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Sleep Quality And Sleeping Strategies For Work Productivity, A Handbook For Freska's Workers.



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<p>Short sleep duration and unrestful nights of sleep are already a common pattern in world-wide population. Research shows that 70% of Finnish people actually sleep "Fairly well", however, there is still a large amount of people sleeping poorly and foreigners/immigrants are not included in these studies. The purpose of this thesis was to develop a handbook for the workers of a Finnish company called Freska about sleep quality and sleep strategies for better work productivity. This handbook has general information about the importance of sleep, its direct and indirect effects on health and work productivity and recommended instructions for better sleeping patterns. The handbook was developed by taking in consideration the data gathered from a sleep survey given to the workers, making its content relatable, practical and easy to read. The research tasks were the following: 1) Why sleep is important for workers?, 2) How to have better sleeping quality?, 3) What kind of sleeping strategies could be used for better sleep quality and work performance? And 4) How to plan, test and estimate a good handbook product?.</p> <p>The thesis was developed from Spring 2019 to Spring 2020. The handbook received positive feedback from the commissioning party's supervisor and the theoretical background on sleep, as well as the survey for the workers, supports the handbook's purpose. In early February 2020 the final version of the handbook was handed in as an electronic copy (PDF-file) for the commissioning party. This thesis gave the author the possibility of developing professional learning on sleep, sleep physiology, work productivity and product Design. Moreover, applied knowledge in research and development, health and wellbeing promotion, anatomy and physiology, product development and academic writing.</p>	
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1 INTRODUCTION

Sleep is one of the most important elements for overall levels of health, vitality, alertness and productivity for all human beings. Sleep disturbances, depending on intensity and frequency can lead to lack of attention, reduced work performance, accidents, daytime sleepiness and overall decreased quality of life. (World Health Organization, 2004.)

Since this is a global phenomenon, Finland is not excluded. According to the Journal of Sleep Research, subjectively, 70% of Finnish people have sleeping quality considered “fairly well” (Hublin, Lehtovirta, Partinen, Koskenvuo, & Kaprio, 2017). However, a significant amount of people still suffer from “poor sleep” and in addition to that, there can be a significant change in sleep quality, sleeping habits and sleep affected lifestyle choices from different groups, cultures and immigrants in a new country. (Voss & Tuin, 2008; Schneeberger, et al., 2019.)

With this in mind, the thesis is going to address a specific group of workers at the cleaning company called Freska Oy, the commissioner party. The purpose of this thesis is to develop a handbook for Freska workers about sleep quality and sleep strategies for better work productivity. The tailor-made handbook will inform about the research on sleep quality and strategies for both overcoming the most prevalent issues people encounter for high quality, restful nights and for work productivity.

The objectives are:

- For the author: To develop new learnings on Sleep, Sleep physiology, Work Productivity and Product Design and apply the studies already taken in Research and Development, Health and Wellbeing Promotion, Anatomy and Physiology, Product Development and Academic Writing. By doing this thesis the author will acquire a better professional knowledge on how to coach people to have better sleeping quality.
- For the commissioning party: To provide research based information about sleep to Freska’s workers in order to increase awareness on the topic at

hand, increase sleep quality amongst them and result in workers that are more rested, mentally clear, socially present and productive.

Freska Oy's workers are in majority foreigners, people from different cultures, habits and lifestyles, therefore it is important to obtain information about all of them, that way we can know with more certainty if they suffer from similar sleeping problems or sleeping challenges so that strategies can be applied and focused on their common, most important issues.

2 SLEEP

Sleep, alongside food, water and air is a biological necessity for human existence (Grandner, 2017). Researches define sleep as a natural and reversible state where there is diminished responsiveness followed by a loss of consciousness and decreased reaction to external stimuli. (Rasch & Born, 2013.)

When sleeping we experience 2 different kinds of sleep, rapid eye movement (REM) and non-REM. Non-REM sleep has 3 stages within which we go from an awakened state to deeper and deeper levels of unconsciousness, our breathing slows as well as our heartbeat and brain waves, our muscles relax and body becomes temporarily numb. REM is the phenomenon in which, in an unconscious state, eyes move rapidly behind the eyelids. In REM sleep, legs and arms becomes momentarily paralyzed, dreams are most likely to occur and breathing, heartbeat and brainwaves becomes faster, more active. During a full night of sleep we cycle through all these stages many times, with deep REM sleep gradually increasing towards waking time. (National Institute of Neurological Disorders and Stroke, 2019.)

Sleep is one of the most fundamental parts of our lives, according to the World Health Organization, we humans spend approximately 1 third of our lives sleeping. It is no wonder why we need to dedicate so much time for that, the simple act – but complex mechanism – of sleep can create a cascade of profound effects in all areas of our lives, from our physical health to our mental health, work productivity, relationships and overall quality of life. (World Health Organization, 2004.)

Sleep has been shown to play a major role in many biological procedures such as inflammation, glucose control, appetite, cellular toxin cleansing, cardiovascular and metabolic regulation, energy conservation, and survival. Psychologically and cognitively sleep is important for memory consolidation, neural development, emotional processing and learning curves. (Matricciani et al., 2017; Mukherjee, Patel, Kales, Ayas, Strohl, Gozal, Malhotra, et al., 2015.)

In human beings, sleep patterns are strongly influenced by external stimuli to light and darkness over lengths of 24 hour periods, as well as internal circadian rhythms

based on physiological and genetic processes of sleep-wake cycles (Gooley, 2008). This means that although there is already an internal predisposition for the body to sleep and wake up in a rhythmic manner, changes in solar or artificial light exposure as well as darkness can affect sleep duration and quality. People with healthy sleeping patterns have natural secretions of cortisol and melatonin (hormones responsible for regulation of sleep-wake cycles) according to day time cycles; during the day showing higher levels of alertness and performance peak and during the night, stabilising rest and recovery. On the other hand, people with sleep disorders can have patterns of sleep-wake cycles that are misaligned with external circadian rhythms of day and night. (Cho et al., 2016; Duffy & Czeisler, 2009.)

2.1 Sleep duration recommendations

According to Waterhouse, Fukuda, & Morita, "A good sleep is recuperative and removes the feelings of fatigue" (2012), however a very prevalent question about sleep is "How much sleep do we need?".

The amount of sleep necessary for optimal health, wellbeing and work performance can be very different from each individual and it can differ greatly in age throughout life (Mukherjee, Patel, Kales, Ayas, Strohl, Gozal, & Malhotra, 2015). The concept of optimal sleep is multifaceted, often misunderstood and oversimplified or vague by enabling authorities, for example as "the daily amount of sleep that allows a subject to be fully awake (i.e. not sleepy) and able to sustain normal levels of performance during the daytime" (Ferrara & De Gennaro, 2001). Though, substantial arguments challenge such assumptions stating that there is "no magic number" for optimal sleep (Horne & Horne, 2006; van Vugt, 2011). When recommending optimal sleep durations, health authorities acknowledge that all sleep demands may differ, and that other sleep features, such as sleep quality, timing, structure, daily variability and continuity also play a significant role. (*How Much Sleep Do We Really Need? - National Sleep Foundation, n.d.; Your Guide to Healthy Sleep, n.d.*)

Sleep time or perception of inadequate sleep by adults may also have risen in reaction to a rise in sleep need. For instance, an increase in cognitive functions

over the past century, such as more time spent on education and an increase in the amount of cognitively demanding employment, may have improved demands for adult sleep (Flynn, 2013; Silverman, 2010). Given the significance of sleep for learning and memory, broad senses of inadequate or poor sleep may represent the need for more sleep to deal with life and work contemporary enhanced cognitive requirements. (Matricciani et al., 2017.)

With this in mind, it is nonetheless relevant to consider what the research recommends for duration of sleep. Population studies continue to demonstrate that the smallest mortality and morbidity risks are associated with mid-sleep durations of 7 to 8 hours, while highly brief or long sleep durations are associated with enhanced health problems (Kurina et al., 2013; Li et al., 2016). Short sleep times have generally been described as 6 hours or less of daily sleep, and lengthy sleep usually relates to 9 hours or more. Prospective studies show the risk of all-cause mortality (Gallicchio & Kalesan, 2009), cardiovascular disease (Cappuccio et al., 2011), diabetes (Cappuccio et al., 2010), hypertension (Meng et al., 2013) and obesity (McAllister et al., 2009) with both brief and long sleep durations.

The World Health Organization (WHO) recommends a minimum of 8 hours of sleep per night for best performance and prevention of sleep depriving problems and diseases. (*WHO technical meeting on sleep and health*, n.d.)

After rigorous, systematic and scientifically grounded reviews of best sleeping patterns, the American National Sleep Foundation now recommends a sleep range of 7 to 9 hours for all adults (18-64 years old) and does not advise on sleeping less than 6 hours or more than 10 hours. (*National Sleep Foundation Recommends New Sleep Times | National Sleep Foundation*, n.d.)

Overall, there's a consensus that sleep duration of 7 to 9 hours per night is advised and more beneficial in a broad spectrum of populations.

2.2 Sleep deprivation

Short sleep duration and unrestful nights of sleep are already a common pattern in general population. When people fail to achieve enough of any of the two main aspects of sleep – quantity and quality – they get into a sleep deprived state. (Altman et al., 2012.)

The World Health Organization (WHO) says that Indicators of poor sleep quality and quantity are commonly shown as higher levels of drowsiness during the day and the need for compensatory sleep, such as a day time nap. If sleep deprivation continues for days on end, these short-term negative impacts may remain being more or less permanent. In terms of working capacity and working accidents, these effects may have serious implications. For example, simple and complex reaction time tests demonstrates an increase in response length in individuals who are sleep deprived for several nights because of noise. Long deprivation of sleep leads to chronic tiredness, excessive sleepiness, reduced incentive and reduced daily performance. (*WHO technical meeting on sleep and health*, n.d.)

As for the reasons why such sleep insufficiency exists, research shows that the appearance and continuation of technological developments such as in artificial lighting, TV, computers, internet, smartphones and other display-based devices are thought to contribute to shorter sleep, since artificial blue light can create nights without darkness and that can contribute to a disturbance in human sleep and wake rhythms. (Cho et al., 2016; Matricciani et al., 2017.)

When taking in consideration the relationship between the environment with sleep quality, environmental stressors such as noise shows to be widespread amongst short-term sleep disorders. (World Health Organization, 2004.)

Another main constraint on adult sleep quality and sleep time seems to be employment: with employed people sleeping less than those who are unemployed, people with various jobs sleeping less than those with only a single job, long working hours, shift work, jobs requiring long commutes and certain jobs such as executives, managers, transport/warehouse employees and manufacturing workers being at a higher risk for insufficient sleep. Specific employees involved in high-

level work often demonstrate high levels of anxiety, as they have hard duties to accomplish and require high energy reserves and restful sleep. (Matricciani et al., 2017.)

As already addressed before, sleep duration can vary widely amongst different individuals. However, although this statement is true, regardless of the amount of time needed to feel well rested and alert, if a person does not reach his/her individual recommended sleep time and quality in a consistent basis, signs of sleep deprivation starts to occur with the appearance of numerous psychological, physiological and performance negative effects.

While depriving humans being of full nights of sleep can clearly contribute to a number of negative health consequences, sleep deprivation of only a few hours per night can also lead to similar health and performance issues. Those, varying from cardiovascular diseases, lack of cognitive functioning, lack of attention, reduced work performance, accidents, obesity, daytime sleepiness, depression, mortality, morbidity and decreased wellbeing.(Van Dongen, Maislin, Mullington, & Dinges, 2003; Wells & Vaughn, 2012.)

One of the important consequences of sleep deprivation is that it has shown to affect the ability to process emotions. Insufficient sleep can increase the tendency for negative moods and diminish the effectiveness in which individuals can identify facial expressions. In a recent study which 37 healthy volunteers were tested for they emotional processing abilities with and without a full night of sleep, the group who was sleep deprived demonstrated being less able to express empathy in a social setting than those fully rested. The authors of this study concluded saying how “sleep loss impairs the ability to share the emotional state of others, which is an important skill in everyday social interactions in both the workplace and personal life”.(Guadagni, Burles, Ferrara, & Iaria, 2014.)

In the deeper realm of mental health, Tsuno, Besset and Ritchie (2005) shows in a meta-analysis from years of research how several studies have exposed that the connection between sleep and depression is noteworthy. Insomnia, which involve lasting difficulties initiating or staying asleep, is one of the most prevalent type of sleep disorder and depression is the most prevalent condition among all insomnia-

related psychiatric ailments. 90% of depressed patients have been shown to complain about their quality of sleep. (Freeman et al., 2017; Tsuno et al., 2005.)

3. WORK PRODUCTIVITY

Since sleep has a very active function of protecting the human body and its respective systems of short and long term degradation, tiredness and stress by playing an important role in physical and psychological recovery, energy conservation and concentration. When comparing the close relationship between sleep and work productivity, we can see that by depriving human beings of sleep, voluntarily or involuntarily, generates a variety of biological problems. (Irwin, 2015.)

According with Ayala-Guerreiro, Aguilar and Medina (Ayala-Guerreiro; et al., 2010) work consequences of sleep deprivation includes:

- Alterations of executive functions, which comprises basic cognitive processes. Influencing decision making, inhibition of irrelevant answers and changes in strategies.
- Learning problems, affecting reading, writing and speaking to lower levels of intelligence.
- Memory deterioration, making it hard to remember words.
- Slower rational mathematic development.
- Lower levels of response in attention and concentration tasks, especially present in simple and repetitive tasks over complex and interesting ones. Moreover, there is a higher deterioration when attention must be selective.
- Over auditive tests, sleep deprived people tends to have a higher reaction time.
- Lower performance on the realization of psychomotor tasks.
- Beyond cognitive problems, sleep deprivation also affects metabolic activity in the brain, temperature regulation and the immune system.
- Increase in sensitivity to pain and a steady decline in muscular strength and blood adjustments.

- Possible development of psychological, neurological and cognitive disorders.
- Signs of irritability, fatigue and irritation. However, with an increase in positive, euphoric responses to circumstances previously considered neutral.
- Disfunctions on psychosocial functions.

All this to say how sleep deprivation can have serious costs in biological, neurological, social and psychological systems in the human body.

Other researches also show a strong relationship between sleeping less and work performance. In a study by Dongen, Maislin, Mullington, & Dinges (Van Dongen et al., 2003), healthy adults were gathered in 2 different groups comprised of people who did not sleep at all for 3 nights and people who slept in different lengths of times per night (4, 6 and 8 hours) for a total period of 14 days. Results showed that the groups of people who slept only 4 or 6 hours per night for 2 weeks had an accumulation of negative consequences related to cognitive performance on all tasks similarly equivalent to those who were sleep deprived for 1 to 2 entire days. This shows not only how total sleep deprivation has obviously degrading consequences for the neurological system, working memory performance, alertness and cognitive act, but also how the long term restriction of daily sleep for only a few hours (2 hours) can have serious, and equally important, negative impacts. Moreover, the subjects who were sleep deprived for 4 or 6 hours related being highly oblivious about these growing cognitive deficits, which may explain why chronic sleep deprived individuals have often bought into the misbelief that there is a benign effect on waking cognitive functions. The study group who slept 8 hours per night had normal levels of increasing cognitive and learning abilities, demonstrating once again how an average of 8 hours can be beneficial. For workers in all fields in which cognitive learning, testing and performance is used – a vast amount – healthy sleeping patterns must be taken in consideration for optimal engagement and overall levels of health.

4. SLEEPING STRATEGIES

The previous sections already mentioned the fundamentals of an understanding about sleep, what sleep is, it's benefits and some researched recommendations about it. Now, this section is going to address the various sleeping strategies and lifestyle changes that is advised in the literature for optimizing sleep quality and therefore indirectly impacting work productivity.

Firstly, as already addressed, if sleep duration per night is below 7 hours or above 9 hours, negative consequences are most likely to build up in the body and its performance levels. This is a fundamental aspect of which all following strategies are based on. Individual experimentation within these recommended hours is advised in order to find the best sleep duration time in the current time. Moreover, it is once again important to notice how human subjective observation of performance and attention levels is not entirely accurate, thus, a more objective approach to work performance and amount or quality of daily activities performed over time is recommended.

Regular schedule

One sleeping strategy that is highly regarded is to have a sleeping schedule or routine that one can always follow in a day to day basis as best as one can. That means that if an individual is sleeping at 22pm and waking up at 06am, this schedule should be kept constant for as long as possible.

Research shows that irregular sleep/wake patterns are associated with poorer academic performance and productivity. People who have irregular sleep cycles tend to need more sleep per night, experience more daytime sleepiness and obtain more daytime naps to compensate for the lack of sleep quality per night. (Phillips et al., 2017.)

Sleep timing

Sleeping 7 to 9 hours per night and having a regular sleep schedule is important, but what time is best for one to sleep?

Firstly it is important to notice that since human beings have internal biological clocks that are influenced by external light and darkness, and specific hormones related to sleep that are secreted at night and others related to alertness secreted at daytime, it is sensible to assume how it is of one best natural interest to wake up in the morning and sleep in the night. Matthew Walker, PhD, head of the Sleep and Neuroimaging Lab at the University of California states: “When it comes to bedtime, there’s a window of a several hours—roughly between 8 PM and 12 AM – during which your brain and body have the opportunity to get all the non-REM and REM (sleep) they need to function optimally”. (Heid, n.d.; *Why We Sleep: Unlocking the Power of Sleep and Dreams by Matthew Walker*, n.d.)

Within this window of time, genetics then plays a role if one would sleep early in the night or later. Some people are more predisposed to sleep later in the night (those so called night “owls”), having levels of alertness that drops later than those who are more predisposed to feel sleepy earlier in the night (the early “larks”). If the feeling of sleepiness is not yet built up at the early night, forcing oneself to sleep then may be counterproductive and not beneficial. Sleep timing should be in sync with this genetic processes. (Goel, 2011.)

A research by the journal of Cognitive Therapy and Research showed that people who considered themselves as “evening” people – and consequently sleeping late at night (at or above 12am) – experienced more negative thinking and rumination compared to the “morning” types who would sleep earlier at night (22pm to before 12am). (Nota & Coles, 2015.)

In addition to that, self-report measures, such as chronotype questionnaires are commonly utilized measures to identify the genetic timing of circadian sleep, such as “The Power of When” quiz. (*The Power of When Quiz | Discover the Right Time to Do Everything!*, n.d.)

Artificial light

Artificial light exposure at night can contribute to irregular sleep and negatively impact biological circadian rhythms, affecting brain wave patterns, hormone production, and cell regulation. (Duffy & Czeisler, 2009.)

Blue light, which is emitted by a propagation of electronic devices, is precursor of attention, mood and reaction time, making it a beneficial use during the daytime – as well as sun light exposure. However, during the night, blue light is considered part of why so many people don't have good quality sleep, affecting circadian rhythms and hormone secretion. (Publishing, n.d.)

It is advised to avoid blue light exposure between 2 to 3 hours before bedtime, or as long as possible. If one must be exposed to such light, it is then recommended the use of blue light blocking glasses or screen light filtering software. (Chi, 2017; Mortazavi et al., 2018; Publishing, n.d.)

At night, dim red lights or candles can be used, for studies have shown how red lights do not suppress melatonin production or negatively affect circadian rhythms as other lights, furthermore, it can be even beneficial for better sleep quality. (Zhao, Tian, Nie, Xu, & Liu, 2012.)

Stress

Stress is a natural part of the human experience, during the day, stress related hormones, such as cortisol, is secreted in order to stimulate alertness, focus and action. This is a reason why bright light exposure, exercise and activity can help tremendously in the quality of sleep one experiences at night, for with energy expenditure high during the day, the body naturally craves for rest and sleep during the night.(Dolezal, Neufeld, Boland, Martin, & Cooper, 2017.)

However, if stress is continually present during the night, it can result in decreasing slow brain waves during sleep, sleep efficiency and increasing awakenings during bedtime. It can be a main precursor of insomnia and other sleeping problems. (Kim & Dimsdale, 2007.)

Therefore, it is recommended activities that has the influence in lowering stress levels such as yoga, meditation, exercise, reading or other therapeutic practices, such as Cognitive Behavioural Therapy. (Bankar, Chaudhari, & Chaudhari, 2013; D'Aurea et al., 2019; de Bruin, Bögels, Oort, & Meijer, 2015; Dolezal et al., 2017; Rusch et al., 2019.)

Bedtime routine

Creating a routine in the night by giving the body its required time, space and needs to unwind before sleep is already researched to be highly beneficial for sleep quality. Practices such as teeth-brushing, reading, stretching, journaling and bathing before bedtime are examples of such activities. By building a continuous habit, the body and mind are given the chance to slow down and relax, making it conducive for a better sleep. (Kitsaras, Goodwin, Allan, Kelly, & Pretty, 2018; Mindell, Telofski, Wiegand, & Kurtz, 2009.)

Sleep Environment

Where one sleeps can strongly affect their sleep quality. WHO states: "Sleep disturbance is frequently considered the most serious consequence of environmental noise". Making sure the sleeping room has low exposure to outside noise as well as inside noise being managed (such as sleeping with a snoring partner) can highly contribute to better sleep. (*WHO technical meeting on sleep and health*, n.d.)

Another environmental aspect is darkness, since as mentioned before, light exposure can increase sleep latency and sleep effectiveness. Sleeping in a completely dark room with devices' lights switched off and the use of a sleeping mask can strongly influence good sleep. (Gooley et al., 2011.)

Lastly, room temperature. Research is not conclusive in telling the right room temperature for high quality sleep, for it depends on people's needs and preferences. However, there's a consensus that rooms above 23° degrees Celsius and below 12° degrees can negatively impact sleep. Furthermore, there is an agreed prevalence that a slightly cooler room may be more beneficial, since it mimics the lower temperature drop the body naturally experiences during sleep. (Okamoto-Mizuno & Mizuno, 2012.)

Naps

Napping, or brief sleeping, can be highly effective for diminishing sleepiness, improving alertness, mood and cognitive performance, especially under sleep deprivation, night shift work and long driving times. With napping, psycho-motor rate

and short-term memory acquisition were shown to increase. (Lovato & Lack, 2010.)

In a study published in Nature Neuroscience researchers tested subjects four times a day on their perceptive performance. Performance worsened each time the tests were carried out, but people who took a 30-minute nap between tests stop performance from worsening and people taking a 60-minute nap even reversed their previous scores.(Mednick et al., 2002.)

Naps has its benefits, however, long naps or naps taken too late in the day can adversely impact sleep length and quality. Moreover, for people who already have difficult time falling/staying asleep at night or with sleep disorders, naps can also unfavourably effect sleep. (*Napping Benefits & Tips—National Sleep Foundation*, n.d.)

The studies recommend naps of short duration (10-20 minutes), showing how the benefits of such brief rest from wakefulness is clear. For naps longer than 30 minutes, even more benefits can be experienced, however, feeling of grogginess can be also present moments after such long naps. Therefore, if one is to immediately perform after a nap, short naps are advised. Furthermore, such as with sleep duration, it is important to take individual differences and preferences on the length of time. (Lovato & Lack, 2010.)

Exercise

According to The National Sleep foundation, physical exercise increases the quality of sleep and the duration of sleep. Exercise can also strengthen sleep in other ways, as it reduces stress, raises tiredness levels and body temperature, a perfect recipe for sleep a few hours later, since temperature will slowly drop and sleepiness increases. For acquiring the positive effects on sleep, practicing exercises in a regular basis for as little as 10 minutes of aerobic activity seems to be enough. In addition, exercise early in the morning and afternoon may help re-establish a sleep wake cycle. It can be particularly helpful when you practicing exercise outdoors whilst receiving sun lighting. Nonetheless it is important to notice that evening exercise close to bedtime may or may not disturb sleep depending on each individual. ('How Exercise Affects Sleep', n.d.)

Nutrition

The research on best nutrition for sleep quality is still not entirely clear and affirmative. Certain diets and foods can definitely impact sleep, however a definite recommendation of which is best is still missing. What studies show, however, is that diets both very high in carbohydrates, sugars or very high in fats may disturb sleep, as well as heavy meals before bedtime. A more foundational and balanced approach of mixed high quality, non-processed intake of carbohydrates, fats, protein and vegetables are strongly advised and associated with good sleep. (St-Onge, Mikic, & Pietrolungo, 2016.)

Certain drinks are more conclusive by research to be sleep disruptive. Caffeinated drinks – such as coffee – taken in the evening has the potential of lowering deep sleep by 20% with only 1 cup. This negative impact is also objectively present with people who report no sleep problems whatsoever. By disrupting deep sleep, late-in-the-day doses of caffeine causes the individual to wake up unrefreshed, thus, reaching for more caffeine and engaged in a frustrating looping quest for more energy and alertness. Caffeine is therefore recommended to be used until midday in order to preserve sleep and alertness when waking up. (*Why We Sleep: Unlocking the Power of Sleep and Dreams* by Matthew Walker, n.d.)

As for alcohol, moderate to high levels of alcohol consumption contribute to REM sleep deterioration. Alcohol can seem helpful in sleeping, since it actually help with more sleepiness in the first half of sleep duration, however, alcohol can disturb with slow deep waves on the second half of the night, leading to more awakenings and insomnia. (*How Alcohol Affects the Quality—And Quantity—Of Sleep—National Sleep Foundation*, n.d.)

5. FRESKA OY

Freska OY is cleaning company established in Finland in 2015. Then in Norway in 2016 and Sweden in 2018. This thesis has for commissioning party the one located in Helsinki area.

Freska is a company initially founded with the intention of providing good home cleaning services through a simple and effective internet check-out system. Its main purpose is to provide home cleaning services to the market, but also office cleaning, window cleaning and moving out cleaning. Freska makes use of website and application technologies both for customers and employees. Therefore, the company comprises of professional roles varying from managers, designers, marketers, customer relation and IT professionals, CEOs and cleaners. There are approximately 315 cleaners and 44 office staff at Finnish Freska Oy. In total there are more than 30 different citizenships presently working at Freska.

6. PRODUCT DEVELOPMENT

For the main purpose of this thesis being the creation of a handbook on sleep quality and strategies for better sleep for the workers at Freska Oy, it is essential the understanding of the product development process in order to increase the effectiveness of its creation.

The product development process is comprised as a series of steps or practices one uses to plan, design and commercialize a product. Many different processes may be utilized, however a fundamental understanding of a precise and detailed method of development is aimed.(Ulrich & Eppinger, 2011, p. 12.)

According to Ulrich & Eppinger (2011), this process is comprised of 6 phases, the first one being considered Planning. Planning comes even before the actual product development and it consists on reflecting on the broad strategy and main reasons behind the project, it is a phase to address opportunities available. The second phase involves recognizing the needs of the target group, creating target specifications, establishing and evaluating different options for product concept and choosing one or more concepts to further develop and test them; product concept meaning an explanation of the look, role and characteristics. On the third phase, system-level design is focused, it is where is defined the draft description of the product, the breakdown into subsystems and modules and the conceptual design of key components. The output of this phase typically consists of a geometric material. The fourth phase consists on building a more comprehensive layout with a detailed design process, it includes the full structure of materials used, digital design, thorough product description and cost of production. The fifth phase is about testing the development of different concepts and refinement. Prototypes are tested to check whether the product works as designed and whether the product meets the most important requirements of the customer. The sixth stage of ramp-up production aims at preparing the target audience, delivering the product and addressing any remaining problems during production. (Ulrich & Eppinger, 2011, pp. 15–16.)

7. PURPOSE AND RESEARCH TASKS

The purpose of this thesis is to develop a handbook for Freska workers about sleep quality and sleep strategies for better work productivity.

This handbook will have general information about the importance of sleep, its direct and indirect effects on health and work productivity/performance and recommended instructions for better sleeping patterns. The handbook will be developed by taking in consideration the information gathered from the questionnaire that will be given to the workers. Therefore, it will also be a tailor made, relatable and easy to read material.

The objectives are:

- For the author: To develop new learnings on Sleep, Sleep physiology, Work Productivity and Product Design and apply the studies already taken in Research and Development, Health and Wellbeing Promotion, Anatomy and Physiology, Product Development and Academic Writing. By doing this thesis the author will acquire a better professional knowledge on how to coach people to have better sleeping quality.
- For the commissioning party: To provide research-based information about sleep to Freska's workers in order to increase awareness on the topic at hand, increase sleep quality amongst them and result in workers that are more rested, mentally clear, socially present and productive.

Moreover, the research tasks are:

1. Why sleep is important for workers?
2. How to have better sleeping quality?
3. What kind of sleeping strategies could be used for better sleep quality and work performance?
4. How to plan, test and estimate a good handbook product?

In order to gather information on the sleep quality of Freska's workers, many options are possible. Up to date, sleep assessments have been measured in different

ways, through objective standards such as actigraphy and polysomnography, subjectively through questionnaires and diaries, through the need of medical assistance or self-assessed and with or without use of devices. (Ibáñez, Silva, & Cauli, 2018.)

This thesis will make use of the subjective criteria of self-assessed questionnaires for the assessment of sleep. Sleep questionnaires has been used for many years already as it is an inexpensive, quick measure of identifying sleep patterns and problems. Although it is common thought that subjective procedures are not as reliable as objective ones, since they can more easily be influenced by individual's bias, flawed perceptions or changing moods, self-assessed sleep questionnaires has been proven valid by numerous studies. (Chai-Coetzer et al., 2015; El-Sayed, 2012; Firat, Yuceede, Demir, & Ardic, 2012; Jinmei, Rong, Xu, Yi, & Jiong, 2014; Pataka, Daskalopoulou, Kalamaras, Fekete Passa, & Argyropoulou, 2014; Silva, Vana, Goodwin, Sherrill, & Quan, 2011.)

For the purpose of assessing quality of sleep and its impact on daily working life, The Pittsburgh Sleep Quality Index (PSQI) will be used, since it assess accumulated sleep issues, sleep latency, quality of sleep, snoring, sleepiness and the impact of excessive sleepiness on daily life. (Ibáñez et al., 2018; Partinen & Gislason, 1995.)

In using the PSQI questionnaire, permission from the original authors is necessary and already granted from email exchange.

The questionnaire will be used in an online form and sent by email for Freska's workers. After filled, the researcher will collect all data and calculate the results. Lastly, an analysis of results will be made for the development of the handbook, as it's content must be tailor made and relevant for all the participants in the assessment. The researcher will store the answers in a safe location, no more than six months after the interview, when the results are then safely deleted.

8. PROCESS

This section has the purpose of describing the practical process taken to develop the handbook based on the 6-phase process that was researched.

Phase 1 - As mentioned from Ulrich & Eppinger's (2011) research, the first phase is the planning. The main reasons behind the development of this handbook is to provide Freska's workers with information about sleep quality and sleeping strategies for better work productivity. The readers are to read through an easy but informative guide, with design similar to the company's. The handbook will take in consideration the research knowledge of this thesis and the results of the questionnaire.

Phase 2 – Recognizing the needs of the target group and creating target specifications are the main points of the second phase of the product development process (Ulrich & Eppinger, 2011, pp. 15–16.). The target group that is present here are adult workers above 18 years old from professional roles such as cleaners, office workers, managers and CEOs. Cleaners are the main foreign professionals, office workers, managers and CEOs are in majority Finnish. Taking in consideration the broad aspect of this target group, it can be said that the main group needs are the need for more effective and productive work, the need for good communication and team work with people from different cultures and backgrounds and the need for growth, creativity and innovation – for it is a start-up company.

At this phase, Ulrich & Eppinger (2011) also consider the development of product concept an important task. There are different alternatives for the product concept, the handbook can be one that are more formal, with knowledgeable language, graphics, more texts and a sharper look. It can also be more informal, with easy to read language, humour and more pictures in it. Since this handbook will be given to professionals who are working in both simple, mechanical jobs and more complex, cognitively demanding ones, seems fair to assume that a mixture of both formal and informal approaches might work best.

Phase 3 – Since this level aims to focus on system-level design, where it is defined the draft description of the product (Ulrich & Eppinger, 2011, pp. 15–16.), the

equivalent of this process with the handbook is the breakdown of the content structure. After introducing the content list of the book, it will start by showing the readers the importance of sleep, showing the benefits of good sleep and the detriments of poor sleep. It will state the foundational aspects of optimal sleep quality as well as sleep duration recommendations, it is also here where the results of the questionnaire will be addressed in order to show the reader how relevant this information is, particularly to them. The next section of the handbook will talk about the close correlation between sleep and work productivity, this has the purpose of showing the reader a major area of benefit they can acquire through developing better sleeping quality. Then, the handbook will address answers for the “How” of the matter, how to have better sleep? Which sleeping strategies can one already start implementing for better work productivity? This section will have specific researched based guidelines as well as notices to let the reader beware how each individual differences must be taken in consideration and how it is up to self-experiment and self-exploration that one will find the right answers for them.

Phase 4 – Since this phase consists on giving a detailed design process and the full structure of materials used (Ulrich & Eppinger, 2011, pp. 15–16.), for the production of this handbook the online design software used was Canva.com. In total the handbook comprises 20 pages, the pages size was equivalent to A4, making it easier afterwards to either print half horizontal pages or full vertical pages. Images and icons used are royalty free and taken from Unsplash.com, Canva.com, Flaticon.com and Google.com. The main colour theme was dark blue and white throughout the whole book and the font type was consistently from Poppins family (light, medium and bold). Graphics used to present the results of the survey were made on Microsoft Word. Since Canva.com provide users with 1 month free subscription, there were no costs with the production process.

Phase 5 – As for this phase, taking in consideration that the end product is an online handbook and the commissioning party is responsible for the printing, real life prototypes, as mentioned by Ulrich & Eppinger (2011) are not necessary. However, at this stage the authors also point out a need to evaluate the relevance of the product to the customers. With this in mind, online drafts have been sent to the

commissioning party's supervisor and approved after misspelling corrections. Furthermore, through the final thesis presentation, the handbook was given positive feedback

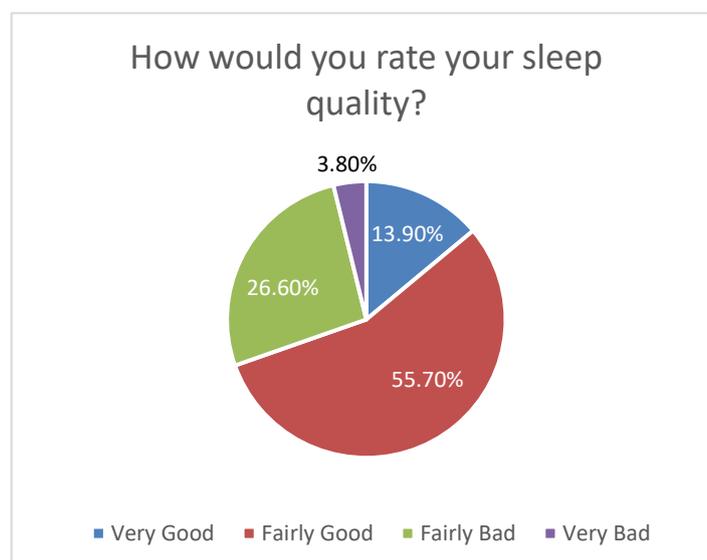
Phase 6 – Ulrich & Eppinger describe this phase as “Production Ramp-Up (2011). Besides sending the final online product to the commissioning party, Freska Oy is the main responsible for this phase, since preparing the target audience, delivering the product and addressing any remaining problems during production (Production Ramp-Up) are jobs made by the current supervisors.

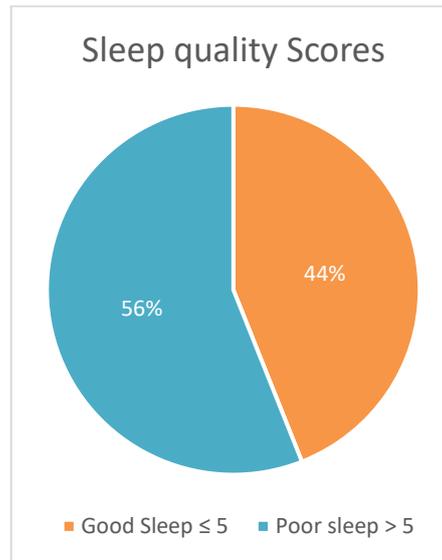
8.1 Results

The PSQI questionnaire was submitted to all employees on 05.11.2019 to 19.11.2019 by the use of Google Forms online software. The scoring of this questionnaire was entirely based upon the “Form Administration Instructions, References, and Scoring” original document taken from the University of Pittsburgh’s website, altogether with the use of a scoring database also provided from the same source.

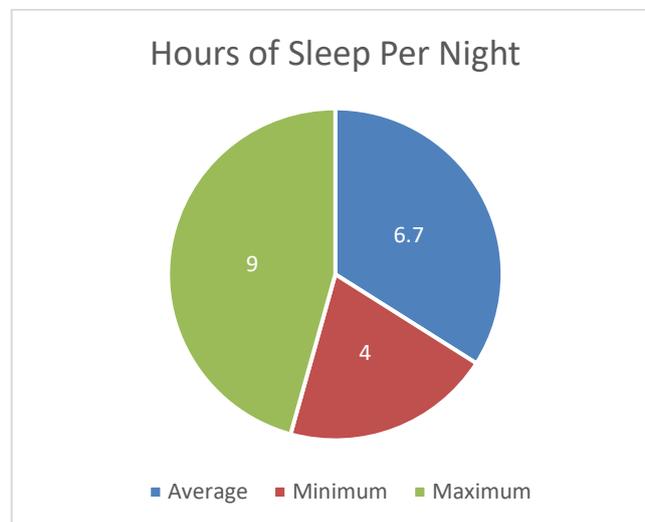
In total, 79 surveys resulted in valid answers, while 9 were either completely or partially empty and other 5 surveys had invalid answers, therefore those could not be counted.

Total scores have a range between 0 to 21, the higher score the worse sleep quality. A total of 35 of the 79 surveys (44%) resulted in “Good Sleep” (Total score of ≤ 5). In contrast, 44 of the 79 surveys (56%) fell in the category of “Poor Sleep” (Total score of >5). Scores ranged between 1 to 15.

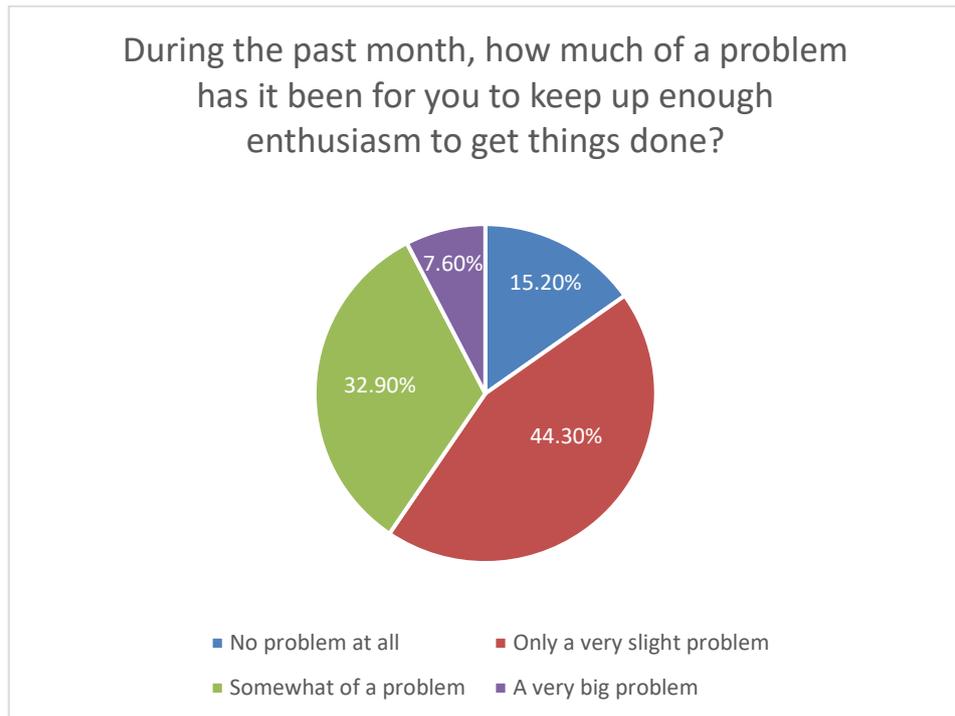




Subjectively, a total 69,6% of people rated their sleep quality to be "Fairly Good" and "Very Good", however, according to their total scores only 44% of people are found to have good sleep. This reflects on the previously addressed theoretical background where states how people's perception of their sleep quality is often not coherent with actual objective testing.



In average, Freska's workers are sleeping 6,7 hours per night, with the maximum recorded time of 9 hours and the lowest, an alarming 4 hours. These results show how there needs to be improvement in this regard if they are to follow the recommended sleep duration time frame of 7 to 9 hours.



Answers to a question made to assess productivity had results showing approximately 40% of all respondents stating “Somewhat of a Problem” and “A very big Problem” to “keep up enough enthusiasm to get things done”. While approximately 60% has either only a very slight problem or no problem at all.

Results demonstrate how sleep quality amongst the majority of surveyed Freska workers is below good standards. However, it is important accentuate how these results are based on a small sample from the totality of workers. Results may differ greatly amongst other sample sizes.

9. DISCUSSION

For the purpose of this thesis, a handbook was to be created for the workers at the commissioning party. Regarding the handbook development, the main objective was to provide research based information about sleep to Freska's workers in order to increase awareness on the topic at hand, increase sleep quality amongst them and result in workers that are more rested, mentally clear, socially present and productive. This chapter is created to discuss the product development process, the reliability and ethicality of this work as well as the professional development acquired and possibilities for further future development.

9.1 The product and its development process

Since the reliability of research review is high to the extent of the quality of the studies included (*Validity and Reliability of Systematic Review*, n.d.), this was taken in consideration during research for the content of the handbook. The product developed was created from a background of numerous scientific sources of research, many of which is highly regarded in the topic of sleep. Results of the sleep assessment questionnaire strengthened the handbook's main objective and validity, since it revealed how workers are indeed in need for better quality of sleep, thus, making the sleeping strategies given more sensible to be used. As for the relevance of the product to the target group and to address their needs (Ulrich & Eppinger, 2011, pp. 15–16.), the handbook is made to be easy to read and understand for any worker's position, in addition, pictures creates a fun element into a topic that can seem uninteresting or obvious. The color theme is in accordance to the commissioning party's colors. Moreover, Freska's supervisor approved the product after misspelling corrections had been made. In early February 2020 the final version of the handbook was handed in as an electronic copy (PDF-file) for the commissioning party.

Challenges included sorting through a vast amount of research, data analysis and filtering the most important information in the handbook. From a standpoint of sampling validity, the higher the amount of participants in the questionnaire, the better (Lynn, 1986); a bigger sample of people would create more reliable results, this thesis' research might be lacking in this area. Also, in order to fully evaluate

the product development, phases 5 and 6 – layed out by Ulrich & Eppinger (2011) – clearly states that an important step is the product feedback from the target audience and the refinement of it, as well as addressing any problems after deliverance. For this thesis, this process was delegated to the commissioning party, making the evaluation incomplete from the author's perspective.

9.2 Reliability and ethicality of the thesis

As this thesis made use of quantitative research by the application of questionnaire, it was important to ensure proper reliability and/or validity in this method. Validity of research is referred to the degree of which a concept is measured accurately. ('Validity and reliability in quantitative studies | Evidence-Based Nursing', n.d.)

This research has made use of the PSQI questionnaire in order to measure sleep quality amongst workers, which is a well-documented, used and accurate tool in measuring sleep quality (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Regarding content validity – the measurement of whether what is proposed in the research is extendedly investigated, addressing the subject in its fullness – this thesis has researched sleep in thorough way, by speaking to its definition, why is important and its vast array of strategies for better quality sleep. The questionnaire also measures that which was intended on the topic of sleep, making it more valid as a research ('Validity and reliability in quantitative studies | Evidence-Based Nursing', n.d.). Furthermore, all knowledge illustrated was collected from a long list of scientific literature which showed consistency in their findings about the topic at hand, attesting its reliability.

One aspect of reliability is the extent of which participants answers all questions of the questionnaire ('Validity and reliability in quantitative studies | Evidence-Based Nursing', n.d.). It was for this reason that any question not answered was discarded and not applied to the end result of data analysis. However, as not every survey counted and as the total number of surveys was just a fraction of the total amount of workers present in the commissioning party, results may change considerably when scaling the survey to a bigger size.

The PSQI questionnaire makes use of a standard data calculator in order to maintain reliability between all applicants' method of calculation. The validity of this thesis is also shown by the use of such data calculator. ('Validity and reliability in quantitative studies | Evidence-Based Nursing', n.d.)

For handbook development, its process has been addressed and followed through based on researched validity. Furthermore, different theses of final product containing successfully made handbooks has also been investigated during the development of this one. (Laakso, n.d.; Miina & Sanni, n.d.)

Concerning ethics, avoidance of plagiarism is required while writing a scientific text. Plagiarism can be stopped by recognizing the work properly, such as with the use of citations and referencing the authors. Reliable sources, such as research articles, books and information collected from databases, will validate the statements made in writing in order to made it adequate. (*What Is Ethics in Research & Why Is It Important?*, n.d.)

This thesis aligns with ethical standards since no text has been paraphrased from any document without proper reference. The survey was given to be filled anonymously and voluntarily and the results has been fully deleted both from the online form and computer analysis software.

9.3 Professional development

To analyze how this thesis improved the author's professional development, we must first look into the main objectives in this regard.

The objectives for this thesis were:

- For the author: To develop new learnings on Sleep, Sleep physiology, Work Productivity and Product Design and apply the studies already taken in Research and Development, Health and Wellbeing Promotion, Anatomy and Physiology, Product Development and Academic Writing. By doing this thesis the author will acquire a better professional knowledge on how to coach people to have better sleeping quality.

- For the commissioning party: To provide research-based information about sleep to Freska's workers in order to increase awareness on the topic at hand, increase sleep quality amongst them and result in workers that are more rested, mentally clear, socially present and productive.

Based on Kajaani University of Applied Sciences' (KAMK) curriculum, indeed this thesis gave the author the opportunity to develop new learnings on sleep, sleep physiology, work productivity and product design, as well as to put in practice the studies already taken at KAMK, such as Research and Development – by the means of research throughout this thesis – IT – through the use of excel, word and Microsoft Access Database when collecting data from the survey – Health and Wellbeing Promotion – by the creation of the handbook on the subject of sleep – Anatomy and Physiology – through the study of how sleep affect the body and its subsequent systems – Product Development – by developing the handbook – and Academic Writing – as writing this academic text in its legal and appropriate way. (*Bachelor's Degree in Sports and Leisure Management 2015—Opinto-opas*, n.d.)

Capabilities of researching for valid and reliable material in the midst of numerous studies were improved, as well as the ability to articulate in writing what was learned in academic standards and creativity for the product development. Interpersonal communication skills were also improved as there was a need for meetings with the commissioning party and well as email exchanges and feedback from thesis supervisor.

9.4 Future development

In the future, by scaling the survey into the full audience of the commissioning party, more reliable results can be achieved. Perhaps dividing the survey audience by job roles can also bring interesting and useful results for data analysis. Through feedback from the employees, the handbook can be better crafted in the future. One more possibility of expansion is the use of the questionnaire for all international chains of the commissioning party if they were to improve the quality of health and work productivity across borders.

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