability to tolerate glucose decreases. Long-lasting sleep deprivation reduces wellbeing and quality of life. It predisposes to various diseases and decreases body's immune system. Even two sleepless nights decrease a human body's glucose tolerance and ability to control glucose balance, and leads to hormonal changes. There has been a research which says that if health adolescents shorten their sleeping time during a night only with three hours per day the glucose tolerance decreases in less than one week. Also the effect of insulin decreases so adolescent will suffer from transient insulin resistant.

Sleeplessness increases the level of stress hormone called cortisol and appetite-enhancing hormone called ghrelin. It also decreases appetite diminishing hormone called leptin. These changes in hormones that control appetite can increase the risk of overweight. (Okkonen 2007, 20.) When an individual has been awake for 17-18 hours, it correlates to stage of 0.5 per mille intoxication in performances which require balance and coordination. When an individual has been awake for 24 hours, it correlates to stage of one per mille intoxication. Long periods of staying awake, so called deliberate disturbed sleep patterns, produce similar phenomenon as a long flight, so called Jet Lag. (Aalto, Antikainen & Tanskanen 2007, 31.)

The study made by Kata Aaltonen (2010, 21) from Turku University of Applied Sciences shows that people who were doing night shift work in restaurant, 79.2% of them had some sleeping problems. "The following problems were arising: Snoring (18), grinding of teeth (10), cramps in the feet (7), nightmares (14), so called ´horror attack´ at night (6), sleep talking (14), and sleep walking (2)." 12.5 % of the target group found their quality of sleep bad. 22 % was feeling that night shifts have negative impact to their well-being. Smoking and alcohol consumption increased in a target group when compared to people working at day time.

Complete and also partial sleep deprivation cause the increased amount of c- reactive protein. C-reactive protein is also called CRP, and its concentration increases in a human body when there is some sort of tissue damage or an inflammation caused by bacteria. (Härmä & Sallinen 2004, 46.)

Like sleep deprivation also eating at night might cause disturbances in glucose balance. Snacks which are eaten at night increase blood sugar levels more than snacks which are eaten during a day. (Härmä & Sallinen 2004, 48.)

4.2 Sleep Stages

Sleep is divided into two types; slow sleep which is also called non-rapid eye movement sleep (non-REM or NREM) and rapid eye movement sleep (REM sleep) (Nienstedt, Hänninen, Arstila & Björkqvist 2006, 571-572). There are five different stages in sleeping. In NREM stage 1 person is relaxed and eyes are closed. This stage is between wakefulness and sleep. Approximately 5% of the adult's sleep belongs to first stage. (Härmä & Sallinen 2004, 26,28.)

In NREM stage 2 a person does not react to external stimuli like quiet noises anymore. If the person has been sleeping in this stage for only one minute and then something wakes the person up, it is common that the person feels that they had been sleeping. (Härmä & Sallinen 2004, 28.) Approximately 50% of the adult's sleep belongs to the second stage (Nienstedt, Hänninen, Arstila & Björkqvist 2006, 580).

NREM stage 3 includes stages 3 and 4. Relaxation is complete, inhaling and exhaling are deep and pulse is low. Brain fills energy stores. Growth hormone is excreted in children and youth. (Nienstedt, Hänninen, Arstila & Björkqvist 2006, 580.) Person is torpid if they have waked up during this stage. Approximately 25% of adult's sleep belongs to third stage. During normal sleep NREM stage 3s amount is the biggest during the first 4-5 hours and after that the amount of the REM sleep increases. (Härmä & Sallinen 2004, 28-29.)

In the REM stage people usually see dreams (FIOH 2007, 18-19). Sleep during small hours and the morning belongs mainly to the REM stage (Härmä & Sallinen 2004, 29). Approximately 20% of the adult's sleep belongs to REM sleep (Nienstedt, Hänninen, Arstila & Björkqvist 2006, 572). REM sleep is also called "paradoxical sleep", because its' electroencephalogram (EEG) is quite similar with waking EEG (Härmä & Sallinen 2004, 29).

These stages of sleep form sleeping cycles lasting a 90-110 minutes, where a person moves from shallow NREM sleep via deep sleep stages to REM sleep. Duration of each stage of sleep in the sleeping cycle depends on the time the person went to sleep, the time person has already been sleeping and the age of the person. There are also individual differences. (Okkonen 2007, 18.)

4.3 Sleep Hygiene

National Sleeping Foundation (NSF) (2009) states that the promotion of healthy and regular sleep is sleep hygiene. Here are some good sleep hygiene practises; establishing consistent wake and sleep schedules, even on weekends and creating a regular, relaxing bedtime routine such as listening music. (as cited by Wells & Vaughn 2012, 241-242.) Creating a sleep-conducive environment that is quiet and dark but also comfortable and cool (Karhula 2002, 5). According to NSF (2009) bedroom should be used only for sleep and sex, not for television or computer. People should sleep on comfortable pillows and mattresses and eating should be finished at least two to three hours before regular bedtime. (as cited by Wells & Vaughn 2012, 242.) Clean and pleasant bed clothes might help people to sleep (Karhula 2002, 5). NSF (2009) states that physical activities should be done regularly during the day but at least a few hours before bedtime. Alcohol and caffeine should be avoided close to bedtime and it would be clever to give up smoking. (as cited by Wells & Vaughn 2012,. 242.)

5 PHYSICAL ACTIVITY

Physical activity (PA) refers to bodily movements which help increase energy expenditure and health-related levels of fitness. PA can vary from high to low intensity activities to team related, dual and individual sports and games. (Shimon 2011, 36.) PA promotes person's physical, psychological and social health (Siukonen 2000, 648 - 649). A research shows that those who report long-term physical inactivity had higher risk of job strain persistent activity. People reporting long-term physical inactivity were in greater risk for job strain than people reporting long-term activity. Diminishing physical activity was related with increased job strain job demands, and decreased job control. (Yang et al. 2010, 369, 372.)

5.1 Vigorous and Moderate PA

Vigorous-intensity PA requires a large amount of exertion, and it causes rapid inhaling and exhaling. Also the heart rate increases in a substantial way. For instance running, aerobics and fast cycling are vigorous-intensity physical activities. Moderate-intensity PA requires smaller amount of exertion than vigorous-intensity PA. It also requires that the heart rate accelerates considerably. For instance, brisk walking, gardening and dancing are moderate-intensity physical activities. (World Health Organization [WHO] 2013.)

5.2 Aerobic and Anaerobic PA

Aerobic PA is also called endurance PA. Aerobic PA strengthens a heart, respiratory and circulatory system. (Aalto 2006b, 38.) In aerobic muscle work energy is produced by oxygen and when an individual is able to talk during walking, it is one form of aerobic PA (Siukonen 2000, 637). During aerobic PA individual is using more fats. Good and very basic-endurance physical activities are, for example, brisk walking, jogging, cycling and skiing. (Aalto 2006b, 38.) Endurance PA can be divided into three parts (Siukonen 2000, 637). Firstly, there is basic endurance which is low-intensity and easy physical activity. Secondly, there is speed endurance which is quicker: an Individual is sweating and out of breathing. Speed endurance physical activities are, for example, more action-packed jogging and

group fitness classes including stepping. (Aalto 2006b, 38.) The third one is maximal endurance (Siukonen 2000, 637.) Calculary heart rate areas for different age groups can be seen in table 1.

Table 1. Calculatory heart rate areas for different age groups (Aalto, R. 2006b. 47)

Age (years)	Maximal heart rate (beats/min)	Basic endurance 60- 70 % (beats/min)	Speed endurance 70- 85% (beats/min)
under 25	200	120- 140	140- 170
25- 29	195	117- 137	137- 166
30- 34	190	114- 133	133- 162
35- 39	185	111- 130	130- 157
40- 44	180	108- 126	126- 153
45- 49	175	105- 123	123- 149
50- 54	170	102- 119	119- 145
55- 59	165	99- 116	116- 140
60- 64	160	93- 109	109- 139

Anaerobic PA develops body's ability to split lactic acid, which helps exercise long time without feeling tired. In anaerobic muscle work energy is produced without oxygen (Siukonen 2000, 637) and the major part of the energy comes from carbohydrates which are stored to the body. When anaerobic threshold has been passed, breathing changes to panting and lactic acid flows to muscles and that is why an individual is not able to continue the performance long time anymore. (Aalto, Antikainen & Tanskanen 2007, 149-150.)

5.3 Benefits and Recommendations of PA

PA promotes a person's physical, psychological and social health (Siukonen 2000, 648- 649). It also increases circulatory organs' and musculature's ability to function. Regular and versatile PA increases the amount of bone's high-mass and reduces the loss of bones. (Rehunen 1997, 12, 43.) Load strengthens the bone, and the most effective way to strengthen bone is to have so called "bone physical

activity" which contains hits, jolts, quick rotations and repetitions (Kannus 2012). Lack of PA weakens the bone leading to increased risk of osteoporosis (Rehunen 1997, 44).

PA among children supports growth and development and helps them embrace a healthy lifestyle. PA among adolescents prevents later developing so called "people diseases" and their risk factors. Among adults PA helps to prevent several diseases and enhances fitness for work. For elderly physical activity promotes independent coping in everyday life. (Rehunen 1997, 271, 276.)

According to UKK recommendations, adults should be physically active at least 2 hours and 30 minutes per week in moderate intensity, or at least 1 hour and 15 minutes per week in vigorous intensity. Muscle-strengthening and balance exercises should be done at least two times a week. The recommendations can be achieved by being physically active at least 10 minutes at the time. (UKK-institute 2013.)

A well-balanced health – related fitness program has to include both muscular endurance and muscular strength when thinking about the development of total fitness. There are four main training methods for training muscular endurance and strength. These methods are weight training, partner-resisted training, bodyweight training and alternatives methods of training. (Ayers & Sariscsany 2011, 93.)

5.4 Kettlebell Training

Kettlebell training can reduce the pain intensity of the neck, shoulders and lower back (Jay et al. 2011). Nursing staff of the intensive care unit wanted us to plan kettelebell training program for them, and because their work includes a lot of sitting on computer, we decided that kettlebell training is a good option for our clients

The origin of kettlebells is a matter of speculation, but archeological evidence shows their usage in Ancient Greece. At the beginning of the 18th century kettlebells were used as a weight to measure grains and other goods in Russia. However, during festivals kettlebells were used to show vendors strength. (History of the Kettlebell.) Nowadays kettlebell training is a versatile sport, kettlebells are used, for example, in group fitness, musical choreographies, circuit training and rehabilitation. Kettlebell also has a competitive aspect known as Girevoy Sport. (Nurmi 2012, 140.)

Kettlebell is, at its simplest, just an iron ball with a handle which can be used for versatile resistance training. Kettlebell training fits men and women, and it does not require good physical condition to be

able to start. Kettlebell suits for whole body exercises like swings, clean, and snatch. Kettlebells can be used, for example, for common fitness exercises, strength training, mobility training, and body control exercises. (Kahvakuula.) Kettlebells are supposed to be quite heavy since most of the work is done with legs and core muscles. For women a good starting weight is 4-12 kilos and for men 12-16 kilos (Nurmi 2012, 8).

5.5 Nordic Walking

Physical activities done regularly outdoors are recommended for people who are doing shift work which is done in rapid cycles. The reason why it is recommended is that, person who is making physical activities outdoors during a day is exposed to sun light which prevents delay of circadian rhythm. (UKK institute 2010.) Therefore, Nordic walking can be good option for nursing staff in the intensive care unit in KAKS.

Walking with poles is called Nordic walking. Poles give rhythm, more length to the step and speed to walking. Because of the poles, shoulders and upper back works which increases the efficiency of exercise. Poles support balance in walking consequently individuals can also use them in slippery weather for protection. (Arvonen & Heikkilä 2001, 54.)

Research; Nordic walking improves daily physical activities in chronic obstructive pulmonary disease (COPD) say that "Nordic walking is a feasible, simple and effective physical training modality in COPD. In addition, Nordic walking has proven to positively impact the daily physical activity pattern of COPD patients under short- and long-term observation". This shows that Nordic walking is suitable physical activity also for people with different kinds of diseases. (Breyer et. al 2010, 1.)

According Tschentsche, Niederseer and Niebauer (2013, 76) "Nordic walking exerts beneficial effects on resting heart rate, blood pressure, exercise capacity, maximal oxygen consumption, and quality of life in patients with various diseases and can thus be recommended to a wide range of people as primary and secondary prevention." This shows that Nordic walking has important health effects.

Even though Nordic walking is a simple physical activity, the right walking technique affects a lot to its efficiency. In Nordic walking individual's upper body should lean slightly forward. Because of the lean, back muscles become activated, which increases the support of back muscles. Shoulders should be relaxed and steps should be flexible. Pole crib should be light and when the individual push the pole backwards, in the end hand should open. Poles should be near the body and feet should point forward.

During walking, hands should not raise upper than to waist line. (Arvonen & Heikkilä 2001, 56-57.) Poles are used by rolling the body. The recommended length of the poles is 0.72 times person's height so it means that poles are approximately 50 cm shorter than person itself. For instance, if person is 190 cm long, the recommended length of the poles is approximately 135 cm. (Siukonen 2000, 662- 663.)

Arvonen & Heikkilä (2001, 58-61) states that Nordic walking can be done in many different ways depending on individual's goals. Nordic walking can be done, for example, as a health enhancing physical activity, flexibility and mobility to shoulders and back, as a method to tone the body, raise physical condition or having it as a recovery physical activity. It is also possible to do different exercises with poles in one place, like body rotations and stretches.

5.6 Strength Training

The sufficient amount of strength training is usually two to three times a week among youth to adult beginners, who are aiming to develop their strength. Five to six training times during a week is enough among professional athletes in sports that requires great physical strength. (Mero, Nummela, Keskinen & Häkkinen 2007, 265.) Strength can be divided to different pieces which are speed strength, maximal strength and endurance strength. Speed strength is divided to quick strength and explosive strength. Maximal strength is divided to neural maximal strength and basic strength. Endurance strength is divided to muscle endurance and strength endurance. (Niemi 2006, 95.) The study made in Denmark shows that only one hour strength training reduces pain in shoulder and neck area among people who are working in offices. (Andersen, Andersen, Mogens, Pedersen, Mortensen,O., Zebis, M., & Sjøgaard, G. 2012, 1004.)

In endurance strength training a person is aiming to move from movement to another without long breaks. Because of that the ability of muscles to work in situation where the amount of lactate in muscles is high, increases. Also the ability to produce energy aerobically develops. Aims of training endurance strength are to improve individual's endurance features and to develop ability of the neuromuscular system to produce strength even dozens of minutes at the time. (Niemi 2006, 102.) Endurance strength is divided to muscle endurance and strength endurance and can be still divided to aerobic circuit training, anaerobic circuit training and speed strength circuit training (Niemi 2006, 103; Mero et al. 2007, 263).

Niemi (2006, 105, 110) states that speed strength refers to the ability of neuromuscular system to produce the highest power possible in the highest speed possible. Speed strength is divided to quick strength and explosive strength as mentioned earlier. Without high muscle fitness an individual should not start this type of training, because of its high accident risk. Main effects of maximal strength training are that nervous system develops and new motor units recruits. Also metabolism of muscles and lactate tolerance increases. One aim of maximal strength training is to increase muscles' ability to produce the highest power possible.

Strength training can be done in many different ways. Weight training is a training done with weights. A program might use machine or free weights or both depending on what equipment are available, what kind of goals client has and the space in which to do weight training. (Ayers & Sariscsany 2011, 106.)

According to Ayers & Sariscsany (2011, 103-104) bodyweight training helps to build endurance and muscular strength with some or no equipment. This type of exercising is appropriate for very young children or persons who are just beginning this kind of exercise. For instance push-ups are body-weight exercises. Partner-resisted training is same kind of exercise form as body weight training but it is done with a partner. It is suitable for all age groups.

There are many different equipment what an individual can use in training. Those equipment are appropriate for most of the people. For instance those kinds of equipment are bands like Dyna Bands, Flexi - Cords, Exertubes and Thera-Bands. Then also Medicine balls, kettlebells and stability balls are good equipment when thinking about alternative methods of training. Individual can have very effective workout by using these equipment. (Ayers & Sariscsany 2011, 104.)

5.7 Stick Exercises

Stick is simple, easy, fun and inexpensive physical activity equipment which is suitable for example to break workout. People can use for example broom handle or poles as a stick. (Aalto 2006c, 111.)The appropriate length for the stick is about 120 - 140 centimeters. Stick is suitable for mobility and muscle condition training and when stick exercises training is done in movement series, it is a good endurance physical activity form. (Aalto & Kykyri 2009, 85.) It is good way to rehabilitate back pain and give more mobility to neck and shoulder area (Aalto 2006c, 111).

Stick exercises improve all areas of fitness and strain big muscle groups. They require cooperation between muscle groups and therefore they are improving body control and balance. Circulations and rotations improve mobility of the spine and body's main joints. In addition of major muscle groups, also the deep muscles are activated which means stick exercises improve muscle balance and for example neck and shoulder areas problems and back problems. (Aalto, 2009,116.) Exercises done with stick help neck and shoulder areas stress areas by circulating fresh, oxygen-rich blood to the muscles and pumping them back to the resting length.

5.8 Stretching

Intensive physical activity tightens and shortens muscles, and that is why stretching should be part of every physical activity session. Even though, physical activity does shorten muscles temporarily, the biggest reason for poor mobility is inactivity. (Aalto 2008, 128.) Mobility means joints motion features. If joints are not used in their whole range of motion, stretch in ligaments around joints decreases. Active stretching is usually part of peoples everyday life, when joints are used with their whole range of motion, but stretching can also be used as an individual exercise form. Stretching does not increase the strength or endurance of muscles, but it maintains the elasticity of ligaments. Stretching elongates muscles and tendons temporarily, which causes a relaxation of the actin-myosin complex which is the contracting part of the muscle. Warmth increases ligaments elasticity. Therefore, cold muscles should never be stretched. Muscles should always be warmed up with light exercising before stretching, but also heat or massage can be used. (Talvitie, Karppi & Mansikkamäki 2006, 215-217.)

Talvitie et al. (2006, 219) state that better mobility can be achieved with static stretches, active stretches, passive stretches or contraction-relaxation-stretch (CRS) techniques. Static stretching means stretching a muscle as far as it is possible without causing an injury. Stretch is hold in this position as long as it

takes a muscle to relax. Stretching is started gently and force used for stretching is gradually increased. Long, steady and calm stretch makes receptors that control muscle length to adapt so that they do not generate muscle contraction. Slow static stretching is a good way to increase muscle mobility, and the risk for injuries is small.

When stretches are created and maintained with persons own muscle work, it is called active stretching. It is the easiest stretching method, and it is easy to control and adjust stretching sensation. (Aalto 2008, 138.) Aim of active stretching is to increase agonist muscle strength and antagonist muscle mobility, since stretch in antagonist muscles is created by long contraction of agonist muscle (Talvitie et al. 2006, 217). Passive stretch is created by other person, gravity or machine. Passive stretch needs to be done carefully to avoid possible injuries to muscles or tendons. (Talvitie et al. 2006, 219.) It is important to listen to person whom muscles are stretched to maintain safety in stretching. During passive stretching person can just relax and enjoy, when other is taking care of stretches. (Aalto 2008, 139.) Winters's, Blakes and Trosts research indicates that active and passive stretching are both good ways to improve muscle mobility. They had two groups of youngsters with limited hip extension. One group stretched hip flexor muscles passively using gravity, and other stretched actively using hip flexor muscles to create stretch. Range of motion increased equally in both groups during six- week period. (as sited by Talvitie et al. 2006, 219.)

CRS technique is also quite common and functional method for stretching. CRS technique includes three stages: contracting muscles statically for a few seconds, relaxing muscles for 2-3 seconds, and stretching muscles for 20-40 seconds. (Aalto 2008, 140.) Contracting the muscle helps become aware of the muscles that will be stretched, which helps directing the stretch to the right muscle (Aalto 2007, 185).

Stretching can be done as an individual exercise, before exercising and after exercising. When stretching is its own exercise, stretches can be relatively long, from 30 seconds to 2 minutes. Aim of this kind of stretching is to increase mobility. Stretching should be comfortable, but when aim is to increase mobility stretches should feel like proper stretches and they should be performed almost at limit of the comfort zone. (Aalto 2006a, 125.) Aalto (2008, 132) states that when stretching is done before exercising aim is to wake up the muscles and to check range of motion. Stretches should be held only for 5-10 seconds. Long stretches should be avoided before exercising since they can relax muscles and disturb fast muscle work and coordination. When stretching after exercising, aim is to enhance muscles recovery by stretching muscles back to their resting length. In this way muscles circulation and

metabolism improve, and muscles get oxygen better and they can get rid of waste products. Stretches after exercising should be held for about 20-30 seconds.

Pitkänen and Tissari (2010, 35.) researched effects of stretching among rescuers over period of eight weeks. Research results suggest that stretching twice a week can improve joints mobility. Over half of the subjects also reported improved working ability after eight week period.

6 COMBINATION OF SHIFT WORK, SLEEP AND PHYSICAL ACTIVITY

Hakola (2011, 58-59) states that there are many reasons why shift workers should be physically active. Persons with better physical condition can manage better in shift work, because physical activities enhance the quality of sleep and make sleeping habits more regular. Physical activities relax and enhance heath condition. It may also enhance alertness during night shifts.

People who are doing shift work should try to find suitable physical activities for individual's needs. These physical activities should be congenial to do even though a person has irregular working times. (UKK institute 2010.) An individual should try to do moderate physical activities such as walking, jogging or swimming 2- 5 times a week, 20-60 minutes at a time (Karhula 2002, 12). Physical activities done regularly outdoors are recommended for people who are making shift work which is made in rapid cycles. The reason why it is recommended is that, person who is making physical activities outdoors during a day expose to sun light which prevents a delay of the circadian rhythm. Person who has done a day shift it is recommended to do physical activities immediately after the shift, which means between 3 to 7 p.m. (UKK institute 2010.)

Light and long- lasting endurance- enhancing physical activities improve the quality of sleep and promote falling asleep. This kind of physical activity is, for instance, walking with a calm tempo for 1-2 hours. People who are not physically active could start physical activities in shorter periods. (UKK institute 2010.) Heavy physical activities should be avoided 2 hours before going to sleep, since a body needs enough time to recover from exercising (Karhula 2002, 12). Very heavy endurance physical activities should be avoided 3- 4 hours before work, if the work requires a very good state of vitality. For instance, these kinds of heavy physical activities are jogging and running. (UKK institute 2010.) If a person is doing physical activities between night shifts, it is recommended to sleep a little bit before next night shift. It is not recommended to do physical activities just before the night shift, because the night shift is heavy enough itself. (Karhula 2002, 12.)

6.1 Sleeping Between Night Shifts

If a person works 1 to 3 night shifts one after another it means that the person is following rapid shift cycle. During rapid shift cycle person should try to keep one's daily rhythm as carefully as possible and go to bed after the night shift as soon as possible. Before the first night shift is recommended to take nap and after the last night shift a person should sleep only few hours so that the person is able to go a bed again in the same evening. During the night shift people should try to eat lightly. When the night shift is almost over, person is going back home and before going to bed it would be good to apply for day light or bright artificial light which light power is around 2000 to 6000 lux. (Karhula 2002, 2)

If a person works minimum 4 night shifts one after another it means that person is following slow shift cycle. As in rapid shift cycle, person should eat lightly during the night shift. It is recommended that the most important meal is eaten during the first few hours of the shift. There are two way to sleep between night shifts. The first way is to sleep only once, in which case the person is taking naps a few hours later. The second way is to sleep immediately after the night shift and just before the next one. It is recommended to avoid day light and bright artificial light during 5 to 12 a.m. Applying to artificial light between 23 to 5 a.m. speeds up the integration to night shift rhythm. (Karhula 2002, 3)

Karhula (2002, 3) states that if a person mainly does night shifts, it means that the person follows continuous night shift cycle. In this case person should try to integrate to night shift rhythm. Eating during night shifts should happen as in slow shift cycle. It is recommended to avoid sun light and bright artificial light during 5 to 12 a.m. by using, for instance, sun glasses. As in slow shift cycle applying to artificial light between 23 to 5 a.m. speeds up the integration to night shift rhythm. It is recommended to follow the night shift rhythm also during free days and that will happen when a person is going to bed late and waking up late. Person should also try to eat same way like during the working cycle.

When a person is tired during a night shift and it would be important to keep the alertness there are many things what to try. The person can take a break if it is possible or walk a little bit. Also opening the window to have some fresh air or washing face might help. Light snack or drink might also help to keep the alertness as talking with co-workers, putting more lights, and singing, whistling or keeping the ice cube in the mouth. If it is possible, person could take 10- 30 minutes lasting naps between 1 to 4 a.m. If it is possible to make all the most monotonous work in the beginning of the night shift, it would be recommended to do so. (Karhula 2002, 7.)

6.2 Sleeping in a Night Shift

Many hospitals allow their nursing staff to sleep during night shifts. If staff does not sleep enough, they will not recover properly and it might be a problem. Study made in Rio de Janeiro classified all together 396 nurses to three different groups: nurses who did not sleep; nurses who slept 2 hours; and nurses who slept 2-3 hours, during a night shift. Results showed that sleeping approximately 2-3 hours during a night shift was related to better recovery from work. (Silva-Costa, Rotenberg, Griep & Fischer 2011, 972.)

Fallis, McMillan and Edwards (2011, e6-e8) researched the effects of napping during night shifts. They interviewed 13 nurses which 10 of them were napping regularly during their breaks at night shifts. Nurses who napped regularly reported improved mood, energized feeling and clearer judgment after napping. Also improved vigilance and increased nurse and patient safety were reported. However, not all nurses felt energized after napping: some felt disoriented, and decided not to nap at their breaks. Those nurses who usually napped during their breaks reported irritability, slowed mental processing and safety concerns if they were not able to nap. They also felt that time between four and six in the morning was the most challenging if they had not napped. Ten out of 13 nurses reported improvements in mood and energy levels already after 20-minute nap.

7 RESEARCH TASK

The purpose of this thesis was to make a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, sleep and physical activity, fitness programs and demonstrations of exercises for nursing staff.

The main aim of the thesis was to provide information about the health disadvantages of shift work, importance and suitable amount of sleep and physical activity, and also fitness programs for nursing staff in order to improve their well-being. The second aim of this thesis was to plan and instruct health enhancing physical activities for nursing staff in the intensive care unit in the KAKS. Thesis process included a handbook containing information and fitness programs, and two Tyky days where we implemented fitness programs. The third aim of this thesis was to provide information for the KUAS about shift work, sleep and physical activity, which employees and students can apply to their studies and work.

The research tasks were the following:

1) How could shift work, sleep and physical activities be combined?
2) What would be the sufficient amount of sleep?
3) How could sleep be scheduled with different shifts?
4) How could physical activity be scheduled with different shifts?
5) What kind of physical activities would be good for shift workers?

8 PRODUCT DEVELOPMENT PROCESS

The purpose of this thesis was to create a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, work wellbeing, sleep and physical activity, fitness programs and demonstrations of exercises for nursing staff. The purpose of the handbook was to provide information about shift work, sleep and physical activity and, help clients combine them. The aim of the thesis was to provide information about the health disadvantages of shift work, the importance and suitable amount of sleep and physical activity, and also fitness programs for nursing staff in order to improve their well-being.

A product development process contains series of activities that the corporation follows in order to plan, develop and commercialize a product. Many of these activities are not physical but organizational and intellectual. Six phases are included in the common product development process. (Ulrich & Eppinger 2003, 12-13.)

The first phase is planning which precedes the project acceptance and start of the actual product development process. The second phase is concept development where needs of the target group are recognized, different options for product concepts are created and evaluated, and one or more concepts are chosen for further development and testing. A concept is an explanation of the appearance, function and characters of a product. The third phase, system-level design, consists of the description of the structural design of the product and the decomposition of the product into subsystems and components. The fourth phase is called detail design which includes the total design of the geometry, materials, and tolerance of all of the parts in the product. Robust performance and production costs are two most critical issues addressed in the detail design phase. The fifth phase, testing and refinement, includes the construction and evaluation of several preproduction versions of the product. Early prototypes are tested to verify whether the product will work as designed and whether product satisfies the most important customer needs. The purpose of the sixth phase, production ramp-up, is to educate the work force and to solve any remaining problems in the production process. (Ulrich & Eppinger 2003, 13, 15.)

Product quality, facilitation of coordination among team members, planning of the development project and increasing improvements in the process are all assisted by the well-defined product development process (Ulrich & Eppinger 2003, 30). Product development process was started by creation of production manuscript which ensured well-defined process.

The handbook includes basic information about shift work, sleep and physical activity, and examples of training programs and instructions how to interpret them. There is also a weekly training program which includes possible shifts and physical activities for each day. For example, if an individual has a morning shift they can do for instance gym training in the evening or when they have a night shift, they can go for a walk for 30 minutes before it. We made training programs and instructions of home exercises; things what an individuals can do by themselves alone at home. Training programs are more specific than a weekly program. From there individual can see a specific exercise, which could be, for example, squat, and how many repetitions and sets she should do. After training programs there are instructions for every individual exercise such as squats and push-ups. These instructions will include pictures where correct performance techniques are demonstrated together with written instructions and key points.

After the handbook was finished, we instructed two Tyky Days for nursing staff in the intensive care unit to introduce the handbook and its exercises, and to observe satisfaction rate. We also made one example of Tyky day in the handbook, so the Central Hospital of Kainuu can arrange similar days also later. In the end we put instructions how to do fitness tests.

9 DISCUSSION

In this chapter we are discussing about the thesis as whole. Discussion starts with description of implementation process. After that pair work and reliability are evaluated. Finally, our professional development during the thesis process is discussed.

9.1 Implementation

When we started to plan our thesis topic we had many ideas. First we planned to take one or more clients, make fitness programs for them and observe what kind of changes would occur in their body and mind. After that we thought that we could make a thesis concerning children or pregnant women, but we could not figure out what we could create about those topics, because there were too many options. Then we got an idea from working life that we could create something concerning middle body muscles. However, later we heard that there were not many employees who actually wanted to take part in this type of thesis. Finally we had an idea about shift work.

Next we started to discuss what we would do about shift work. First we thought we would instruct some group fitness exercises for our clients every week but we realized that it would be too hard for Sanni if she should come every week from Savonlinna to Kajaani. We also thought that instructing fitness group for nursing staff would have been difficult since everybody would not be able to participate every time because of their work shifts. Then we thought we would make individual fitness programs and fitness testing for our clients. That was the point when we had an idea that we could combine instructing, testing and planning fitness programs. We started to think about creating a handbook, but we still wanted to instruct something. The whole work felt disorganized.

When we presented our Thesis topic idea, we received a lot of good feedback and ideas what we could do. But the idea finalized when we were writing our thesis plan. We decided to create a handbook and then have two Tyky Days. Fitness programs could be included to handbook. We wondered should our thesis consist of shift work, rest and physical activity or shift work, nutrition and physical activity. We left nutrition out because our working life was more interested about rest. First the name of our thesis was "Shift work, Rest and Physical Activity", but then we changed it to "Shift work, Sleep and Physical Activity", because in our opinion the most important form of resting is sleep and if a person only rests, they will not recover. According Aalto, Antikainen & Tanskanen (2007, 31) during sleep the brain and

body recover from the day's load and stress. The brain fills energy stores when they get a needed rest period during sleep. Sleep also maintains healthiness widely. In the end we decided to change the name again to be more specific and now it is "How to Combine Shift Work, Sleep and Physical Activity? – A Handbook for Nursing Staff".

The purpose of this thesis was to make a handbook for nursing staff in the intensive care unit in the Central Hospital of Kainuu. The handbook contains general information about shift work, work wellbeing, sleep and physical activity, and also fitness programs and demonstrations of exercises for nursing staff. Physical activities selected for the handbook were gym training, Nordic walking, kettle bell training, home exercises, stick exercises and stretching. These activities were selected based on clients' interests and previous research results. More specific structure of the handbook can be seen from production manuscript (Appendix 1).

When we made production manuscript of our thesis we thought there would be maximum 25 pages in our handbook. It was challenging to start writing our handbook. We were not sure how to start the process, but after beginnings difficulties we really started. In the end there were over 50 pages which surprised us. Some points we thought, if we were able to limit our handbook well enough. During the process we had new ideas that we wanted to add to our handbook and working life made also suggestions for us and that was how we modified the handbook. We also had a lot of pictures and text boxes which took space from the handbook. Also we had many topics what we discussed so if we added only short paragraphs of text in every topic, it made the handbook larger. Now we are quite pleased to our handbook. After the handbook was ready, it was time to have Tyky Days.

Tyky activities mean activities that are aiming for enhancing and supporting working ability and working order of employees. Researchers suggest that correctly implemented Tyky activities can improve employees working ability and health, and motivation, functionality and working environment of working places. (Työterveyslaitos 2013.) Tyky Day means Tyky activities that are arranged during one day (Tyky-päivä). During the Tyky Days we wanted to test our fitness programs and show our clients how to do the movements described in the handbook correctly. Also we wanted to have direct feedback from them and that we had.

We held two almost similar Tyky Days. Only small things like music, instructor or repetitions changed. We started our Tyky Days in the Sports Hall of Kajaani University of Applied Sciences. First we introduced ourselves and told about the day. After the introduction we started with home exercises as a warm up. Then our clients had an opportunity to do fitness tests including abdominal test, back muscle test, push up test and squat test. They also had a possibility to have the body composition test (Inbody)

done in our University's learning environment Myötätuuli, if they wanted. After the tests we went outdoors where we instructed stick exercises with Nordic walking poles. After that we went Nordic walking. After Nordic walking we moved to Kunnon Syke where musical exercise room and gym are. In the musical exercise room of Kunnon Syke we had short discussion about shift work and a game where all the clients got a paper heart to their backs and other clients had to write something positive for each other's paper hearts. After the game we instructed kettle bell training, which was a new form of sports for many clients. Finally we had stretching and relaxation.

The atmosphere during the both Tyky Days was pleasant. We and clients enjoyed both days. We got along with clients well and we had fun time with them. There were very talkative clients in the first group so the first day was hilarious. The second day was more official than the first one. We wanted to give relaxed and fun day for our clients. We planned our timetable carefully but we decided together that if necessary we would keep it open. For instance, in Nordic walking, we spent there more time than we supposed.

In the end of both Tyky Days we asked feedback about the handbook from our clients. In the first Tyky Day we got a lot of positive feedback, but not any improving proposals. In the second Tyky Day we also got a lot of positive feedback and one improving proposal. The one proposal we got was to include some relaxation exercises to the handbook. With the help of this feedback we added one relaxation exercise which can also help to fall asleep, to the handbook. Because we only got one improving proposal, we were not sure whether all clients had really said all feedback they had in their minds. However, we do not think we could have done anything more to get more improving proposals from the clients. Some of the positive feedback we got during and after thesis process was "This was the best Tyky Day we have ever had" and "This handbook has been very beneficial". We think that staying in close contact with working life helped us to create handbook that responds their needs and wants, and that is why we did not get a lot of improving proposals.

9.2 Pair Work

Because there were two of us doing this thesis, we had to pay attention to pair work. We had been made a lot of school works together and that was why we thought that we could also do the thesis together. On February 2013 Sanni moved back to her home town Savonlinna and Amina stayed in Kajaani. We decided that it would not be a problem and we could do the thesis together. During spring 2013 we both were doing practical training and it felt that we do not have enough time to focus

also to the thesis. We tried to find suitable weekend when Sanni could come to Kajaani, but at first we could not find any. Then during April 2013 there was a chance when Sanni could come to Kajaani and that was the time when we really started to work with our handbook. We were able to do quite much during that one weekend. We were proud of ourselves. Always when Sanni came to Kajaani, she was staying in Amina's apartment. That was a good thing because then we could all the time focus on the thesis. Even though we had breaks from writing we could still have our minds on thesis by having discussions about issues what we were wondering.

During summer 2013, we were able to get together few times and those times were quite productive. During the summer we for instance, took all the pictures to our handbook and searched theoretical background from different books and results from previous researches.

During autumn 2013, after Tyky Days, we decided that now was time to keep in touch regularly. We decided that Sanni would call to Amina every Sunday at 8 p.m. and Amina would call to Sanni every Wednesday at 8 p.m.. During those mobile phone conversations we talked what we had done to our thesis during last few days and what to be done next. Sometimes we were also calling in some other days.

If we had to arrange the meeting with our Teacher Supervisor Katri Takala or with our working life coordinator Marja-Leena Forsberg, Amina could arrange them and go there, because Sanni was is Savonlinna. Also if we had to print thesis versions out and give to Mrs. Takala opportunity to read our work, Amina was taking care of these kinds of things.

We divided our main topics to half and started to write about them. For instance Sanni was taking care of shift work and Amina was taking care of sleep. Then we were reading through each others' chapters and then if other one wanted to give some comments, add, modify or take away something she was able to do that. When we were not in same town, we were sending our chapters to each other's by email. We were also communicating by Skype. However, sometimes it was challenging to understand what the other one was thinking. Occasionally, we were thinking the same things, but we were not immediately able to explain it properly to each others.

Sometimes when Sanni came to Kajaani, Amina's husband was working. That meant that we had Amina's two years old daughter writing thesis with us. Sometimes it was challenging, but then we made so that we were taking care of the child together and at the same time we were thinking together how

to write some particular things to our thesis and if there were some problems, we solved them together. It felt effective when we could at the same time take care of child and write the thesis.

We are pleased with the way our pair work functioned. We had a similar ideas and thoughts throughout the process, and therefore we did not have to do a lot of big compromises. During thesis process we had many interesting conversations about the topic and beyond. We were able to exchange our thoughts related to our profession and we got new point of views on things.

9.3 Reliability

"Identifying customer needs is an integral part of the concept development phase of the product development process. The resulting customer needs are used to guide the team in establishing product specifications, generating product concepts and selecting a product concept for further development." (Ulrich & Eppinger 2003, 68.) It was very important for us to know what our clients needed to ensure a good quality of the product. We stayed in contact with our working life supervisor throughout the process, and we had meetings where we were able to present our ideas. Working life's opinion was taken into consideration when agreeing on the topic and the content of the product. Information about shift work and different sports was searched to determine customers' needs.

The trustworthiness of the product is assessed with credibility, reliability, reflexivity and transferability. Credibility means the researcher has to verify that results reflect participants' perception of the phenomenon. Credibility of the research can be reinforced by discussing results with participants during different stages of the research. (Kylmä & Juvakka 2007, 128.) To verify that product reflects participants' perception of the phenomenon we stayed in contact with the working life coordinator throughout the process. When the first copy of the handbook was ready in summer 2013, we send it to our clients so they could study it. During autumn 2013 we instructed Tyky Days for our clients to get feedback from the handbook, and to verify whether content of the hanbook corresponds to customers' needs and wishes. After the Tyky Days we modified the handbook to its final form.

Reliability requires researchers to write their research process in a way that other researchers can follow its main points (Yardley as cited by Kylmä & Juvakka 2007, 129). Researchers can benefit from the notes on different phases of research and also importance of keeping diary emphasizes. (Malterud as cited by Kylmä & Juvakka 2007, 129).

Mays & Pope (2000), Malterud (2001) and Horsburgh (2003) state that reflexivity requires researchers to evaluate how they impact their material and research process, (as stated by Kylmä & Juvakka 2007, 129) and they need to critically observe their own theories and actions. Researchers need to be self-aware and self-conscious about the research process. Through reflexivity researchers can present reasons for their choices to the readers. (Holloway 1997, 135-136.) Our personal preferences have probably affected selection of physical activities in the handbook, but researches also showed that selected physical activities are good for our target group.

Transferability means how well research results can be transferred to other similar circumstances. Researchers need to give enough information about research subjects and environment in order for readers to assess a transferability of results. (Lincoln & Cuba as sited in Kylmä & Juvakka 2007, 129.) Our product development process focused on combining shift work, sleep and physical activity, and therefore it should be transferable to other shift work environments. Even though, our clients were nurses, we think that other professionals can also benefit from our product.

9.4 Professional Development

We created a handbook and two Tyky Days which were based on our handbook. Our handbook became wider than we first thought. When we noticed that there were over 50 pages of written text and many pictures, we thought that our handbook could be the beginning of a book.

Thesis was wide learning experience in which we could use our skills and knowledge learned during this education. Aim of the thesis process is not only to develop working life, but also to develop authors own knowhow. Our professionalism in a field of Sports developed in many areas. Big part of Finnish working force is doing shift work and this is why we think that we can utilize our professional competence developed during thesis process in working life.

Working ability starts to decrease quicker in age of 45 years if a person does not pay attention to physical activities and ergonomics. Weak oxygen uptake, heavy physical work, depression and weak health condition are highest risk factors to disability pension. (Aalto 2006a, 11.) Lack of work well-being can lead to work stress. Prolonged work stress can result to burn-out, which can lead to depression or even incapacity for work. (Työterveyslaitos 2012.) Handbook we developed can support nursing staffs work well-being and prevent burn-out.

During our education, we have had wide range of theoretical information and hand-on practices for example on fitness testing and health-enhancing physical activities. We were able to use previous knowledge we had in the handbook and in Tyky Days. During product development process and Tyky Days we acted as experts in a field of Sports. During Tyky Day we felt ourselves more confident during our instructions than before. Because our thesis was quite wide we had possibility to develop our professional skills in many areas such as planning, instructing, fitness testing and product development. We think we are able to do fitness testing more effectively and in more reliable way since we have had more practice. Now we know what our style to instruct physical activities is and we are able explain for our clients what we are doing and why we are doing it.

Important part of the thesis process was effective and appropriate information retrieval which, in our opinion, succeeded well. We learned a lot about searching knowledge from different sources. By searching knowledge about different sports we improved our sports specific skills and extended our professionalism. Therefore, in the future we can give to our clients more specific, professional and informative advices and answers than before.

When our handbook was ready, we had two Tyky Days. We got experiences on how to arrange a sport event by ourselves. We had to agree on timing with our client and school, and book the facilities and equipment we needed. The days had to be selected in a way that all the nursing staff could participate either one of them. Even thought Tyky Days content was from our handbook, we had to plan how to instruct different activities. When planning Tyky Days schedule, we were in close contact with our working life coordinator in order to develop appropriate day for them. After the first Tyky Day, we discussed together about small changes we would like to do. Because we had two Tyky Days, we were able to learn from the first one and improve the second one.

We also got a chance to communicate a lot with our working life coordinator and staff from our University of Applied Sciences. We believe that all what we learned during thesis process will be beneficial when we move to working life.

SOURCES

Aalto, R. 2006a. *Työelämän selviytymisopas: käytännön ohjeita työhyvinvointiin*. Saarijärvi: Saarijärven offset oy.

Aalto, R. 2006b. *Uudista olemuksesi – kevyesti liikkeelle*. Saarijärvi: Saarijärven offset oy.

Aalto, R. 2006c. *Kuntoon kotona: Opas monipuoliseen harjoitteluun eri välineillä*. Saarijärvi: Saarijärven Offset oy.

Aalto, R., Antikainen, S. & Tanskanen, R. 2007. *Kunto-ohjaajan opas*. Saarijärvi: Saarijärven offset oy.

Aalto, R. 2008. *Kuntoilijan lihashuolto-opas*. Saarijärvi: Saarijärven offset oy.

Aalto, R. 2009. *Liikkeelle: Hyvänolon opas senioreille*. Saarijärvi: Saarijärven offset oy.

Aalto, R. & Kykyri, H. 2009. *Sauvaliikunta*. Esa Print Oy 2009.

Aaltonen, K. 2010. *Effects of irregular wake-sleep rhythm on health, well-being and sleep in night shift workers*. Bachelors Thesis. Turku University of Applied Sciences. Available from http://theseus.fi/bitstream/handle/10024/14721/Aaltonen_Kata.pdf?sequence=1

Anafi, R., Pellegrino, R., Shockley, K., Romer, M., Tufik, S & Pack, A. 2013. Sleep is not just for the brain: transcriptional responses to sleep in peripheral tissues. *BMC Genomics* 2013, 14:362

Andersen,C., Andersen,L., Gram, B., Pedersen, T., Mortensen,O., Zebis, M., & Sjøgaard, G. 2012. Influence of frequency and duration of strength training for effective management of neck and shoulder pain: a randomised controlled trial. *British Journal of Sports Medicine 2012, 46:1004-1010.*

Arvonen, S. & Heikkilä, M. 2001. *Ulkoilijan kuntokirja sauvakävelystä keppijumppaan*. Helsinki; Edita Oy.

Ayers, S.F. & Sariscsany, M.J. 2011. *Physical Education for Lifelong Fitness* (third ed.). United States of America.

Breyer, M-K., Breyer-Kohansal, R., Funk, G-C., Dornhofer, N., A Spruit, M.,Wouters, E., Burghuber, O., & Hartl, S. 2010. Nordic Walking improves daily physical activities in COPD: a randomised controlled trial. *Respiratory Research 2010, 11:12*

Davis, S., Mirick, D. & Stevens, R. 2001. Night Shift Work, Light at Night, and Risk of Breast Cancer. *Journal of the National Cancer Institute*. Vol. 93, No. 20, October 2001.

Fallis, W., McMillan, D. & Edwards, M. 2011. Napping during Night Shift: Practices, Preferences, and Perceptions of Critical Care and Emergency Department Nurses. *Critical Care Nurse. OnlineNOW Vol 31, No. 2,2011.*

Hakola, T. 2011. *Univaje väijyy vuorotyössä: Hyväkuntoinen pärjää paremmin*. Liikunta ja tiede.

History of the Kettlebell. Retrieved March 13, 2013 from http://www.kettlebellscience.com/kettlebell-history.html

Härmä, M & Sallinen, M. 2004. *Hyvä uni – hyvä työ.* Vammalan kirjapaino Oy.

Jay, K., Frisch, D., Hansen, K., Zebis, M. K., Andersen, C. H., Mortensen, O. S., Andersen, L. L. 2011. Kettlebell training for musculoskeletal and cardiovascular health: a randomized controlled trial. *Scandinavian Journal of Work, Environment & Health. 2011;37(3).*

Kahvakuula. Finnish Kettlebell Association. Retrieved March 15, 2013 from http://kahvakuula.fi/kahvakuula/

Kannus, P. 2012. *Vahvat luut- liikuntaohj*e. Retrieved March 16, 2013, from http://www.terveyskirjasto.fi/terveyskirjasto/tk.koti?p_artikkeli=dlk00982&p_haku=luuliikunta.

Karhula, A-L. (Eds.). 2002. *Hyvinvointia vuorotyöhön*. Edita Prima Oy.

Knutsson, A. 2003. Health disorders of shift workers. [Electronic version] *Occupational Medicine, 53, 103-108.*

Mero, A., Nummela, A., Keskinen, K., & Häkkinen, K. 2007. *Urheiluvalmennus.* Jyväskylä: Gummerus Kirjapaino Oy.

Niemi, A. 2006. *Menestyjän kuntosaliharjoittelu & ravitsemus*. Jyväskylä: Docendo Finland Oy.

Nienstedt, W., Hänninen, O., Arstila, A., & Björkvist, S-E. 2006. *Ihmisen fysiologia ja anatomia* (16ed.).Werner Söderström Oy.

Nurmi, A. 2012. *Tehokas Kahvakuula*. Hämeenlinna: Kariston Kirjapaino Oy.

Nykänen, E. 2007. *Rennosti töissä, käytännön ohjeita työssäjaksamiseen*. Saarijärvi: OFFSET OY.

Nykänen, E. 2009. *Eroon työstressistä*. Jyväskylä: WSOYpro Oy.

Ohayon, M., Smolensky, M. & Roth, T. 2010. Consequences of Shiftworking on Sleep Duration, Sleepiness, and Sleep Attacks. *Chronobiology International, 27(3): 575-589*.

Okkonen, H. (Ed.). 2007. *Toimivat ja terveet työajat (2nd ed.).* Vammala: Vammalan kirjapaino

Partinen, M. 2012. *Epäsäännöllinen työaika ja vuorotyö*. Retrieved November 11, 2012, from www.terveyskirjasto.fi/terveyskirjasto/tk.koti?p_artikkeli=dlk01013

Payne, J., Tucker, M-A., Ellenbogen, J-M., Wamsley, E-J., Walker, M-P., Schacter, D-L. & Stickgold, R. 2012. Memory for Semantically Related and Unrelated Declarative Information: The Benefit of Sleep, the Cost of Wake. *Plos One, March, 2012, 7,3*.

Pisano, V. 2007. *Liikkuva äiti, Opas odotusajan ja synnytyksen jälkeiseen liikuntaan.* Saarijärvi: Saarijärven offset oy

Pitkänen, N. & Tissari , A. 2010. *Kahdeksan viikon venyttelyharjoittelun vaikutukset pelastajien nivelten liikkuvuuteen ja koettuun työkykyyn*. Thesis, Savonia University of Applied Sciences. Available from https://publications.theseus.fi/bitstream/handle/10024/22800/pitkanen_nelli.pdf?sequence=1

Rajaratman, S. 6 Arendt, J. 2001. *Health in a 24h-society*. Lancet 2001; 358: 999-1005

Rehunen, S. 1997. *Terveys ja liikunta*. Jyväskylä: Gummerus Kirjapaino Oy.

Shimon, J.M. 2011. *Introduction to teaching physical education: principles and strategies*. United States of America.

Silva-Costa, A., Rotenberg, L., Griep, R & Fischer, F. 2011. Relationship between sleeping on the night shift and recovery from work among nursing workers – the influence of domestic work. *Journal of Advanced Nursing.*

Siukonen,M. 2000. *Urheilun sääntö- ja kunto-opas 2*. Jyväskylä: Gummerus kirjapaino Oy.

Talvitie, U., Karppi S-L. & Mansikkamäki, T. 2006. *Fysioterapia*. Helsinki: Edita Prima Oy

The European network for workplace health promotion. *Workplace health promotion*. Retrieved November 4, 2013, from http://www.enwhp.org/workplace-health-promotion.html

Tschentscher, M., Niederseer, D., & Niebauer, J. 2013. Health Benefits of Nordic Walking: A Systematic Review. *American Journal of Preventive Medicine. 2013;44(1)*

TYKY-päivä. Retrieved December 1, 2013 from http://www.tykypaiva.net/

Työterveyslaitos. 2013. *Tykytominta.* Retrieved November 13, 2013, from http://www.ttl.fi/fi/tyohyvinvointi/tykytoiminta/Sivut/default.aspx

Työterveyslaitos. 2012. *Yksilön työhyvinvointi*. Retrieved November 4, 2013, from http://www.ttl.fi/fi/tyohyvinvointi/terveyden_edistaminen_tyopaikalla/yksilon_tyohyvinvointi/sivut/default.aspx

UKK institute. 2013. *Liikuntapiirakka.* Retrieved September 25, 2013, from http://www.ukkinstituutti.fi/liikuntapiirakka

UKK institute. 2010. *Liikunta kohentaa myös vuorotyöläisen unta*. Retrieved June 22, 2013, from http://www.ukkinstituutti.fi/tietoa_terveysliikunnasta/liikunnan_vaikutukset/liikunta_parantaa_unta/vuorotyo_uni_ja_liikunta

Ulrich K.T. & Eppinger S.D. 2003. *Product and design development* (3rd ed.). New York: McGraw-Hill/Irwin

van Amelsvoort, L.G.P.M., Jansen, N. W. H. & Kant, I. 2006. *Smoking among shiftworkers: More than a confounding factor.* [Electronic version] Chronobiology International, 23(6), 1105-1113.

van Amelsvoort, L.G.P.M., Schouten, E.G. & Kok, F.J. 1999. *Duration of shift work related to body mass index and waist to hip ratio*. [Electronic version] International Journal of Obesity, 23, 973-978.

Wells, M.E. & Vaughn, M.D. 2012. Poor Sleep Challenging the Health of a Nation. *Neurodiagnostic Journal.*

Winters, MV., Blake, CG., Trost JS et al. 2004. Passive versus active stretching on hip flexor muscles in subjects with limited hip extension: a randomized clinical trial. *Physical Therapy 2004; 84(9): 800-7.*

World Health Organization. 2013. *What is Moderate-intensity and Vigorous-intensity Physical Activity?* Retrieved January 11, 2013, from http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/index.html

Yang, X., Telema, R., Hirvensalo, M., Hintsanen, M., Hintsa, T., Pulkki-Råback, L. & Viikari J.S. A. 2010. The benefits of sustained leisure-time physical activity on job strain. *Occupational Medicine 2010;6*

Åkersted, T. & Gillberg, M. 1982. Experimentally displaced sleep: Effects on sleepiness. *Electroencephalogr. Clin. Neurophysiol. 54:220-226.*

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<table>
<tr>
<td>1. Title page
Shift work, Physical activity and Sleep

Amina Miloudi and Sanni Hirsikangas

- Color: light blue
- Size: 4A
- Font: times new roman</td>
<td>2. Nice moments with physical activity!

- picture</td>
</tr>
<tr>
<td>3. Foreword/ introduction</td>
<td>4. Content of table</td>
</tr>
<tr>
<td>5. Work Wellbeing</td>
<td>6. Shift work
- What is shift work
- Shift work and health</td>
</tr>
<tr>
<td>7. Sleep
- What is sleep
- Sleep periods
- Sleep recommendations</td>
<td>8. Physical activity (PA)
- What is PA
- Benefits of PA
- heart rate areas
- PA recommendations</td>
</tr>
<tr>
<td>9. Combining shift work, sleep and physical activity</td>
<td>10. Instructions to how to interpret training programs
- name of the movement
- repetitions
- set
- load
- rest</td>
</tr>
<tr>
<td>11. Weekly training program
<table><tr><td>morning</td><td>walking 30 min</td></tr><tr><td>evening</td><td>..</td></tr><tr><td>night</td><td>..</td></tr><tr><td>night</td><td>..</td></tr><tr><td>free</td><td>..</td></tr><tr><td>morning</td><td>..</td></tr><tr><td>free</td><td>..</td></tr></table>- examples from shifts + exercise what could be suitable to include to one’s day</td>
<td>12. Gym training
- Information
- Training program</td>
</tr>
</table>

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13. Nordic Walking - Information	14. Kettle bell - Information - Training program - Pictures
15. Strength training at home - Information - Training program - Pictures	16. Exercising with Stick - Information - Training program - Pictures
17. Stretching - Information - Training program - Pictures	18. Example of Tyky Day - we had two Tyky Days after handbook was ready - Handbook includes Tyky Days schedule
19. Fitness tests - Instructions for abdominal, squat and push-up tests - Results tables	20. Sources Aalto, R. 2006. Kuntoon kotona. Saarijärvi: Offset Oy Arvonen, S., & Heikkilä, M. 2001. Ulkoilijan kuntokirja sauvakävelystä keppijumppaan. Helsinki: Oy Edita Ab Fluchaire, P. 1988. Uni ja nukkuminen. Juva: WSOY. Partinen, M. 2012. Epäsäännöllinen työaika ja vuorotyö. Retrieved November 11, 2012, from www.terveyskirjasto.fi/terveyskirjasto/tk.koti?p_artikkeli=dlk01013 Ulrich, K., & Eppinger, S. 2004. Product design and development (3rd. ed.). New York: The McGraw-Hill companies.