Samu Sjövall

COPING WITH STRESS: FIRSTBEAT LIFESTYLE ASSESSMENTS FOR FAMILY WORKERS

Degree Programme in Physiotherapy
2015

Satakunnan ammattikorkeakoulu
Satakunta University of Applied Sciences

COPING WITH STRESS: FIRSTBEAT LIFESTYLE ASSESSMENTS FOR FAMILY WORKERS

Sjövall, Samu
Satakunta University of Applied Sciences. Satakunnan ammattikorkeakoulu
Degree Programme in Physiotherapy
September, 2015
Supervisor: Törne, Mari
Number of pages: 43
Appendices: 2

Keywords: family work, heart rate variability, recovery, stress

---

The purpose of this thesis was to assess the balance between stress and recovery of family workers. Furthermore, the aim was to educate the family workers in stress management during feedback sessions. The assessment was implemented using Firstbeat Lifestyle Assessment and BODYGUARD 2 measurement device of Firstbeat Technologies Ltd.

The research was performed on five family workers working in Tukeva Satakunta service unit. The practical implementation of the research was conducted between February and May in 2015. The practical implementation of the research included an informative lecture about autonomic nervous system (ANS), heart rate variability (HRV) and the use of BODYGUARD 2 device, a three day Firstbeat Lifestyle Assessment and a feedback session about the results and stress management.

The theoretical part of the thesis consists of topics including stress, physiological and psychological effects of stress, physiology and division of autonomic nervous system, heart rate variability, Firstbeat Lifestyle Assessment and family work. The research method of the thesis was quantitative since the data of the Firstbeat Lifestyle Assessments is presented statistically and numerically.

The results of the Firstbeat Lifestyle Assessment revealed that the balance between the family workers' stress and recovery was stress-driven. The average daily balance figures of the group were 55% of stress and 22% of recovery. Most of the family workers did not recover from the load of their work sufficiently during sleep and leisure time. The average share of stress per day clearly exceeded the Firstbeat database's average value of 47% and the average share of recovery did not reach the recommended value of 30%, or even the 25% average of Firstbeat database. In addition, the average proportions of recovery during work time and leisure time were very low and did not promote the recovery process.

CONTENTS

1 INTRODUCTION

Private sector family workers face stressful situations in their work every day. They have irregular working hours, the schedule is tight and they have to drive long distances between clients' homes. In addition, they face child welfare cases, drug abuse and children abandoned by their parents on a daily basis. Their work is mentally loading and in the case of an acute problem, which requires immediate solution, the mental load can increase to a point that it is hard to recover from it before the next day. Therefore, family workers suit well for stress and recovery assessment.

Stress is a common and widely recognized phenomenon among working aged people. According to Finnish Institution of Occupational Health, stress together with other psychosocial problems cause significant costs for employers and it is estimated that they also cause approximately half of the lost work days in Finland. (Website of Finnish Institution of Occupational Health, 2015) Stress is a global harm both for individuals and businesses. For instance, in Great Britain the data of Labour Force Survey revealed that workers lost 11.3 million work days during a one year period between 2013 and 2014 due to work-related stress (Health and Safety Executive 2015, 2, 8). The economical costs are vast and that is why it is good to pay more attention to the mental well being of employees.

Firstbeat Technologies Ltd. is specialized in providing physiological analytics for wellbeing. Firstbeat Technologies has developed a Firstbeat Lifestyle Assessment which is a tool for measuring work-related stress and recovery. This happens during three consecutive days with a BODYGUARD device which collects for example data of heart function and heart rate variability. Based on the collected data, Firstbeat provides information about different body functions and states. (Firstbeat Technologies Ltd. 2015)

This bachelor's thesis was implemented on this specific topic mainly due to inspiration of three factors. First, the school-related stress throughout the studies got the author interested in stress. Second, the author was interested in Firstbeat's Lifestyle As-

sessment as it is the leading tool for measuring stress and recovery. Third, the client showed interest to learn about the loading of its employees.

2 PURPOSE AND AIM OF THE THESIS

The purpose of this thesis was to conduct a research on family worker's stress and recovery. The aim was to answer to the following research questions: What is the family workers' balance between stress and recovery and do the family workers reach positive levels on the body resources section of the lifestyle assessment? In other words, do the family workers recover from the stress and load of their work sufficiently on their leisure time and during sleep?

In addition, one further goal was to provide some stress management methods for the family workers. The aim was to empower the family workers in their own stress management by giving them information about methods which could be used every day if needed. The information about stress management methods was included in the feedback session.

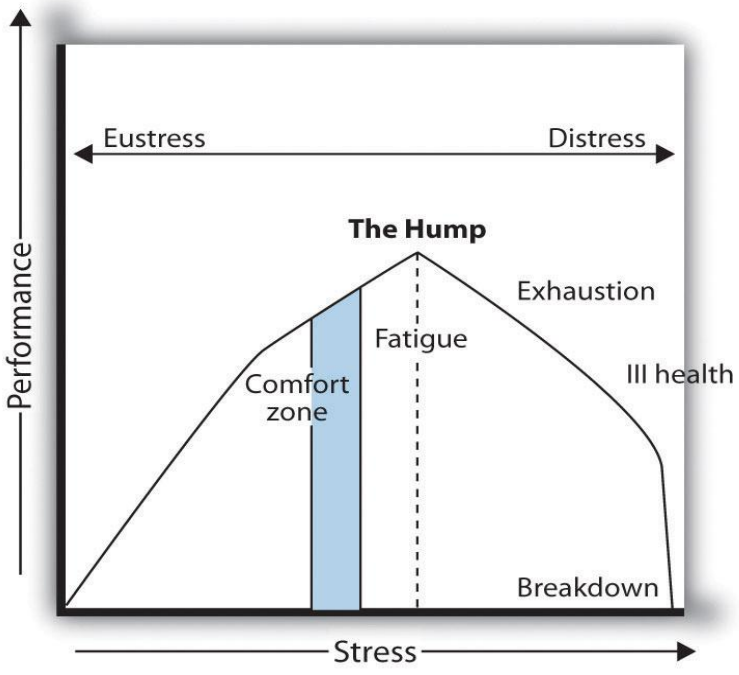
3 STRESS

Hans Selye, a pioneer in stress research, once said:"Everyone knows what stress is, but nobody really knows" (The American Institute of Stress, 2015). Selye's statement has some truth in it. Even though we know much about stress nowadays, several different definitions for stress are still used. In addition to its many definitions, stress can be difficult to define and research due to the numerous theories there are on why and how much the stress affects individuals. (Tummers 2013, 8)

As discussed, there are various definitions for stress and it is difficult to say which one best describes it but here are few definitions which, in the author's opinion, together give a good picture of the concept. Oxford dictionary defines stress as "a state of mental or emotional strain or tension resulting from adverse or demanding cir-

cumstances" (Website of Oxford Dictionaries, 2015). Stress can be considered also from a broader perspective. For example, Ahola & Lindholm (2012, 11) describe stress as an interactive process between the individual and environment where body systems prepare the body and mind to cope in a situation where normal activity is not sufficient. Finally, stress can be thought as a mere physiological reaction like Firstbeat Technologies Ltd. has described it: "… stress can be physiologically characterized by reduced recovery of the neuroendocrine reaction and sympathetic dominance of the ANS function" (Firstbeat Technologies Ltd. 2014, 2).

Stress can be divided into two categories: the good stress or eustress and the bad stress or distress. Eustress can motivate one to exceed his or her limits while performing a challenging task. Opposed to eustress, there is distress which becomes present in prolonged stress situations and can make one anxious and out of focus (Picture 1). In distress we are no longer thinking logically and creatively which lowers our productivity. (Tummers 2013, 6) Usually when people talk or think about stress, they think about distress which is understandable because it causes more noticeable changes and symptoms in our body than eustress. These changes and symptoms caused by stress are further discussed later in this chapter.



Picture 1. A figure showing the difference between eustress and distress and their affect on performance (New Charter University, 2015)

In addition to eustress and distress, stressor and stress response, or stress reactivity, are important concepts when talking about stress. Stressor is a term used to describe the cause of stress and stress response means one's reaction to the stressors. (Tummers 2013, 8)

3.1 Physiological Effects of Stress

When you are exposed to stressors and you get stressed, various things start to happen in your body. It all starts with a change in the balance of your autonomic nervous system. The activity of your sympathetic nervous system is increased and the activity of the parasympathetic nervous system decreased. The activity of your heart, blood pressure, blood coagulation rate and blood flow all increase and blood from visceral tissue is distributed to the voluntary muscles to prepare you for the upcoming task. Your respiratory rate is increased and sensory awareness enhanced. In addition, glucose content of the blood and sweat gland activity are increased to provide more energy and improve excess heat loss. In contrast to all this increase in body systems, there happens also decrease in the activity of digestive system. (Payne 2000, 4-5)
All of the above mentioned physiological changes in our body systems happen to ensure that we survive from approaching danger or a challenging task. In other words, these changes are good for us, yet even they can have adverse health effects. If the stress reaction becomes chronic, the good changes will turn against us. Payne (2000, 4-5) describes this situation as follows: "When the changes are pronounced and occur frequently, the organs concerned can become fatigued which has given rise to the concept of psychosomatic illness".

The autonomic nervous system is not the only body system which activates when we are exposed to stressors. The endocrine system, or the hormone controlling system of our body, is activated too and starts to release stress hormones. When the exposure to stressors continues, hypothalamus releases corticotrophin releasing factor (CRF) which activates the pituitary gland. The pituitary gland then releases adrenocorticotrophic hormone (ACTH) to the bloodstream. (Tummers 2013, 13) In addition to hypothalamus and pituitary gland, one part of the endocrine system in particular is ac-

tive during stress reaction. The release of ACTH activates adrenal glands, glands located on top of our kidneys, which start to release norepinephrine, epinephrine (also known as adrenaline) and cortisol into the bloodstream. Norepinephrine is associated with increased alertness and a pleasant feeling which prepares you for a fight. Epinephrine, on the other hand, is associated with anxiety which prepares you to escape and avoid possible danger. The function of the third stress hormone released by adrenal glands, cortisol, is to preserve the energy supply to the muscles and support the action of the other stress hormones. As in the case of sympathetic nervous system activity, if the stress hormone activity is prolonged it can cause ill health. For example, high cortisol levels are connected with immune system suppression. (Payne. 2000, 5-6)

In addition to everything addressed above, stress can have numerous effects on our body (Table 1). Tummers (2013, 2) has listed some of the physical symptoms caused by stress which are presented in the following table.

Physical Symptoms of Stress	
Headaches and migraines	**Cold hands**
Muscle tension	**Chest pain**
Loss of appetite	**Lack of sex drive**
Cravings	**Jitters**
Indigestion, or gas, acid reflux, stomachaches	**Diarrhea**
Not wanting to be active	**Constipation**
Being accident prone	**Extreme PMS**
Weight gain	**Lethargy**
Weight loss	**Disturbing dreams or nightmares**
Shortness of breath	**New aches or pains**
Feeling exhausted	**Inability to shake off a cold**
Sleeping a lot	**Excessive eating**
Having difficulty falling asleep or sustaining restful sleep	**Stress eating**
Elevated blood pressure	**Jaw pain or grinding of teeth**

Table 1. Physical Symptoms of Stress according to Tummers (2013)

3.2 Psychological Effects of Stress

In addition to physiological changes, stress can also have a psychological impact. Especially if one is suffering from chronic stress, there can be changes in behavior and cognitive abilities. The release of stress hormones in the acute stage of stress, which was discussed in chapter 3.1, can already cause anxiety and irrational thinking but when the stress reactions continue for prolonged time the psychological effects can be more numerous (Tables 2, 3 and 4). Tummers (2013, 3) has listed some of the psychological effects dividing them into emotional, intellectual and social symptoms. These symptoms are described in the tables below.

Emotional Symptoms of Stress	
Rumination about or rehashing stressful memories	**Crying spells**
Feeling defensive	**Change in voice tone**
Crankiness	**Quick temper**
Having difficulty remembering things	**Racing thoughts**
Freezing or not being able to retrieve information	**Constant negative self-talk**
Not being able to laugh or or see the humor in situations	**Depression**
Bad mood	**Feeling numb**

Table 2. Emotional Symptoms of Stress according to Tummers (2013)

Intellectual Symptoms of Stress	
Test anxiety	**Making excuses, blaming**
Public speaking anxiety	**Staring off into space, inability to focus**
Having difficulty to focus	**Lack of motivation**
Inability to prioritize	**Irrational thoughts**
Procrastination	

Table 3. Intellectual Symptoms of Stress according to Tummers (2013)

Social Symptoms of Stress	
Shyness	**Having difficulty following a conversation**
Aggressiveness	**Lowered desire of stress**
Loss of voice	**Inability to get organized**
Becoming violent or lashing out	**Confusion**
Feeling isolated or lonely	**Forgetfulness**
Seeking isolation, not wanting to go out	**Pessimistic outlook**
Passivity	**Using others**

Table 4. Social Symptoms of Stress according to Tummers (2013)

3.3 Stress Management Methods

There is a large quantity of research done about stress management and numerous different stress management methods have been researched. For the family workers, only studies concerning such methods which could be adapted to daily routines were included. Some of these evidence based stress management methods are briefly presented in this chapter. The same methods were introduced to the family workers in the feedback session, which is discussed in chapter 9.

Breathing exercises have been found to lower the amounts of cortisol in long-term. Already a five minute calm breathing session with a 5-second inhale and 15-second exhale rhythm causes dominance of parasympathetic nervous system. (Cea Ugarte, Gonzalez-Pinto Arrillaga & Cabo Gonzalez 2010, 54; Pramanik, Pudasaini & Prajapati 2010, 154) Meditation has also been proven to be an effective coping method for work-related stress and depression like symptoms. Manocha, Black, Sarris & Stough (2011) researched the effect of Sahaja Yoga, which has the focus on the silence of the mind, on full-time workers and found that it works better for stress reduction than normal relaxation.

Both massage and aromatherapy reduce stress. Massage decreases the activity of sympathetic nervous system and the amount of cortisol already in five minutes. Massage has also been found to reduce stress in subjects suffering from brain tumors (chronic stress) significantly. Breathing aromatic and etheric oils during aromathera-

py was also found to reduce stress in female students. (Lindgren et al. 2010, 158; Seo 2009, 65; Keir 2011, 5)

Walking in a forest environment is a good stress management method especially for chronic stress. It has been shown to efficiently reduce stress on otherwise healthy adults. It activates parasympathetic nervous system and decreases the activity of sympathetic nervous system. (Morita et al. 2007, 63; Park et al. 2014, 103)

Resistance and aerobic exercise has been studied much also in the field of stress sciences. It was found in one study that resistance exercise does not increase the amount of stress hormone cortisol in bloodstream during the exercise even though heavy exercise is a stressor for our body (Fatouros, et al. 2010, 8). Another, an older study, had found out that intensive aerobic exercise like cycling decreases the amount of cortisol significantly (Cornil, De Coster, Copinschi & Franckson 1965, 168).

Listening to music is pleasant activity for many and many also does it when they are stressed. According to Cervellin & Lippi (2011, 374), there is increasing evidence of experimental research which demonstrates that music can change several functions of cardiac and nervous system and stimulate measurable biochemical stress-reducing effects in some of the tested individuals.

Tai Chi is sometimes described as meditation with movement. Regarding stress management, it has similar effects on stress reactions as meditation. Tai Chi performed after a stress reaction has been proven to decrease the level of cortisol in our body (Jin 1992, 361).

The effect of everyday tasks and activities on stress has been subject to research too. It might feel insignificant but as simple thing as gum chewing has been studied to reduce stress and increase the alertness. The test subjects' stress reactions were tested during acute stress situation both while chewing a gum and not having chewing gum, and the results were significantly better when the test subjects were chewing a gum. (Scholey et. al. 2009, 304) In addition, the relation between tea consumption and stress has been studied. Steptoe, et. al. (2007, 89) found that drinking black tea re-

duces the amount of cortisol in post-stress reaction situation and increases the feeling of relaxation in test subjects.

Sleep deprivation is common in today's society, especially among students and working aged. When there is enough sleep deprivation, it takes a toll on our body and causes stress. Faraut et. al. (2011, 24) studied the effects of napping in a situation where test subjects had sleep deprivation. The level of cortisol was reduced immediately after a 30 minute nap in test subjects and their alertness was increased as well.

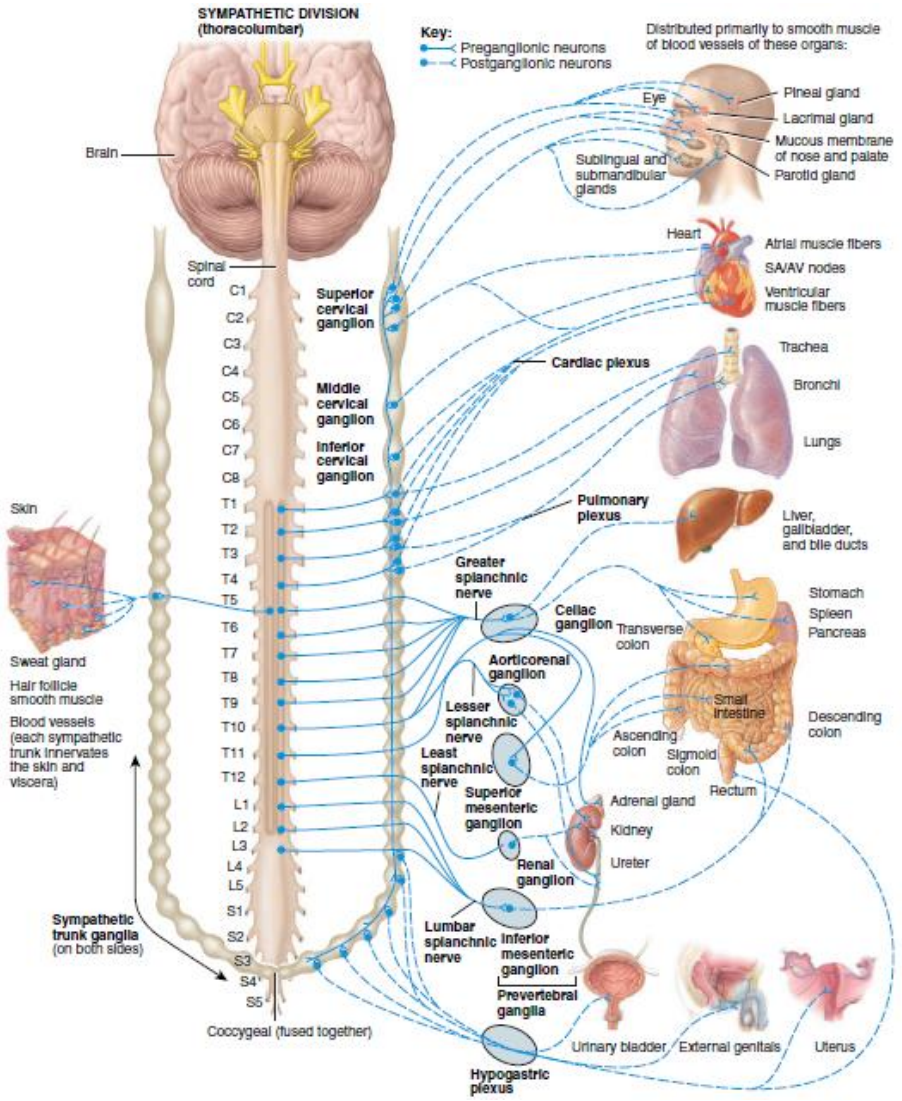
4 AUTONOMIC NERVOUS SYSTEM

Our nervous system can be divided into two parts: central nervous system and peripheral nervous system. Central nervous system includes the brains and spinal cord. Peripheral nervous system, which includes rest of the nervous system of the human body, can further be divided into somatic, autonomic and enteric nervous system. (Tortora & Derrickson 2011, 581) The somatic nervous system is in control of voluntary actions like contractions of big muscle groups. Autonomic nervous system (ANS) on the other hand is, as the name already implies, more independent part of the nervous system. The ANS has control over functions which are involuntary, such as the cardiovascular system and digestive system. (Firstbeat Technologies Ltd. 2014, 2)

ANS plays an important role in the control of physiological reactions when one is having stress. ANS has balance between its two parts, sympathetic nervous system and parasympathetic nervous system which is called autonomic tone and it is regulated by the hypothalamus in the brain. During a stress reaction the autonomic tone between sympathetic nervous system and parasympathetic nervous system changes. Sympathetic nervous system starts to dominate over the parasympathetic nervous system. The structure and function of sympathetic and parasympathetic nervous system are briefly described below. (Tortora & Derrickson 2011, 596)

4.1 Sympathetic Nervous System

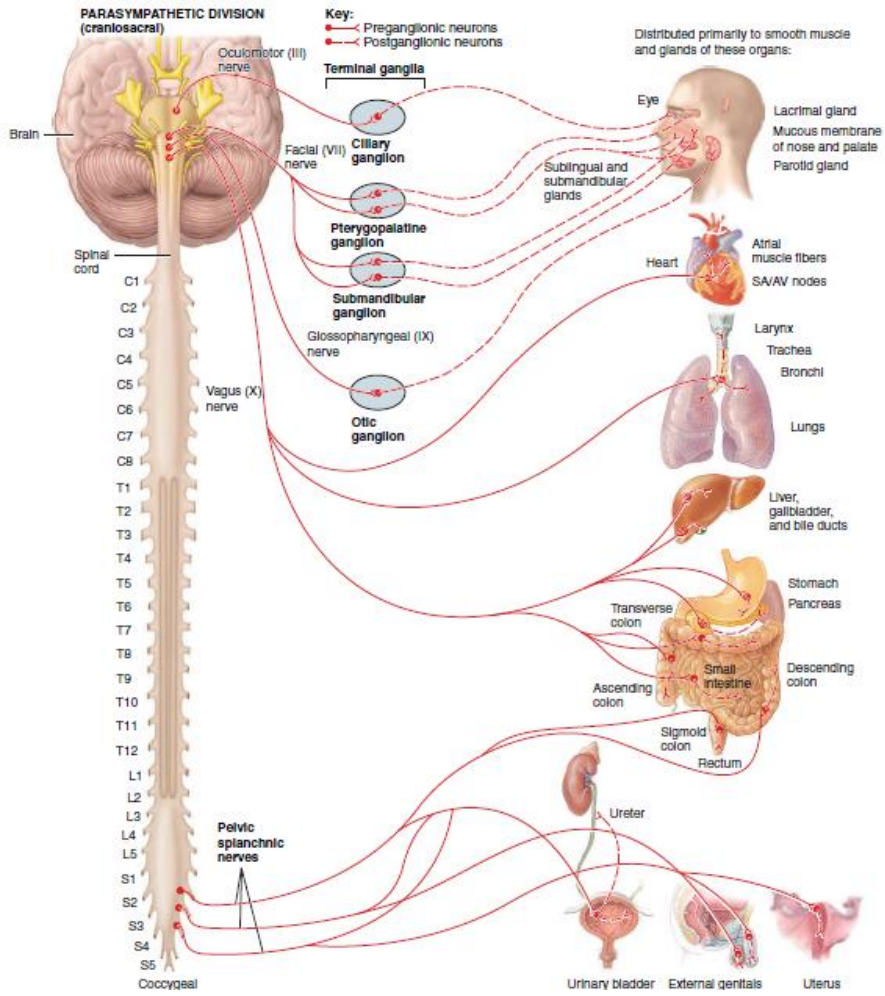
Sympathetic nervous system (Picture 2) prepares your body for an upcoming physical activity, work task or other event which requires adaptation and concentration from the body and mind in order to achieve the goal. This process is more commonly known as fight or flight-response. (McCorry, 2007, 2) When sympathetic nervous system is active, body functions that support forceful physical activity and quick production of ATP are favored. Simultaneously, the sympathetic nervous system decreases the level body functions which support the storage of energy. In addition to physical demand, emotions can also stimulate the sympathetic division. (Tortora & Derrickson 2014, 537) The division of sympathetic nervous system is presented in the picture below.



Picture 2. The division of the sympathetic nervous system (Tortora & Derrickson. 2014, 527)

4.2 Parasympathetic Nervous System

Parasympathetic nervous system (Picture 3) is the part of the ANS which is responsible of calming our body. When we are relaxed, for instance taking a nap, it controls our basic body functions and metabolism. The functions of the parasympathetic nervous system are more commonly known as rest and digest functions. (McCorry, 2007, 2) Tortora & Derrickson (2014, 538-539) use an abbreviation of SLUDD to describe the activities stimulated by the parasympathetic nervous system. The letters stand for salivation (S), lacrimation (L), urination (U), digestion (D) and defecation (D). In general, parasympathetic nervous system's function is to activate body functions which conserve and restore energy, and reduce physical activity supporting body functions. The division of parasympathetic nervous system is presented in the picture below.

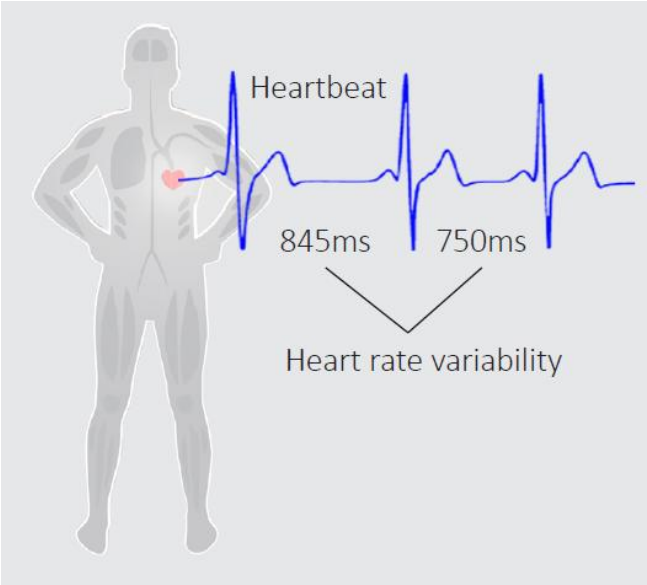


Picture 3. The division of the parasympathetic nervous system (Tortora & Derrickson. 2014, 528)

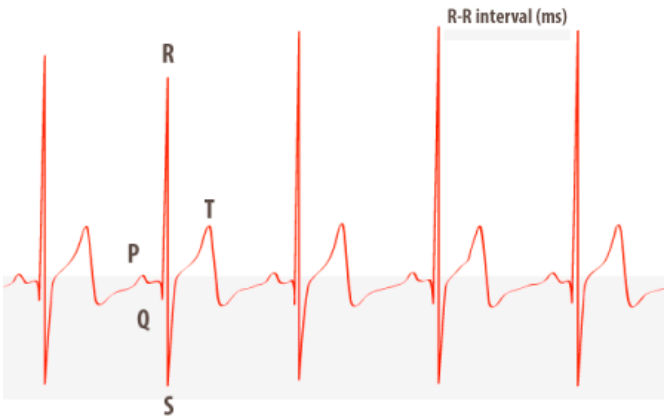
5 HEART RATE VARIABILITY

A healthy heart does not work at the regularity of a metronome which results in heart rate variability (HRV) (Picture 4). The Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology (1996, 354) defines HRV as "… the oscillation in the interval between consecutive heart beats as well as the oscillations between consecutive instantaneous heart rates".

One way to measure HRV is by determining the R-R intervals (Picture 5) of individual's heart rate. The R-R interval means the interval between two consecutive R-wave peaks in heart rate (Nasim, Jahan & Syed 2011, 71). One of the most used methods to determine the HRV is RMSSD (root mean square of successive differences) value which means the average variation of successive R-R intervals. The RMSSD value is expressed in milliseconds. (Peltomaa. 2015, 39) HRV indicates the ability of the heart to respond to stimuli of physiological and environmental origin as well as to compensate the disorders caused by diseases (Vanderlei, Pastre, Hoshi, Carvalho & Godoy 2009, 206). At the moment, measuring HRV will more effectively give information on the activity of parasympathetic nervous system than the activity of sympathetic nervous system. Traditionally, HRV has been measured in rest, since then the activity of parasympathetic nervous system can be clearly noticed and measured and the factors affecting to the HRV can be easily distinguished. (Peltomaa 2015, 33) High HRV has been connected with good recovery, reduced morbidity and mortality, psychological well-being and good quality of life. In addition, high HRV has been associated with better physical fitness and lower age of the individual while low HRV has been associated for example with reduced recovery, work stress, autonomic neuropathy in diabetic patients, future health problems and as a correlate of mortality. (Firstbeat Technologies Ltd. 2014, 4; Shaffer McCraty & Zerr 2014, 7)



Picture 4. Heart Rate Variability (Firstbeat Technologies Ltd., 2015)

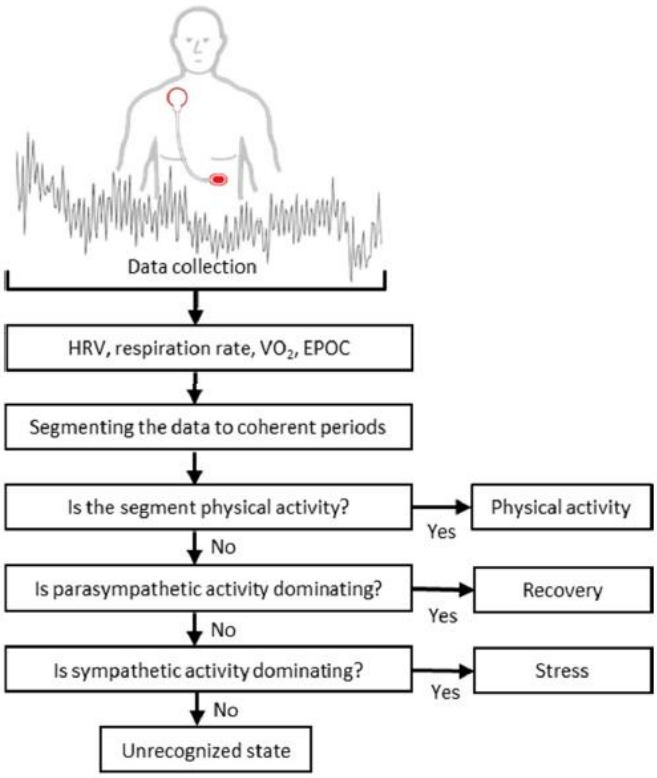


Picture 5. An illustrated electrogardiogram showing the R-R interval of the heart rate (Firstbeat Technologies Ltd., 2015)

Stress causes an increase in the activity of sympathetic nervous system and a decrease in the activity of parasympathetic nervous system. Cardiovascular system is one of the first body systems to react to the changed parasympathetic and sympathetic nervous system activity with an increase in heart rate and blood pressure as well as a decrease in HRV. (Tummers 2013, 11; Nasim, Jahan & Syed 2011, 74) Consequently, HRV embodies the state of autonomic nervous system and the reaction of heart to the neural regulation (Peltomaa 2015, 27). These features of HRV are used in non-invasive assessment methods of the ANS, such as Firstbeat's Lifestyle Assessment.

6 FIRSTBEAT LIFESTYLE ASSESSMENT

The Firstbeat Lifestyle Assessment is a non-invasive tool for measuring stress and recovery. It was invented by a Finnish corporation Firstbeat Technologies Ltd, which was established in 2002. The Firstbeat Lifestyle Assessment is based on measuring HRV which provides information about the autonomic tone of an individual. In other words, the stress reactions and recovery can be determined from the recorded HRV-data by analysis (Picture 6). (Website of Firstbeat Technologies Ltd. 2015; Firstbeat Technologies Ltd. 2014, 5-7)

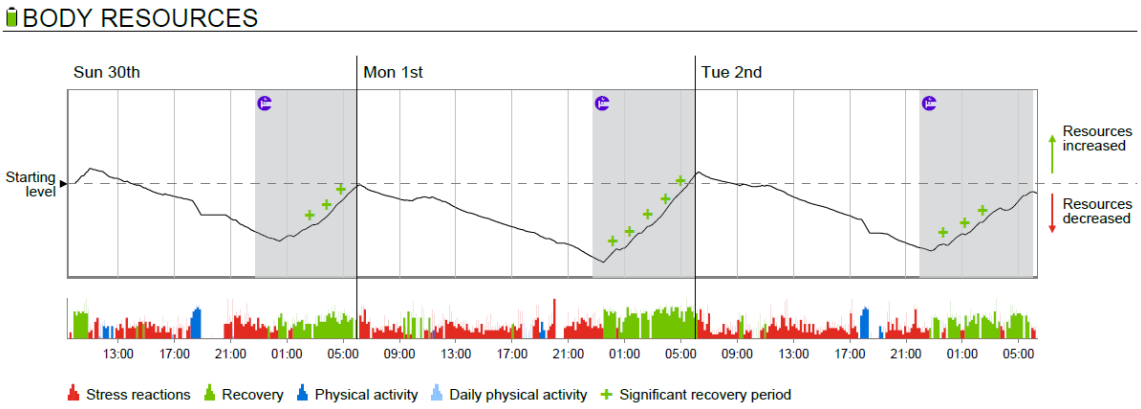


Picture 6. Simplified illustration of HRV data analysis process (Firstbeat Technologies Ltd. 2014, 5)

The implementation of the Firstbeat Lifestyle Assessment happens during three days when the client is wearing electrodes and a BODYGUARD 2 device (Picture 7), which collects the measured data. For doing the Firstbeat Lifestyle Assessment, one needs Firstbeat's BODYGUARD 2 device and a health care professional with an access to Firstbeat's analysis software.

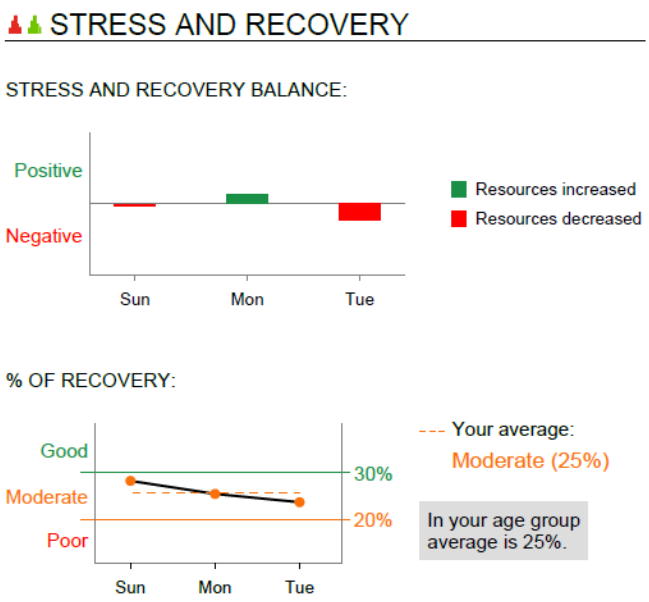
Picture 7. Firstbeat BODYGUARD 2 device (Firstbeat Technologies Ltd., 2015)

Firstbeat Lifestyle Assessment report includes easy-to-read and detailed graphics of the measured data. An example of the full report can be seen in the Appendices (Appendix 1 and 2). Examples of the parts of the report which were analyzed by the author can be seen below (Pictures 8, 9 and 10).



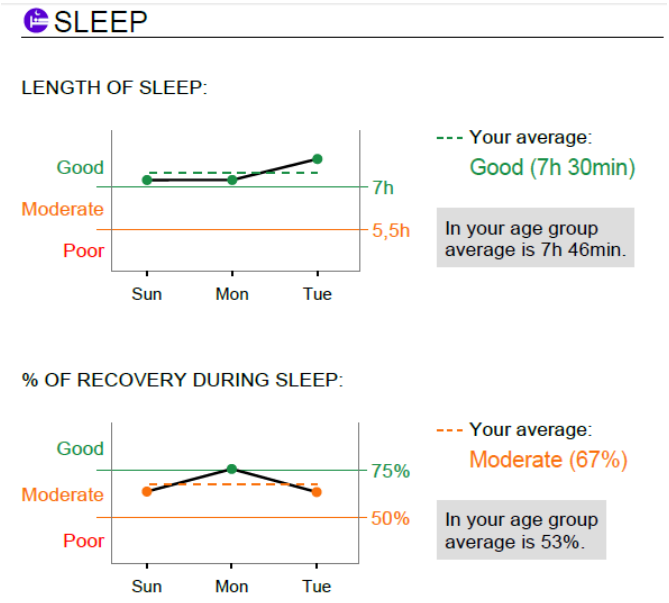
Picture 8. Example of the Body Resources diagram. (Firstbeat Technologies Ltd., 2015)

The Body Resources diagram shows the decrease and increase in body resources according to the measured activity of the ANS. Dominance of sympathetic nervous system, or low HRV can be seen as stress reactions (red) which decreases body resources and dominance of parasympathetic nervous system can be seen as recovery (green) which increases body resources.



Picture 9. Example of the Stress and Recovery diagrams. (Firstbeat Technologies Ltd., 2015)

The Stress and Recovery diagrams show the balance between stress and recovery (upper) as well as the percentage of recovery for each day (lower). In the upper diagram, which shows the balance between stress and recovery for each measurement day, green signifies increased body resources and red decreased body resources.



Picture 10. Example of Sleep diagrams (Firstbeat Technologies Ltd., 2015)

The sleep diagrams show the length of sleep for each measurement day. They also present the share of recovery of sleep and the average amount of recovery from sleeping time.

7 TUKEVA SATAKUNTA SERVICE UNIT AND FAMILY WORK

Tukeva Satakunta service unit is part of MilaPro Oy. It offers private sector supportive services for municipalities in the area of child welfare services. Their aim is to help children in a need of special support and adolescents who are starting their independent lives after they turn 18 and are not anymore customers of child welfare services. Tukeva's other purpose is to support the parents and legal guardians in their task of raising the children and adolescents. Their work aims to reinforce the families' own resources, seek networks to support children and adolescents and creating a safe foundation for the future. The frame of the work forms from co-operation between clients, co-operation partners and the social workers of the clients.

The Tukeva Satakunta service unit provides various services for municipalities. These services include for example family centered services like family guidance, family assessment as well as functioning child and family intervention. Other services include mentor activity, after care work, socio-pedagogical horse activity, animal-assisted therapy and speaking of children courses (Website of MilaPro, 2015).

Several stressors of the work were revealed in a brief interview with a Tukeva Satakunta service unit's family worker. The family workers on private sector have irregular working hours. Work days include driving long distances between clients' homes and the transition times in their busy schedules are short. In addition, acute problems which require quick response and solving might occur even outside the working hours. There can be days with discontinuous working hours, for example waking up an adolescent client in the morning and the next client situation might be at 11 a.m. The family workers have also on-call turns when the predetermined family worker carries a company phone along at all times in case a client calls. On top of everything mentioned above, the client material is already a stressful factor itself and

can be emotionally disturbing. The clients can include for example children abandoned by the parents (even though the children might live with them), families with mental illnesses, drug abuse and child welfare backgrounds. Many of the client families are long-term clients with already long client history.

8 RESEARCH METHODS

The research methods of the thesis can be either qualitative or quantitative. According to Vilkka & Airaksinen (2004, 58-63) qualitative research method is appropriate selection when the aim of the thesis is a comprehensive understanding of a phenomenon and quantitative research should be selected when thesis requires measurable and statistically informed numerical data. Quantitative research method was selected as a research method for the thesis specifically since the Firstbeat Lifestyle Assessment reports are presented in numerical data.

The quantitative research method can be described more precisely using assumptions on which the method is based on. First of the assumptions is that the reality is single and objective, and the nature of the reality can be determined through measurement of the phenomenon the researcher is interested in. The second assumption deals with the relationship between the researcher and subject; the subject should be unaffected by the researcher. Third, the results of the research should be generalizable to other population under similar conditions. In addition, the measurement of the phenomenon of interest should concentrate on specific attribute or variable, for example in this case the balance between stress and recovery. (Domholdt, 2005, 55-59; Website of Study.com, 2015)

The thesis was done using systematical observation, which is the most applicable form of quantitative research. Systematical observation can be implemented using different senses, like hearing, sight, taste and smell, or automatic observation instruments, like Firstbeat BODYGUARD 2. The target of systematical observation can be someone's behavior, an event, natural phenomenon or body functions like in this thesis. (Vilkka, 2014, 29-30)

9 THESIS PROCESS

The thesis process (Figure 1) was started in October 2014 when the subject of the thesis was decided. The initial subject was to make Firstbeat assessments, not for the family workers, but for students of degree program in physiotherapy in Satakunta University of Applied Sciences. The initial plan was to measure students from both Finnish and English degree programs to see if their results would differ greatly. That plan changed already in the end of October when the family workers of Tukeva Satakunta service unit interest towards the Firstbeat Lifestyle Assessments came to the attention of the author.

The implementation of the assessments started in the early stages of the thesis. After the measurement clients were known, a discussion with the supervisor of the thesis took place regarding practicing the Firstbeat Lifestyle Assessment for the author itself. That way the author could ensure how the BODYGUARD 2 device works, how it feels to be measured, and what things to take in consideration when educating the clients about the Firstbeat Lifestyle Assessment and the use of BODYGUARD 2 device. In addition, the agreement on making the thesis in co-operation with and for Tukeva Satakunta service unit had to be made to get official approval for the thesis from all parties, i.e. the author, Tukeva Satakunta service unit and Satakunta University of Applied Sciences. During the process of signing the agreements, a possible date to start the assessment process was agreed with the client.

9.1 Implementation of the Firstbeat Lifestyle Assessments

When the date and time of the educational lecture and the start of the Firstbeat Lifestyle assessments had been agreed with the clients the Firstbeat BODYGUARD 2 devices were reserved. The actual process of measuring the family workers with the Firstbeat Lifestyle Assessment started with a one hour educational lecture. The lecture was held on Friday, 6th of February and included information about autonomic nervous system, heart rate variability and the effects of stressors on heart rate variability. The clients were informed on how the lifestyle assessment starts and proceeds, and how to use the Firstbeat BODYGUARD 2 device and online-journal. A contact

person, with the job of passing the authors messages forward for the rest of the family workers, was also elected.

The family workers were interested in the subject and asked questions during the lecture especially considering the use of BODYGUARD 2 device and the importance of placement of the electrodes. Since the placing of the electrodes and the use of the Firstbeat BODYGUARD 2 device raised so many questions, the guidance regarding the use of the device and electrodes was repeated. In addition, the clients were provided with small notebooks in which they could mark their daily activities. The author's contact information was also given for the clients in case of further questions before or during the assessment. The Firstbeat Lifestyle assessment itself started the following Monday and lasted until Thursday. This measurement schedule was chosen because then the measurement period would include three working days which were most important regarding the purpose and aim of the thesis.

The Lifestyle assessment started on Monday morning, 9th of February before the family workers started their working hours. During Monday the contact person of the family workers was asked and ensured if everything went as planned and that no one had any problems with the BODYGUARD 2 device. In addition, they were reminded to keep their small notebooks with them at all times. The notebooks were used as a "emergency note" if they experienced something worth writing to the online-journal at a time when they had no access to any device with a possibility to it. By contacting the clients through the contact person the aim was to ensure a smooth assessment period for the family workers and to lower the threshold of contacting the author in case of any questions or problems. No problems occurred during the first measurement day so the clients were contacted next on Wednesday when the end of the measurements, Thursday morning, was getting closer. No questions were asked by the clients, which is either because the BODYGUARD 2 devices are simple to use, the informative lecture was a success or both. On Thursday the clients were reminded via the contact person to finish their online-journals so that the data would be ready for analyzing. After the clients had finalized their part of the measurements, they returned the BODYGUARD 2 devices to their work place where they were picked up.

9.2 Feedback Session

After receiving the BODYGUARD 2 devices from the clients, the data was downloaded and ran through Firstbeat's analysis program. When the Firstbeat Lifestyle Assessment reports were ready, the analysing process was begun. The reports were analyzed by the author with the focus being in the data of interest, which in this case were the body resources diagram and the stress and recovery diagrams. During the analysis process the client's contact person was contacted to agree on a time for the next and last meeting. Since the author was carrying out long clinical practice period, a time for the feedback session which was suitable for both parties was agreed to happen in the beginning of May.

The feedback session for the family workers was held on Friday, 8th of May. It was a one and a half hour long session which consisted of individual feedback regarding the measurement results and a PowerPoint presentation regarding stress and stress management methods respectively. All of the family workers, except for one, were able to participate in the feedback session. 15 studies concerning stress management strategies which they could incorporate in their daily and weekly routines were included in the presentation. This meant that all studies where biofeedback, such as Firstbeat Lifestyle Assessment, was used as a stress management tool had to be excluded.

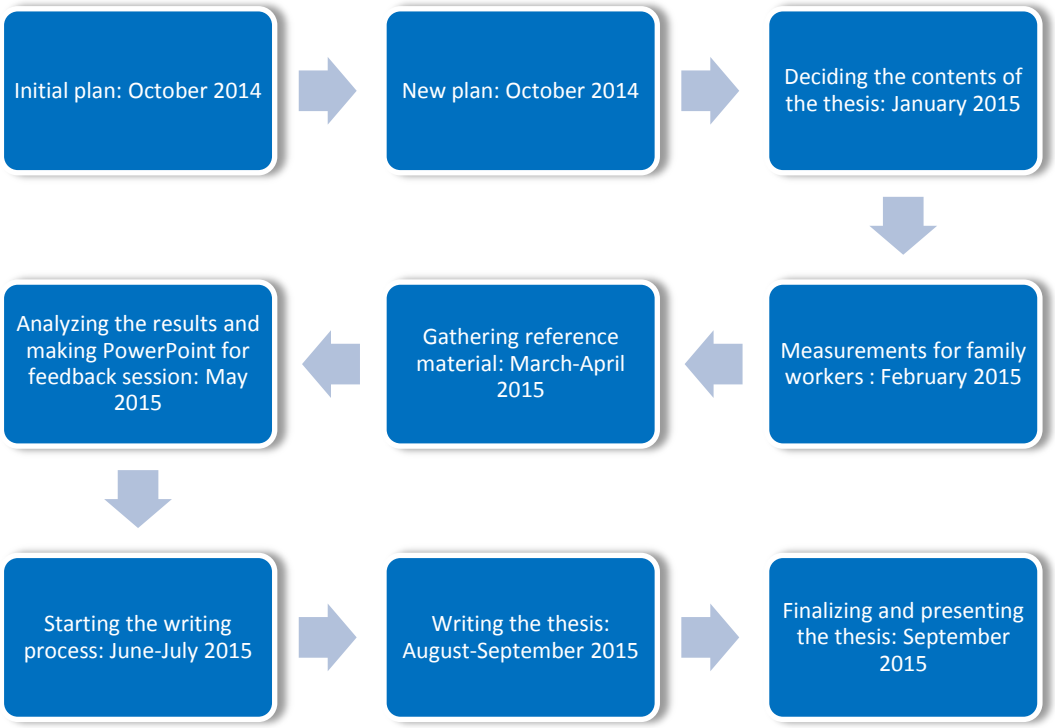


Figure 1. Thesis Process

10 RESULTS

From the measurement error point of view, the Firstbeat Lifestyle Assessments of the family workers were successful and reliable. The average measurement error per day was 2,4% and the maximum error was 7%. Both of the values are clearly under the 20-25% error limit for reliable data set by Firstbeat Technologies Ltd.

The overall balance between stress and recovery for the group was stress-driven. The average share of stress per day was 55% and the average share of recovery was only 22%. The average amount of stress per day in the Firstbeat's database is 47% and the recommended minimum amount of recovery per day is 30%.

From the group, three out of five had a decline in body resources during the three day measurements. Presumably, the body resources of the family workers clearly declined during work time. The group's average recovery time during work time was only 9 minutes which does not support coping with stress (Figure 2). Two out of the

five family workers had some recovery periods during the work time which supported their coping with stress and recovery of the body resources. The other three out of five family workers did not have any recovery periods during their work time. Another issue which did not support the coping with stress was low amount of leisure time recovery on average which was 32 minutes (Figure 3). The average shares of work time and leisure time recovery are presented in the figures below. The values have been calculated using all of the 15 measurements (five clients and three measurement days which Firstbeat's analysis program counts as three consecutive separate measurements) during the three day Firstbeat Lifestyle Assessment.

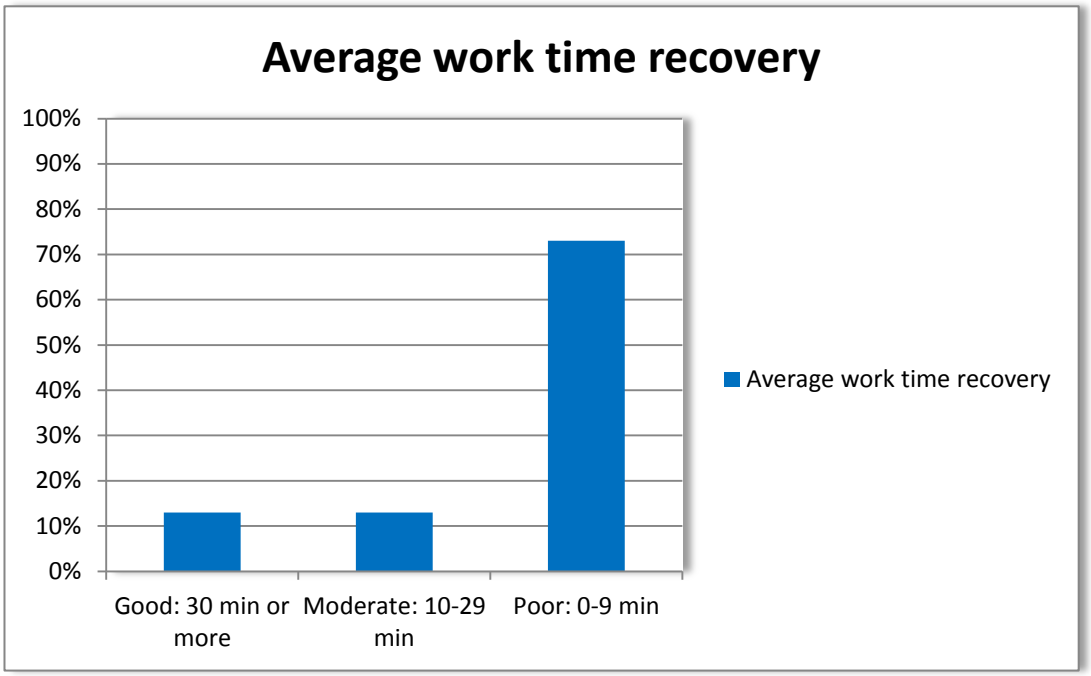


Figure 2. The average work time recovery

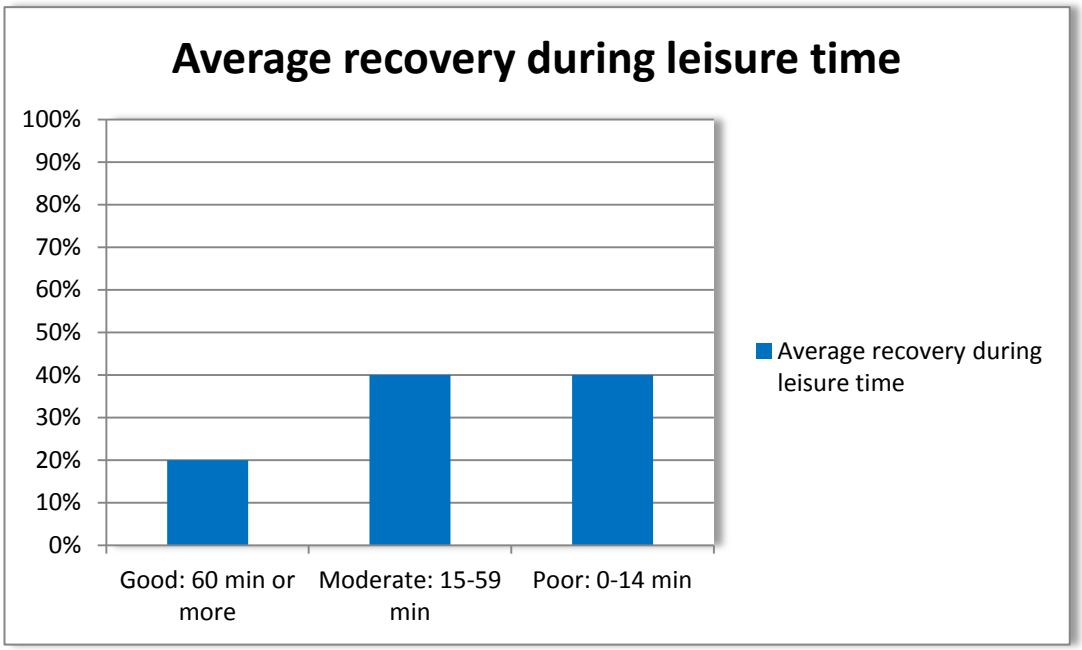


Figure 3. The average leisure time recovery

The duration of sleep for the family workers was 7 hours and 19 minutes on average, which is considered as good level sleep duration according to Firstbeat Technologies. The Firstbeat's recommendation for the sleep time recovery is 75% for it to be sufficient regarding the recovery of body resources. In contrast to the good level of average duration of sleep, the family workers' average share of recovery during sleep was only 64%, which clearly falls short from the recommendation value (Figure 4). The average share of recovery during sleep of the whole group is presented in the below figure.

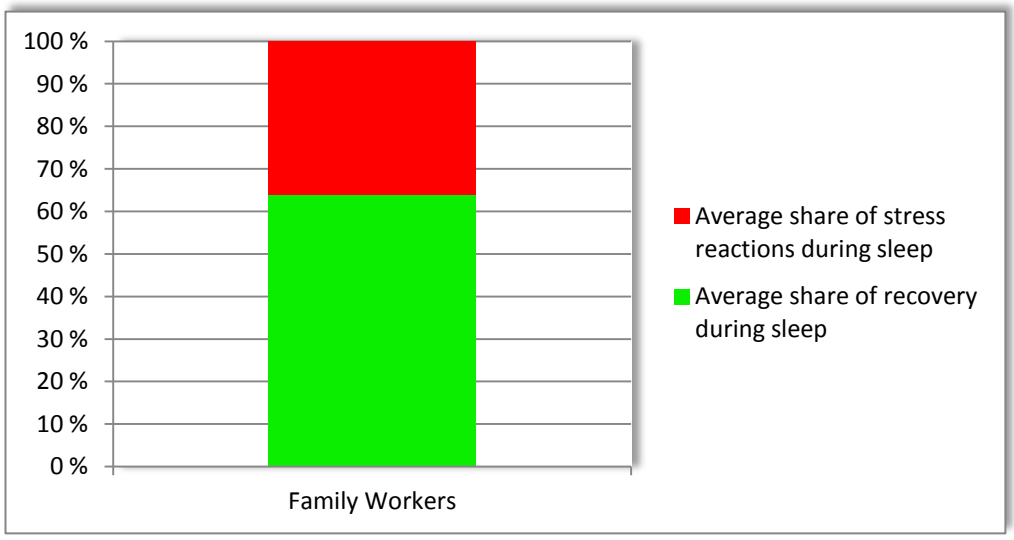


Figure 4. The average share of the group's sleep time recovery

When looking at the individual results of each family worker (FW1 to FW5), the average share of recovery during sleep was between 56% and 68% (Figure 5). This means that everyone from the group had less recovery on average during sleep than recommended. The individual average sleep time recovery shares can be seen in the figure below.

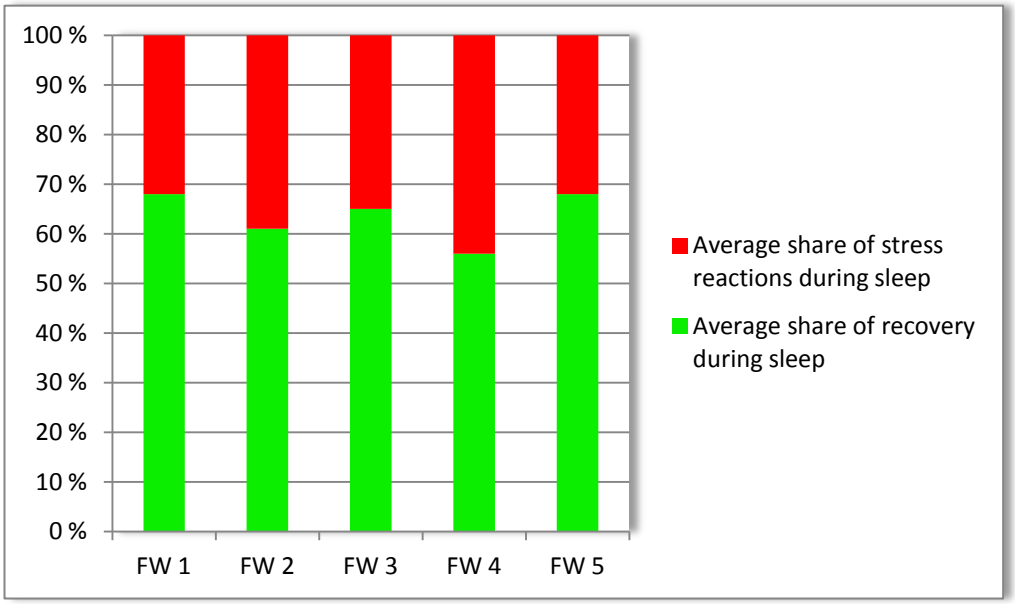


Figure 5. The average share of individual sleep time recovery of the family workers (FW)

In addition to only moderate amount of recovery during sleep, also the average quality of recovery during sleep did not reach good levels according to the Firstbeat Lifestyle Assessment (Figure 6). The average RMSSD value of sleep time HRV for the group was 30ms. The average quality of sleep is presented in the figure below.

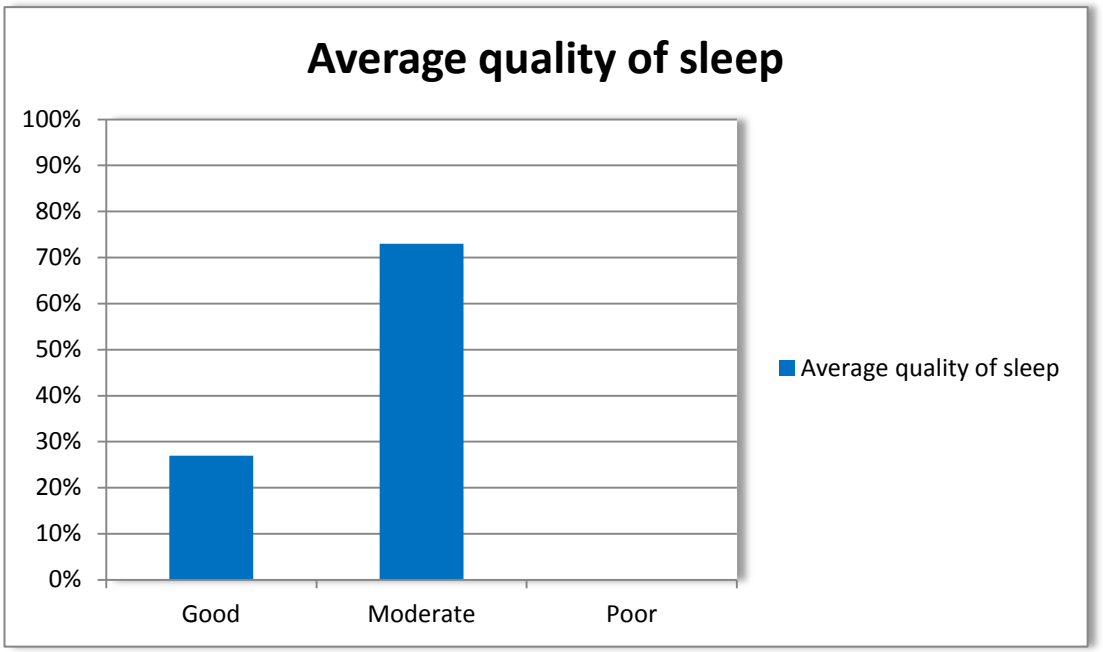


Figure 6. The average quality of sleep according to the Firstbeat Lifestyle Assessment

Overall, two out of five family workers had body resources increased above the starting level on each of the three measurement days. The other three family workers had steady decline in body resources excluding two separate days when the body resources raised above the level they were in the morning. From the group's total of 15 measurement days, seven days resulted in an increase of body resources above the starting level after sleep and from those seven days, six was from two individuals.

11 CONCLUSION

The study revealed that the family workers are indeed much stressed and the recovery was insufficient in three out of five. Most of the family workers did not recover from the load of their work sufficiently during sleep and leisure time. The average share of stress per day (55%) exceeded the Firstbeat database's average value of 47% and the average share of recovery (22%) did not reach the recommended value of 30% or even the 25% average of Firstbeat database. When examining the individual results, the share of recovery during sleep was only moderate (50-74%) for each of the family workers and additionally the quality of sleep did not reach good levels. As sleep time recovery plays a key role in overall recovery from stress and load of work,

it was not a surprise that the overall stress and recovery balance was 55 to 22 percent considering the amount and quality of sleep time recovery the family workers had. In addition, the average leisure time recovery of the group was low and it did not support good overall recovery process.

As the author could cautiously predict before the start of the measurement process, the proportion of recovery during work time was really low. The effect of work time recovery on body resources was evident when looking at the individual measurement results. The two out of five family workers, who had work time recovery during the three day assessment period, were also the only two who had their body resources to recover above the starting level.

From the reliability point of view, there were some factors in the family worker's measurements which affected the results. One of these factors was that one of the family workers had thyroid medication which increases HR and decreases HRV. Furthermore, the implemented Firstbeat Lifestyle Assessment only measured data on three working days. Three days is a limited time and does not show the whole picture. For example, it excludes the weekends which is part of a recovery process and most likely leads to a major recovery of body resources and prepares the family workers for forthcoming work week.

12 DISCUSSION

Physiology has been an interest since the beginning of the studies and it is exciting to see facts about the physiological functions and reactions of the body. In addition, practical works and assignments have always been more pleasant than writing assignments. Hence, including Firstbeat Lifestyle Assessment to the thesis was clear from the start of the thesis process. It made the process interesting and motivating. Regardless of the interesting subject, the thesis process lasted for almost a year and included a difficult start from the writing point of view. The problem was starting the writing process. Searching for relevant theory and gathering possible references was not hard but often the reference search process got me derailed from the objective as I started for example reading various studies which did not suit for the thesis. Even

thought the search for reference material was not hard, it was time consuming. Before the writing process had even started the implementation of the Firstbeat Lifestyle Assessment for the family workers began. The practical implementation part of the thesis was the most pleasant part of the thesis process. When the implementation of the practical part was done, the writing process was meant to start. However, it took the whole summer before the writing process was properly initiated. Postponing the start of the proper writing process made the thesis process really laborious since the theory and results of the measurements had to be written within a short time span. The majority of the thesis was written during my last clinical practice and implementation of two last courses. Thus, the last month of the thesis process was ironical: I wrote about stress, stress management and recovery while my subjective stress level was really high.

Nonetheless, the thesis process was an educational experience. I learned good skills in using the Firstbeat Lifestyle Assessment and I know how to implement the assessments for client groups. Moreover, I gained deeper knowledge on stress and the importance of recovery. It got me also to think stress as a phenomenon and the effects of stress for example on economics. I came to conclusion that it would be beneficial for the whole public sector to use Firstbeat Lifestyle Assessment or similar tools to measure the stress and recovery of its employees. The same applies to private sector employers, especially if the work is considered stressful or if major share of sick leaves could be caused by stress or stress-related problems. As mentioned in the Introduction, stress causes great expenses for employers and some of these expenses could be avoided by monitoring and studying the load, stress and recovery of the employees.

12.1 Working Methods

During the end of the thesis process I began to think that the whole process could have been easier or I could have made it easier for myself if I had done some things differently. The lack of clear writing schedule was one of the reasons why the writing process was postponed. If I had made a clear and strict writing schedule in the start, I could have made the thesis process less stressful and loading for myself by dividing

the writing process over a longer period of time. The strict writing schedule could have pushed me over the unpleasant threshold of starting the writing process. In addition to writing schedule, I could have benefitted from mind maps. Writing the theory based chapters, the results and conclusion part would have been easier if I had made a mind map on the subject first. It would have cleared my thoughts of which things I want to write on and made the writing process faster.

12.2 Suggestion for Further Research Topics

As mentioned in the chapter 11.1, the measurement period of three days gives a limited point of view regarding the stress and recovery of the family workers. It would be interesting for example to include weekends which could provide better and longer recovery periods. Thus, a longer Firstbeat Lifestyle Assessment including weekend or days off could be implemented to have better understanding of the whole stress and recovery process of the family workers. After a stressful work week, how much the family workers are able to recover during weekend for the forthcoming work week.

REFERENCES

Ahola, K. Lindholm, H. 2012. Mitä Stressi On? Teoksessa S. Toppinen-Tanner, K. Ahola (toim.) Kaikkea Stressistä. Työterveyslaitos.

Cea Ugarte J., Gonzalez-Pinto Arrillaga A., Cabo Gonzalez OM. Efficacy of the controlled breathing therapy on stress: biological correlates. Preliminary study, Revista de Enfermeria 2010 May; 33(5):48-54.
http://www.ncbi.nlm.nih.gov/pubmed/20617660?report=abstract#

Cervellin G., Lippi G. From music-beat to heart-beat: a journey in the complex interactions between music, brain and heart. Eur J Intern Med. 2011 Aug; 22(4):371-4. doi: 10.1016/j.ejim.2011.02.019. Epub 2011 Mar 22.
http://www.ncbi.nlm.nih.gov/pubmed/21767754

Cornil, A. De Coster, G. Copinschi, and J. R. M. Franckson Effect of Muscular Exercise on The Plasma Level of Cortisol in Man. 1965 Acta Endocrinol 48 163-168.
http://www.eje-online.org/content/48/1/163.abstract

Domholdt, E. 2005. Rehabilitation Research: Principles and Applications. 3rd edition St Louis: Elsevier Saunders

Faraut B, Boudjeltia KZ, Dyzma M, Rousseau A, David E, Stenuit P, Franck T, Van Antwerpen P, Vanhaeverbeek M, Kerkhofs M. Benefits of napping and an extended duration of recovery sleep on alertness and immune cells after acute sleep restriction. Brain Behav Immun. 2011 Jan; 25(1):16-24. doi: 10.1016/j.bbi.2010.08.001. Epub 2010 Aug 8.
http://www.ncbi.nlm.nih.gov/pubmed/20699115

Fatouros I1, Chatzinikolaou A, Paltoglou G, Petridou A, Avloniti A, Jamurtas A, Goussetis E, Mitrakou A, Mougios V, Lazaropoulou C, Margeli A, Papassotiriou I,Mastorakos G. Acute resistance exercise results in catecholaminergic rather than hypothalamic-pituitary-adrenal axis stimulation during exercise in young men. Stress. 2010 Nov; 13(6):461-8. doi: 10.3109/10253891003743432. Epub 2010 Jul 28.
http://www.ncbi.nlm.nih.gov/pubmed/20666650

Finnish Institute of Occupational Health 2015. Referred 3.9.2015
http://www.ttl.fi/partner/riskithaltuun/psykososiaalinen_kuormitus/sivut/default.aspx

Firstbeat Lifestyle Assessment Specialist Manual 2014. Referred 14.9.2015

Firstbeat Technologies Ltd. 2015. Referred 28.9.2015
http://www.firstbeat.com/physiology/heart-beat-analysis

Firstbeat Technologies Ltd. 2015. Referred 9.9.2015
http://www.firstbeat.com/company

Firstbeat Technologies Ltd. 2015. Referred 9.9.2015
http://www.firstbeat.com/work-well-being/product-overview#Stress%20measurement

Firstbeat Technologies Ltd. 2014. Stress and Recovery Analysis Method Based on 24-hour Heart Rate Variability White Paper
http://www.firstbeat.com/userData/firstbeat/research-publications/Stress-and-recovery_white-paper_2014.pdf

Health and Safety Executive 2015. Stress-related and Psychological Disorders in Great Britain 2014, 8. Referred 3.9.2015
http://www.hse.gov.uk/statistics/causdis/stress/stress.pdf

Jin P. J Psychosom Res. 1992 May; 36(4):361-70. Efficacy of Tai Chi, brisk walking, meditation, and reading in reducing mental and emotional stress. J Psychosom Res. 1992 May; 36(4):361-70.
http://www.ncbi.nlm.nih.gov/pubmed/1593511

Keir ST. Effect of massage therapy on stress levels and quality of life in brain tumor patients--observations from a pilot study. Support Care Cancer. 2011 May;19(5):711-5. doi: 10.1007/s00520-010-1032-5. Epub 2010 Nov 3.
http://www.ncbi.nlm.nih.gov/pubmed/21046417

Lindgren L, Rundgren S, Winsö O, Lehtipalo S, Wiklund U, Karlsson M, Stenlund H, Jacobsson C, Brulin C. Physiological responses to touch massage in healthy volunteers. Auton Neurosci. 2010 Dec 8; 158(1-2):105-10. doi: 10.1016/j.autneu.2010.06.011.
http://www.ncbi.nlm.nih.gov/pubmed/20638912

Manocha R1, Black D, Sarris J, Stough C. A randomized, controlled trial of meditation for work stress, anxiety and depressed mood in full-time workers. Evid Based Complement Alternat Med. 2011; 2011:960583. doi: 10.1155/2011/960583. Epub 2011 Jun 7.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3118731/

McCorry L.K., Physiology of the Autonomic Nervous System, Am J Pharm Educ. 2007 Aug 15; 71(4): 78. Referred 26.8.2015
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1959222/pdf/ajpe78.pdf

MilaPro Ltd. 2015. Referred 10.9.2015
http://milapro.fi/avopalvelut/tukeva_pori.html

Morita E, Fukuda S, Nagano J, Hamajima N, Yamamoto H, Iwai Y, Nakashima T, Ohira H, Shirakawa T. Psychological effects of forest environments on healthy adults: Shinrin-yoku (forest-air bathing, walking) as a possible method of stress reduction. Public Health. 2007 Jan;121(1):54-63. Epub 2006 Oct 20.
http://www.ncbi.nlm.nih.gov/pubmed/17055544

Nasim K., Jahan A.H., Syed S.A. Heart rate Variability – A Review. 2011. Journal of Basic and Applied Sciences Vol. 7, No. 1, 71-77
http://www.researchgate.net/publication/228664207_Heart_rate_variability_-_A_review

New Charter University 2015. Safety and Health at Work. Referred 23.9.2015
https://new.edu/resources/safety-and-health-at-work--3

Oxford Dictionaries 2015. Referred 5.9.2015
http://www.oxforddictionaries.com/definition/english/stress

Park BJ1, Tsunetsugu Y, Morikawa T, Kagawa T, Lee J, Ikei H, Song C, Miyazaki Y. Physiological and psychological effects of walking in stay-in forest therapy. Nihon Eiseigaku Zasshi. 2014;69(2):98-103.
http://www.ncbi.nlm.nih.gov/pubmed/24858504

Payne, R.A. 2000. Relaxation Techniques – A Practical Handbook for the Health Care Professional. London: Churchill Livingstone

Peltomaa, H. 2015. Stressi, Palautuminen ja Hyvinvointi: Ihmisen mahdollisuudet vaikuttaa kehon- ja mielentilaan. Vaasa: Opintoverkko

Pramanik T., Pudasaini B., Prajapati R. Immediate Effect of a Slow Pace Breathing Exercise Bhramari Pranayama on Blood Pressure and Heart Rate., Nepal Med Coll J. 2010 Sep;12(3):154-7.
http://www.ncbi.nlm.nih.gov/pubmed/21446363

Scholey A1, Haskell C, Robertson B, Kennedy D, Milne A, Wetherell M. Chewing gum alleviates negative mood and reduces cortisol during acute laboratory psychological stress. Physiol Behav. 2009 Jun 22;97(3-4):304-12. doi: 10.1016/j.physbeh.2009.02.028. Epub 2009 Mar 5.
http://www.ncbi.nlm.nih.gov/pubmed/19268676

Seo J.Y. The effects of aromatherapy on stress and stress responses in adolescents. J Korean Acad Nurs. 2009 Jun;39(3):357-65. doi: 10.4040/jkan.2009.39.3.357.
http://www.ncbi.nlm.nih.gov/pubmed/19571632

Shaffer F., McCraty R., Zerr C. A Healthy Heart is not a Metronome: An Integrative Review of the Heart's Anatomy and Heart Rate Variability. 2014. Frontiers in Psychology
http://journal.frontiersin.org/article/10.3389/fpsyg.2014.01040/full

Steptoe A.1., Gibson E.L., Vuononvirta R., Williams E.D., Hamer M., Rycroft J.A., Erusalimsky J.D., Wardle J. The effects of tea on psychophysiological stress responsivity and post-stress recovery: a randomised double-blind trial. Psychopharmacology (Berl). 2007 Jan;190(1):81-9. Epub 2006 Sep 30.
http://www.ncbi.nlm.nih.gov/pubmed/17013636

Stress and Recovery Analysis Method Based on 24-hour Heart Rate Variability, Firstbeat Technologies Ltd. 2014.White paper, 2, 7. Referred 6.5.2015
http://www.firstbeat.com/userData/firstbeat/research-publications/Stress-and-recovery_white-paper_2014.pdf

Study.com 2015. Research methodologies. Referred 10.9.2015
http://study.com/academy/lesson/research-methodologies-quantitative-qualitative-mixed-method.html

Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology. Heart rate variability: Standards of measurement, physiological interpretation, and clinical use. 1996 European Heart Journal 17, 354-381.
http://www.firstbeat.com/userData/firstbeat/download/Heart-rate-variability.pdf

The American Intitute of Stress 2015. What is Stress. Referred 22.8.2015
http://www.stress.org/what-is-stress/

Tortora G.J., Derrickson B. 2011. Principles of Anatomy & Physiology 13th Edition. Hoboken: John Wiley & Sons, Inc.

Tortora G.J., Derrickson B. 2014. Principles of Anatomy & Physiology 14th Edition. Hoboken: John Wiley & Sons, Inc.

Tummers, N.E. 2013. Stress Management – A Wellness Approach. Champaign: Human Kinetics.

Vanderlei L., Pastre C., Hoshi R., Carvalho T., Godoy M. Basic notions of heart rate variability and its clinical applicability. 2009. Rev Bras Cir Cardiovasc; 24(2): 205-217.
http://www.firstbeat.fi/userData/firstbeat/download/Basic-notions-of-heart-rate-variability-and-its-clinical-applicability_2009.pdf

Vilkka, H. 2014. Tutki ja Mittaa: Määrällisen Tutkimuksen Perusteet. Helsinki: Kustannusosakeyhtiö Tammi

Vilkka, H. Airaksinen, T. 2004. Toiminnallinen opinnäytetyö. 1st-2nd edition. Jyväskylä: Gummeruksen Kirjapaino Oy.

APPENDIX 1

EXAMPLE OF FIRSTBEAT LIFESTYLE ASSESSMENT REPORT

Firstbeat Lifestyle Assessment Reports

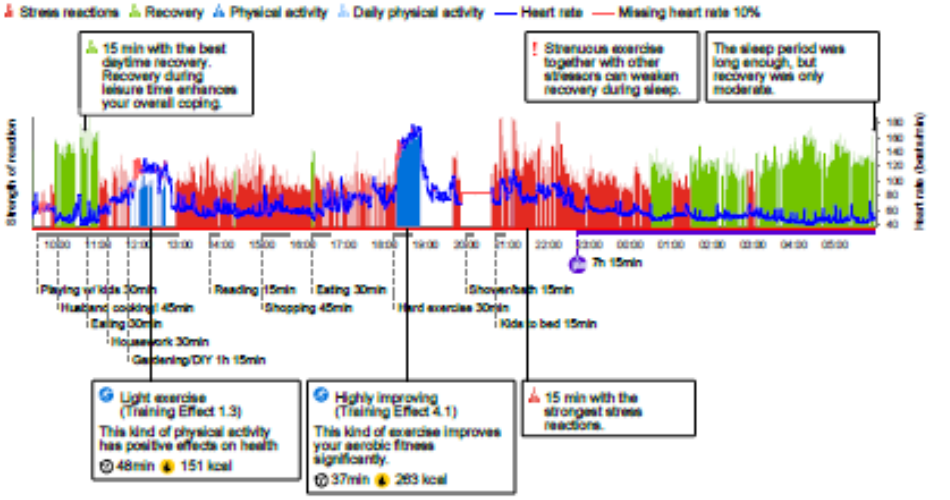
Case Tired Mom

FIRSTBEAT

LIFESTYLE ASSESSMENT

Person: Case Tired Mom			
Age	50	Activity Class	6.0 (Good)
Height (cm)	170	Resting heart rate	35
Weight (kg)	82	Max. heart rate	189
Body Mass Index	21.5		

Measurement:	
Start time	Sun 30.09.2012 09:23
Duration	20h 37min
Heart rate (low/avg./high)	39 / 66 / 179



STRESS AND RECOVERY

		More than usual	Normal	Less than usual
% of Stress reactions (day & night):	43%	> 60%	40 - 60%	< 40 %

		Low	Moderate	Good
% of Recovery (day & night):	26%	< 20%	20 - 2[illegible]%	≥ 30%

WORK

No work period

SLEEP

Self-reported sleep quality:

		Poor	Moderate	Good
Length of sleep:	7h 15min	< 5.5h	5.5h - 7h	≥ 7h
% of Recovery during sleep:	60%	< 50%	50 - 74%	≥ 75%
Quality of recovery (HR variability, RMSSD):	45 ms	0 - 15 ms	15 - 30 ms	≥ 30 ms

PHYSICAL ACTIVITY

The total duration of physical activity **1h 2min** of which fitness-improving physical activity **36min.**

Physical activity index: **82/100**

Low	Moderate	Good
0 - 29	30 - 59	60 - 100

ENERGY EXPENDITURE

Total energy expenditure:

1580 kcal

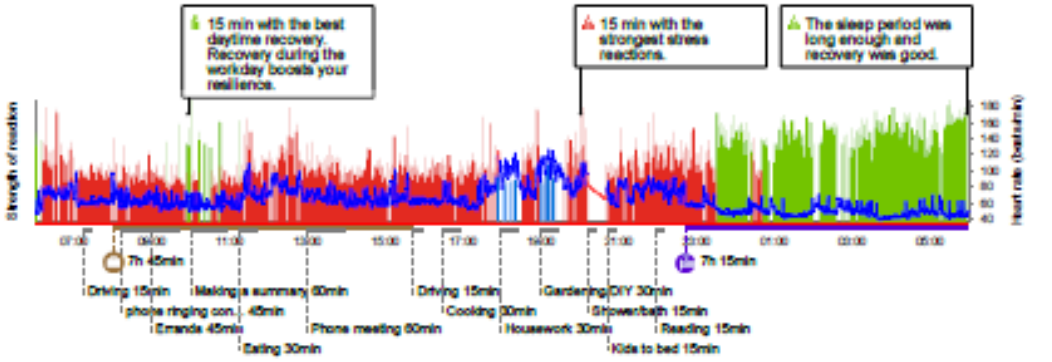
- Physical activity 377 kcal
- Other 1061 kcal
- Daily physical activity 141 kcal

LIFESTYLE ASSESSMENT

Person: Case Tired Mom			
Age	50	Activity Class	6.0 (Good)
Height (cm)	170	Resting heart rate	35
Weight (kg)	62	Max. heart rate	189
Body Mass Index	21.5		

Measurement:	
Start time	Mon 01.10.2012 08:00
Duration	24h 0min
Heart rate (low/avg./high)	39 / 62 / 126

Stress reactions | Recovery | Physical activity | Daily physical activity | Heart rate | Missing heart rate 4%



STRESS AND RECOVERY

- Stress reactions (13h 6min)
- Recovery (5h 31min)
- Physical activity (21min)
- Daily physical activity (11min)
- Other state (4h 50min)

		More than usual	Normal	Less than usual
% of Stress reactions (day & night):	55%	> 60%	40 - 60%	< 40 %

		Low	Moderate	Good
% of Recovery (day & night):	23%	< 20%	20 - 29%	≥ 30%

WORK

Length of work periods: **7h 45min**

Amount of recovery during work: **11min**

Low	Moderate	Good
< 10 min	10 - 29 min	≥ 30 min

SLEEP

Self-reported sleep quality:

		Poor	Moderate	Good
Length of sleep:	7h 15min	< 5,5h	5,5h - 7h	≥ 7h
% of Recovery during sleep:	72%	< 50%	50 - 74%	≥ 75%
Quality of recovery (HR variability, RMSSD):	53 ms	0 - 15 ms	15 - 30 ms	≥ 30 ms

PHYSICAL ACTIVITY

The total duration of physical activity **21min** of which fitness-improving physical activity **0min.**

Physical activity index: **19/100**

Low	Moderate	Good
0 - 29	30 - 59	60 - 100

ENERGY EXPENDITURE

Total energy expenditure:

1504 kcal

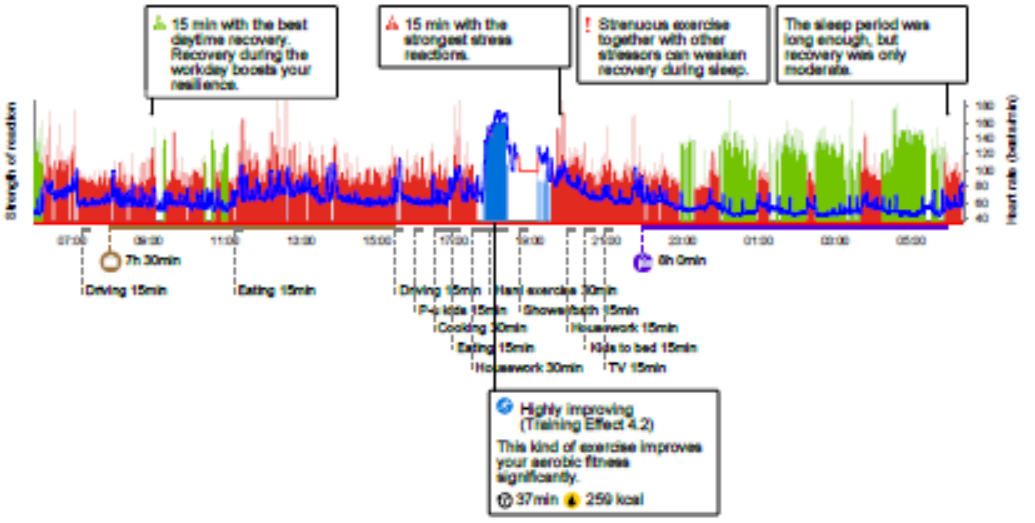
- Physical activity 80 kcal
- Daily physical activity 109 kcal
- Other 1315 kcal

LIFESTYLE ASSESSMENT

Person: Case Tired Mom			
Age	50	Activity Class	6.0 (Good)
Height (cm)	170	Resting heart rate	35
Weight (kg)	62	Max. heart rate	189
Body Mass Index	21.5		

Measurement:	
Start time	Tue 02.10.2012 08:00
Duration	24h 22min
Heart rate (low/avg./high)	42 / 85 / 178

Stress reactions · Recovery · Physical activity · Daily physical activity · Heart rate · Missing heart rate 4%



STRESS AND RECOVERY

		More than usual	Normal	Less than usual
% of Stress reactions (day & night):	60%	> 60%	40 - 60%	< 40 %

		Low	Moderate	Good
% of Recovery (day & night):	21%	< 20%	20 - 29%	≥ 30%

WORK

Length of work periods: **7h 30min**

Amount of recovery during work: **14min**

Low	Moderate	Good
< 10 min	10 - 29 min	≥ 30 min

SLEEP

Self-reported sleep quality:

		Poor	Moderate	Good
Length of sleep:	8h 0min	< 5,5h	5,5h - 7h	≥ 7h
% of Recovery during sleep:	57%	< 50%	50 - 74%	≥ 75%
Quality of recovery (HR variability, RMSSD):	49 ms	0 - 15 ms	15 - 30 ms	≥ 30 ms

PHYSICAL ACTIVITY

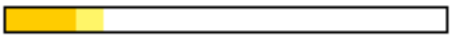
The total duration of physical activity **42min** of which fitness-improving physical activity **34min.**

Physical activity index: **68/100**

Low	Moderate	Good
0 - 29	30 - 59	60 - 100

ENERGY EXPENDITURE

Total energy expenditure:



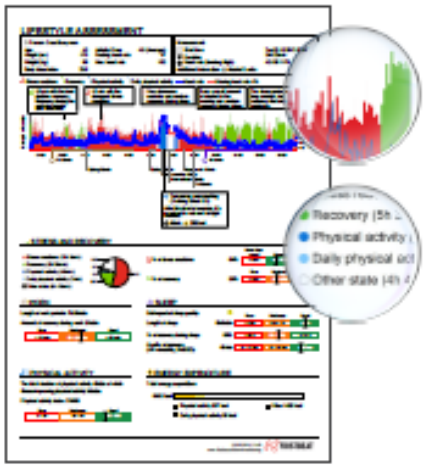
Physical activity 281 kcal · Other 1316 kcal · Daily physical activity 87 kcal

WHAT DOES THE LIFESTYLE ASSESSMENT MEASURE?

The Lifestyle assessment will help you with stress management, recovery and exercise prescription. The assessment is based on analysis of heart rate variability.

The Lifestyle assessment will help you understand how you can take control and positively affect your health and well-being. Measurement of heart rate variability gives accurate information about your body's **stress reactions** and **recovery** response as well as the **intensity of exercise.**

The goal is to find a **balance between work and leisure** and **between activity and rest.** It is not essential to eliminate stress, but to ensure sufficient recovery and find a manageable rhythm to life.



STRESS REACTION means an increased activation level in the body. The reaction can be positive or negative. On average, there are 47% of stress reactions in a 24-hour period.*

RECOVERY means that the body's activation level drops. Important recovery periods include sleep, peaceful moments during the day and days off. On average, there is 25% of recovery in a 24-hour period.*

DAILY PHYSICAL ACTIVITY means low-intensity physical activity during which the intensity is 20-30% of the estimated maximal capacity.

PHYSICAL ACTIVITY means moderate physical loading during which the intensity is over 30% of the estimated maximal capacity.

Fitness-improving physical activity means exercise during which the intensity is over 50% of the estimated maximal capacity.

OTHER STATE is typically shown during recovery from exercise, short awakenings during sleep, and missing data periods.

Training Effect (TE) tells the effect of the exercise session on aerobic fitness. The scale of training effect is 1-5 (see right).

5.0	Temporary overreaching
4.0 - 4.9	Highly improving
3.0 - 3.9	Improving
2.0 - 2.9	Maintaining
1.0 - 1.9	Easy recovery

Physical activity index sum up the effect of physical activity on health during the day. The index accumulate based on duration and intensity. For example, in order to achieve a good score (60), you should perform 30 mins of moderate intensity activity or a longer duration of lighter physical activity. The average physical activity index is 48 per day.*

The **length of sleep** is the period recorded in the journal, from going to bed to waking up. On average, there is 60% of recovery during the sleep period.*

Quality of recovery is based on analysis of heart rate variability. Low values can indicate weak recovery, whereas higher values suggest good recovery. Age influences heart rate variability, and its effect has been accounted for in the reference values. Recovery during sleep can be weakened by various stressors or conditions, such as stress, insufficient sleep, illnesses, alcohol and drugs, poor physical fitness and overweight.

The sleep period should be long enough and of good quality to be restorative.

GOALS

Please set some personal goals for making changes in your lifestyle.

Work

- ☐ I will take regular breaks and won't deal with work tasks during the breaks.
- ☐ I will remember to drink and eat regularly and healthily, even when I'm busy.
- ☐ I will set a realistic work schedule / won't promise to do things that I don't have time to do.
- ☐ I will alternate between easier and harder work tasks during the day.
- ☐ I will value my leisure time / set a "no-later-than" time for leaving work.
- ☐ After the workday, I will try to disengage from work by doing things that I enjoy.

Leisure time

- ☐ I will engage in recovery activities that I feel work best for me (e.g. relaxation techniques, watching TV, reading).
- ☐ I will find a way to disengage from the daily bustle that works for me.
- ☐ I will learn to say "No".
- ☐ I will continue to engage in my hobbies because positive experiences enhance my well-being.
- ☐ I will increase my amount of daily activity, e.g. by taking the stairs instead of the lift and walking short distances (instead of driving).
- ☐ I will maintain a regular meal rhythm (2-3 meals + 1-3 snacks per day).
- ☐ I will pay attention to the quality of what I eat; e.g. avoid products that contain excessive fats, sugar or salt.
- ☐ I will reduce my alcohol consumption.
- ☐ I will stop smoking / chewing tobacco.
- ☐ I will attempt to engage in physical activity/exercise at least ____ times per week.
- ☐ I will lose weight ____ kg.

Night and sleeping

- ☐ I will avoid high-intensity exercise late at night.
- ☐ I will avoid heavy meals just before bedtime.
- ☐ I won't think about or do stressful tasks just before bedtime (e.g. work / e-mail).
- ☐ I will attempt to go to bed early enough to get enough sleep (app. 7-8 hrs).
- ☐ I will engage in activities that I find relaxing and help me to fall asleep (reading, listening to music, gentle stretching, etc.)

Own goals

_____

_____

_____

APPENDIX 2

EXAMPLE OF A FIRSTBEAT LIFESTYLE ASSESSMENT SUMMARY

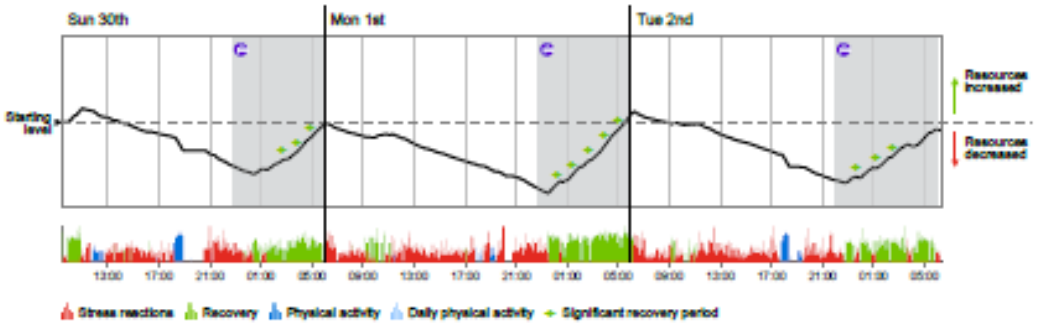
LIFESTYLE ASSESSMENT SUMMARY

Person: Case Busy mom

Age	42	Activity Class	4.0 (Average)
Height (cm)	170	Resting heart rate	37
Weight (kg)	68	Max. heart rate	182
Body Mass Index	23.5		

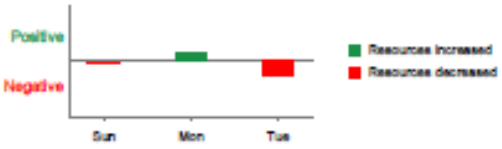
Assessment: 30.09.2012 - 02.10.2012
Additional information:
Alcohol: Sun 30th (2 units), Tue 2nd (2 units)

BODY RESOURCES

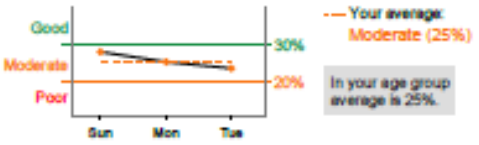


STRESS AND RECOVERY

STRESS AND RECOVERY BALANCE:

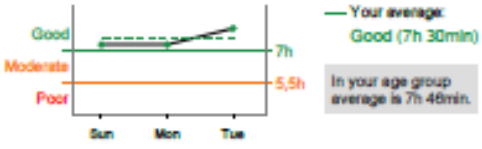


% OF RECOVERY:

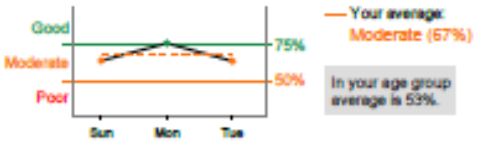


SLEEP

LENGTH OF SLEEP:

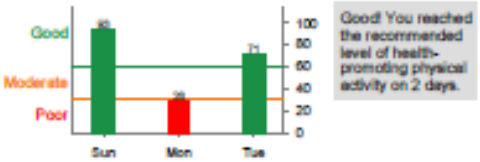


% OF RECOVERY DURING SLEEP:



PHYSICAL ACTIVITY

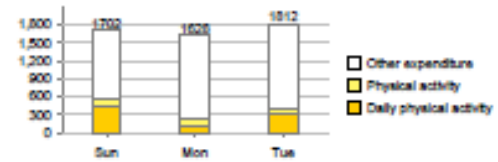
PHYSICAL ACTIVITY INDEX:



The measurement included 2 very hard workouts. Remember to balance with rest and light exercise.

ENERGY EXPENDITURE

ENERGY EXPENDITURE (kcal):



Steps	8441	7432	9123

09.06.2014 09:36
www.firstbeat.fi/work-well-being

FIRSTBEAT