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SHIFT WORK'S EFFECTS ON HEALTH AND WELL-BEING – A
LITERATURE REVIEW

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The purpose of the thesis is to review the available literature about shift work and its effects on occupational health and work-wellbeing. Also, the thesis will cover basic information and concepts about shift work, loading factors of work and methods for coping in shift work.

The method used in this thesis was systematical review and the databases used for literature search were PubMed, Science Direct, OVID and EBSCO. Used search key terms were “Shift work” plus following variables: AND “occupational health”, AND “work well-being” AND “coping methods”.

Summarization of results was done with table which includes following things: author(s) of the article, type of the article and publishing year, patients or subject(s), main aims of the article and main results of the article.

There are multiple effects shift work has on health and well-being, such as sleeping disorders and increase in stress levels and work itself is a loading factor. There is a lot to be done to ease the effects, but it remains as a challenge to the employee to do all required actions. Studies or articles listed in this thesis support the fact that shift rotations and preventive actions should be done in cooperation with occupational health care, employer and employee. Even though the thesis holds a large amount of information about shift work and its effects on health and well-being, the reader should keep in mind that there might be some errors in study quality or language and context.

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1 INTRODUCTION

Working time organization is becoming a key factor on account of new technologies, market globalization, economic competition, and extension of social services to general populations, all of which involve more and more people in continuous assistance and control of work processes over the 24 hours in a day. The large increase of epidemiological and clinical studies on this issue document the severity of this risk factor on human health and well-being, at both social and psychophysical levels, starting from a disruption of biological circadian rhythms and sleep/wake cycle and ending in several psychosomatic troubles and disorders, likely also including cancer, and extending to impairment of performance efficiency as well as family and social life (Costa 2010, 112-113).

Since the author of this thesis has worked shifts in a factory he is familiar with possible health effects of shift work, especially shift work's effects to sleep-awake rhythm. This particular work experience created an interest to this topic and raised questions like what an employee can do to prevent health effects of shift work or what researched information there is about this issue? This thesis is done in cooperation with Satakunnan ammattikorkeakoulu (SAMK).

2 THE PURPOSE OF THIS THESIS

The purpose of the thesis is to review the newest literature about shift work and its effects on occupational health and work-wellbeing. Also, the thesis will cover basic information and concepts about shift work, loading factors of work and methods for coping in shift work. Additionally, review of articles and a conclusion of the collected data (articles) is provided. As an end-product, material (for Power Point presentation) used by the tutoring teacher, is made. The thesis questions are following:

- 1) What are the main effects of shift work to (occupational) health and work well-being according to reviewed articles?
- 2) What coping methods there are for shift work according to reviewed articles?
- 3) What similarities the reviewed articles have?

3 THESIS PROCESS

This thesis started at November 2014, as the final topic was chosen. During the end of year 2014, writing of theory part started and it continued until February 2015. After this the search for studies was conducted in early March 2015 and study results were summarized in the end of March 2015. Also at the end of March 2015 final adjustments and writings was done. The thesis was presented 9.4.2015.

4 WORK WELL-BEING

Work-wellbeing means every individual's wellbeing, in other words personal feeling and state of alertness. On the other hand it means alertness of the whole working community. Work-wellbeing is above all a constant development of people and working community into such that everyone has a possibility to be part of success and experience the joy of work (Ojala & Ahonen 2003, 19). In addition to employer's physical and mental resources, work-wellbeing is associated with working community's features; with its practices and atmosphere, leadership, the work itself and the sense of control on own life and the one's vision of working community. The concept of work-wellbeing is trying to focus also on where work satisfaction, positive work motivation, work engagement and experiential learning are formed (Toivanen et al. 2014, 13).

When the definition of work-wellbeing is achieved, the employer experiences work and working conditions as an empowering feeling of joy, respect, meaningfulness, control, health and safety. From the working community's point of view work well-being means that the members (of working community) are energized by community's structure, functions and interaction with its challenges. Findings from different working communities indicate that the hindering factors for work-wellbeing are usually quite similar: they are related to decision making and leadership, possibilities to be influential in work related matters, lack of recourses and the spirit of working community (Toivanen et al. 2014, 14).

5 LOADING FACTORS OF WORK

Well-made work, health and well-being are the foundation for work well-being. Overall well-being of a human is built from the balance of entirety. Strong commitment both motivates and loads, depending on how the coping resources and working effort are divided. A full commitment to work can either "carry" or "sink" the employee. As such, employee can handle loading factors well, when there are recovering or empowering stimuli as a counterbalance (Toivanen, Eerola, Hyvönen, Jääskeläinen, Piirainen & Valopaasi 2014, 13).

5.1 Mental loading

Health is not only the lack of diseases and symptoms, but also one's ability to work in a constructive interaction with others. Mental health as a concept means also control of life, self-esteem, vitality and mental resistance. The work itself has many positive consequences for mental health: work punctuates life and gives meaningful content and strengthens self-esteem. For many the work is also a prerequisite for income. Work also plays a major role in promotion of social cohesion and a maker of developmental possibilities. Work related, prolonged loading factors or other negatively experienced occurrences can on the other hand trigger or worsen a wide range of mental disorders

and effect on the progression of any mental disorder (Martimo, Antti-Poika & Uitti 2010, 70).

Mental disorders are almost always multifactorial: Some part of the population is more vulnerable and more prone to fall ill in the stressful situations of life or in a crisis. Vulnerability for mental disorders may be associated with heredity, early life, personality factors and the combined effects of previously mentioned. Most common mental disorders among working aged adults are varying degrees of depression episodes, anxiety and substance abuse disorders (affective disorders). The most important anxiety disorders are panic disorder, social anxiety disorder, generalized anxiety disorder and obsessive–compulsive disorder. Also quite common mental disorders among working aged adults are posttraumatic stress reactions and –disorders (Martimo et al. 2010, 74).

5.1.1 Stress

In scientific literature the definition of stress is a comprehensive process, which starts in a situation what is experienced to be challenging. In such situation the increased activity of the human body is trying to provide a change to survive from the experienced challenge. Stress is talked about a lot without clarifying the actual meaning of it. Most of the stress factors of life are related to changes or threats of changes in close human relationships, in health and in work. Most commonly the term “stress” is used to describe one’s feeling of pressure. Person experiences stress in a situation where environmental challenges and demands are in such extent, that the resources used to cope with these challenges exceed limits and the person feels that he can’t survive from this situation (Martimo et al. 2010, 71).

In work any factor that the person experiences, like described above, can cause stress (the experience of the same situation varies between persons). In most cases, the cause of work related stress is great or too big amount of work, which leads to unbalance with the human resources. In a common level it is difficult to define what is too much work, when one’s health and well-being is viewed; on the other hand, too little amount

of work can be also loading. The appropriate workload dimensioning is dependent on work, working community's and individual's features and it (workload) is determined case by case (Martimo et al. 2010, 71).

5.1.2 Burnout

Work related stress, burnout and depression are concepts which easily mixed in everyday language. Temporarily work related stress is rather ordinary and it's not harmful for health. If the work related stress forms into a prolonged stress period without recovery episodes, it might lead into burnout, unless the situation cannot be solved in co-determination or resources cannot be increased. Burnout means a psychological syndrome, which can develop as a result of continuous work related stress. Burnout is associated with both work and employee's features. The likelihood of burnout to develop is increased in situations where great demands of work combine with minor work resources (Martimo et al. 2010, 75-76).

Burnout can be described as an employee's crisis related to his work. Burnout occurs as a comprehensive fatigue, which builds up after prolonged efforts towards goal achievement, without necessarily resources. In addition, employee's attitudes towards own working and work changes as well understanding of own skills and production. A burnout person feels that his work has lost its importance and meaningfulness as well his feeling of professional capabilities lowers. According to Health 2000 – material, in the years 2000-2001 from 30 years old Finnish people who were in working life 2,5% suffered from severe-degree burnout and 25% suffered from mil-degree burnout (Martimo et al. 2010, 76).

5.2 Physical loading

The relationship between work and musculoskeletal system is multi-dimensional. It is a time-dependent dynamic system, in which previous occurrences and the amount of loading, frequency and durations effects to the dosage what body is taking and what responses it causes. The impacts of the consequences can be harmful/injurious and they can lead in to symptoms and onset of a disease. On the other hand human body is

characterized with adaptation: a suitable loading, so that the loading ends before it starts an injury-leading chain, will lead to the strengthening of musculoskeletal system and this will lead to better resistance for loading. This is sought with physical rehabilitation and health promoting exercising as well for example firefighter's physical exercising done inside working hours. All these methods need to have sufficient recovery time before next loading situation (Martimo et al. 2010, 87-88).

When working in difficult positions the leverages of external forces lengthen and the torque which is directed to the body increases. Thus muscles are demanded to produce more power and especially forces directed to tissues can multiply, when compared working in a neutral position. Hence, even small external forces can lead into great internal forces (in the body) which exceed the tolerance of tissues and causes damages (Martimo et al. 2010, 89).

6 SHIFT WORK

Shift work is nowadays a very significant risk factor of work related illnesses. This is, on the other hand, due to its prevalence (20%) and also due to that shift work is a risk factor for several common diseases. Shift work which includes night work is likely to increase risk of overweight, coronary artery disease, type-two diabetes and breast cancer. It can possibly increase the risk of other cancers, duodenal ulcer and osteoarticular diseases. Shift work mixes the normal sleep-wake rhythm, which can lead to increased risk of traffic- and work related accidents and it can affect to efficiency and productivity of the employees. In irregular working hours the maintenance of regular living habits become more difficult (Viitasalo, Hemiö, Härmä, Lindström, Peltonen, Puttonen & Koho 2011, 13-14).

Human is biologically adapted to be awake and active during daylight hours and sleep when it's dark. The difficulty to adapt oneself to the demands of changes in sleep-wake rhythm, which are due to irregular working hours, occurs in extreme drowsiness in the wake-phase and in insomnia at the sleep-phase. In shift work, before the first

morning shifts and during daytime after night shifts, the main sleep-phase shortens on average by two hours. Additionally, based on their own estimate, one-third of shift workers have often difficulties to fall asleep, more than half has discontinuous sleep at daytime and after sleeping half of the shift workers experience themselves poorly rested. Abnormal and interfering tiredness and short-term insomnia occurs in almost all shift workers, in connection with early morning shifts and night shifts (Viitasalo et al. 2011, 14-15).

7 COPING METHODS FOR SHIFT WORK

When the harms of shift work are wanted to be reduced, the main means are rotation planning and organization of work. Also regular health monitoring, education and informing, organized by occupational health care, are important ways to reduce harms of shift work. Additionally, the means how the employer himself can affect to the adaptation to shift work are worth of mentioning; physical activity, meals and sleep (Härmä et al. 2011, 2).

7.1 Shift rotation planning

The most effective way to prevent health hazards is to seek ways to influence shift rotation system used by the company/employer. Employees often cannot anticipate new shift rotation systems and their real effects on alertness, or employees may underestimate additional risk caused by illnesses because new shift rotation systems may offer better leisure time arrangements, extra income or both. Doctors and occupational nurses have knowledge of biological limits of the human body, coping related issues and importance and changes of sleep in different times of the day (Martimo et al. 2010, 134).

7.2 Health counselling of shift workers

The key role of occupational health care is health promotion and motivation of employees who are doing shifts that differ from normal and regular day work. Important is to give information and approaches what the shift worker can use for prevention and reduction of disadvantages of shift work. For example this information could include best sleeping rhythms for every shift rotation system, correct sleep hygiene and physical activity, correct dining rhythm and right psychosocial adaptation methods. Support and attitudes of family and one's inner circle are prerequisites for successful shift work adaptation. For example, if the employee sleeps at the day time after a night shift, the sleeping environment should be undisturbed and there should be reserved enough time for sleeping. Naps should be taken before first night shift, on brakes when working in night shift and after first morning shift (Martimo et al. 2010, 134).

7.3 Sleep aids and stimulants

If shift work related sleep disorders or sleep disorder caused by the shift work are affiliated with one certain shift (night shift or early morning shift), the considered treatment can be medication. It should be emphasized that the only official use of sleep aids is short-term treatment of insomnia. In long-term insomnia the treatment methods are non-pharmacological (based on cognitive behavioral methods). Because of the similar mechanisms of action in all actual sleep aids, the users who use sleep aids continually develop tolerance (loss of effect), which can be fixed only with stopping the use of medicine. If sleep aids are the chosen treatment, only sleep aids with minimal side effects and ones that does not change the structure of sleep or cause tiredness after waking up due to long-lasting residual concentration should be used. The best sleep aid to fill the above mentioned criterion is zolpidem (Martimo et al. 2010, 135).

Traditionally used substances for relieving the symptoms of tiredness are drinks with caffeine or similar substances; for example coffee, tea or cola drinks. Adenosine, which is a metabolite made in the cells in the body could be described as a "body's own sleep aid". Caffeine blocks the effect of adenosine and caffeine content halves in

the body in 3-5 hours, and usually one serving of caffeine stimulates for the said period. Adenosine block instead can last about five times more than the stimulating effect of caffeine. Because of this the usage of caffeine can significantly worsen prerequisites for falling asleep or stay in sleep. There are great individual differences for effects of caffeine, but great amounts of caffeine should be avoided during night shift, if the employee has intentions to sleep after the shift (Martimo et al. 2010, 135).

8 COLLECTING DATA AND SEARCH STRATEGY

Literature review is a process which includes reading, analyzing, evaluating and summarizing text material of one specific subject. The search from following databases was done on 9.3.2015. The databases were PubMed, Science Direct, OVID and EBSCO. Used search key terms were “Shift work” plus following variables: AND “occupational health”, AND “work well-being” AND “coping methods”. Also, while the search was done, following filters were used:

1. Publications from 1.1.2010 to date.
2. Free full text
3. In English
4. Humans only

8.1 Search results

After the search was conducted with usage of previously mentioned filters, following amount of studies and articles were found; total of 111. Used search key terms, databases and results are represented in Table 1.

Table 1. Search key terms and databases used for acquiring relevant data

Search key term		Databases			
		PubMed	Science Direct	OVID	EBSCO
Shift work	AND occupational health	8	11	4	12
	AND work well-being	18	42	4	5
	AND coping methods	6	1	0	0
Sub-Total		32	54	8	17
Total		111			

8.2 Studies selected to review

After search was conducted, total of 111 studies and articles were found. The amount was this large mostly due to the fact that some databases include, for example, a result where word “work” was used and because of this many irrelevant results got through the search filters. Some databases included duplicate search results and this also effects on the total result number and they also included older than 2010 results, even though filter “newer than 2010” was used. After this some studies or articles were excluded due to fact that they were not relevant (they were not about shift work and occupational health / work well-being / coping methods) or they did not hold relevant information about searched key-terms or subject. Some studies or articles were excluded due to fact that they were not offering free full text (even though such filter was used). After filtering the results with previously mentioned ways there were total of 7 articles to be studied and concluded.

9 RESULTS OF THE STUDIES

After selection of studies with previously mentioned filters, a summarization table was done. The Table 2 presents author(s) of the article, type of the article and publishing year, patients or subject(s), main aims of the article (issues relevant to shift work and its effects on occupational health and well-being). Lastly the main findings of the articles are also summarized in the Table 2.

Table 2. Summarization of articles

Author and publication year	Article type	Patients or subject(s)	Main aims	Main findings
Lim, Bogosian & Ahern 2010	Systematic review	Studies from 1996-2008. Australian nurses (total n=6092) reporting stress and coping.	Aims to identify stress factors in Australian nurses, effects of stress and various coping methods for stress.	Most of the nurses were reporting moderate to high level of stress. Some reported stress due to aggression (at work or nurse-to-nurse). Stress due to high workload. Mentioned coping methods were: social support, plan full problem solving, self-control, escape-avoidance coping, emotion and negative coping, distancing and even some reported none for coping method.
Rathore et al. 2012	Qualitative research	60 female Indian nurses working in flexible rotating shifts. 30 nurses in age group of 30-45 and 30 in 45-60 years of age.	To explore problems related to shift work faced by female nurses and to study the impact of shift work on female nurses in terms of sleep, fatigue, health and	During morning shifts overall 43,3% felt unsafe at work while the percentage increased to 73,3% during night shifts. 57% had to change rosters at short notice frequently or almost always and 41% were given notice sometimes. Age plays a negative role on general feeling: the old group's scores were higher than young group respondents (in a questionnaire of impact of shift work on sleep and fatigue). Still, both groups had full 150 points in feeling of tired all the time. Highest impact on general

			well-being and social and domestic situation	feeling of tiredness was among old group respondents. From results can be generalized that shift work does affect the sleep pattern of an individual. Gastrointestinal and digestive problems such as indigestion, heartburn, stomachache and loss of appetite are more common among rotating shift workers and night workers than among day workers. There was namely no scoring variation with old and young group while considering the satisfaction to domestic situations. In both groups the result were low to moderate.
Costa 2010	Review	Shift working in general	Overview of the problems of occupational health associated with shift work and main guidelines at organizational and medical levels on how to protect workers' health and well-being. Multiple references and resources.	The misalignment of circadian rhythms of body functions is responsible of the so called "jet lag" ("shift lag") syndrome, which is characterized by feelings of fatigue, sleepiness, insomnia, digestive troubles, irritability, poorer mental agility and reduced performance efficiency: all though person recovers in a few days depending on shift phase duration, personal characteristics and coping strategies. Morning shift can reduce sleep due to early awakening which is not compensated with proper advancing of bedtime due to social habits and activities. Afternoon shift disturbs sleep the least, unless it ends too late (11 or 12 p.m.) or there is long commuting time. Increased risk of incidents 18% in afternoon shifts and 30% in night shift, when compared to morning shift. Risk increases in successive shifts (6% in 2 nd , 17% in 3 rd and 46% in 4 th). After sleeping, digestive problems are most frequently complained by shift workers, due to troubles with

				<p>mealtimes and normal gastrointestinal rhythm. Higher prevalence of nutritional and metabolic disturbances in shift workers, such as overweight and obesity and increased triglycerides and total cholesterol. Several major cardiovascular risk factors, such as smoking, obesity, and dyslipidemia are more prevalent among shift workers than among day workers. Rotating shift work which includes night shift work has a higher risk of miscarriage. Shift work has a relevant interference on family and social life, which may result in psychological stress and psychosomatic disorders. Shift schedules should be designed with some ergonomic criteria to lessen stress and limits adverse effects; limit night work as much as possible, avoid large number of consecutive night shifts, to prefer quick (1-3 days) rotation shift systems, prefer clockwise rotation (morning/afternoon/night) and avoid too early morning shift starts. To deal with different domains, there needs to be implied concurrent actions of several actors beside occupational health system, such as ergonomists, psychologists, sociologists, educators, legislators, as well as managers and workers.</p>
Fossum et al. 2013	Systematic review	Offshore shift workers in petroleum industry	Systematically review all the studies which examine effects of shift and night work	Shift work and its association with sleep and sleepiness was identified. Shift/night workers reported more sleep problems than day workers. Permanent day workers reported better sleep quality than all other shift schedules. Offshore workers reported better sleep quality

			<p>offshore petroleum industry; how shift work offshore may affect the workers. A total of 29 studies.</p>	<p>during night work than day work, while onshore workers reported the opposite. Subjective sleepiness was highest in the beginning of night and swing shifts. Sleepiness at home was higher following night shift compared to following swing shift. The majority of or all workers were fully adapted to night work within a week. Offshore workers had significantly higher anxiety scores than onshore workers across day work, night work and the off work period. Continuous exposure to day/night shift work was associated with increased BMI. Shift work predicted gastric problems. When no control for job type, shift work predicted work-related injuries. Relative risk of accidents was 51% higher during the dark period between 1801-0559 hours. Shift workers offshore had difficulties in reconciling work with family life. Offshore shift workers reported significantly greater exposure to physical environmental stressors than day workers.</p>
Wang et al. 2013	Meta-analysis	Female breast cancer in night shift workers	<p>To conduct a systematic review to sum up evidence of the associations between different aspects of night shift work and female breast</p>	<p>Shift work in various occupations, such as healthcare, transportations, and services, is becoming a more common practice among different sectors. The dose-response analysis showed a positive gradient of breast cancer risk with the year of night shift work and cumulative night work. The theoretical biological plausibility for the positive association between night work and breast cancer risk are: 1) long-term exposure to night shift work and/or light-at-night can disturb the human day-night</p>

			cancer using a dose-response meta-analysis approach. A total of 10 studies included.	rhythm and result in circadian disruption, causing the resetting of the internal pacemaker of the synchronization nuclei and the suppression of the hormone melatonin output. 2) Evidence from experimental studies suggested that vitamin D intake and higher circulating vitamin D levels may be protective against breast cancer. As a substantial proportion of time in adult life, night work may decrease the exposure of sunlight and subsequently reduce vitamin D levels.
Wagstaff & Sigstad 2011	Systematic review	Workplace stressors that might increase risk of workplace accidents	To provide a systematic, updated overview and scientific review of empirical research regarding accidents in relation to long work hours and shift work	Shift work and long working hours present a substantial and well-documented detrimental effect on safety. Studies included had one or more findings on safety. Findings are most relevant to transport and health sectors. Work periods greater than 8 hours have increased risk of accidents, which cumulates so that the risk of accidents in 12 hours is twice risk at 8 hours. Shift work with night shifts increases risks of accidents, whereas plain night work may bring some protection against this effects due to re-synchronization. No difference in results among age groups or gender.
Amani & Gill 2013	Systematic review	Shift working, nutrition and obesity and their effect on workforce health.	Assessing the association 1) between shift working and obesity and/or BMI 2) between shift working	High levels of total cholesterol (>200mg/dL) and LDL cholesterol (>130mg/dL) were significantly more prevalent in nearly all groups of shift workers, irrespective of their ages. No differences were seen in obesity prevalence (BMI \geq 30), the serum levels of triglyceride, HDL-C, fasting blood glucose and blood pressure levels between shift workers and day

			and nutritional/dietary patterns. A total of 15 studies.	workers. Although, shift working is a risk factor for lipid profile disturbances. Working in rotating shifts including nights was significantly associated with being overweight (as defined by BMI) after adjusting for age. One reference showed that shift workers had significantly higher BMI compared to non-shift workers. The findings yielded that late shift workers reported greater weight gain than day workers. Late shift workers showed a higher food intake compared with the day workers when combined with those reporting exercising less. However late shift workers reported eating fewer meals. The amounts of energy and nutrients intakes of shift workers, particularly the late shift workers, were smaller than that of daytime workers.
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From the results we can agree on following main findings and similarities within the studies and articles. Most of the nurses were reporting moderate to high level of stress due to aggression or stress due to high work load and coping methods for shift work were for example social support, plan full problem dosing, self-control and even in some cases “none” was reported for coping method (Lim, Bogossian & Ahern, 2010). Older age has a negative effect on general feeling of tiredness and gastrointestinal and digestive problems are more common among rotating shift workers (Rathore et al. 2012). The misalignment of circadian rhythm causes “shift lag” syndrome, which is characterized by feelings of fatigue, sleepiness, insomnia, digestive problems and reduced performance efficiency. There is increased risk of incidents of 18% in afternoon shifts and 30% in night shifts and after sleeping, digestive problems are most frequently complained by shift workers. Shift schedules should be designed with some ergonomic criteria to lessen stress and limit adverse effects; this needs to be done not only by occupational health care, but also with several other actors (Costa, 2010). Fossum et al. (2013) state that shift work and its association with sleep and sleepiness was

identified and shift/night workers reported more sleep problems than day workers. Also continuous exposure to day/night shift work was associated with increased BMI and when no control for job type was available, shift work predicted work-related injuries.

Wang et al. (2013) reports a positive gradient of breast cancer risk with the year of night shift work and cumulative night work. Wagstaff & Sigstad (2011) report that shift work and long working hours present a substantial and well-documented detrimental effect on safety; findings are most relevant to transport and health sectors and no differences in results among age group or gender. High levels of total cholesterol and LDL cholesterol were significantly more prevalent in nearly all groups of shift workers and shift work is a risk factor for lipid profile disturbances. Also, working in rotating shifts including nights was associated with being overweight (as defined by BMI) (Amani & Gill, 2013).

10 CONCLUSION

In conclusion, there is multiple effects shift work has on health and well-being, such as sleeping disorders and increase in stress levels and work itself is a loading factor. There is a lot to be done to ease the effects, but it remains as a challenge to the employee to do all required actions. Studies or articles listed in this thesis support the fact that shift rotations and preventive actions should be done in cooperation with occupational health care, employer and employee. Even though the thesis holds a large amount of information about shift work and its effects on health and well-being, the reader should keep in mind that there might be some errors in study quality or language and context. The main similarities that are found from the studies are high level of stress due to high work load, older age has a negative effect on general feeling of tiredness, gastrointestinal and digestive problems are more common among rotating shift workers, and there is increased risk of incidents of 18% in afternoon shifts and

30% in night shifts. Also similarities such as, continuous exposure to day/night shift work was associated with increased BMI and shift schedules should be designed with some ergonomic criteria to lessen stress and limit adverse effects, were found.

11DISCUSSION

I would like to point that this was my first thesis and a review of scientific data. So this thesis was not done by a professional or experienced scientist. This might have an effect on study selection, their quality, search database and filter usage and overall quality of this thesis. Even though I felt rather comfortable writing the thesis in English, there might occur some misspellings or context misunderstandings. The thesis process itself started early in 2014. Then it was supposed to be an exercise package for factory workers for preventing shoulder problems, then the subject switched into questionnaire about work-wellbeing. At this point the interest towards shift work and its effects on health sounded the most familiar to me. Due to the fact that I was not able to cooperate with my at-the-time employer, the final subject was formed: a literature view of shift work and its effects on health and well-being.

After starting the thesis process on November of 2014 the writing of theory part was simple forward and I felt comfortable with it. I got reliable and relevant references to form the theory part from. The most consuming part was the search of databases and concluding the findings. Also, I encountered with some problems with computer- and search engine systems. Inclusion and exclusion criterion and search key terms for the selected studies and articles could have been more exact: with some key terms was found only few results and some duplicate results and older than 2010 results got through the filters for some reason. A pause with the thesis was from December 2014 to February 2015 due to I was working in shifts and training five to six times a week.

After my work ended and I got more time, with the tutoring teacher we agreed on little bit over one month time frame for completing the thesis.

The results were from the author's point of view similar to what he has experienced due to working in shifts and these kind of results were predictable to rise up. More things and findings were found, what were somewhat new to the author, such as gastrointestinal problems and that the increased risk of incidents was so high. For future studies or theses such things or fields as culture's effect on shift work (from coping point of view) and different shift schedule variations around the world could be studied. Also some local studies should be made for more efficient regulations and rotations of shift work schedules.

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