Correlation of quantified self-tracking and subjective stress perception

An exploratory cross-sectional study

Master Thesis

For attainment of the academic degree of
Master of Science in Engineering (MSc)

in the Master Programme Digital Healthcare
at St. Pölten University of Applied Sciences

by

Eva Maria Kamper, BA

1710756803

First advisor: Romana Bichler, MAS

[19 September 2019]

Declaration

I declare that I have developed and written the enclosed Master Thesis completely by myself and have not used sources or means without declaration in the text. Any thoughts from others or literal quotations are clearly marked. This work was not used in the same or in a similar version to achieve an academic grading or is being published elsewhere.

....

Place, Date Signature

Abstract

The digitalization of many areas of life in modern time has been manifested for some years in the physically active environment of many people. Using various fitness watches or smartphone apps, it became possible to track and store all movement data throughout the day. At the same time, in the fast-paced world there is also an increase in mental illness due to stress.

This master thesis deals with the degree of utilization and personal expectation of the “quantified self-tracking" of movement data (with fitness watch or smartphone application) and the general, subjective perception of stress. It is to be investigated whether there is a correlation between the intensity of the personal usage of self-tracking and the level of the subjectively perceived stress level.

The method of this research study is a quantitative online survey of physically active people between the ages of 25 and 50 who use tracking methods, and also people who don’t use self-tracking technology.

A certified questionnaire was used to determine the perceived stress level (Dr. Satow's 2012 Stress and Coping Inventory).

The result shows that the usage of self-tracking tools is nearly 50% in this random sample. The age group between 25 and 30 years uses digital tracking tools most often. The motivation for tracking is the mostly for privat documentation of the data like movement duration, distance, heart rate and steps. A correlation between the self-tracking and the subjective perceived stress level could not be proven by this study.

Kurzfassung

Die Digitalisierung vieler Lebensbereiche in der heutigen Zeit manifestiert sich seit einigen Jahren auch im sportlichen und bewegungsfreudigen Alltag vieler Menschen. Mittels verschiedenster Fitnessuhren oder Smartphone-Apps ist es möglich, sämtliche Bewegungsdaten über den Tag aufzuzeichnen und zu speichern. Gleichzeitig gibt es in der schnelllebigen Welt aber auch einen Anstieg von psychischer Belastung aufgrund von Stress.

Diese Master These beschäftigt sich mit dem Nutzungsgrad und persönlicher Erwartungshaltung von „Self-Tracking“ der körpereigenen Bewegungsdaten (mit Fitness-Uhr oder Smartphone-Applikation) und dem allgemeinen, subjektiven Stressempfinden. Es soll erforscht werden, ob es einen Zusammenhang zwischen der Intensität des persönlichen Ntzungsgrades von „Self-Tracking“ und der Höhe des subjektiv empfundenen Stresslevels gibt.

Die Methode dieser Forschungsarbeit ist eine quantitative Online-Erhebung unter sportlich aktiven Menschen zwischen 25 und 50 Jahren, die entweder Tracking Methoden verwenden oder ohne Technik trainieren bzw. sich bewusst bewegen.

Zur Feststellung des subjektiv empfundenen Stresslevels wurde ein zertifizierter Fragebogen herangezogen (Stress- und Coping Inventar von Dr. Satow 2012).

Als Ergebnis zeigt sich, dass die Nutzung von Tracking Methoden beinahe von der Hälfte der Testpersonen in dieser Stichprobe betrieben wird. Die Altersgruppe zwischen 25 und 30 Jahren nutzt digitale Trackingsmethoden am häufigsten. Die hauptsächliche Motivation zum Tracken ist die private Dokumentation der körpereigenen Daten wie Dauer und Wegstrecke der Bewegungseinheiten, Puls oder Anzahl der Schritte. Eine Korrelation zwischen dem Self-Tracking und der Höhe des subjektiv empfundenen Stresslevel konnte in dieser Forschungsstudie nicht nachgewiesen werden.

Table of Content

1 Introduction

This master thesis with the main backround of health promotion is dedicated to investigating a connection between self-tracking per fitness trackers or mobile application on devices (in sport or daily routine movement) and the subjective stress perception by people at the age of 25 – 50 years.

It's a well-known fact, that the smartphone is a fixed component of today's society. Many people have a variety of apps on their devices to track their physical activity.[1] At the same time, the number of stressors or burnout disorders among the working population has also increased. [2]

The motivation for this topic comes from the personal experience of the change in mobile technology and the knowledge on the one hand, what it's like to train and move with mobile technology and to enter physical data in apps, or on the other hand, what it is like to do it without technology. The considered apps are intended to promote sportive motivation and long-term participation in the respective health-promoting activity. But as a risk, they also may increase the pressure to perform, promote unnatural expectations and generate frustration and depression. [3]

According to literature research on PubMed[1] and google scholar[2], hardly any critical studies dealing with the topic of self-tracking in comparison with the psychological level of the probands was found. That was the motivation to explore this aspect.

[1] https://www.ncbi.nlm.nih.gov/pubmed

[2] https://scholar.google.at/

1.1 Problem

Nowadays, a big number of people are recording their activities with fitness apps or tracking tools digitally and producing data about their health. [4] “Self-tracking” is meant to increase motivation and provide an overview of people’s health behaviour. The findings that people receive while quantifying themselves should help to adapt their behaviour voluntarily in favor of health or to compare it with other people. [5] These different apps can store different parameters over years.[6]

But there are also health-conscious people who train without technology and are only listening to their own physical feelings while practising the activities. [7]

At the same time, more and more people are suffering from common diseases and stress symptoms due to everyday’s life overload. [8] Also, the excessive use of smartphones can cause a mental addiction. Excessive sports and pressure to perform can also cause health problems. [9]

A preventive and health-conscious lifestyle is undoubtedly positive and exemplary. The apps are also mainly dedicated to show the advantages in use. However, digital progress in this area also has its downsides and dangers. [10] The constant adaptation of the lifestyle can also get out of control. [11] The privacy is at risk and the self-maintenance including the pressure to perform can also cause more stress than health-promoting effect. [3]

Apart from the risk of data misuse, there is a real risk that the self-trackers develop an irresistible urge to an addiction to be constantly monitored by a device - almost for self-purpose. And only define themselves by their raised numbers, which can take on even too much ambition even an unhealthy competitive character. In the worst case, they will achieve the opposite of what they are aiming for: Instead of learning to better assess themselves, self-trackers can unlearn to listen to their body. [12] [13]

1.2 Questions of Research

The pivotal questions of this thesis are the following:

RQ1

What is the degree of intensity of self-tracking applications and tools currently in use by people between the age of 25 and 50?

RQ2

Which data are tracked by people and what are the expectations on tracking them?

RQ3

Is there a correlation between self-tracking and the subjective stress perception?

T01

There is no correlation between self-tracking behaviour and the subjective stress perception of physically active people

1.3 Method

First, for the hermeneutical part, the theoretical backround of sport and stress and a analysis of the state of the art of the historical beginning of investigation of the self-tracking movement, was conducted. The opportunities, risks and state of the art of the self-tracking behaviour were illustred. Further literature research was carried out all the time.

Second, by developing a representative questionnaire with important queries about movement behaviour, utilization and expectations of self-tracking tools and at last indication of stress-symptoms, a finding was reached in the empirical part. This study enhances academic understanding of the psychological factors concerning the quantified self-tracking.

In an explorative cross-sectional study, the current study examines the influence of self-tracking by mobile devices or wearables on stress-related life (measured

with a certified stress level test) in daily routine. The study is based on a one-time anonymous online survey and consists of approximately 100 probands, who are male and female and of an average age between 25 and 50 years. The participants were acquired via social networks, for example facebook groups for healthcare or the sports interests. The data was collected through an online questionnaire that compares the behaviour in self-tracking (with general questions about personal movement behaviour, facts on how people track themselves and what they do feel and except from tracking) including selected parameters of the “stress and coping inventory SCI for stress and stress symptoms from Dr. Satow (2012)”. [14]

1.4 Goal

To sum up, the data was analysed by a describtive statistic with a bivariate correlation. From the results it can be deduced if there is a correlation between self-tracking and the subjective stress perception. As a result, the analysed data is graphically presented.

1.5 Structure of the thesis

This thesis is structured into six chapters.

- **Chapter 1** describes the issue and the actual problem statement with the pivotal questions, the used methodology and the goal of the thesis.
- **Chapter 2** describes the theoretical background of definition of sport, stress and the tracking of the physical movement. An overview of the measurability of stress and the origin of fitness trackers is included.
- **Chapter 3** illustrates the method of the study.
- **Chapter 4** demonstrates the findings and the analysis of the results.
- **Chapter 5** consists of the discussion of the results in relation to the theoretical background and the research questions. Additionally, it provides limitations and approaches for future work.
- **Chapter 6** is the conclusion which summarizes all findings.

2 Theoretical backround

In this part of the master thesis the author wants to describe the theoretical background of the topic. The following chapters will discuss the effects of sport on the human body and the physical exercise recommendations of the WHO (World Health Organisation). The author wants to demonstrate the meaning of stress and which types of stress there are. Various possibilities of measuring stress will be presented. Finally, an overview of self-tracking history and self-tracking systems and tools currently existing will be given.

2.1 Physical movement

In the prehistory of evolution, as hunters and gatherers, humans had to master great distances and constantly strain their muscles. Walking, running, rock climbing as detailed performed actions, were part of the survival strategy to find food and escape from enemy attacks. Later, the human muscle was used for agriculture, building and transportation. With technological advances, people's physical activity in the 21st century has been steadily reduced and, at the same time, there has been an increase in obesity as one result among others. [15]

In literature there are different terms for the physical activity of the body: eg. sports and exercise, physical activity, fitness training, etc. "Sport" is used in general parlance as a collective term of different possibilities of movement, but is still associated with a competitive behaviour or a record idea in a competition. [16] Sport is a muscular effort with a competitive character or with the goal of outstanding personal performance. [17]

If sport is not understood as a competition, but as a health-oriented movement, the term used in the English language is "exercise". "Physical activity" or "lifestyle activity" is used when the muscular effort or energy expenditure is increased. Even a minimal increase in energy expenditure, eg. when walking, is considered beneficial to health. “Physical training” is a term used to systematically and

physically focus on a person's physical activity and increase physical performance. In "health training" the preservation or the restoration of lost movement functions plays the biggest part. Schlicht and Brand (2007) explained the difference between “Physical movement” [14, p.16], as the following figure shows:

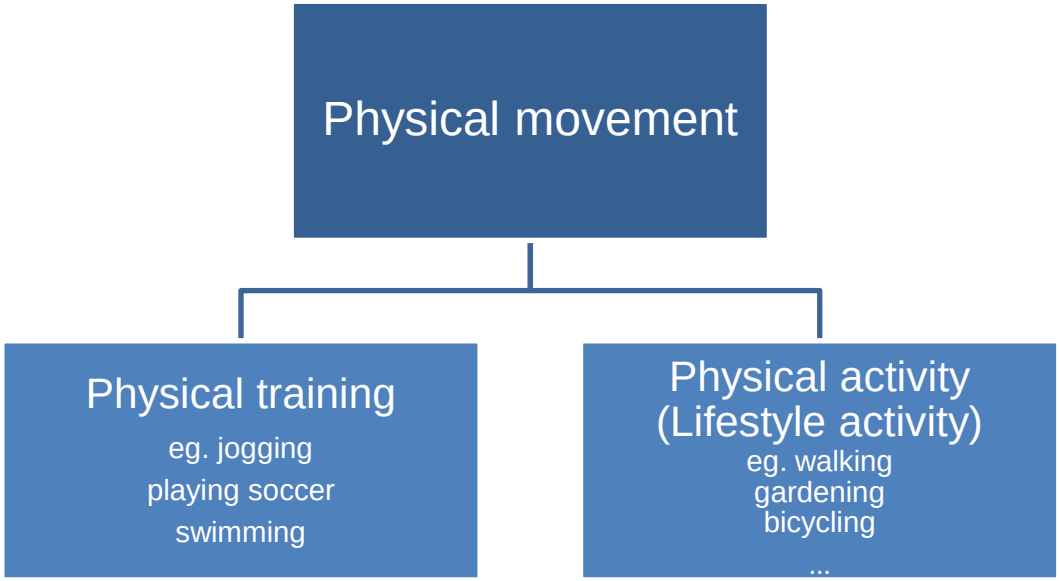

Figure 1: Concept hierarchy of physical movement based on Schlicht und Brand (2007) [14]

In this master thesis the terms “sport” and “workout” are used for physical training. “Physical activity” and “daily routine movement” are used for movement during the lifestyle activity, without doing sport explicitly.

2.1.1 Effects of doing sport

General physical inactivity has serious negative consequences for human health. So, doing sport and physical activity have many beneficial effects. Most chronic diseases can be prevented by doing physical activity regularly.

Positive effects:

Exercise and enough physical activity are necessary for the healthy performance of the organism. If the movement level is high enough, growth processes are triggered (eg. of the muscles). A strong musculature serves as a supportive function for the skeleton. Regular exercise increases bone density and promotes

the resilience of the joints. In endurance exercise, the energy metabolism is increased. The performance of the body is basically increased. Sport with high load and short duration increases the power output. Sport mainly increases the coordination of the interaction of the muscles. [18]

At rest, the heart beats about 60-80 times a minute. During physical activity, the heart rate is increased to about 200 beats and this increases the stroke volume of the heart. As a result, the blood flows faster and delivers more oxygen to the muscle cells. Also, the tidal volume increases, the capacity of the lungs can be used more fully. Another positive effect is the improved body energy balance, which means improved fat and sugar metabolisms. Likewise, the immune system can be improved. [18]

But there can also be negative effects:

One result of muscular activity is fatigue, or the reversible reduction of physical functioning. [17] Too vigorous exercise can pose a problem too. The risk of injury increases with increasing fatigue. The type and severity of injuries depend on the intensity and nature of the sport, as well as the age of the person. Short-term injuries, but also long-term signs of wear and tear can occur. The psychological risks are related to the increase in the feeling of stress when sport is done compulsively. Depression, inner restlessness, irritability and headaches can be the result The occurence of addiction is also possible. [19]

There are also the definitions of "overreaching" and "overtraining" in sport science:

- "*Overreaching*" is a short-term condition of fatigue and exhaustion. Physical symptoms such as severe muscle soreness, muscle strain or muscle inflammation are possible. Normally, this condition is regenerated after a few days to weeks of break or rest.
- "*Overtraining*" is a long-term ignored effect of overreaching. There is a lasting imbalance between stress and regeneration. This can also lead to depression and burn-out. [20]

The causes of overtraining may vary, often an external pressure is the reason, if people expect too much from the body. Psychological reasons such as the own body image, can cause people to train far beyond the limit. [20]

The following table shows the summary of the health effects of doing sport: [15]

Condition	***Effect***
Heart disease	*Reduced risk*
Stroke	*Reduced risk*
Overweight and obesity	*Reduced risk*
Type 2 diabetes	*Reduced risk*
Colon cancer	*Reduced risk*
Breast cancer	*Reduced risk*
Musculoskeletal health	*Improvement*
Falls in older people	*Reduced risk*
Psychological well-being	*Improvement*
Depression	*Reduced risk*

Table 1: Summary of the Health Effects by WHO, associated with physical activity [15]

The WHO (World Health Organization) is a specialized organization founded in 1948 by the United Nations. Its objective is to advise the public as a leading and coordinating authority for international issues and health issues. With its recommendations on the health of people, it aims to achieve the highest possible level of health of all people. [15]

The WHO has put out some exercise recommendations for eg. the age group of people between 18 and 64 years. People should do at least 150 minutes of moderate intensity physical activity or 75 minutes of high intensity during the week, or a combination of moderate and powerful intensity. [15] The still recommended target of 10,000 steps per day dates from 1965 and was suggested by Dr. Yoshiro Hatano, who spoke from his own experience in matters of personal well-being. [21]

The following table by WHO shows in which way the recommended levels of physical activity can be reached per age group: [15]

Person	***Activities***
Young child	*Daily walk to and from school Daily school activity sessions (breaks and clubs) 3–4 afternoon or evening play opportunities.* *Weekend: longer walks, visits to park or swimming pool, bicycle rides*
Teenager	*Daily walk (or cycle) to and from school 3–4 organized or informal midweek sports or activities.* *Weekend: walks, cycling, swimming, sports activities*
Student	*Daily walk (or cycle) to and from college Taking all small opportunities to be active: using stairs, doing manual tasks 2–3 midweek sports or exercise classes, visits to a gym or swimming pool.* *Weekend: longer walks, cycling, swimming, sports activities*
Adult with paid job	*Daily walk or cycle to work Taking all small opportunities to be active: using stairs, doing manual tasks 2–3 midweek sport, gym or swimming sessions.* *Weekend: longer walks, cycling, swimming, sports activities, home repairs, gardening*
Adult working in the home	*Daily walks, gardening or home repairs Taking all small opportunities to be active: using stairs, doing manual tasks Occasional midweek sport, gym or swimming sessions.* *Weekend: longer walks, cycling, sports activities*
Adult, unemployed	*Daily walks, gardening, home repairs Taking all small opportunities to be active: using stairs, doing manual tasks.* *Weekend: longer walks, cycling, swimming or sports activities Occasional sport, gym, or swimming sessions*
Retired person	*Daily walking, cycling, home repairs or gardening Taking all small opportunities to be active: using stairs, doing manual tasks.* *Weekend: longer walks, cycling or swimming*

Table 2: WHO: How People of all ages could reach the recommend levels of physical activity [15]

2.1.2 Motivation to do Sport

The incentive for doing sport is usually geared toward achieving a specific goal. You either want to feel better and more efficient or improve your body shape. Numerous models of behavioural theories can be found throughout literature. Carver and Scheier (1998) have illustrated two types of target tracking: avoidance and approximation of the target state. Approaches are more likely to motivate a behaviour and maintain consistency. The emotions of enthusiasm and pride are affective states that one would like to experience and achieve again and again. The anticipation of successfully mastering an activity plays a major role in motivation. It is even better if a person intrinsically strives for their "identity goal" and prefers health-conscious behaviours in this regard. Those extrinsically motivated people are led by their environment to behave in a way that helps them to escape punishment or receive a reward. This is the case, for example, when politicians or health insurances make their insurance benefits or services dependent on the health behaviour of citizens. This kind of motivation will only be successful, as long as the pressure from outside works. This kind of motivation also occurs when the circle of friends or the partner exerts pressure on the individual to do sport. The best motivation for sport is succeedings in being physically active, because enjoying the movement can make a person feel proactive and it can be stimulating. [14, p. 114]

According to past surveys, every third person in Austria is physically active. Running, cycling, swimming and hiking are the most popular physical activities. A big part of the people train alone. Only 15 % of Austrians are active in sport clubs. [22]

The following graph (Figure 2) shows the evaluation of the survey in the years 2017 and 2018, by statista.com[3] about sport behaviour in Austria (N = 1.014) graphically:

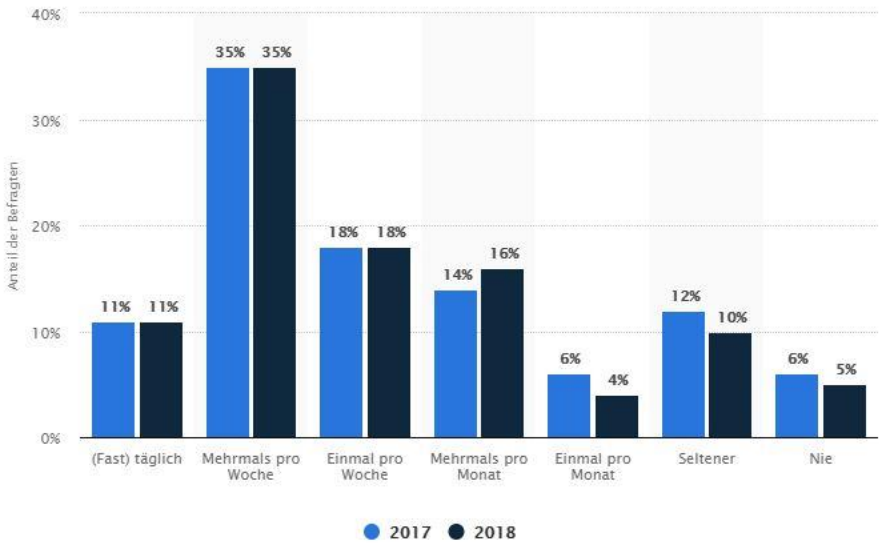

Figure 2: The result of a survey on the frequency of sports activities in Austria in the years 2017 and 2018 [23]

About 35% of respondents (N = 1.014) said they were active in doing sport several times a week. 11% did sport eyery day. 18% exercised once a week. 14% did sport several times a month in 2017 and increased to 16 % in 2018. 6% exercised once in a month in 2017 and in 2018 there were 4% which did so. The other surveyed probands did any sportive activities seldom or never. [23]

2.2 Stress

The following chapter aims at discussing the definition of stress and explaining the effects of stress on health. An overview of the general situation in Austria and several measurement methods of stress are provided:

[3] www.statista.com

Stress is a natural reaction of the body to a challenge or an exceptional situation. The word "stress" derives from the Latin word "strictus" and can be translated as "tight, or tense". Pressure, tension or change in daily routine situations can create stress. [24]

Stress plays a big role in society. Too much stress can be the cause of many serious diseases, such as cardiovascular diseases, diseases of the nervous system, arteriosclerosis, diabetes, and many more. Stress is an important topic in the business world and in sport. It is a fact that stress is not generally to be considered as bad. Without regular challenges to the body and mind, humans would also fall ill. Humans need an optimal dose of stress. [25]

There are two types of stress:

Eustress:

Eustress refers to the "good stress" that poses a positive challenge to people. The chemical reaction in the body helps to stay motivated, to focus on goals and to keep a good attitude to life. [26]

Distress:

Distress refers to the physical condition of the overload or negative stress. Whether a situation becomes stressful or not depends on the duration of the stress, the personal stress threshold and the personal self-assessment. Thus the difference between Eustress and Distress can not be objectively defined, and seems to be an individual feeling of each person. Distress is generally describable as an imbalance of requirements and coping options. [27]

Depending on the trigger, the effects of stress may vary. Prolonged stress can lead to chronic consequences. There are four different levels of negative stress signals:

1. Muscular level
2. Vegetative-hormonal level
3. Emotional level
4. Cognitive level

On the physical, muscular level, stress usually manifests with tension in the skeletal muscles. Possible effects include tremors, twitching, distorted facial expressions, teeth grinding, etc. Constant tension leads to a faster fatigue of the body. At the vegetatitv-hormonal level, various processes in the nervous system are activated. The sympathetic nervous system causes the stress hormones epinephrine, noradrelanine and cortisol to be released. The effects can be: increased blood pressure, rapid heartbeat, indigestion, immunodeficiency, insomnia. Emotions and feelings belong to the emotional level. Stress causes nervousness, insecurity, irritability, aggression, panic, depression, etc. The cognitive level includes mental processes. The learning and memory performance is impaired and concentration is difficult. The consequences can be the so-called black-out, a complete emptiness in the head. [28]

In Austria, about 900,000 people were affected by a mental illness within a year. [29] The *Bundesministerium für Arbeit, Soziales und Gesundheit* has therefore published a "National Strategy for Mental Health[4]". It states that "mental health is part of the overall health". Especially the age group between 15 and 44 years is affected. On the basis of the care data an increase of the mental illnesses is to be noted. [30]

[4] https://www.sozialministerium.at/cms/site/attachments/0/8/8/CH3999/CMS1383641380655/strategie_fassung_beirat_version_31.7.2018.pdf

Since the mid-1990s, the number of absence days due to mental illness has almost tripled as the figure 3 illustrates:

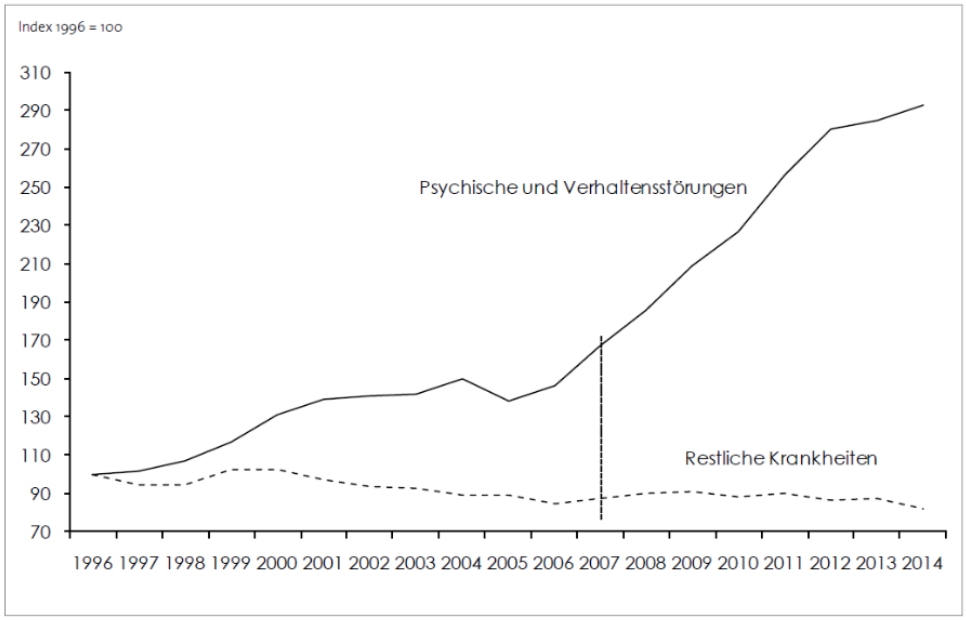

Figure 3: Increase of psychological illnesses [9]

It can be assumed that these numbers could be even higher because over time the willingness of physicians to attribute health problems to the mental health sector has probably tended to increase. [9]

2.2.1 Stress by physical activities

Sport is basically a positive balancing factor in stress. However, it can be a problem when people are putting themselves under stress with their physical activity. Excessive workouts can be counterproductive and prevent the desired health benefits. Also, serious health consequences such as burn-out can be caused by too much ambition in the sport. To body perceives the workout as an additional stress unit. It needs a balanced relationship between stress and relaxation phases. [31]

The following aspects can make the workout a stressor:

- The workout is perceived as an indispensable duty.
- The workout can only be done under time pressure, or the necessary warming up is dispensed with.
- The workout is carried out under pressure and motivated by a craving for validation and prestige, eg. only winning counts in the course of a competition.
- The workout is running irregularly or inconsistently and therefore far too intensively to compensate for the deficiency in sport, or to get maximum use out of the regular payments in the gym.
- After the exercise session, the entire body needs to hurt, to give the impression that the person has exercised enough. [32]

Some people become addicted to sports. They lose all sense of what is good for the body and what is not. Although there is no diagnosis of "sports addiction" yet, uncontrolled, excessive movement, without competitive ambitions, becomes a problem. The body reacts with congestion pain and signs of wear. Addictive behaviour acts like a drug. Approximately 1% of people among recreational athletes are addicted to exercise. Here also the body's own happiness hormones (endorphins) may be responsible. Under extreme stress, the body releases the body's own drugs to control the pain. [33]

2.2.2 Measurability of stress

Stress can be measured with different methods. There are two types of stress level in the body: the objective and the subjective measurable stress level. [34] Monitoring of stress is not limited to either subjective or objective measures, instead they can be used to complement each other in best practise. [35]

Objective measures:

A technical method to make the stress level objectively visible is the HRV measurement (heart rate variability). This measurement provides information on how and how quickly the body can recover independently. A healthy body always adapts to the respective situation and effort by adjusting the heartbeat. During physical exertion, the heartbeat increases, and in rest it reduces again. This is

associated with the increase in the activity of the sympathetic (activ nerve). Therefore, the more irregular the heartbeat is, the healthier the adaptability of the heart and the internal stimuli. The more stress the body is used to be confronted with, the more regular the heartbeat becomes. [36] Another way to measure stress is the laboratory parameter of cortisol in saliva. Cortisol production is activated by stress hormones. If the stress trigger disappears again, the regeneration phase begins, and the cortisol level drops again. Stress can also be measured by the neurotransmitter serotonin. With continuous stress, the level of serotonin decreases. This can be measured in urine.[37]

Subjective measures:

When measuring the subjective level of stress, a questionnaire can be used, as the values consist of how a person assesses their own state of health. In psychology and scientific there are lots of certified questionnaires to measure stress. [35] In the following paragraphes three different examples of available stress questionnaires from the past and present are introduced:

One of the first attempts to measure stress was the Holmes and Rahe “Life Events Scale” (1967), called the Social Readjustment Rating Scale (SRRS), to identify stressful life situations. 43 events from the past 12 months had to be awarded a "Life Change Unit". A total value of the subjective stress level could be calculated.[38] From today's perspective, the test is no longer suitable for calculating the stress level, since this method does not consider that people process negative events quite differently.[14]

Another science-based method is the *Perceived Stress Questionnaire (PSQ)* by Levenstein et al. (1993). The test consists of 30 items with 4-level rating scales. With this instrument the subjective stress perception can be determined with a high value of reliability (according to Cronbach α = .93). [39] “Chronbach's Alpha” is a measure of the internal consistency or homogeneity of a test composed of several items or a questionnaire scale. [40]

A modern, certified stress level test is the *Stress and Coping Inventory (SCI) by Dr. med. Satow (2012*). The aim of this questionnaire, with its 54 items, is to record the stress state of persons and their stress levels by means of physical and psychological stress symptoms. In contrast to the “Life Events Scale” by Holmes

and Rahe (1967), the SCI records the subjective assessment of the probands. [14] *(All three examples of questionnaires are attached in appendix B of this master thesis.)*

2.3 Self-tracking

The ensuing chapter discusses the topic of "self-tracking", giving an explanation of the term and the origin and analyzing chances and risks. This master thesis is limited to the tracking of **movement data** in sport and daily routine.

2.3.1 History of self-tracking

The term "self-tracking" or "the quantified self" describes the act of recording and evaluating the body's own parameters of a person. For this purpose, different devices are used. For example, a watch that can measure steps, heart rate, GPS data, and so on, is used on the wrist. Modern smartphones allow self-tracking even with modern apps using sensors. In principle, a wide variety of data can be tracked, including nutrition and sleep among others. [12]

Ever since the Rennaissance, people have kept their experiences and memories in diaries and thereby experienced a self-reflection. Similarly, there are so-called training diaries for the sport to understand the performance process. The phenomenon of self-measurement has its origins in the US and originally served to exchange personal data. [41] The movement started in 2007 on the website quantifiedself.com[5], led by journalists Gary Wolf and Kevin Kelly. [42]

Thanks to modern development, digital self-measurement is gaining in importance. New technologies, cultural change and the modified communication behaviour of people bring the social model of self-optimization into the foreground. Accordingly, one's own body is no longer considered a biological destiny, but is the result of personal achievement. The digital self-measurement underscores a paradigm shift in health care, as it makes up a part of self-responsibility. [11]

[5] https://quantifiedself.com/

The history of self-tracking goes back to the inventor Leonardo Da Vinci. He was already thinking about a “pedometer” in the 15th century. His sketches of the prototype of a "pedometer" (Figure 4) are considered the oldest source of a fitness tracker, but he could not implement the technology back then. [21]

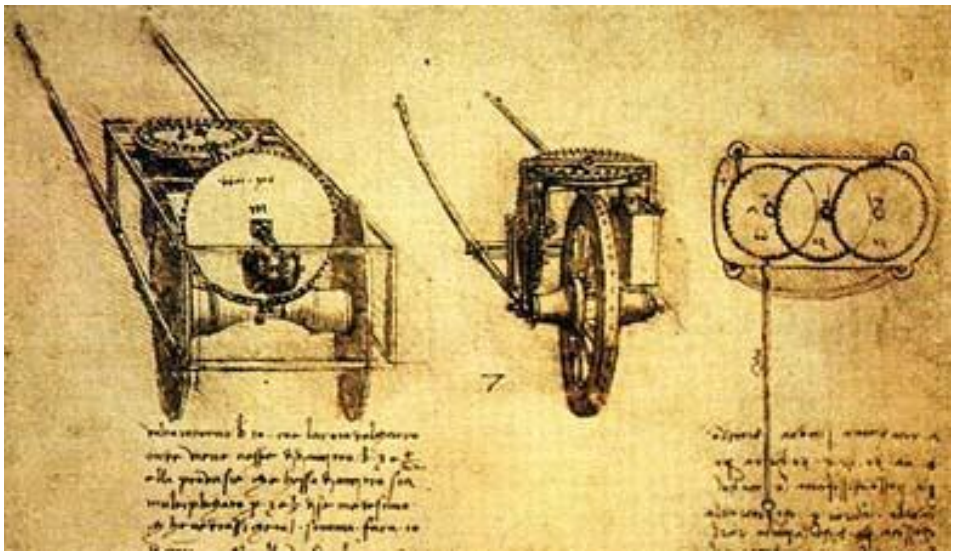

Figure 4: Sketches of the prototype of a "pedometer" by Leonardo Da Vinci [42]

Swiss watchmaker Abraham-Louis Perrelet is said to have invented the first pedometer in 1780. Since he did not patent the idea, it was finally the American Thomas Jefferson who brought a variant of the pedometer on the market in 1788. The technology of the sensors of fitness trackers goes back to the development of the lie detector in the 1920s. For the first time, chemical substances were used to measure and record body functions such as pulse and blood pressure. In 1971 the technology of an accelerometer was developed. These mechanisms are still part of every fitness bracelet today. [21]

In 1982, the company "Polar Sports"[6] launched sporty watch models that offered more than just typical timekeeping. The "PE2000" is considered the first tool that also displayed circulatory data using a chest strap. Successors that were also able to show pulse and blood pressure quickly followed. "Polar Sports" is considered the origin of all fitness trackers. In 1996, then-US President Bill Cinton authorized

[6] https://www.polar.com/at-de

the civilian use of GPS data, which until then had been reserved for the military only. Since 2005, there are digital self-trackers as websites and applications on devices. Calory counters, training partner searching, and motivational aids have become the basis of today's fitness apps since then. One of the first big websites or apps was "myFitnessPal"[7]. In 2006, "Nokia"[8] launched the "5500 Sport" mobile phone which was able to capture accurate measurements of distance, activity and calories burned. [21]

In 2009, the Austrian start-up company "Runtastic"[9] was founded by Florian Gschwandtner, Christian Kaar, Alfred Luger and René Giretzlehner. The original idea was to support technology-conscious runners on specially installed running tracks via an app. The company has evolved very quickly and re-defined the app for use in all locations. In 2015, the app had over 100 million counted downloads and was purchased by the company "Adidas"[10] for 220 million euros. [43]

A fitness bracelet was launched for the first time by the company "Samsung"[11] in 2013 with data recording and sleep monitoring using the "Samsung Galaxy Gear Fit". In the same year, in cooperation with the navigation manufacturer “Garmin”[12], Samsung also developed the first portable tracker as a fitness watch. The first "Smart watch" was released in 2015 by “Apple”[13], it also includes tracking capabilities. The leader in market share in 2016 was the company "Fitbit"[14] with 24.5 %. Since 2017, fitness bracelets have been considered highly accurate data measuring sensors with good results. Meanwhile, the boundaries between fitness bracelet and smartwatch blur. In the future there will be more and more data trackers designed as small finger rings or smart headphones. [21]

[7] https://www.myfitnesspal.com/
[8] https://www.nokia.com/de_int/
[9] https://www.runtastic.com/de/
[10] https://www.adidas.com/us
[11] https://www.samsung.com/at/
[12] https://www.garmin.com/de-AT/
[13] https://www.apple.com/at/
[14] https://www.fitbit.com/de/home

2.3.2 Example of available Apps and Tracking-Tools

There is a myriad of *apps for the smartphone* in the field of fitness or nutrition. The free app "Runtastic" for Android and iOS operating systems is one of the most popular on the market. The user has to register in the app. During motion units, the app uses GPS to record the distance covered, the speed and the calories burned. Users can choose different kind of sports in the app, collect the results and share them on social media. Thus, the smartphone can do the job as a transparent training diary. [44] In 2015, 20 % of 15 to 29-year-old Austrians confirmed in a study for statista.com[15] that they use the "Runtastic" app (N=301). One in five is running or training with Runtastic. The data on the use of digital self-trackers shows they were used by up to 40 % of all physically active people in the year 2015. [22]

There is also a large number of different *fitness watches* on the market. They are worn on the wrist like analog watches and have numerous sensors and a variety of functions. Above all, the sensors should record the actual movement of the body, eg. steps. More expensive models are also able to distinguish between various sports, to operate GPS tracking and have an integrated heart rate measurement. Also, sleep analysis is one of the functions of modern fitness watches. The measurement data can usually be sent from the watch to a smartphone app. [45]

[15] www.statista.com

The current top-ten ranking of tracking devices is following: [46]

1. Moov Now	6. Samsung Gear Fit 2 Pro
2. Fitbit Charge 3	7. Honor Band 4
3. Garmin Vivosmart 4	8. Garmin Vivosport
4. Huawei Band 2 Pro	9. Amazfit Bip
5. Withings Pulse HR	10. Garmin Vivofit 4

Table 3: Current top-ten ranking of tracking devices [45]

2.3.3 Chances and risks from self-tracking

Digital self-measurement goes hand in hand with the technology trend "gamification". On a playful basis, behavioural change and a healthy lifestyle should be supported. By getting the data by incorporating mechanisms such as goals and rules, tips and feedback, and rewards, people can find motivation to move. Surveying and visualization provide a clear status quo of the own performance. The smallest positive changes are immediately recognized and provide the user with confirmation and further motivation, even if subjectively no progress is recognizable. This awareness generates clarity and has an impact on intrinsic motivation. The efficacy is already proven by the example of some fitness products. The mapping of properties through information can help people across different areas of life in their individual development. [41]

The main benefit of self-tracking is that the quality of life of users can be increased. The advantage of tracking the workouts is that the determination of body values helps in optimizing performance. The digital presentation of the values should also increase the fun factor in the behaviour. [12]

Research has shown that self-tracking leads to increased motivation, perseverance and fun factor in sports and daily routine. It helps create personal self-efficacy. Especially newcomers can thus easily build a training routine and remain consistent. [47] In older qualitative studies, it has been stated that continuous self-tracking can also help to improve occupational status by controlling and improving the body. [48]

Nowadays, people are too busy with their smartphone in general. The Nobel Laureate for Medicine (2013) Thomas Südhof[16] explicitly warns against too much stress from the smartphone. [49] There are several studies that show that excessive smart phone usage has a negative impact on the psyche. It can trigger legitimate and unjustified fears, as well as depression and sleep disorders. Offers from the online world can promote addictive behaviour. Also, poor handling characteristics of these technical tools can cause stress. [50] By comparison, constantly checking and documenting one's own movements and actions can also trigger stress. By putting people in high expectations, they are under pressure. [13]

Independent studies examined eg. self-criticism and purposeful perfectionism in different areas and came to the conclusion that it had a negative correlation to the goal progress. [51] Psychologists and doctors issue a warning against exaggeration and self-exploitation. The constant self-insinuation implies an increased risk of injury, stress, frustration, insomnia, depression, burn-out, addictions or different psychosomatic symptoms as a possible consequence. [52]

A study has found that the monitoring of sleep units also leads to increased stress. Increasing the use of tracking devices during sleep has the effect of reducing the quality of night sleep. The tracker puts the user in a performance situation. The subjective experience of sleep is thereby disturbed. The users rate their sleep based on the data in the tracker and may diagnose themselves with a sleep disorder, although they do not have one. [53]

Critics also fear that the large amount of data people collect may more likely trigger hypochondriacal behaviour. The self-tracking can also provide much misunderstood information and the unreflective long-term observation can be a burden.[54] The intense concentration on one's own body can cause too much pressure, and fear of failure or even self-hatred can also be the result. The term "*cyberchondriene*"[17] was coined on the internet and describes people who are overly concerned about their state of health due to collected data, among others.

[16] https://med.stanford.edu/sudhoflab.html

[17] https://flexikon.doccheck.com/de/Cyberchondrie

Another disappointment people repeatedly report, that the devices and tools are little effective in practice because of being uncomfortable or incompatible [55].

Interface between health and medicine

There are a variety of apps and devices that help people to self-measure. From the perspective of the law, they are divided into consumer and medical products. Consumer products include all quantified-self systems designed to track fitness, lifestyle, health and wellness. If a medical purpose is pursued, such as the documentation of chronic diseases, the term is “medical product”, which is subject to the strict regulations of the right of cure. The self-measurement phenomenon is more of a dynamic market for device manufacturers. The medical potential has not yet exhausted the quantified-self-movement. [54] According to studies, the use of smart wearable sensors in the field of medicine continues to be used as an innovation. Self-measurement is valued as a new opportunity and revolution, especially for chronic diseases. [56]

2.3.4 Excursus: Data protection

Fitness apps are very popular among users, but little information is provided on how and for what purpose personal information is used. In the privacy statements, the providers are extremely reserved when it comes to information on the use of sensitive data. [44] Employers and health insurances may be very interested in this sensitive data of the health behaviour of people. [55]

Health insurance companies have already tried in pilot projects to use the "Quantified Self" movement for the processing of insurance. In doing so, health scores are provided by the insured and the premiums are calculated according to these. The pharmaceutical industry, employers, all insurance companies and banks are also interested in this sensitive data. [57]

Currently, the proportion use of wearables in Austria’s inhabitants is six percent. In the 15-29 age group, fitness- and smartwatches and activity trackers are the most popular. The skepticism of the Austrians towards wearables has declined: while concerns about data protection and health are decreasing, the acceptance of fitness bracelets and smartwatches has risen compared to 2016. [58]

2.4 Summary

Resumed, after this previous illustration of the reviewed literature on sport, exercise recommendations, stress, effects of stress and the common methods, opportunities and risks of self-tracking, the following findings can be shown:

Physically movement is important and healthy and WHO advocates clear recommendations for exercise. However, sport can be exaggerated, which can lead to injuries and negative psychological effects.

Stress can severely damage the body. In Austria, increasing numbers of mental illnesses are recorded. Too much expectation and pressure on people's performance can be a trigger for stress.

For centuries, people have longed for a system to document physical achievements. Sport trackers are in vogue and are launched on the market in vast numbers. In addition, the trackers in general should provide an increase in motivation for physical performance, but there are also numerous expert warnings that an exaggerated desire for self-optimization can cause too much pressure on the psyche.

Experts also consider the fact about the data security, because the wearable tracker systems store sensitive data about the movement behaviour.

3 Requirements/Methodology

This chapter discusses the exact description of the requirements and methodology of the research questions, the study design and the type of survey. The research questions and their intended considerations are presented in detail. Furthermore, the development of the questionnaire is described. The data of the research questions were collected by an online-survey containing closed, half-closed and scale questions about demographic data, personal habits of doing sports and using self-tracking tools. Further, a certificated questionnaire about stress and personal reasons and feelings about self-tracking is included. It will also be described in which form the results are evaluated in the end.

3.1 Research Questions

This thesis aims to explore if there is a connection between self-tracking and subjective stress levels. The following research questions were formed in this master thesis:

RQ1

What is the degree of intensity of self-tracking applications and tools currently in use by people between the age of 25 and 50?

The first research question gives a statistical answer of the actual use of self-tracking tools by analysing the given data of the questionnaire, grouped per gender and groups of ages. In the end the result shows which types of self-tracking methods - in which degree of utilization and intensity, are currently used by the probands.

RQ2

Which data are tracked by people and what are the expectations on tracking them?

The second research question treats the facts which data are recorded by probands and what expectations they have on tracking them. By analysing the data, the results will show a classificated list of the most tracked data and the most important reason for self-tracking sports and movement, grouped per gender and groups of ages. This question deals with the probands' own motivation, depending on expectations and goals of tracking the movement data and with whom the data is shared.

RQ3

Is there a correlation between self-tracking and the subjective stress perception?

The main question of this master thesis is, whether there is a correlation between self-tracking of sport and movement-data and the subjective stress perception of the probands. This research question compares the data of the probands on the one hand, in which intensity they track their movement data, and on the other hand the value of the certificated stress level test by Dr. Satow (2012). [14] The main goal is to show if there is a correlation between these data.

T01

There is no correlation between self-tracking behaviour and the subjective stress perception of physically active people.

If the findings are not greatly at variance with what would be expected under the assumption that the null hypothesis is true, then the null hypothesis is not rejected.

3.2 Study Design

The author of this master thesis chose a descriptive-explorative study design. After the theoretical part of the thesis, a one time online survey provides the basis for the empirical part. The demographic group of probands at the age between 25

and 50, female and male, give detailed data about their habits in doing sports and "self-tracking" and a status quo of their subjective stress level. In this consideration, a possible correlation of those variables (intensity of tracking, or not tracking and the subjective stress percepton) is aimed to be evaluated. Further hypotheses could be provided after the results.

This master thesis started with the theoretical background about sport, stress and the state of the art of self-tracking tools. After the preceding literature demonstration, the empirical research is summed up in this master thesis. In the context of the problem, it is about answering the pre-formulated research questions and the evaluation of the created questionnaire. Closed, half closed and scale questions were answered in this quantitative survey via online questionnaire. The anonymous probands (N=115) recruited in social media groups are primarily active in sport. The probands indicate whether they track their movement data, respectively in which intensity they track, or even not, and then participate in a certified stress level test. They also answer questions about their personal habits in sport and self-tracking.

The goal is to explain the context and check the hypothesis that using fitness trackers or fitness apps is (not) related to the subjective perception of stress. The approach is deductive, that means there is a conclusion from the general (based on the premises / hypotheses) to the individual (the available empirical data). The test is carried out via descriptive explorative statistic. These research tests are intended to show if the probands have a different subjective stress level perception.

Specifically, the null hypothesis was written here: The null hypothesis describes the initial situation, according to which there is no difference or correlation. The opposite would be the research hypothesis, it contains the assumed effect. A quantitative analysis always tests on the basis of the null hypothesis, that is: a significance test attempts to reject the null hypothesis to accept a research hypothesis. [59]

For the investigation of the research questions and the hypothesis, a quantitative procedure in form of a questionnaire was chosen. To collect a larger sample in a timely and cost-effective manner, an online survey was conducted. The

questionnaire (see appendix A.) was created with the software "SoSci" by the German company SoSci Survey GmbH[18] and was made available to the probands via a hyperlink. SoSci Survey is an online survey software for students and academic employees at colleges, universities and research institutes. The software enables an attractive, external design of the questionnaire, an anonymous data collection and a transfer of the data into the evaluation program. In addition to the socio-demographic questions, the questionnaire includes a certified stress level test by Dr. med. Satow (Stress- und Coping-Inventar SCI von Satow (2012) [14] for the collection of subjective physical stress symptoms of the probands.

At the beginning of the research, an ethics committee and the University of Sankt Pölten, study programme digital healthcare, approved the study for this master thesis.

3.3 Questionnaire

The following chapter describes the preparation of the survey-questions after the review of the literature. For the measurable value of the subjective stress level, after examining the possible methods for measuring stress, the "Stress- and Coping-Inventory (SCI)" by Dr. Satow (2012) was selected.

3.3.1 Development of the Questionnaire

According to Bortz and Döring (2005), a survey is the most frequently used method for empirical scientific work. It can be oral or written. A standardized questionnaire is a typical measuring instrument. [60, p. 237] The written survey is a cost-effective option and is suitable for a homogeneous group. The survey contents are structured, the disadvantage is that the survey situation is uncontrollable. The formulation of the questions should be evaluated to avoid misunderstandings. For

[18] https://www.soscisurvey.de/

the structured elaboration of the questionnaire closed questions are particularly suitable. [60, pp. 253-255]

The questions are related to the sportive behaviour when it comes to sport common in Austria's public, e.g. running, cycling, swimming, weight training etc. There was the possibility to supplement other sport in semi-open questions. The duration of the exercise was queried by minutes per week. The question on which tracking methods were used, was also based on common tools that are available on the market, just like apps on smartphones or fitness watches.

Other tracking methods could be supplemented in semi-open questions. Information on which data is being tracked was collected in a list of the data the common tools are capable of providing. The questions from the certified part were taken over verbatim, this explicitly was the condition by Dr. Satow when using the stress and coping investory (2012). Questions about personal expectations were split into positive "motivation" and negative "bad conscience" tendencies.

The questionnaire was equipped with a filter. Thus, the questionnaire was tailored to the behaviour of the probands. For example, if probands' answer to the question, "Do you use digital tracking methods to record athletic activity?" was "No", the system automatically skipped detailed questions about digital tracking (eg. "What data do you track during your exercise?").

In total, **26 questions** had to be answered. Answering the questionnaire took about five to ten minutes. Among them were single-choice questions with closed and semi-open answer options, and questions with the option to chose more than one answer. (*The complete questionnaire is attached in Appendix A*.)

The basic structure oft the questionnaire was divided in four parts as follow:

In the first part of the questionnaire, demographic data of the probands were collected. This study was interested in which gender the probands have and which group of ages they belong to. Further information about demographic statistics were collected.

In Part 2, the main questions were about *habits of movement and self-tracking*:

- Do you do sport?
- What kind of sport do you do and in which intensity per week? (multiple answers question)
- Do you use digital tracking-tools while workout?
- Which tracking-tools do you use?
- Since when did you use Tracker?
- In which of your tracked data of the workout are you interested in? (multiple answers questions)
- How often is the data tracked by you?

Also for *daily routine* were questions about the habits of self-tracking formed:

- Do you use tracking-tools in daily routine (without sport)?
- Which tracking-tools do you use in daily routine?
- In which of your tracked data of daily routine are you interested in? (multiple answers questions)
- How often do you track your data in everyday life?

The third part of the questionnaire was the certified question part of Dr. Satow's Stress-and Coping-inventury with 13 items had to be answered by *Likert scale* (1932). A Likert scale assumes that the intensity of an attitude is linear, eg. on a continuum from "strongly agree" to "strongly disagree" and makes the assumption that attitudes can be measured. [61] A four-level Likert scale with verbal anchors (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree) was chosen as the answer option on this scale to rule out neutral (inconspicuous) response behaviour. The probands were instructed to answer very spontaneous. They had to think about their feelings of the last six month. This certified test by Dr. Satow will be described in details beyond this subchapter.

The fouth part of the questionnaire was filled with questions about the proband's own assessment, feelings and expectations from self-tracking. Probands should answer, why they decided to do self-tracking. The following multiple answer options were given:

"I would like to…"

- motivate myself
- document my achievements
- save my muscular effort
- increase my performance
- watching the change in my performance
- challenge myself against other people on social media platforms

The next question was about the habit of puplishing the tracked data on social media. The answer options were:

Do you publish your tracked data on social media?

- Yes, every time
- Yes, sometimes
- Yes, but just for chosen kind of sport
- Yes, but just for special performances
- No, I only track my movement data for my own interests

The following questions had to be answered by the ranking of the Likert Scale. The first two questions were about bad feelings and the last one about a good feeling wearing and using a self-tracking tool.

- I have a bad conscience when I renounce my sport or exercise unit.
- I feel bad when I have a lower performance than before
- I feel motivated and I want to gain myself

The very last question about the survey was weather the subjective stress level perception has changed during the use of a self-tracking tool. Probands were asked if they feel:

- More relaxed
- Same as before
- More stressed
- No Answer

Summary of the four parts of the questionnaire is as following:

Part 1: Welcome text, question on consent of data processing and socio-demographic questions (age, gender, marital status, education, employment relationship and caring duties).

Part 2: Questions about the movement behaviour and application of digital tracker tools or wearables. In case of affirming the use of a tracing tool, a distinction was explicitly made between sport exercise and exercise in daily routine.

Part 3: Certified questionnaire according to Dr. med. Satow (physical and mental stress symptoms).

Part 4: Personal feelings and self assessment of the recorded movement data.

The following subchapter describes the stress and coping-Inventory by Dr. Satow (2012) in details:

3.3.2 Stress and Coping-Inventory (SCI) by Dr. Satow

For this master thesis, the Stress and Coping-Inventar (SCI) by Dr. Satow was chosen to collect the stress level rate of the probands. The SCI is a scientific questionnaire tool for the reliable measurement of stress, stresssymptoms and coping strategies, written by Dr. Lars Satow, a German doctor who developed numerous psychological testing procedures. All scales achieve convincing psychometric parameters. The stress and coping inventory will be included in the PSYNDEX test database (PSYNDEX Test No. 9006508) as a scientific procedure as well as in the test archive of the Leibniz Center for Psychological Information and Documentation. For the scales, Conbach's Alpha is measured satisfactory to

very good internal consistencies with α = .69 to α = .88. (“Chronbach's realiability” is a measure of the internal consistency or homogeneity of a test composed of several items or a questionnaire scale. [40]) All scales with one sample size (N = 5220) achieve convincing psychometric parameters from the year 2012. [14]

Licence required: After selecting the certified SCI questionnaire system, Dr. Satow was contacted by mail and asked for a license to use the quenstionnaire. On May 14, 2019, the license and the download link of the test documents was received from Dr. Satow. Likewise, Dr. Satow made the assurance that the test is also valid if using only the subscale necessary for individual research. For the data collection of this master thesis only the scale for the measurement of the "physical and mental stress symptoms" is used. The coping behaviour of the probands was not measured, as this is not of primary interest to the research question and would have unnecessarily extended the scope of the questionnaire.

Scale: Physical and mental stress symptoms

To record the physical and psychological stress symptoms of the probands, 13 characteristic signs of stress by constructed items are queried in the certified questionnaire by Dr. Satow. The answers are given in a four-level Likert scale: 1 (strongly disagree), 2 (disagrees), 3 (agree), 4 (strongly agree). The scale achieves a good value in the order of chronbach’s reliability (α = .86). The 13 symptoms asked in the subscale of “Physical and mental stress symptoms” were:

- I sleep badly.
- I often suffer from stomach or abdominal pain.
- I often have the feeling of having a lump in my throat.
- I often have a headache.
- I often ponder my life.
- I am often sad.
- My desire for sex has dropped significantly.
- I often withdraw into myself and am so lost that I do not notice anything.
- I often do not feel like anything anymore.

- I have lost or gained weight (more than 5 kilos).
- I have twitching in my face that I can not control.
- I can concentrate badly.
- I have nightmares.

"The norms of the certified test may not be included in the appendix or in the main body of scientific work. They may even not be published in extracts in the scientific work." (Communication Dr. Satow, May 9, 2019)

3.4 Pretest

There is a strong recommendation to check questionnaires with a pretest before starting the actual survey. The usability and quality of the survey is tested by a small sample of probands. This pretest run is very important and provides important insights. The pretest is considered under the following aspects: comprehensibility of the questions, assignability of the answer possibilities, clear layout, length and duration of the questionnaire, enough space to answer the questions, neutral answer possibilities, understandability in the structure and ability to answer of the research questions. The answers from the pretest should be incorporated into the final versions necessarily. [62]

The pretest took place from 3rd to 11th June 2019 with 15 voluntary test persons. 11 probands did the survey and had the options to leave comments for every question. They reported if something was hard to understand or did not work correctly. That left comments were analysed and if applicable, then incorporated into the questionnaire before coming online.

3.5 Random Sample

A random sample is a selection of elements of the population used to model the population. [63] The random sample of this master thesis represents a subset of the population of persons in Austria who are physically active. It is a representative,

simple random sample. Another considered feature is the fact of whether or not they are using a self-tracking tool.

The selection of participants to collect the sample was arbitrary, so only those who felt intrinsically motivated by the topic of the study and wanted to voluntarily participate in the survey, completed the online questionnaire. Therefore, no final statement can be made on the quality of the random sample.

The following inclusion and exclusion criteria were considered:

Inclusion criteria	Exclusion criteria
• Agreed to particiate	• Did not agree to participate
• Age 25-50	• Age under 25/over 50
• Physically active	• Not physically active at all

Table 4: Inclusion and exclusion criteria of the survey

3.6 Execution

The Online survey was implemented during 25th June to 10th August 2019. The probands were invited to submit the survey via social media. The probands were acquired in sport group forums. The response rate was rather weak, repeated invitations to the survey were necessary.

Overall, 203 persons logged on to the online questionnaire survey. 115 participants completed the questionnaire. This resulted in a response rate of 56.65%. The net participation was 126 probands. 11 cancelled the questionnaire. Thus 91.27% filled out the entire questionnaire. Of the 115 participants, 27 were excluded due to the exclusion/inclusion criteria requested. (Age from 25 to 50). Thus, 88 probands completed the questionnaire survey.

3.7 Analysis

The process of analyzing the questionnaire starts from exporting the data downloaded from “SoSci” in an Excel sheet, version 1907. The data from the survey are automatically transformed in a codeplan, on which the statistic software can count with. The data (N = 115) are imported to Excel and first of all adapted to the age group to be investigated. (25 to 50) All data under the age of 25 and over 50 are cleaned up. The remaining data set (N = 88) is examined for incorrect entries. The index for the factor of the physical stress symptoms is formed with the variable "index_stress". It is the raw data of the evaluation of the stress and coping inventory according to Dr. Satow (2012) [14]. The desciption of the columns in Excel are named with clean variable names to facilitate finding them. For the statistical evaluation, IBM SPSS Statistics, Version 22.0.0 is used. After opening the program SPSS, the Excel file with the total data was imported. In the next step, the variable properties were defined to make the overview easier. The demographic data were divided into groups of gender and ages.

Resumed, the descriptive statistics were represented and easily made recognizable by tables and charts, using IBM SPSS Statistics and Microsoft EXCEL. A list of the sports behaviour of the probands was calculated. The ratio of trackers and non-trackers was shown. The physical and mental evaluation was made.

The answers of the research questions 1-2 give an overview of the current use of self-tracking tools, the data which were tracked and the expectations from the tracking by the probands.

The research question 3 is answered by a nonparametric Spearman’s rank order correlation, divided in gender and groups of ages, using IBM SPSS Statistics.

4 Evaluation/Results

This chapter represents the evaluation results from the online questionnaire survey. The data are itemized by a descriptive explorative statistic and are presented in tables and charts. The subchapters are divided into demographic statistic, results of behaviour in sport and results of the measured stress level. Further the research questions and the hypothesis were evaluated.

4.1 General evaluation

For this master thesis, the proband's demographic data was evaluated first.

The distribution of gender age of the 88 probands participating was as follows (Figure 5): 38.6% of the participants were male and 61.4% were female. The age groups of the participants were also defined. The largest proportion was the age group of 25-30-year olds with 46.6%, then the age group 31-40 with 34.1% and the smallest group the probands between 41-50 years with 19.3% (N = 88)

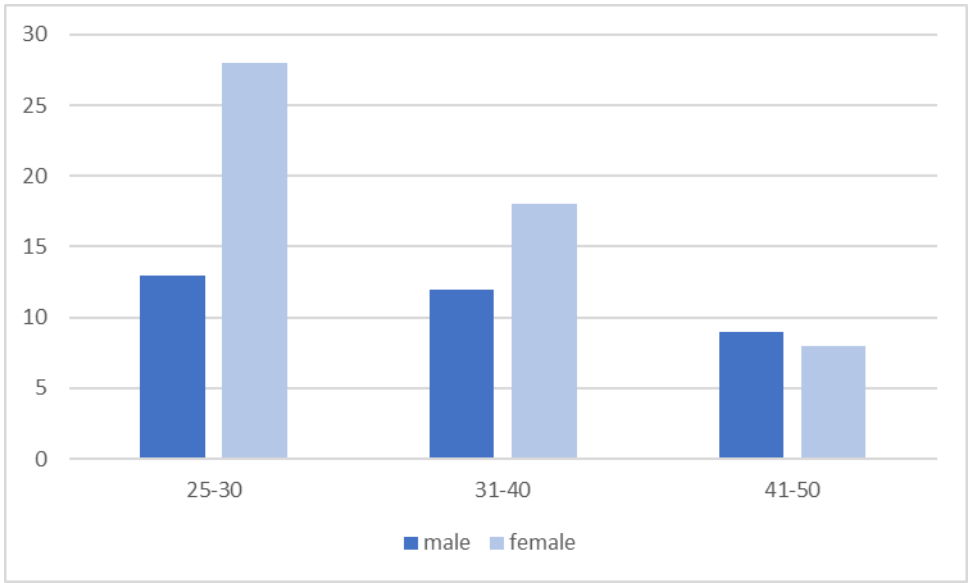

Figure 5: Total number of participants (N = 88) grouped per gender and age

The largest part of the participants was female probands at the age of 25-30. The statistical distribution of the sport carried out can be structured as shown in figure 6:

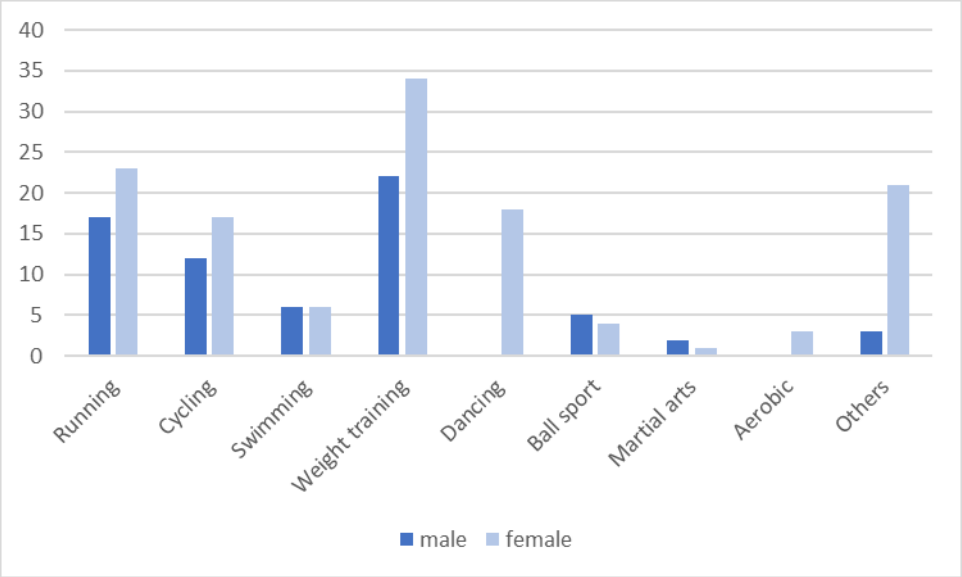

Figure 6: Types of sport grouped per gender

The probands (N = 88) were able to specify several sports. The largest proportion of the random sample came from the field of weight training. (22 male and 34 female participants). The proband's second most popular sport was running. (17 male and 23 female participants), followed by 18 female probands who do "dancing" as sport. 12 male and 17 female participants do "cycling". 21 female participants named several other types of sport they are practising.

When distributing the duration of the sport (minutes per week), it can be seen in the following table (Table 5), that the probands in the random sample practise the longest "cycling" with an average duration of 156.72 minutes (mean). The most common duration (mode) is 60 minutes per week. The high span between minimum (min = 10 minutes) and maximum (max = 500 minutes) results in a standard deviation of 137.42 minutes. The standard deviation is a measure of the dispersion of the value around the mean value.

The sport "weight training" is the most frequently performed sport in the random sample and is operated on average 150 minutes per week. The modal values for all sport amount are 60 to 120 minutes per week (see Table 5):

	N	mean	mode	st.-deviation	minimum	maximum
Running	40	92,88	60	65,544	20	340
Cycling	29	156,72	60	137,427	10	500
Swimming	12	75,83	30	60,672	10	200
Weight training	56	149,13	60	95,042	6	480
Dancing	18	107,22	90	70,611	30	330
Ball sport	9	123,33	120	95,131	20	360
Martial arts	3	150,00	120	30,000	120	180
Aerobic	3	53,33	60	11,547	40	60

Table 5: Duration of the sport (in minutes)

To sum up, in the random sample of this research study, female probands at the age of 25-30 participated the most. As the probands have to be physicallay active in the inclusion criteria, the most frequent types of sport are weight training, running, dancing and cycling are presented. In evaluation of the statements on the duration of the sport, it is shown, that the probands have totally different behaviours in training routines, so there are large values of standard deviation.

4.2 Physical und mental stress evaluation

The following matrix (Table 6) shows the results of the Stress and Coping Inventory (SCI) by Dr. Statow (2012):

		N	sum	mean	st.-deviation
1	*I sleep badly.*	88	181	2,06	0,822
2	*I often suffer from stomach or abdominal pain.*	88	148	1,68	0,781
3	*I often have the feeling of having a lump in my throat.*	88	125	1,42	0,754
4	*I often have a headache.*	88	158	1,80	0,886
5	*I often ponder my life.*	88	206	2,34	0,969
6	*I am often sad.*	88	154	1,75	0,806
7	*My desire for sex has dropped significantly.*	88	156	1,77	0,893
8	*I often withdraw into myself and am so lost that I do not notice anything.*	88	142	1,61	0,749
9	*I often do not feel like anything anymore.*	88	149	1,69	0,807
10	*I have lost or gained weight (more than 5 kilos).*	88	168	1,91	1,046
11	*I have twitching in my face that I can not control.*	88	111	1,26	0,536
12	*I can concentrate badly.*	88	159	1,81	0,771
13	*I have nightmares.*	88	121	1,38	0,649

Table 6: Psychometric data results from SCI

The instructions for evaluation may not be published officially, as a condition of Dr. Satow. The details of the results in stress level symptoms of the probands is not part of the research question in this master thesis. For the further research question an index value was used by the sum of every stress level item. The table above gives an overview of the stress level in the symptoms divided. The higher the value, the more the stress in this case. The maximum sum of each of the the stress level symptoms could be 352, the lowest 88. The lowest result value is for

the item "I have facial twitching that I can not control" (sum = 111). The table shows the highest stress level value for the symptoms "I often ponder my life" (sum = 206, M = 2.34) and "I sleep badly" (sum = 181, M = 2.06) and are thus on the scale in the approval area. Most items occupy the lower scale range of up to 1.8 in the mean value and are therefore in the rejection area. That means, in between 1 and 4 of the Likert scale, they all are more in the area of disagreeing.

Standard deviation: The significance of the spread for the diagnostic value of an item is based on its statement about the ability to differentiate. Most items have a value <1 and are therefore rather not heterogeneous.

Cronbach's alpha is an important measuring-tool to assess the reliability of a questionnaire. That measured value determines a special aspect of reliability, namely the so-called “internal consistency”. In this analyse of reliability the scale SCI stress symptoms of Satow (2012) with 13 items shows the average value of Cronbach's alpha α = .784. The scale of this survey probands’ stress level thus shows an "acceptable" reliability. [40]

Reliabilitätsstatistiken

Cronbachs Alpha	Anzahl der Items
,784	13

Table 7: Realibility of Cronbach

The determined correlation coefficients are interpreted as separation coefficients. They accept values between 0 and 1. Items with a defocus coefficient <.2 can be discarded.

To sum up, all probands did not show elevated stress levels on average in any item. The highest values come from the items “I often ponder my life”, “I sleep badly” and “I have lost or gained weight (more than 5 kilos)”.

4.3 Research Question 1

In this subchapter the research question 1 is evaluated:

RQ1: How is the degree of intensity of self-tracking applications and tools currently in use by people between the age of 25 and 50?

The first research question aims to evaluate the degree of utilization and intensity of the common self-tracking applications and tools, grouped by gender and age of the probands. Further, the evaluation is splitted up into the use of tracking tools during sport (workout) and movement in daily routine (without doing sport) and shows the duration since when the probands use to track their data.

In the focus on doing sport, the following pie chart (Figure 8) is illustrating that 47.7% (42 probands) on the random sample are using tracking tools intentionally. 52.3% (46 probands) do not use tracking tools while doing sport, as a result of this survey (N = 88).

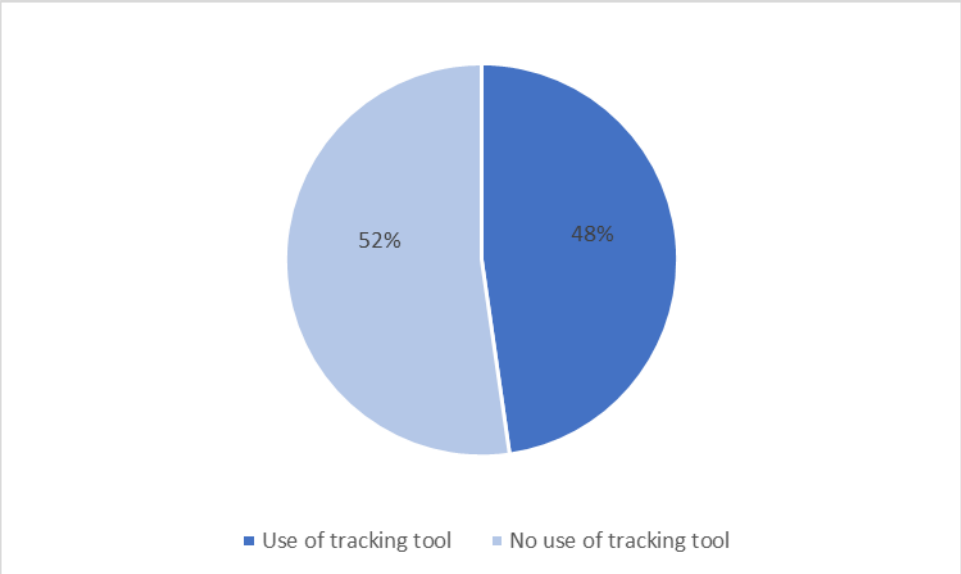

Figure 8: Usage of tracking tools, rounded

The separation of the gender is shown by the following chart (Figure 9). The 34 male probands of this random sample have the same share of using tracking tools and not using tracking tools. The behaviour of the female probands shows a little difference of not using tracking tools by 53.7 % (N = 54).

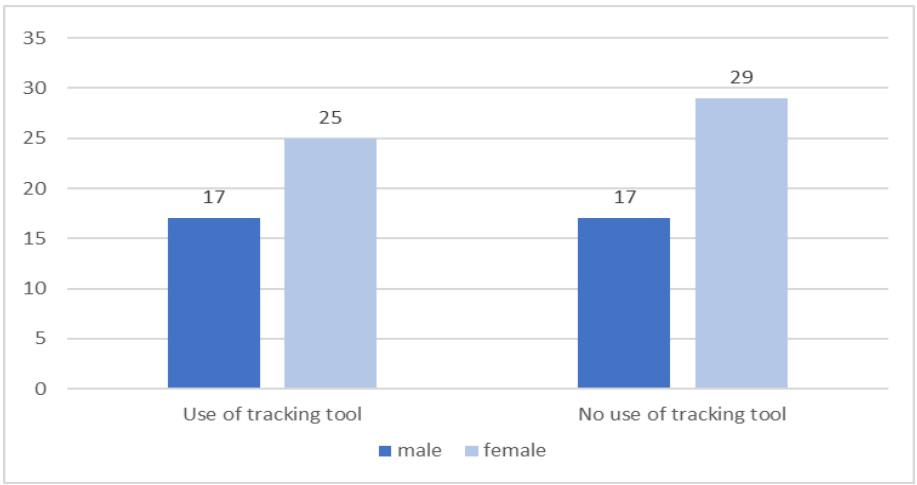

Figure 9: Usage of tracking tools, grouped per gender

The use of tracking tools is divided into age groups in the next graph (Figure 10). Most users of tracking tools are aged 25-30 years. Probands between 41-50 years are the least likely to use tracking tools.

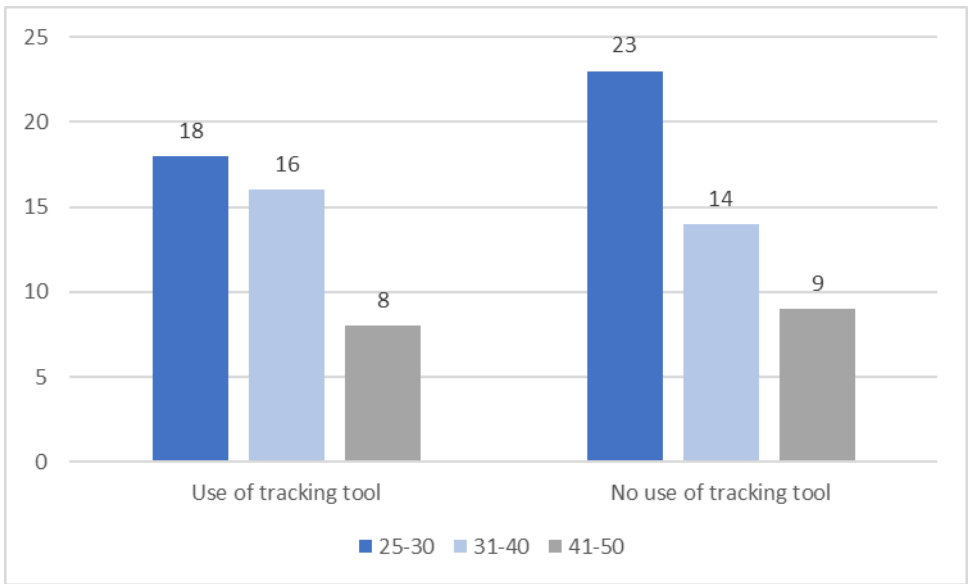

Figure 10: Usage of tracking tools, grouped per age

The next graph evaluates the tracking tool method, grouped by gender (Figure 11). Most frequently, a fitness watch is used by the surveyed female probands as a tracking tool with 43.9% (N = 43).

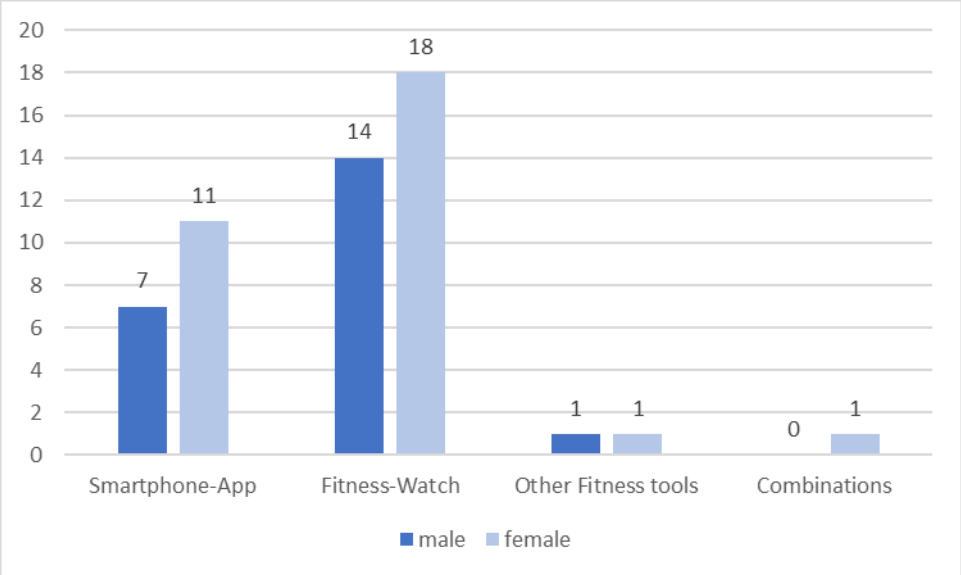

Figure 11: Type of tracking tool, grouped per gender

The next graph shows the tracking tool method, grouped per age (Figure 12). Most often, a fitness watch is used in the age group of 31-40 with 31.7% (N = 43).

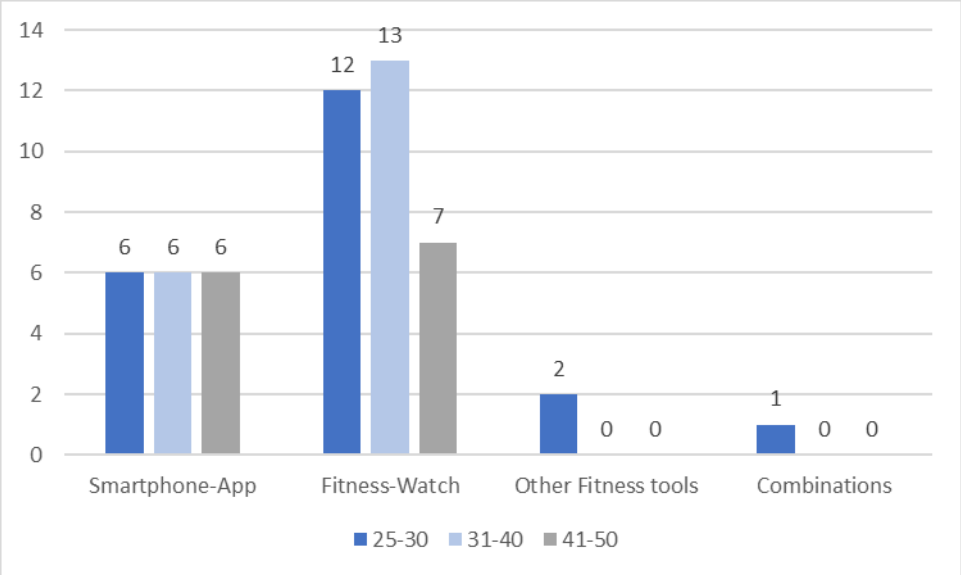

Figure 12: Type of tracking tool, grouped per age

The following tables and charts (Table 13 and Figure 7) show the usage of tracking tools in daily routine movement. 39.8% of the respondents use the tracking tools in addition to daily routine (35 probands), 18.2% use them only for sports (16 probands) and 42.0% (37 probands) stated in this question, not to record the movement data (N = 88).

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	ja	35	39,8	39,8	39,8
	nein, nur die sportliche Betätigung	16	18,2	18,2	58,0
	nein, ich zeichne meine Bewegungsdaten gar nicht auf	37	42,0	42,0	100,0
	Gesamt	88	100,0	100,0	

Table 13: Usage of Tracking tools during daily routine

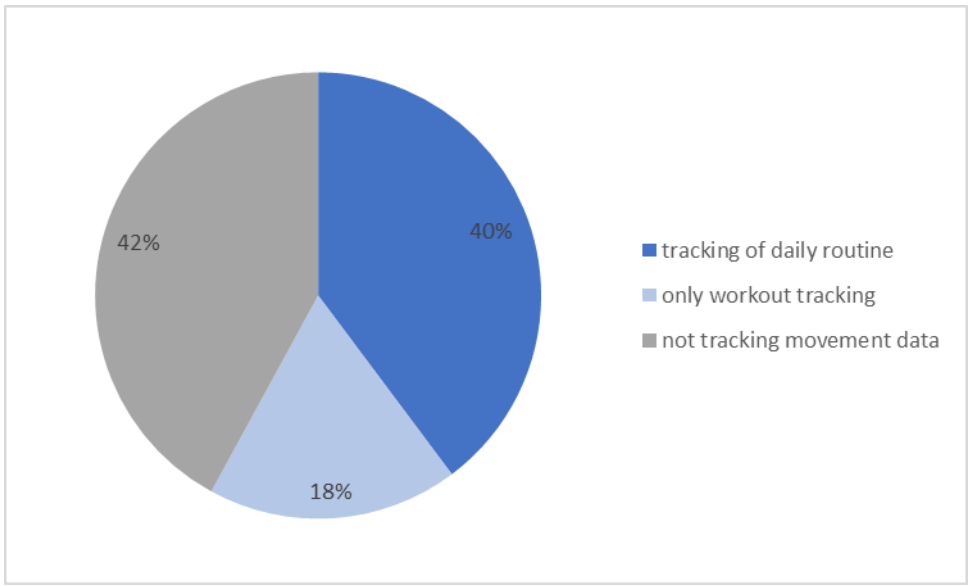

Figure 7: Percentage of tracking tools during daily routine, rounded

The movement data is again grouped by gender and age group, as shown in the following tables (Tables 14 and 15):

			Geschlecht		
			männlich	weiblich	Gesamt
Alltag:Tracking	ja	Anzahl	12	23	35
		% der Gesamtzahl	13,6%	26,1%	39,8%
	nein, nur die sportliche Betätigung	Anzahl	9	7	16
		% der Gesamtzahl	10,2%	8,0%	18,2%
	nein, ich zeichne meine Bewegungsdaten gar nicht auf	Anzahl	13	24	37
		% der Gesamtzahl	14,8%	27,3%	42,0%
Gesamt		Anzahl	34	54	88
		% der Gesamtzahl	38,6%	61,4%	100,0%

Table 14: Use of Tracking tools in daily routine, grouped per gender

Grouped per gender it is shown in table 14 above, that 23 female probands (26.1%) and 12 male probands (13.6%) use self-tracking tools for both, sport and daily routine movement. (N = 88). 10.2% of the male probands and 8.0% of the female probands only track the sport workouts. 42.0% of both genders are non-tracker. (N = 88)

			Alter			
			25-30	31-40	41-50	Gesamt
Alltag:Tracking	ja	Anzahl	14	10	11	35
		% der Gesamtzahl	15,9%	11,4%	12,5%	39,8%
	nein, nur die sportliche Betätigung	Anzahl	7	9	0	16
		% der Gesamtzahl	8,0%	10,2%	0,0%	18,2%
	nein, ich zeichne meine Bewegungsdaten gar nicht auf	Anzahl	20	11	6	37
		% der Gesamtzahl	22,7%	12,5%	6,8%	42,0%
Gesamt		Anzahl	41	30	17	88
		% der Gesamtzahl	46,6%	34,1%	19,3%	100,0%

Table 15: Use of Tracking tools (during daily routine) grouped per age

Female probands between the ages of 25-30 (15.9%) use tracking tools most often in daily routine. Male probands at the age of 31-40 (10.2%) mostly use self-tracking tools only for sport. (N = 88)

The following figures show that the fitness watch is the most popular tracking tool, also in the tracking field in daily routine. This listing applies to the tracking of the movement data in daily routine (Figure 8), grouped by gender:

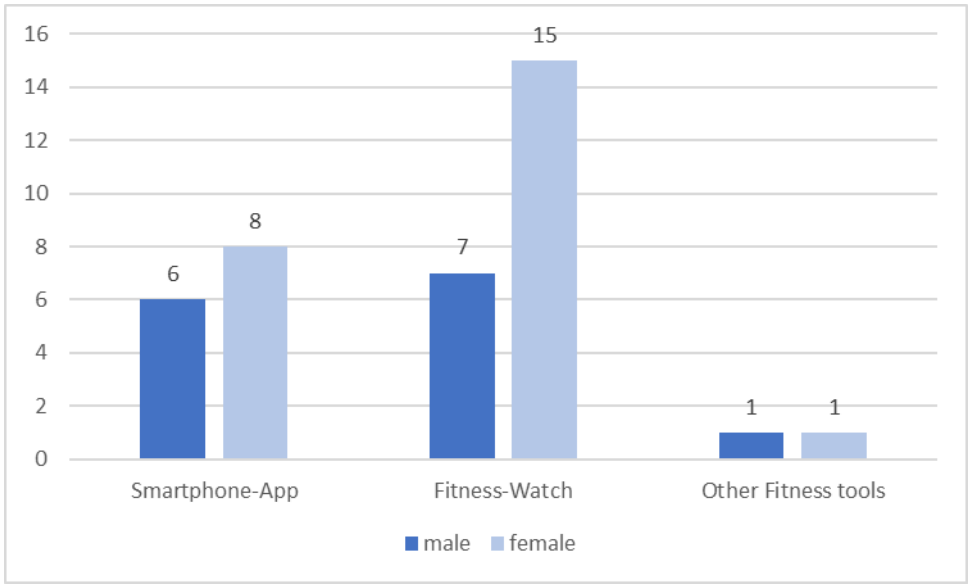

Figure 8: Type of tracking tools (during daily routine) grouped per gender

7 male (20.0%) and 15 female (42.9%) probands use a fitness watch to track the movement data during daily routine. 6 male (17.1%) and 8 female (22.9%) probands are only using a smartphone application to track the data. (N = 35)

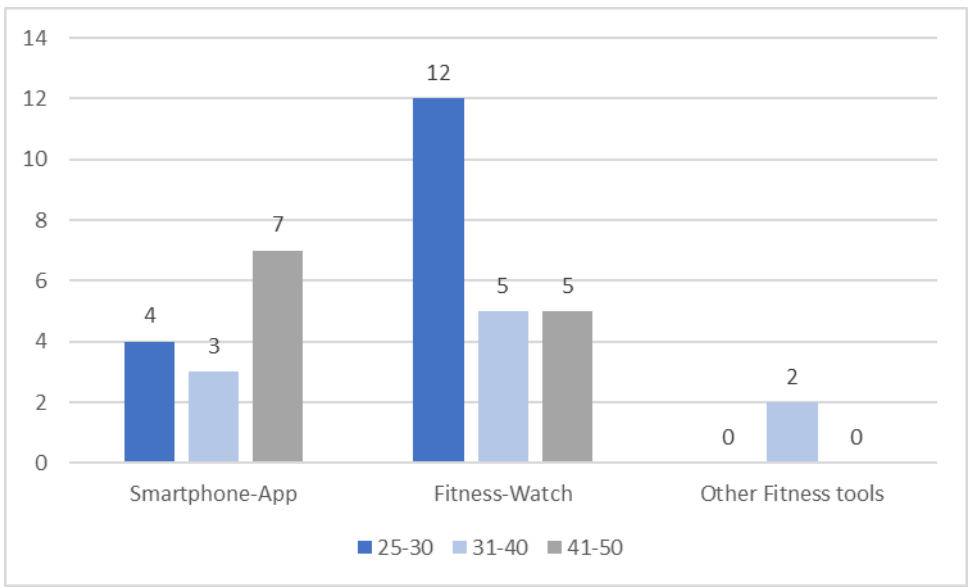

Figure 9: Type of tracking tools (during daily routine) grouped per age

The figure above (Figure 9) shows the usage of self-tracking tools, grouped per age. The group of 25-30 years old probands mostly use a fitness watch (34.3%) to track the data in daily routine. (N = 35)

The following evaluation concerns the *intensity of tracking* during the *sport* sessions. The probands had to indicate whether they track "always" (*immer*) "mostly" (*meistens*) or "rarely" (*selten*) the movement data. The probands who initially stated that they did not track at all, did not get this question. With "never" (*nie*) the number of "non-trackers" is therefore apparent. In sport activities, the most common entries were that the movement data is "mostly tracked", showing the table 16, grouped per gender:

		Geschlecht		
		männlich	weiblich	Gesamt
Tracking Sport	immer	7	8	15
	meistens	8	15	23
	selten	2	1	3
	nie	17	30	47
Gesamt		34	54	88

Table 16: Intensity of tracking (workout) grouped per gender

When sorting according to gender, it can be seen especially that 15 of the female probands (N = 88) “mostly” track.

		Alter			
		25-30	31-40	41-50	Gesamt
Tracking Sport	immer	3	8	4	15
	meistens	13	8	2	23
	selten	1	0	2	3
	nie	24	14	9	47
Gesamt		41	30	17	88

Table 17: Intenstiy of tracking (workout) grouped per age

When sorting according to the age groups, it can be seen especially that 13 probands “mostly” track between the age 25-30 (N = 88)

The following evaluation deals with the *intensity of tracking* during the movement in *daily routine* (without workouts). The probands had to indicate whether they track "always" "mostly" or "rarely" the movement data. The probands who initially stated that they did not track at all did not get this question. With "never" the number of "non-trackers" is therefore apparent.

In daily routine activities, the most common entries were that the movement data is “always” tracked, showing the table grouped per gender:

		Geschlecht		
		männlich	weiblich	Gesamt
Tracking Alltag	immer	4	14	18
	meistens	6	9	15
	selten	2	0	2
	nie	22	31	53
Gesamt		34	54	88

Table 18: Intensity of tracking (daily routine) grouped per gender

When sorting according to gender, it can be seen especially that 14 of the female probands (N = 88) “always” track.

		Alter			
		25-30	31-40	41-50	Gesamt
Tracking Alltag	immer	6	5	7	18
	meistens	7	4	4	15
	selten	1	1	0	2
	nie	27	20	6	53
Gesamt		41	30	17	88

Table 19: Intensity of tracking (daily routine) grouped per age

When sorting according to the age groups, it can be seen especially that 7 probands “always” track between the age 41-50 (N = 88).

For the information on how long the tracking tool has been used, a mean value of 29.4 months became apparent. The shortest duration was one month, the longest 84 months. This results in a standard deviation of 23.9 months, as the following table shows (Table 20):

	N	Minimum	Maximum	Mittelwert	Std.-Abweichung
Sport_Tracking:Anzahl der Monate	42	1	84	29,48	23,958
Gültige Werte (Listenweise)	42				

Table 20: Duration of the tracking behaviour

The frequency of the duration can be seen in the following bar chart (Figure 10). The most common mode (8 probands) is 24 months since self-tracking. (N = 42)

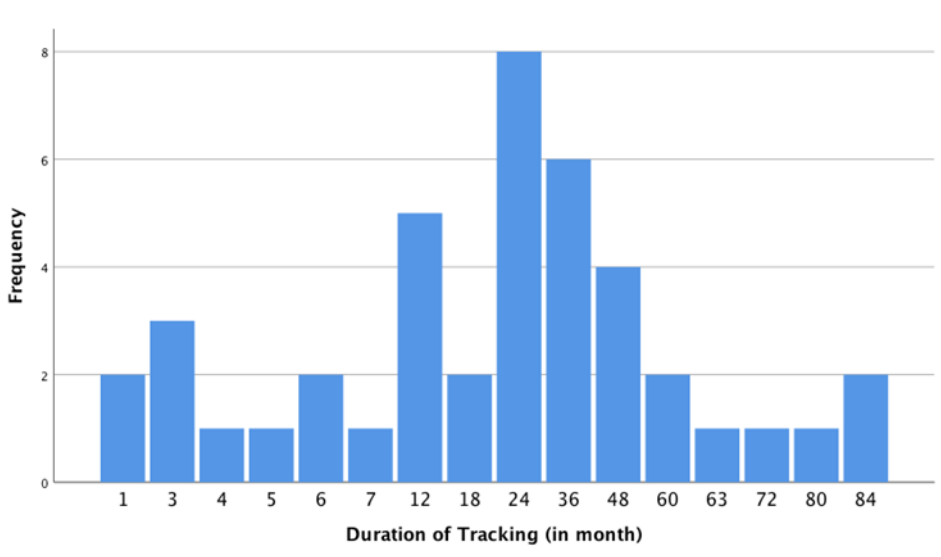

Figure 10: Duration of the tracking behaviour of the probands

To sum up, it is evaluated, that the degree of utilization of tracking tools during sport and movement is 48 percent.

Male probands show the same share of tracking and non-tracking in this random sample. The amount of female non-use of trackers is marginally higher as the use of tracker.

The probands in the group of ages between 25 and 30 have the largest part of using self-tracking tools. The probands in the group of ages between 41 and 50 have the smallest part of using self-tracking tools.

Probands prefer fitness-watches than smartphone-apps in all categorizations. 40% of the probands, which track their data in sport, do also track their movement data in daily routine, 18% do only track the workout.

The degree of intensity is higher in daily routine than in units of sport. In the units of sport workout the tracking habit of the probands is evaluated as “mostly” overriding. In the use of daily routine the probands predominantly track “always”.

To answer the research question 1, it can be demonstrated, that 48 % of physically active probands do currently track their movement data. Grouped per gender there are 50 % of male proband who track, and 50 % who do it not. Female probands who track are about 46 % and 54 % who do it not. Grouped per ages it can be demonstrated that the mainly use take place in the age groups 25-30 and 31-40. Fitness watches are more in use than tracking per smartphone. 40 % of the probands do also track the daily routine movement. In case of tracking the physically training and sport, most of the probands track “mostly”. In case of daily routine movement, most of the probands track “always”. The duration of the general use of the tracking tools is about 30 months in mean.

4.4 Research Question 2

In this subchapter the research question 2 is evaluated:

RQ2: Which data are tracked by people and what are the expectations on tracking them?

The evaluation on which data is tracked by the probands will be determined by the results of the following research question 2. The evaluation of the data of interest is divided in gender and age groups and tracking of sport and daily routine movement in the first part. Further different ways of expectations of tracking the data is illustrated in the second part. The evaluation of the expectations, reasons, habits of publishing and positive and negative feelings while self tracking is showed.

The probands had to answer the question what kind of **data they usually track when doing sport**. The probands were able to select several datas, with a total of 215 entries (N = 215). The most frequent entry is the "duration" from 40 probands. Immediately afterwards follows the “distance" and the "heart rate". 29 mentions were counted for "calories" and 27 for "steps" and "GPS data" (Figure 11).

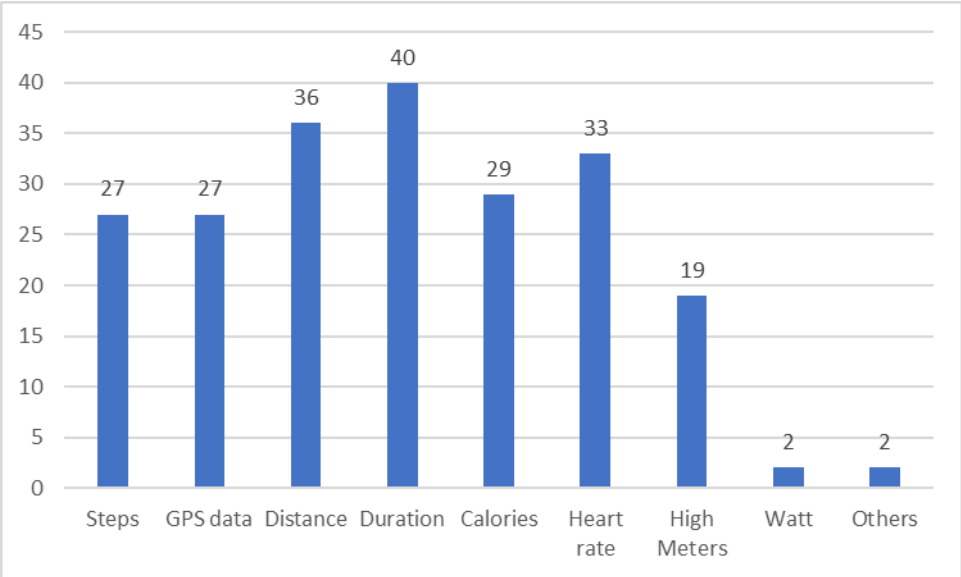

Figure 11: Data of interest (sport), total

The data was divided into group of gender then. The three most popular kind of date in the male group are “duration”, “hearth rate” and “distance”. The female

probands named “duration”, “distance” and “hearth rate” at the most. The three most frequent data tracked show hardly any difference in group of gender. None of the female probands chose “watt” as a data of interest (Figure 12).

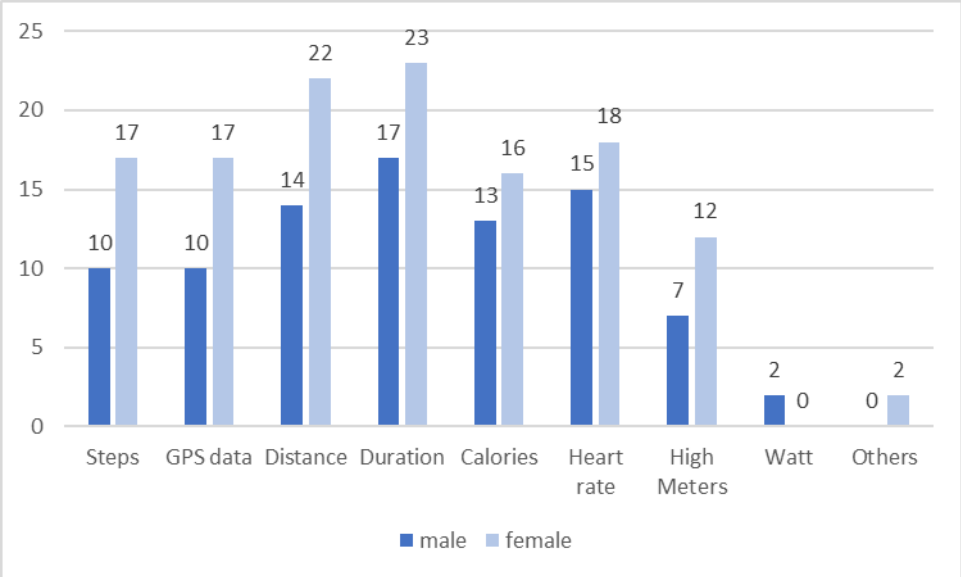

Figure 12: Data of interest (sport) grouped per gender

The data was also divided into groups of age then. The following graph shows the different interests divided in groups of ages (Figure 13):

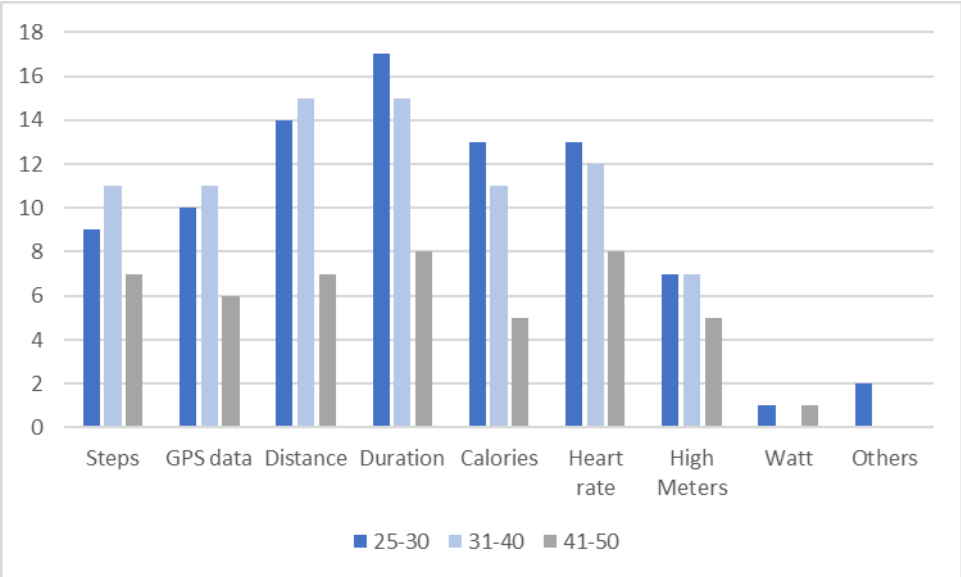

Figure 13: Data of interest (sport) grouped per age

The most popular kind of data in the 25-30 group are “duration”, “distance”, “hearth rate” and “kalories”. The probands in the age group 31-50 named “duration”, “distance” and “hearth rate” at the most, followed by “steps”, “GPS”, “calories”. The age group 41-50 chose “duration”, “hearth rate”, “distance” and “steps” at the most.

The following table shows the most frequent **data to be tracked in daily routine (without doing sport)** The probands were able to select several datas, with a total of 103 entries (N = 103). The most frequent entry is "steps" with 35 entries. Immediately afterwards follows the “calories" (19 probands) and the "heart rate" (16 probands) (Figure 14):

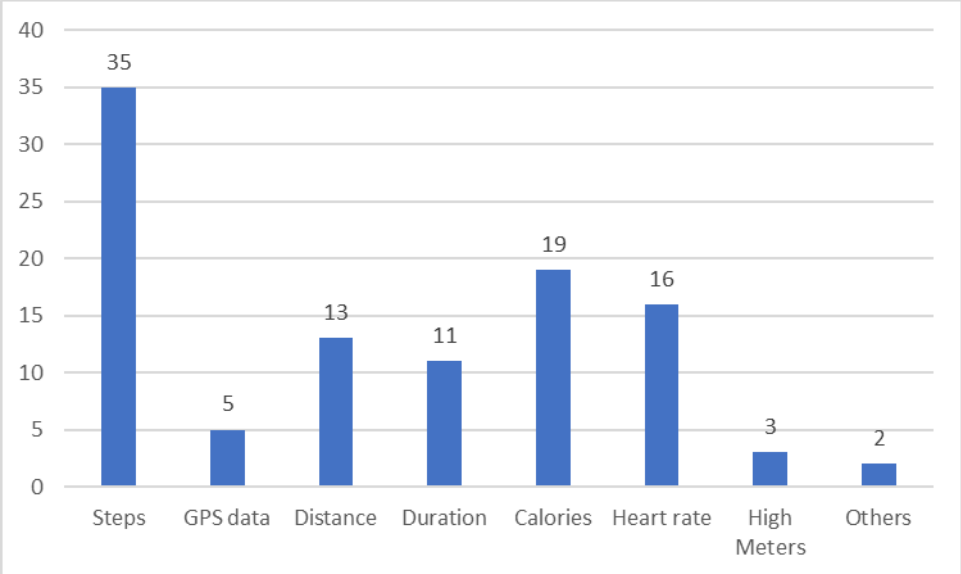

Figure 14: Data of interest (daily routine), total

The data was divided into gender then. The three most popular kind of data in the male group are “steps”, “calories” and “heart rate”. The female probands named “steps” with a big lead, and also “calories” and “hearth rate” at the most (Figure 15):

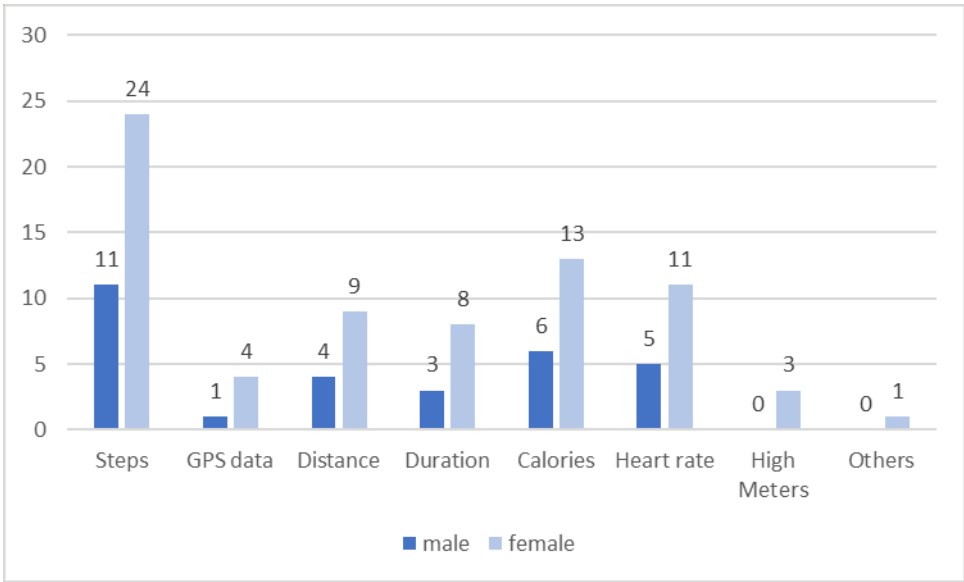

Figure 15: Data of interest (daily routine) grouped per gender

The data was also divided into groups of age then. The most popular kind of data in the field of tracking the daily movement in all groups of ages are “steps”, then followed by “calories” (Figure 16):

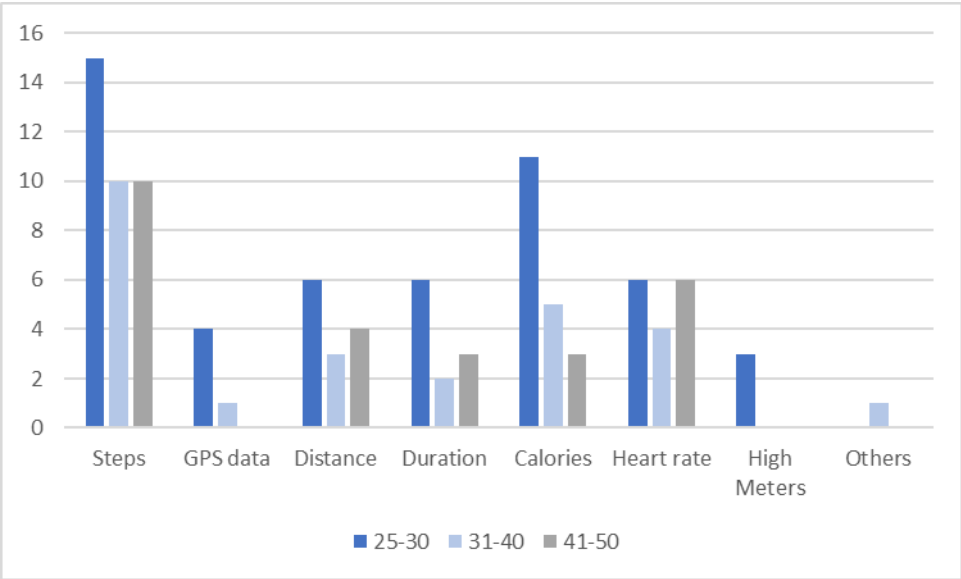

Figure 16: Data of interest (daily routine) grouped per age

To sum up, the data of interest when tracking the movement, the data “duration”, “hearth rate” and “distance”, “steps” and “calories” are currently the most entries.

After evaluating the data mostly tracked by the probands, the second part of the research question is about the expectations that people have on it. The following questions were asked:

1. „*What is the reason to track the data of movement*”

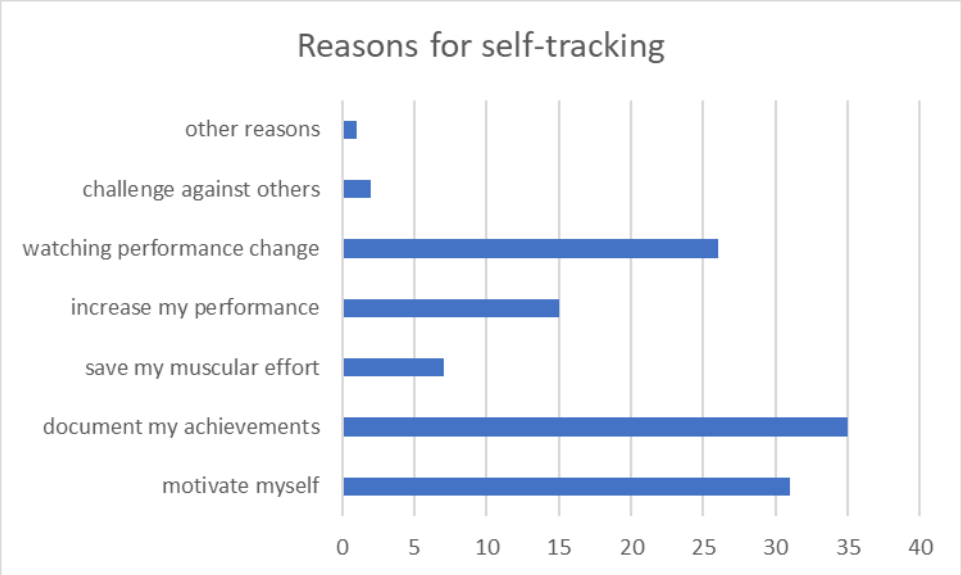

Figure 17: Reasons for self tracking

Multiple answers were possible, so more than 52 entries were received, as figure 17 above shows. The most entries present that “document my achievements” with 29.9%, “motivate myself” with 26.5.% and “watching performance change” with 22.2% are most important reason to track by the probands in this random sample. (N = 117)

The next question was about of publishing the tracked data of movement in the social media zone in the internet:

2. "*Do you publish your tracked data on social media?"*

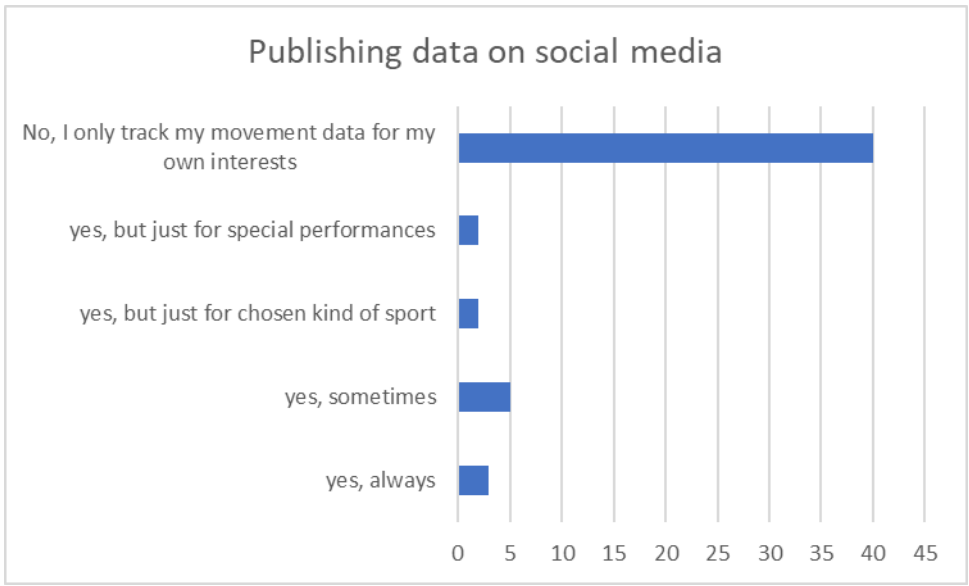

Figure 18: Publishing on social media

It is clear from the data that a majority of probands (76.9%) track only out of self-interest, as figure 18 above shows. (N = 52)

The next three questions were about the probands' feeling of data tracking. The answers were given by Likert scale 1 to 4 ("strongly agree", "agree", "disagree", "strongly disagree"). Probands who do not track the data, did not get these questions.

The first question was "*How do you feel about your self tracking*? *(Feeling 1)"* The results are showed in the following figure 19:

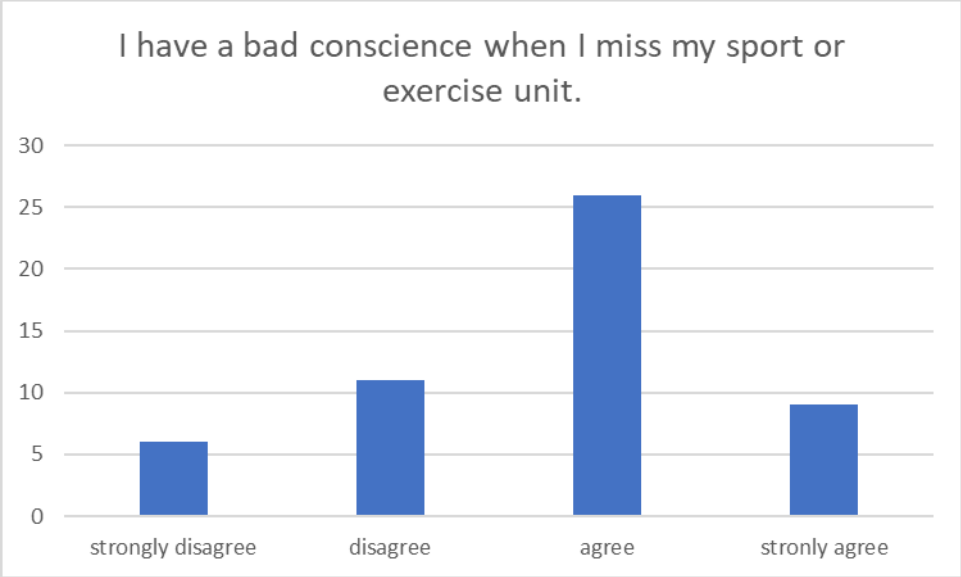

Figure 19: Feeling 1, ranked by likert scale

The result shows that 50% of the probands (N = 52) "agree" to a bad conscience if they renounce or miss the sport or movement unit. The following table (Table 21) and show the separation by gender:

		Geschlecht		
		männlich	weiblich	Gesamt
Gefühl	trifft nicht zu	2	4	6
	trifft wenig zu	3	8	11
	trifft eher zu	10	16	26
	trifft genau zu	6	3	9
Gesamt		21	31	52

Table 21: Feeling 1, ranked by likert scale, grouped per gender

10 male and 16 female probands "agree" to a bad conscience, 5 male and 3 female probands "strongly agree" to a bad conscience when missing the movement unit they usually practising.

The results are also grouped by age, as the following table 22 shows:

		Alter			
		25-30	31-40	41-50	Gesamt
Gefühl	trifft nicht zu	2	3	1	6
	trifft wenig zu	4	2	5	11
	trifft eher zu	12	10	4	26
	trifft genau zu	4	4	1	9
Gesamt		22	19	11	52

Table 22: Feeling 1, ranked by likert scale, grouped per age

In the age group 25-30 there is the most entry of "strongly agree" to having a bad conscience when missing a movement unit. In the age group 31-40 there is the most entry of "agree" to having a bad conscience when missing a movement unit.

In the next question, the probands had to choose a ranked answer in the 1 - 4 Likert Scale: "*I feel bad when I have a lower performance than before (Feeling 2)*" (Figure 20):

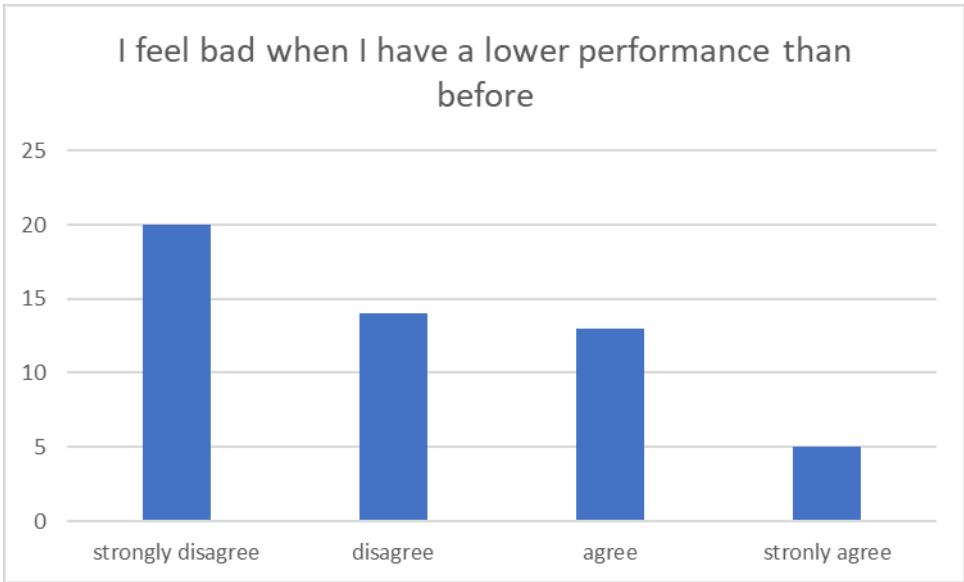

Figure 20: Feeling 2, ranked by likert scale

The most frequent response from probands was 22.7% to "strongly disagree", followed by 15.9% that "disagree". 14.8% "agree" and only 5.7% "strongly agree" to feeling bad when having a lower performance than before. (N = 52)

The results of this question were also grouped by gender and age, as the following tables show:

		Geschlecht		
		männlich	weiblich	Gesamt
Gefühl 2	trifft nicht zu	9	11	20
	trifft wenig zu	4	10	14
	trifft eher zu	8	5	13
	trifft genau zu	0	5	5
Gesamt		21	31	52

Table 23: Feeling 2, ranked by likert scale, grouped per gender

Among the male probands, there was a weaker tendency to say that a bad feeling is "more likely to happen" when performance is lower than before (Table 23).

		Alter			
		25-30	31-40	41-50	Gesamt
Gefühl 2	trifft nicht zu	6	8	6	20
	trifft wenig zu	9	2	3	14
	trifft eher zu	5	6	2	13
	trifft genau zu	2	3	0	5
Gesamt		22	19	11	52

Table 24: Feeling 2, ranked by likert scale, grouped per age

Referring to the age groups, the most common answers are also in the "disagree" area (Table 24). None of the probands in the age 41-50 do “strongly agree” to a bad feeling when the performance is lower than before.

The question about the third feeling considered a positive feeling of motivation and performance: "*I feel motivated and I want to gain myself" (Feeling 3)".*

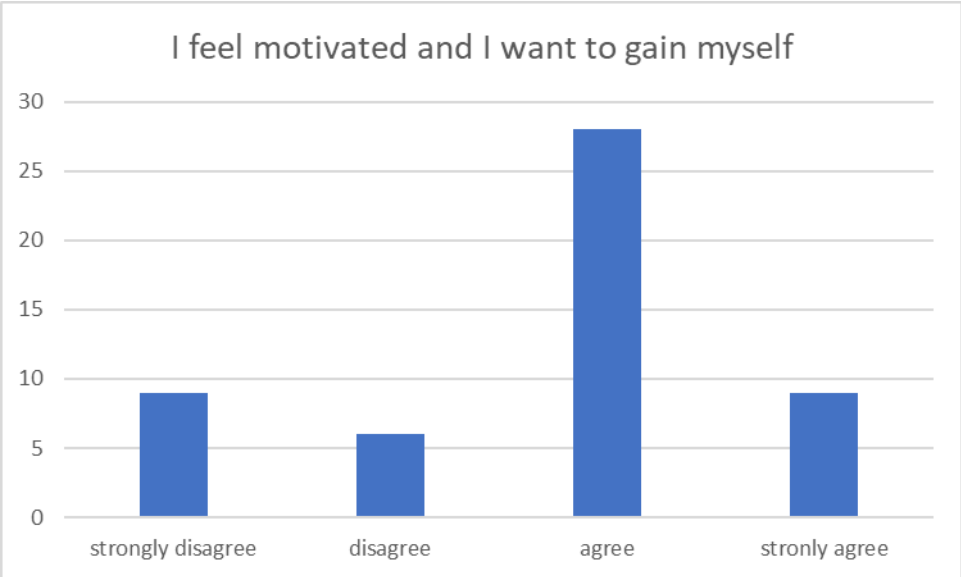

Figure 21: Feeling 3, ranked by likert scale

53.8% of the probands, (N = 52) stated to "agree" of feeling motivated by the self-tracking and want to gain themselves (see Figure 21 above). The following table divide the probands according to gender (Table 25):

		Geschlecht		
		männlich	weiblich	Gesamt
Gefühl 3	trifft nicht zu	2	7	9
	trifft wenig zu	2	4	6
	trifft eher zu	12	16	28
	trifft genau zu	5	4	9
Gesamt		21	31	52

Table 25: Feeling 3, ranked by likert scale, grouped per gender

Male probands as female probads agree the most of being motivated because of the use of a self-tracking tool, as the table above shows.

The following table divide the probands according to gender (Table 26):

		Alter			
		25-30	31-40	41-50	Gesamt
Gefühl 3	trifft nicht zu	1	5	3	9
	trifft wenig zu	2	0	4	6
	trifft eher zu	14	11	3	28
	trifft genau zu	5	3	1	9
Gesamt		22	19	11	52

Table 26: Feeling 3, ranked by likert scale, grouped per age

Divided per group of ages, the 25-30 years old and the 31-40 years old probands “agreed” to be motivated of using a self-tracking tool.

To sum up, the expectations of the probands of using a tracker are to document the movement data, to watch the change in the physical performance of the body and to motivate themself. Movement data is not usually published on social media. The probands mostly “agree” of having a bad conscience when missing a movement unit. But probands mostly do not feel bad when having a lower performance than before. Most of the probands feel motivated and want to gain themselves by self-tracking the movement data.

To answer the research question 2, it can be demonstrated, that the probands in this study select the following data of interest during sport, in descending order: “duration”, “distance”, “heart rate”, “calories”, “steps”, “GPS data”, “high meters” and “watt. The data of interest during daily routine movement are, in descending order “steps”, “calories”, “heart rate”, “distance”, “duraltion”, “GPS data”, “high meters”. The expectations of the probands of using a tracker can be demonstrated as to document the movement data, to watch the change in the physical performance of the body and to motivate oneself. Movement data is not usually published on social media. The probands mostly “agree” of having a bad conscience when missing a movement unit. But probands mostly do not feel bad when having a lower performance than before. Most of the probands feel motivated and want to gain themselves by self-tracking the movement data.

4.5 Research Question 3

In this subchapter the research question 3 is evaluated:

RQ3: Is there a correlation on self-tracking and the subjective stress perception?

The last question dealt with people's own impression of whether tracking has produced a difference in the subjective perception of stress. The question about the own feeling about a change in the stress level perception was answered by 51 probands and found that the stress level perception at 82.4% (N = 51) is "the same as before".

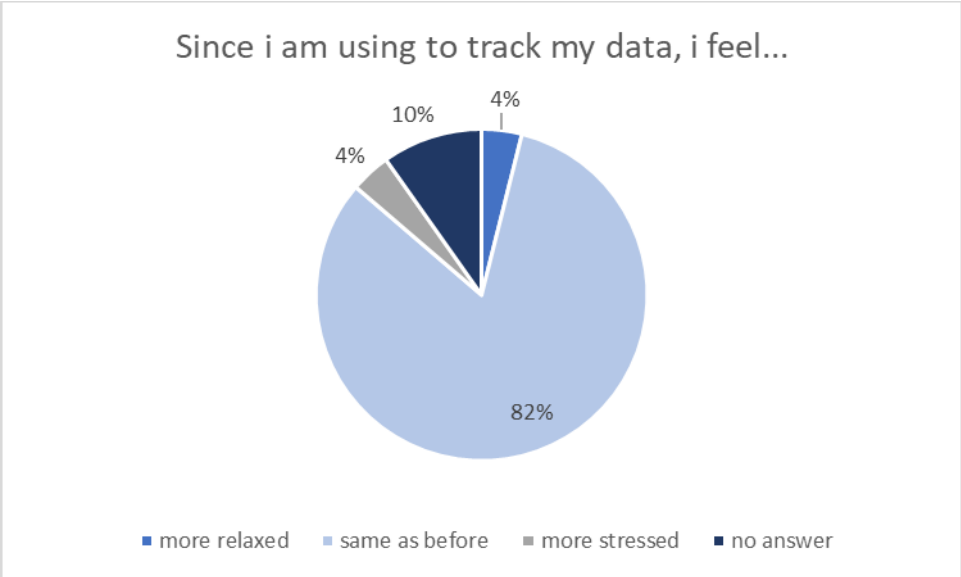

Figure 22: Own stress-assesment of the probands

As figure 22 above shows, most of the probands do not feel, that the use of a tracking tool comes up to a different stress level perception at all. Only 4% of the probands feel that tracking the data leads to more stress perception. (N = 51) In the further evaluation the intensity of self-tracking tools in sport and daily routine with the results of the stress level test by Dr. Satow (2012) are *correlated* in categories of gender and age.

Correlations:

When value p <.05 is determined, is shows a significant result. If a statistical result is described as significant, this indicates that the presumption of an assumed

hypothesis affecting the population is not above a specified level, so it is a correlation.

The index value from the certified questionnaire according to Dr. Satow (2012) *(index_stress)* was correlated with the ordinal distributed survey data according to the frequency of tracking during exercise and in daily routine. Since the ranking of the frequency of the tracking as "always" "mostly" "rarely" "never" is an ordinal distributed measurement, the nonparametric rank correlation coefficient according to Charles Spearman was used.

			index_stress	Tracking Sport
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	,075
		Sig. (2-seitig)	.	,488
		N	88	88
	Tracking Sport	Korrelationskoeffizient	,075	1,000
		Sig. (2-seitig)	,488	.
		N	88	88

Table 27: Correlation between stress level and tracking sport, total

The results are presented in a matrix (Table 27), as can be seen above, the correlations are replicated. A Spearman's rank-order correlation was run to determine the relationship between the stress level of the probands and the tracking behaviour in **sport**. There was no correlation between stress level and self-tracking, which was statistically *not significant* ($p = .488 > .05$) (N = 88)

			index_stress	Tracking Alltag
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,111
		Sig. (2-seitig)	.	,305
		N	88	88
	Tracking Alltag	Korrelationskoeffizient	-,111	1,000
		Sig. (2-seitig)	,305	.
		N	88	88

Table 28: Correlation between stress level and tracking daily routine, total

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the probands and the tracking behaviour in daily routine

("Alltag") as it is shown in the matrix above (Table 28). There was no correlation between stress level and tracking in daily routine, which was statistically *not significant* ($p = .305 > .05$) (N = 88) too.

The following graph as a boxplot contains the average observations of the data. In the box, the bar marks the mean observation, eg. the median (50% quantile) is presented. The bars up and down are at most 1.5 times as long as the length of the box and end at a data point. Data points that are outside the bars are so-called "outliers". The show the minimum and maximum values and are marked separately as points.

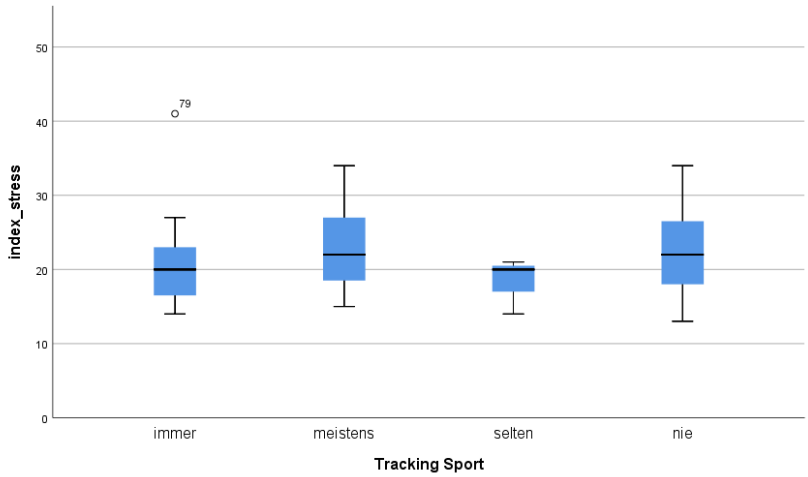

Figure 23: Division stresslevel on frequency of tracking sport

The graph above (Figure 23) shows the division of results from the stress level test by Dr. Satow divided into the frequency of tracking during the sport unit. The ordinal distributed frequency values of the self-tracking during sport are distributed on the x-axis *(always "immer", mostly "meistens", seldom "selten", never "nie")* and the value of the stress level index of the subjective stress level perception of the probands is presented on the y-axis. The bar marks through all four types of frequency are similar, as the boxplot above shows graphically. So it is demonstrated that the mean value of the stress level is similar through all frequency of self-tracking during sport.

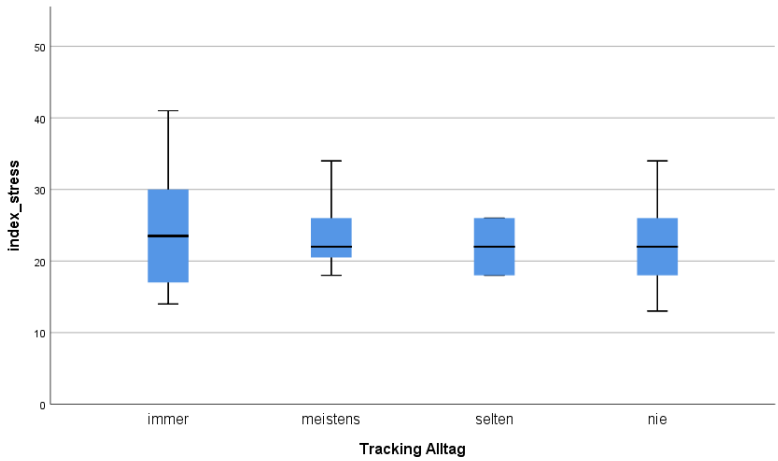

Figure 24: Division stresslevel on frequency of tracking daily routine

The graph above (Figure 24) shows the division of results from the stress level test by Dr. Satow divided into the frequency of tracking during the daily routine movement. The ordinal distributed frequency values of the self-tracking during daily routine are distributed on the x-axis *(always "immer", mostly "meistens", seldom "selten", never "nie")* and the value of the stress level index of the subjective stress level perception of the probands is presented on the y-axis. The bar marks through all four types of frequency are similar, as the boxplot above shows graphically. So it is demonstrated that the mean value of the stress level is similar through all frequency of self-tracking during daily routine movement.

The next result was about the correlation coefficient of the male probands as following (Table 29):

			index_stress	Tracking Sport
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	,170
		Sig. (2-seitig)	.	,338
		N	34	34
	Tracking Sport	Korrelationskoeffizient	,170	1,000
		Sig. (2-seitig)	,338	.
		N	34	34

Table 29: Correlation between stress level and tracking sport, male

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the male probands and the tracking behaviour in sport. There was no correlation between stress level and self-tracking, which was statistically *not significant* (*p* = *.338* > *.05*) (N = 34).

The next result was about the correlation coefficient of the female probands as it is shown in table 30:

			index_stress	Tracking Sport
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,015
		Sig. (2-seitig)	.	,914
		N	54	54
	Tracking Sport	Korrelationskoeffizient	-,015	1,000
		Sig. (2-seitig)	,914	.
		N	54	54

Table 30: Correlation between stress level and tracking sport, female

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the female probands and the tracking behaviour in sport. There was no correlation between stress level and self-tracking, which was statistically *not significant* (*p* = *.914* > *.05*) (N = 54)

So the evaluation if there is a correlation between self-tracking and stress level perception, grouped by gender, is both *not significant*.

The following result was about the correlation coefficient of the probands grouped per ages, as it is shown in table 31:

Alter				index_stress	Tracking Sport
25-30	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	,022
			Sig. (2-seitig)	.	,892
			N	41	41
		Tracking Sport	Korrelationskoeffizient	,022	1,000
			Sig. (2-seitig)	,892	.
			N	41	41
31-40	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	,213
			Sig. (2-seitig)	.	,258
			N	30	30
		Tracking Sport	Korrelationskoeffizient	,213	1,000
			Sig. (2-seitig)	,258	.
			N	30	30
41-50	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,011
			Sig. (2-seitig)	.	,967
			N	17	17
		Tracking Sport	Korrelationskoeffizient	-,011	1,000
			Sig. (2-seitig)	,967	.
			N	17	17

Table 31: Correlation between stress level and tracking sport, grouped per ages

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the probands and the tracking behaviour in sport. There was no correlation between stress level and self-tracking in any group of ages, which was statistically *not significant*:

Age 25-30: ($p = .892 > .05$) (N = 41)

Age 31-40: ($p = .258 > .05$) (N = 30)

Age 41-50: ($p = .967 > .05$) (N = 17)

The following result was about the correlation coefficient of the male probands as they use tracking in **daily routine**, as it is shown in table 32:

			index_stress	Tracking Alltag
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,034
		Sig. (2-seitig)	.	,847
		N	34	34
	Tracking Alltag	Korrelationskoeffizient	-,034	1,000
		Sig. (2-seitig)	,847	.
		N	34	34

Table 32: Correlation between stress level and tracking daily routine, male

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the male probands and the tracking behaviour in daily routine. There was no correlation between stress level and self-tracking, which was statistically *not significant* ($p = .847 > .05$) (N = 34)

The following result was about the correlation coefficient of the female probands as they use tracking in daily routine, as it is shown in table 33:

			index_stress	Tracking Alltag
Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,140
		Sig. (2-seitig)	.	,314
		N	54	54
	Tracking Alltag	Korrelationskoeffizient	-,140	1,000
		Sig. (2-seitig)	,314	.
		N	54	54

Table 33: Correlation between stress level and tracking daily routine, female

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the female probands and the tracking behaviour in daily routine. There was no correlation between stress level and self-tracking, which was statistically *not significant* ($p = .314 > .05$) (N = 54)

The last result was about the correlation coefficient of the probands, grouped by ages as they use tracking in daily routine, as it is shown in table 34:

Alter				index_stress	Tracking Alltag
25-30	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,174
			Sig. (2-seitig)	.	,276
			N	41	41
		Tracking Alltag	Korrelationskoeffizient	-,174	1,000
			Sig. (2-seitig)	,276	.
			N	41	41
31-40	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	-,343
			Sig. (2-seitig)	.	,064
			N	30	30
		Tracking Alltag	Korrelationskoeffizient	-,343	1,000
			Sig. (2-seitig)	,064	.
			N	30	30
41-50	Spearman-Rho	index_stress	Korrelationskoeffizient	1,000	,143
			Sig. (2-seitig)	.	,583
			N	17	17
		Tracking Alltag	Korrelationskoeffizient	,143	1,000
			Sig. (2-seitig)	,583	.
			N	17	17

Table 34: Correlation between stress level and tracking daily routine, grouped per ages

A Spearman's rank-order correlation was run to determine the relationship between the stress level of the probands and the self-tracking behaviour in daily routine. There was no correlation between stress level and self-tracking in any group of ages, which was statistically *not significant*. The “strongest” result of the age group of 31-40 shows ($p = .064 > .05$), so it was also *not significant*.

Age 25-30: ($p = .267 > .05$) (N = 41)

Age 31-40: ($p = .064 > .05$) (N = 30)

Age 41-50: ($p = .583 > .05$) (N = 17)

To sum up, neither in the formation of gender nor in the different group of ages could any correlation be established. It could not be proven that the use of self-tracking tools and the subjective perceived stress level are related to each other.

The result of the corraletion test gives the p-value, the “error probability”. If this p-value is $\alpha < .05$, the result is considered significant. The following two graphs show the total results of the correlations, which were all *not significant*, graphically:

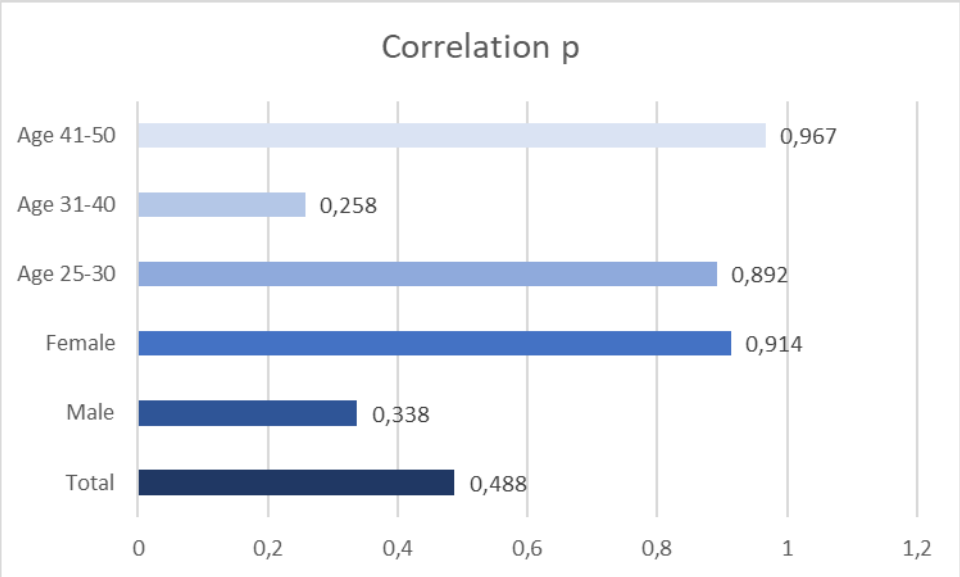

Figure 25: Correlation between stress level and tracking sport, overview

As all the results were *not significant*, figure 25 above shows the different categories of the p-value results of the probands who track their data while doing sport, graphically. Resulting correlation values are different for male from p = .338 and female p = .914. However, as these values cannot confirm on correlation between self-tracking and perceived stress neither. Also in age groups are diffences, but no correlation.

The age group 31-40 shows the smallest value p = .258, but is also not significant.

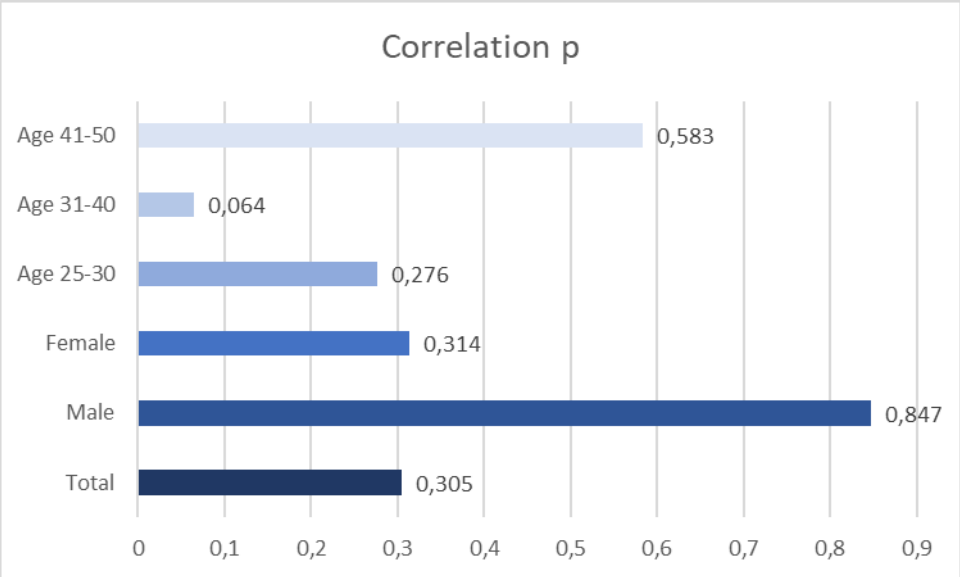

Figure 26: Correlation between stress level and tracking daily routine, overview

As all the findings were not significant, figure 26 above shows the different categories of the p-value results of the probands who track their data while be active in daily routine movement, graphically. Also in male group p = .847 and female group p = .314, as there is no correlation. The age group 31-40 shows the very smallest value p = .064 in this research, but is also still not significant.

To answer the research question 3, it can be demonstrated, that there is no correlation between self-tracking behaviour and the subjective stress perception of physically active people.

4.6 Hypothesis

T01: There is no correlation between self-tracking behaviour and the subjective stress perception of physically active people

As determined in the third research question and shown by Spearman's rank-order correlations, none of the correlations showed significance. *The null hypothesis is confirmed:* There is no correlation between self-tracking behaviour and the subjective stress perception of physically active people.

5 Discussion

The idea for this study came after previous findings that the excessive use of smartphones, as a digital tool, can stress the human psyche. The constant digital accompaniment in sport by fitness-tracker, smart watches and apps was part of the research question in this master's thesis.

When asked about the intensity of tracking, it became apparent that the use of digital tracking tools among athletes and physically active people has continued to increase over the past years, compairing similar research studies. In this study, nearly half of the total respondents indicated that they are tracking their movement data. As seen in many modern achievements, this technology is primarily used by people in the 25-30 and 31-40 age groups.

Most probands of the surveyed who track, have stated that they have been practicing this habit for about the last two or three years or shorter. That proposes that the trend may be relatively young, according that the trend started in 2005 already. However, the study did not measure whether there are people who have tracked and stopped in the past. This may explain why most people have been tracking recently, as there may be a *high dropout rate*.

The majority of people, tracking their athletic workouts, say they are "most of the time" tracking. Most people who track in their daily routine movement said that they are "always" tracking, that shows, the self-tracking tool is a constant accessoire in daily routine and the performance is also recorded unconsciously.

The expectations of tracking the movement data, clearly have the tendency that people prefer to do it for their own documentation. This raises the further question of how these tracked data are evaluated or interpreted by the probands. This question was not asked in the study. The most important parameters of the tracked data were eg. duration, distance or heart rate, so the tracking is rather used for live monitoring and not collected to be analyzed. Most probands have also stated that they want to motivate themselves with the self-tracking habit. The probands who track also have a great awareness not to skip or miss a training performance. This

also reflects the motivational advantage that the self-tracking tools are dedicated to by the manufacturer. The basic idea of the inventor of the data tracker was always the own documentation and also the motivation, which is confirmed by this research work. The motivation to move should bring health benefits, so the self-tracking phenomenon is promising.

Especially when tracking the daily routine as "always", the people must also be aware that a digital tool always knows where and when they are moving, and these of course are highly sensitive data. So, the data is all stored in the tracking tools, and the aspect of data security must also become more interesting, as proven to employers and health insurances could be interested.

With regards to the stress level, neither an increased stress of the probands nor a correlation in connection with the self-tracking in sport and daily routine could be proven. This may be due to the method by using a subjective questionnairy, as an objective measurement method leads to more accurate results.

One possibility is that the athletically active self-trackers have set very realistic goals, which they can achieve without too much pressure. In the role of the motivator, self-tracking is seemingly used for live-monitoring, and it has no negative effects on athletes and daily routine self-trackers, to which they could respond with stress because they voluntarily pursue their training and decision to track their data. Most of the probands do not want to publish the data on social media either.

The probands also stated in the self-assessment that the subjective perception of stress has not changed since the data has been tracked. The awareness to be interested in the physical parameters also means a positive relationship to exercise, sport and movement, which also reduces stress.

The impact on stress, performance and bad conscience in relation to sport and physical activity could change if, in the future, health insurances can match their contributions with people's health behaviors. This could then be observed using the data tracker. If the movement and sport workout then become mandatory, the effects on the stress level could increase significantly.

The author of this master thesis would have found it interesting if the hypothesis that there is no correlation between self-tracking and subjective stress perception could have been rejected.

Limitations: According to the findings of this master thesis, the tracking of the data itself does not modificate the subjective perceived stress level. In the study of subjective stress level, an objective method could yield more accurate results. In the course of a survey there is the possibility that people are unaware that they are suffering from various symptoms already. It can also be assumed that only people participated in the voluntary survey because they were not stressed at that moment. For further studies, it would be very interesting to compare these findings with an objective measurement method to see if the subjective feeling of stress approaches the objective stress level value. It would also be better to do a longitudinal study, to observe how the training with self-tracker and the subjective stress level behaves.

The total population of this research study were athletically or physically active people. The random sample of participants to collect the sample was arbitrary, that means, only those who felt interested in the topic of the study and wanted to voluntarily participate in the survey, completed the online questionnaire. Inadequate representativeness and sampling bias may could be present. The random sample in further studies can be much more large-scaled.

6 Conclusion

The use of digital devices for self-tracking for health reasons is a new phenomenon that is mostly used by people aged 25-40 and is increasingly integrated into sport and daily routine. Both positive and negative dimensions of self-tracking are identified in theory. In practice, no correlation on the subjective stress perception was found in this research work.

Further research and analysis using objective measurement techniques may lead to a different outcome. As the behaviour of being physically active using self-tracking tools, is a rather young habit of the society, the research study maybe could reach more outcome in later years, when eg. the generation 25-30, which do currently use the tracking tools most, has been using it for a really long period.

Because that there have been slight differences on the (non significant) correlation results between the gender and group of ages, further studies could continue to research on divided lifestyle situations (eg. fulltime working, studying, being married) of probands. So, a further hypothesis would be able to define a group of risk ob being more stressed when using a self-tracking tool during sport or daily routine movement.

As has been shown in the survey with the users of self-tracking tools, the self-measurement with digital, mobile devices is currently still clearly located in the private and therefore voluntary area of the people. To share the data on social media is not state of the art. The self-tracking runs without pressure and is associated with motivation. Currently, this casual relationship with the technology that motivates seems indicative.

On the other hand, however, the use is not tied to any extrinsic advantage. Health insurances may represent an external entity that has an interest in the data and their use. Intervening these external factors maybe can greatly change the carefree use of the self-tracking technologies and thus the level of stress in relation with the physically movement. This also would be an interesting research question and hyposthesis for further studies.

Literature

[1] „Österreich - Smartphone-Besitz und Smartphone-Nutzung 2018 | Statistik“, *Statista*. [Online]. Verfügbar unter: https://de.statista.com/statistik/daten/studie/568185/umfrage/smartphone-besitz-und-smartphone-nutzung-in-oesterreich/. [Zugegriffen: 23-Okt-2018].

[2] World Health Organization, World Health Organization, und Mental Health Evidence and Research Team, *Mental health atlas 2017.* 2018.

[3] „Studie ‚Chancen und Risiken von Gesundheits-Apps‘ veröffentlicht“, *Bundesgesundheitsministerium*. [Online]. Verfügbar unter: https://www.bundesgesundheitsministerium.de/ministerium/meldungen/2016/studie-gesundheits-apps.html. [Zugegriffen: 21-Okt-2018].

[4] „Quantified Self - Self Knowledge Through Numbers“, *Quantified Self*. [Online]. Verfügbar unter: http://quantifiedself.com/. [Zugegriffen: 21-Okt-2018].

[5] A. Fotopoulou und K. O’Riordan, „Training to self-care: fitness tracking, biopedagogy and the healthy consumer“, *Health Sociology Review*, Bd. 26, Nr. 1, S. 54–68, Jan. 2017.

[6] D. Lupton, „Self-tracking, health and medicine“, *Health Sociology Review*, Bd. 26, Nr. 1, S. 1–5, März 2017.

[7] M. Gerber, S. Brand, C. Elliot, E. Holsboer-Trachsler, und U. Pühse, „Aerobic Exercise, Ball Sports, Dancing, and Weight Lifting as Moderators of the Relationship between Stress and Depressive Symptoms: An Exploratory Cross-Sectional Study with Swiss University Students“:, *Perceptual and Motor Skills*, Dez. 2014.

[8] A. Antonovsky, *Unraveling the mystery of health: How people manage stress and stay well*. San Francisco, CA, US: Jossey-Bass, 1987.

[9] „Gesunde Arbeit - Psychische Erkrankungen steigen drastisch an“. [Online]. Verfügbar unter: http://www.gesundearbeit.at/cms/V02/V02_7.12.4.a/1342562536719/service/aktuelles/2016/psychische-erkrankungen-steigen-drastisch-an. [Zugegriffen: 21-Okt-2018].

[10] M. B. Barcena, C. Wueest, und H. Lau, „How safe is your quantified self?“, S. 38.

[11] „Quantified Self – Schnittstelle zwischen Lifestyle und Medizin | ZHAW Gesundheit“. [Online]. Verfügbar unter: https://www.zhaw.ch/de/gesundheit/forschung/ergotherapie/projekte/quantified-self/. [Zugegriffen: 21-Okt-2018].

[12] „‚Quantified Self‘ - Nutzen und Gefahren der Selbstvermessung“, *Datenschutzbeauftragter*, 01-Aug-2012. [Online]. Verfügbar unter: https://www.datenschutzbeauftragter-info.de/quantified-self-nutzen-und-gefahren-der-selbstvermessung/. [Zugegriffen: 02-Mai-2019].

[13] „Selbstoptimierung: Warum Instagram & Co uns psychisch krank macht“, *Gesundheitstrends*, 14-Feb-2019. [Online]. Verfügbar unter: https://www.gesundheitstrends.com/a/schlaf-und-psyche/selbstoptimierung-schaedlich-44484. [Zugegriffen: 13-Apr-2019].

[14] „Stress- und Coping-Inventar (SCI) | Dr. Satow“. [Online]. Verfügbar unter: https://www.drsatow.de/tests/stress-und-coping-inventar/. [Zugegriffen: 21-Okt-2018].
[15] N. Cavill, S. Kahlmeier, F. Racioppi, World Health Organization, und Regional Office for Europe, *Physical activity and health in Europe: evidence for action*. Copenhagen: World Health Organization, Regional Office for Europe, 2006.
[16] Wolfgang Schlicht und Ralf Brand, *Körperliche Aktivität, Sport und Gesundheit*. Juventa Verlag Weinheim und München, 2007.
[17] Wildor Hollmann und Theodor Hettinger, *Sportmedizin. Grundlagen für Arbeit, Training und Präventivmedizin*, 4. Auflage. Schattauer Verlagsgesellschaft mbH, 2000.
[18] „Wirkungen von Sport und Bewegung auf den Körper“, *Gesundheitsportal*. [Online]. Verfügbar unter: https://www.gesundheit.gv.at/leben/bewegung/koerper/wirkungen-sport. [Zugegriffen: 13-Aug-2019].
[19] „Risiken von intensivem und exzessivem Sport“. [Online]. Verfügbar unter: https://gesundheit.ccm.net/contents/442-risiken-von-intensivem-und-exzessivem-sport. [Zugegriffen: 09-Juli-2019].
[20] „Burnout-Syndrom durch zu viel Sport: Ursache Übertraining“, *Burnout-Syndrom*, 28-Dez-2016. .
[21] „Geschichte und Entwicklung der Fitness-Armbänder“, *fitnessarmband.eu*, 27-Sep-2017. [Online]. Verfügbar unter: https://fitnessarmband.eu/geschichte-und-entwicklung-der-fitness-armbaender/. [Zugegriffen: 23-Juni-2019].
[22] „Wiener Städtische-Umfrage zu Sport in Österreich“, *MedMix*, 10-Aug-2015. .
[23] „Österreich - Umfrage zur Häufigkeit von sportlicher Aktivität 2018 | Statista“. [Online]. Verfügbar unter: https://de.statista.com/statistik/daten/studie/933764/umfrage/umfrage-zur-haeufigkeit-von-sportlicher-aktivitaet-in-oesterreich-2018/. [Zugegriffen: 24-Aug-2019].
[24] „Stress“. [Online]. Verfügbar unter: http://www.rhetorik.ch/Stress/Stress.html#stressoren. [Zugegriffen: 11-Juli-2019].
[25] M. Hofbauer, „Stressdiagnostik und Stressbewältigung“, 2012.
[26] „Why Eustress Is Good Stress“, *Healthline*. [Online]. Verfügbar unter: https://www.healthline.com/health/eustress. [Zugegriffen: 12-Juli-2019].
[27] W. Stangl, „Distress“. .
[28] F. Online, „Die vier Ebenen der Stressreaktion“, *FOCUS Online*. [Online]. Verfügbar unter: https://www.focus.de/finanzen/news/folgen-fuer-die-gesundheit-die-vier-ebenen-der-stressreaktion_aid_1149777.html. [Zugegriffen: 06-Aug-2019].
[29] „Psychische Gesundheit | Gesundheitsförderung | Gesundheit | Sozialministerium“. [Online]. Verfügbar unter: https://www.sozialministerium.at/cms/site/gesundheit/liste.html?channel=CH3999. [Zugegriffen: 24-Aug-2019].
[30] „Nationale Strategie zur psychischen Gesundheit | Gesundheitsförderung | Gesundheit | Sozialministerium“. [Online]. Verfügbar unter: https://www.sozialministerium.at/cms/site/gesundheit/dokument.html?channel=CH3999&doc=CMS1383641380655. [Zugegriffen: 24-Aug-2019].
[31] „Erschöpfung, Burnout & Co: Wenn Sport Stress macht | SPORTaktiv.com“, 27-Aug-2014. [Online]. Verfügbar unter: https://www.sportaktiv.com/erschoepfung-burnout-co-wenn-sport-stress-macht. [Zugegriffen: 11-Juli-2019].

[32] „No Motivation: Was tun, wenn wir durch Sport plötzlich gestresst sind?“, *Gesundheitstrends*, 22-März-2019. [Online]. Verfügbar unter: https://www.gesundheitstrends.com/a/fitness/stress-durch-sport-7697. [Zugegriffen: 11-Juli-2019].
[33] „Wenn Sport zur Sucht wird“. [Online]. Verfügbar unter: https://www.gesundheit.de/krankheiten/psyche-und-sucht/suchterkrankungen/sportsucht. [Zugegriffen: 14-Mai-2019].
[34] „Kann die subjektive Einschätzung Übertraining effektiv vermeiden?“, *Deutsche Zeitschrift für Sportmedizin*, 20-Mai-2016. .
[35] „Monitoring the athlete training response: subjective self-reported measures trump commonly used objective measures: a systematic review | British Journal of Sports Medicine“. [Online]. Verfügbar unter: https://bjsm.bmj.com/content/50/5/281.full. [Zugegriffen: 26-Aug-2019].
[36] roman, „Ist Stress messbar?“, *Herzlich Willkommen bei Gruber Gesundheit*, 14-Aug-2013. .
[37] „Messung der Stresshormone“, *Neurolab Vital*. .
[38] „SRRS - stressige Lebensereignisse und tägliche Probleme Einfach Psychologie“. [Online]. Verfügbar unter: https://www.simplypsychology.org/SRRS.html. [Zugegriffen: 24-Aug-2019].
[39] R.-D. Kocalevent, A. Hinz, E. Brähler, und B. F. Klapp, „Regionale und individuelle Faktoren von Stresserleben in Deutschland: Ergebnisse einer repräsentativen Befragung mit dem Perceived Stress Questionnaire (PSQ)“, *Gesundheitswesen*, Bd. 73, Nr. 12, S. 829–834, Dez. 2011.
[40] „What does Cronbach’s alpha mean? | SPSS FAQ“. [Online]. Verfügbar unter: https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/. [Zugegriffen: 08-Sep-2019].
[41] „Quantified Self und seine Auswirkungen auf Motivation und Selbstwahrnehmung“, *igrowdigital*, 10-Okt-2011. .
[42] evsan, „Quantified Self - das Ich in Zahlen“, *E-Health*, 13-Nov-2014. [Online]. Verfügbar unter: https://ehealthblog.de/2014/11/13/quantified-self-das-ich-in-zahlen/. [Zugegriffen: 24-Aug-2019].
[43] „Die Runtastic-Story – eine Chronik“, *Gründerszene Magazin*, 06-Aug-2015. [Online]. Verfügbar unter: https://www.gruenderszene.de/allgemein/runtastic-chronik-verkauf-adidas. [Zugegriffen: 23-Juni-2019].
[44] Redaktionsteam, „Die besten Fitness Apps für Smartphones im Überblick › gesund.co.at“. .
[45] „▷ Der Fitness-Uhr Test: die 40 besten Sportuhren im Test 2019“, *fitnessarmband.eu*. [Online]. Verfügbar unter: https://fitnessarmband.eu/fitness-uhr/. [Zugegriffen: 07-Aug-2019].
[46] „Best fitness tracker 2019: the top 10 activity bands on the planet | TechRadar“. [Online]. Verfügbar unter: https://www.techradar.com/news/wearables/10-best-fitness-trackers-1277905. [Zugegriffen: 06-Sep-2019].
[47] „Self-Tracker für den Schlaf: Wenn die App für Unruhe sorgt | kurier.at“. [Online]. Verfügbar unter: https://kurier.at/leben/self-tracker-fuer-den-schlaf-wenn-die-app-fuer-unruhe-sorgt/400037680. [Zugegriffen: 11-Juli-2019].
[48] „Self-Tracking – mehr als kurzfristige Selbstberuhigung? – Aktuelles aus der Goethe-Universität Frankfurt“. .
[49] „Smartphone macht Dauerstress“, *DER STANDARD*. [Online]. Verfügbar unter: https://www.derstandard.at/story/2000023213509/smartphone-macht-dauerstress. [Zugegriffen: 24-Aug-2019].
[50] U.-V. Albrecht, „Chancen und Risiken von Gesundheits-Apps (CHARISMHA)“, S. 370.

[51] T. A. Powers, R. Koestner, D. C. Zuroff, M. Milyavskaya, und A. A. Gorin, „The Effects of Self-Criticism and Self-Oriented Perfectionism on Goal Pursuit“, *Pers Soc Psychol Bull*, Bd. 37, Nr. 7, S. 964–975, Juli 2011.
[52] „Self-Tracking: Ich – einfach verbesserlich“. [Online]. Verfügbar unter: https://journal.bkkgs.de/ausgabe-2017-01/self-tracking-ich-einfach-verbesserlich/. [Zugegriffen: 24-Aug-2019].
[53] K. G. Baron, S. Abbott, N. Jao, N. Manalo, und R. Mullen, „Orthosomnia: Are Some Patients Taking the Quantified Self Too Far?“, *J Clin Sleep Med*, Bd. 13, Nr. 2, S. 351–354, Feb. 2017.
[54] „Quantified-Self-Bewegung: Die Selbstvermesser“. [Online]. Verfügbar unter: https://www.spektrum.de/news/die-selbstvermesser/1334103. [Zugegriffen: 24-Aug-2019].
[55] „Living the quantified self: the realities of self-tracking for health“, *This Sociological Life*, 11-Jan-2013. .
[56] G. Appelboom *u. a.*, „Smart wearable body sensors for patient self-assessment and monitoring“, *Arch Public Health*, Bd. 72, Nr. 1, S. 28, Aug. 2014.
[57] R. ONLINE, „‚Quantified Self‘ im Trend: Neugierige Krankenkassen nutzen Apps zur Datensammlung“, *RP ONLINE*. [Online]. Verfügbar unter: https://rp-online.de/digitales/neugierige-krankenkassen-nutzen-apps-zur-datensammlung_aid-17820811. [Zugegriffen: 07-Aug-2019].
[58] D. T. stellt eine B. dar E. G. für die R. und V. der A. kann nicht übernommen werden A. unterschiedlicher A. können S. einen aktuelleren Datenst und aufweisen., „Themenseite: Wearables in Österreich“, *de.statista.com*. [Online]. Verfügbar unter: https://de.statista.com/themen/4648/wearables-in-oesterreich/. [Zugegriffen: 14-Sep-2019].
[59] „Qualitative und quantitative Forschung | NOVUSTAT“, *Statistik Service*, 31-Jan-2019. [Online]. Verfügbar unter: https://novustat.com/statistik-blog/qualitative-und-quantitative-forschung-studiendesign.html. [Zugegriffen: 23-Juni-2019].
[60] Jürgen Bortz und Nicola Döring, *Forschungsmethoden und Evaluation*, 3. Springer Medizin Verlag, 2005.
[61] „Likert Scale Definition, Examples and Analysis | Simply Psychology“. [Online]. Verfügbar unter: https://www.simplypsychology.org/likert-scale.html. [Zugegriffen: 26-Aug-2019].
[62] Elisabeth Raab-Steiner und Michael Benesch, *Der Fragebogen*, 3. facultas, 2012.
[63] „quantitative - Grundlagen statistischer Auswertungsverfahren“. [Online]. Verfügbar unter: https://www.univie.ac.at/ksa/elearning/cp/quantitative/quantitative-full.html. [Zugegriffen: 09-Sep-2019].
[64] H. Fliege, M. Rose, P. Arck, S. Levenstein, und B. F. Klapp, „PSQ - Perceived Stress Questionnaire“, *Perceived Stress Questionnaire (PSQ; Levenstein, S., Prantera, C., Varvo, V., Scribano, M.L., Berto, E., Luzi, C. & Andreoli, A., 1993) - German modified version*, 2009.
[65] D. L. Satow, „Test- und Skalendokumentation“, S. 24, 2012.

List of Figures

List of Tables

Appendix

A. Survey Data

17.9.2019 Druckansicht base (Selftracking_stresslevel) 17.09.2019, 10:47

Selftracking_stresslevel → base 17.09.2019, 10:47

Seite 01

Sehr geehrte Damen und Herren!

Im Rahmen meiner Masterarbeit für den Studiengang DIGITAL HEALTHCARE an der Fachhochschule St. Pölten führe ich eine Befragung zum folgenden Thema durch:

"Self Tracking" während Sport- oder Bewegungseinheiten

und dem empfundenen Stress-Level

Das heißt, ich möchte herausfinden, ob es einen **Zusammenhang** zwischen der "Aufzeichnung" von körperlicher Bewegung zB. mittels Fitness-Uhr (Puls-Uhr, Smartwatch, etc.) oder Smartphone-App ("Runtastic" o.ä.) auf das persönliche Empfinden von Stress erwirkt.

Der Fragebogen gliedert sich in 4 Teile:

1. Angaben zum Alter, Geschlecht, Familienstand und Beruf
2. Angaben zum Bewegungsverhalten und ob bzw. wie Sie es aufzeichnen
3. Zertifizierter Stresslevel-Test (wissenschaftlich nach Dr. Satow)
4. Angaben über das eigene Empfinden

Dieser Fragebogen wird in etwa 5-7 Minuten Zeit in Anspruch nehmen.

Ihre Angaben dienen wissenschaftlichen Forschungszwecken, sind anonym und werden nicht an Dritte weitergegeben.

Vielen Dank für Ihre Unterstützung!

Eva Maria Kamper, BA

1. Ich habe die Einleitung gelesen, verstanden und möchte an der Befragung teilnehmen

○ Ja, ich stimme zu

https://www.soscisurvey.de/admin/preview.php?questionnaire=base&mode=print&filters=off 1/11

Teil 1:

Folgende allgemeine Angaben dienen der Statistik:

2. Geschlecht

- ○ Männlich
- ○ Weiblich
- ○ Unisex

3. Alter

- ○ Unter 25
- ○ 25-30
- ○ 31-40
- ○ 41-50
- ○ Älter als 50

4. Familienstand

- ○ Ledig
- ○ In einer Partnerschaft
- ○ Verheiratet
- ○ Geschieden
- ○ Sonstiges:

5. Betreuungspflichten

- ☐ Kleinkind
  Anzahl
- ☐ Schulkind < 13 Jahre
  Anzahl
- ☐ Teenager 13-18 Jahre
  Anzahl
- ☐ Pflegebedürftige Erwachsene
- ☐ keine

6. Höchste abgeschlossene Ausbildung:

- ○ Pflichtschule
- ○ Lehre
- ○ AHS
- ○ BHS
- ○ Diplomstudium
- ○ Bachelor
- ○ Master
- ○ sonstiges

7. Arbeitsverhältnis

- ☐ Student/in
- ☐ Arbeiter/in
- ☐ Angestellte/r
- ☐ Selbstständig
- ☐ Arbeitssuchend
- ☐ Pensionist/in
- ☐ Sonstiges
- ☐ keines

8. Ausmaß des Arbeitsverhältnis

- ☐ Vollzeit
- ☐ Teilzeit
- ☐ Geringfügig
- ☐ Sonstiges

Seite 03

Teil 2:

Folgende Angaben betreffen Ihr Bewegungsverhalten und die Benutzung von "Tracking"-Tools

9. Betreiben Sie Sport?

- ○ ja
- ○ nein

Seite 04

jump9

10. Welchen Sport betreiben Sie?

Wählen Sie Ihre gewohnte Sportart und geben Sie bitte die ungefähre bzw. durchschnittliche Dauer pro Woche an.

Mehrfachnennungen möglich.

- [ ] Laufen
  wie viele Minuten pro Woche?
- [ ] Radfahren
  wie viele Minuten pro Woche?
- [ ] Schwimmen
  wie viele Minuten pro Woche?
- [ ] Kraftsport
  wie viele Minuten pro Woche?
- [ ] Tanzsport
  wie viele Minuten pro Woche?
- [ ] Ballsport
  wie viele Minuten pro Woche?
- [ ] Kampfsport
  wie viele Minuten pro Woche?
- [ ] Aerobic
  wie viele Minuten pro Woche?
- [ ] Sonstiges
  welchen? und wie viele Minuten pro Woche?

Seite 05

jump4

Die folgenden Fragen beziehen sich auf die Anwendung des Daten-Trackings:

11. Verwenden Sie digitale Tracking-Methoden, um ihre sportlichen Betätigungen aufzuzeichnen?

- ( ) ja
- ( ) nein

Seite 06
jump8

12. Welche digitalen Tracking Methoden verwenden Sie?

- [ ] Smartphone-App
- [ ] Fitness-Uhr
- [ ] andere Fitness-Tools:
- [ ] Kombinationen aus:

13. Seit wann verwenden Sie digitale Tracking-Methoden, um Ihre sportlichen Betätigungen aufzuzeichnen?

Rechnen Sie bitte die ungefähre Anzahl der Monate aus (zB 3 Jahre = 36 Monate)

Anzahl der Monate

14. Welche Daten tracken Sie während Ihrer sportlichen Betätigung?

Mehrfachnennungen möglich

- [ ] Schritte
- [ ] GP(R)S-Daten
- [ ] Wegstrecke
- [ ] Dauer
- [ ] Kalorien
- [ ] Herzfrequenz
- [ ] Höhenmeter
- [ ] Watt
- [ ] Sonstige:

15. Wie oft tracken Sie Ihre sportlichen Betätigungen?

- ○ immer
- ○ meistens
- ○ selten
- ○ nie

Seite 07
jump5

Folgende Angaben betreffen die **Bewegung im Alltag**, die man ohne Sport betreibt

16. Verwenden Sie digitale Tracking-Methoden, um Ihre Bewegungen im Alltag aufzuzeichnen?

- ○ ja
- ○ nein, nur die sportliche Betätigung
- ○ nein, ich zeichne meine Bewegungsdaten gar nicht auf

Seite 08
jump7

17. Welche digitalen Tracking Methoden verwenden Sie für Ihre Bewegungsdaten im Alltag?

- ☐ Smartphone-App
- ☐ Fitness-Uhr
- ☐ andere Fitness-Tools:
- ☐ Kombinationen aus:

18. Welche Ihrer Daten tracken Sie während der Bewegung im Alltag?
Mehrfachnennungen möglich

- ☐ Schritte
- ☐ GP(R)S-Daten
- ☐ Wegstrecke
- ☐ Dauer
- ☐ Kalorien
- ☐ Herzfrequenz
- ☐ Höhenmeter
- ☐ Watt
- ☐ Sonstige:

19. Wie oft tracken Sie ihre Bewegungen im Alltag?

- ○ immer
- ○ meistens
- ○ selten
- ○ nie

Teil 3:

Zertifizierter Stresslevel-Test

"Stress- und Coping-Inventar (SCI)"

Das SCI ist ein wissenschaftliches Instrument zur Erfassung von Stressbelastung, körperlichen Stresssymptomen und Stressbewältigung.

Die folgenden 13 Stress-Symptome sind ein Auszug aus dem wissenschaftlichen Fragesystem nach Dr. Lars Satow, um den derzeitigen Zustand des persönlichen Stress-Levels zu messen.

Satow, L. (2012). Stress- und Coping-Inventar (SCI): Testmanual und Normen. Online im Internet,

URL: http://www.drsatow.de Copyright

Anleitung:

Antworten Sie möglichst spontan! Es gibt keine richtigen oder falschen Antworten.

Achten Sie bitte darauf, dass Sie keine Aussage auslassen.

Stress und Druck können körperliche Symptome verursachen.

Welche Symptome haben Sie bei sich in den letzten sechs Monaten beobachtet?

20. Beurteilen Sie Ihre körperlichen und psychischen Stress-Symptome

	Trifft gar nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft genau zu
Ich schlafe schlecht.	○	○	○	○
Ich leide häufig unter Magen- oder Bauchschmerzen.	○	○	○	○
Ich habe häufig das Gefühl, einen Kloß im Hals zu haben.	○	○	○	○
Ich leide häufig unter Kopfschmerzen.	○	○	○	○
Ich grüble oft über mein Leben nach.	○	○	○	○
Ich bin oft traurig.	○	○	○	○
Meine Lust auf Sex ist deutlich zurückgegangen.	○	○	○	○
Ich ziehe mich häufig in mich selbst zurück und bin dann so versunken, dass ich nichts mehr mitbekomme.	○	○	○	○
Ich habe oft zu nichts mehr Lust.	○	○	○	○
Ich habe ab- oder zugenommen (mehr als 5 Kilo).	○	○	○	○
Ich habe Zuckungen im Gesicht, die ich nicht kontrollieren kann.	○	○	○	○
Ich kann mich schlecht konzentrieren.	○	○	○	○
Ich habe Alpträume.	○	○	○	○

Seite 10
jump3

Teil 4:

Folgende Fragen beziehen sich auf eigene Einschätzungen und den Umgang mit Ihren aufgezeichneten Daten.

21. Was sind die Gründe, warum Sie Ihre Daten mittels digitalem Tracking aufzeichnen?
Mehrfachnennungen möglich

Ich möchte ...

- ☐ ... mich selbst motivieren
- ☐ ... meine Leistungen dokumentieren
- ☐ ... meine Leistungen erhalten
- ☐ ... meine Leistungen steigern
- ☐ ... die Veränderung meiner Leistungen beobachten
- ☐ ... mich mit anderen Menschen auf Social Media Plattformen messen
- ☐ Sonstige Gründe

22. Veröffentlichen Sie Ihre aufgezeichneten Daten auf den Social-Media-Plattformen?

- ☐ ja, immer
- ☐ ja, manchmal
- ☐ ja, aber nur ausgewählte Sportarten
- ☐ ja, aber nur besonders gute Leistungen
- ☐ nein, ich tracke alle meine Daten nur aus Eigeninteresse

Seite 11
jump1

Überlegen Sie welches **Gefühl** Sie in Bezug auf das Daten Tracking haben:

23. Ich habe ein schlechtes Gewissen, wenn ich auf meine Sport- oder Bewegungseinheit verzichte.

○ Trifft nicht zu ○ Trifft wenig zu ○ Trifft eher zu ○ Trifft genau zu

24. Ich fühle mich schlecht, wenn ich eine geringere Leistung als zuvor geschafft habe

○ Trifft nicht zu ○ Trifft weniger zu ○ Trifft eher zu ○ Trifft genau zu

25. Ich fühle mich motiviert und möchte mich selbst übertrumpfen

○ Trifft nicht zu ○ Trifft wenig zu ○ Trifft eher zu ○ Trifft genau zu

Seite 12
jump2

26. Hat sich Ihr Stressempfinden durch das Tracken Ihrer Daten verändert?
Seit ich meine Daten tracke, fühle ich mich

○ entspannter ○ gleich wie vorher ○ gestresster ○ keine Angabe

Letzte Seite

Vielen Dank für Ihre Teilnahme!

Wir möchten uns ganz herzlich für Ihre Mithilfe bedanken.

Ihre Antworten wurden gespeichert, Sie können das Browser-Fenster nun schließen.

Möchten Sie in Zukunft an interessanten und spannenden Online-Befragungen teilnehmen?

Wir würden uns sehr freuen, wenn Sie Ihre E-Mail-Adresse für das SoSci Panel anmelden und damit wissenschaftliche Forschungsprojekte unterstützen.

E-Mail: Am Panel teilnehmen

Die Teilnahme am SoSci Panel ist freiwillig, unverbindlich und kann jederzeit widerrufen werden.
Das SoSci Panel speichert Ihre E-Mail-Adresse nicht ohne Ihr Einverständnis, sendet Ihnen keine Werbung und gibt Ihre E-Mail-Adresse nicht an Dritte weiter.

Sie können das Browserfenster selbstverständlich auch schließen, ohne am SoSci Panel teilzunehmen.

B. Survey examples

Holmes-Rahe Life Stress Inventory:

The Holmes-Rahe Life Stress Inventory

The Social Readjustment Rating Scale

INSTRUCTIONS: Mark down the point value of each of these life events that has happened to you during the previous year. Total these associated points.

Life Event	Mean Value
1. Death of spouse	100
2. Divorce	73
3. Marital Separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in the health or behavior of a family member	44
12. Pregnancy	40
13. Sexual Difficulties	39
14. Gaining a new family member (i.e.. birth, adoption, older adult moving in, etc)	39
15. Major business readjustment	39
16. Major change in financial state (i.e.. a lot worse or better off than usual)	38
17. Death of a close friend	37
18. Changing to a different line of work	36
19. Major change in the number of arguments w/spouse (i.e.. either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)	35
20. Taking on a mortgage (for home, business, etc..)	31
21. Foreclosure on a mortgage or loan	30
22. Major change in responsibilities at work (i.e. promotion, demotion, etc.)	29
23. Son or daughter leaving home (marriage, attending college, joined mil.)	29
24. In-law troubles	29
25. Outstanding personal achievement	28
26. Spouse beginning or ceasing work outside the home	26
27. Beginning or ceasing formal schooling	26
28. Major change in living condition (new home, remodeling, deterioration of neighborhood or home etc.)	25
29. Revision of personal habits (dress manners, associations, quitting smoking)	24
30. Troubles with the boss	23
31. Major changes in working hours or conditions	20
32. Changes in residence	20
33. Changing to a new school	20
34. Major change in usual type and/or amount of recreation	19
35. Major change in church activity (i.e.. a lot more or less than usual)	19
36. Major change in social activities (clubs, movies,visiting, etc.)	18
37. Taking on a loan (car, tv,freezer,etc)	17
38. Major change in sleeping habits (a lot more or a lot less than usual)	16
39. Major change in number of family get-togethers ("")	15
40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)	15
41. Vacation	13
42. Major holidays	12
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc)	11

Now, add up all the points you have to find your score.

150pts or less means a relatively low amount of life change and a low susceptibility to stress-induced health breakdown.

150 to 300 pts implies about a 50% chance of a major health breakdown in the next 2 years.

300pts or more raises the odds to about 80%, according to the Holmes-Rahe statistical prediction model.

Questionnaire (PSQ) by Levenstein et al. (1993):

	Almost never 1	Some-times 2	Often 3	Usually 4
01 You feel rested				
02 You feel that too many demands are being made on you				
03 You are irritable or grouchy				
04 You have too many things to do				
05 You feel lonely or isolated				
06 You find yourself in situations of conflict				
07 You feel you're doing things you really like				
08 You feel tired				
09 You fear you may not manage to attain your goals				
10 You feel calm				
11 You have too many decisions to make				
12 You feel frustrated				
13 You are full of energy				
14 You feel tense				
15 Your problems seem to be piling up				
16 You feel you're in a hurry				
17 You feel safe and protected				
18 You have many worries				
19 You are under pressure from other people				
20 You feel discouraged				
21 You enjoy yourself				
22 You are afraid for the future				

23 You feel you're doing things because you have to not because you want to				
24 You feel criticized or judged				
25 You are lighthearted				
26 You feel mentally exhausted				
27 You have trouble relaxing				
28 You feel loaded down with responsibility				
29 You have enough time for yourself				
30 You feel under pressure from deadlines				

Stress and Coping Inventory (SCI) by Dr. Satow (2012):

Wie gehen Sie mit Stress um? Es gibt keine richtigen oder falschen Antworten. Antworten Sie möglichst spontan und lassen Sie keine Aussage aus.

		trifft gar nicht zu	trifft eher nicht zu	trifft eher zu	trifft genau zu
positiv	Ich sage mir, dass Stress und Druck auch ihre guten Seiten haben.	O	O	O	O
alk (-)	Egal wie groß der Stress wird, ich würde niemals wegen Stress zu Alkohol oder Zigaretten greifen.	O	O	O	O
aktiv	Ich mache mir schon vorher Gedanken, wie ich Zeitdruck vermeiden kann.	O	O	O	O
support	Wenn ich mich überfordert fühle, gibt es Menschen, die mich wieder aufbauen.	O	O	O	O
positiv	Ich sehe Stress und Druck als positive Herausforderung an.	O	O	O	O
positiv	Auch wenn ich sehr unter Druck stehe, verliere ich meinen Humor nicht.	O	O	O	O
aktiv	Ich versuche Stress schon im Vorfeld zu vermeiden.	O	O	O	O
rel	Bei Stress und Druck finde ich Halt im Glauben.	O	O	O	O
rel	Gebete helfen mir dabei, mit Stress und Bedrohungen umzugehen.	O	O	O	O
rel	Egal wie schlimm es wird, ich vertraue auf höhere Mächte.	O	O	O	O
alk	Wenn mir alles zu viel wird, greife ich manchmal zur Flasche.	O	O	O	O
aktiv	Ich tue alles, damit Stress erst gar nicht entsteht.	O	O	O	O
support	Wenn ich unter Druck gerate, habe ich Menschen, die mir helfen.	O	O	O	O
alk	Bei Stress und Druck entspanne ich mich abends mit einem Glas Wein oder Bier.	O	O	O	O
support	Bei Stress und Druck finde ich Rückhalt bei meinem Partner oder einem guten Freund.	O	O	O	O
positiv	Bei Stress und Druck konzentriere ich mich einfach auf das Positive.	O	O	O	O
aktiv	Bei Stress und Druck beseitige ich gezielt die Ursachen.	O	O	O	O
rel	Bei Stress und Druck erinnere ich mich daran, dass es höhere Werte im Leben gibt.	O	O	O	O
support	Egal wie schlimm es wird, ich habe gute Freunde, auf die ich mich immer verlassen kann.	O	O	O	O
alk	Wenn ich zu viel Stress habe, rauche ich eine Zigarette.	O	O	O	O

Inwieweit haben Sie sich in den letzten drei Monaten durch folgende Unsicherheiten belastet gefühlt?

	nicht belastet						sehr stark belastet
Unsicherheit durch finanzielle Probleme.	o	o	o	o	o	o	o
Unsicherheit in Bezug auf Ihren Wohnort.	o	o	o	o	o	o	o
Unsicherheit in Bezug auf Arbeitsplatz, Ausbildungsplatz, Studium oder Schule.	o	o	o	o	o	o	o
Unsicherheit in Bezug eine ernsthafte Erkrankung.	o	o	o	o	o	o	o
Unsicherheit in Bezug auf die Familie oder Freunde.	o	o	o	o	o	o	o
Unsicherheit in Bezug auf die Partnerschaft.	o	o	o	o	o	o	o
Unsicherheit in Bezug auf wichtige Lebensziele.	o	o	o	o	o	o	o

Inwieweit haben Sie sich in den letzten drei Monaten durch folgende Ereignisse und Probleme überfordert gefühlt?

	Nicht überfordert						Sehr stark überfordert
Schulden oder finanzielle Probleme	o	o	o	o	o	o	o
Wohnungssuche oder Hausbau	o	o	o	o	o	o	o
Leistungsdruck am Arbeitsplatz, im Studium, in Ausbildung oder Schule	o	o	o	o	o	o	o
Erwartungen und Ansprüche der Familie oder Freunde	o	o	o	o	o	o	o
Erwartungen und Ansprüche des Partners	o	o	o	o	o	o	o
gesundheitliche Probleme	o	o	o	o	o	o	o
eigene Erwartungen und Ansprüche	o	o	o	o	o	o	o

Stress und Druck können körperliche Symptome verursachen. Welche Symptome haben Sie bei sich in den letzten sechs Monaten beobachtet?

	trifft gar nicht zu	trifft eher nicht zu	trifft eher zu	trifft genau zu
Ich schlafe schlecht.	O	O	O	O
Ich leide häufig unter Magendrücken oder Bauchschmerzen.	O	O	O	O
Ich habe häufig das Gefühl einen Kloß im Hals zu haben.	O	O	O	O
Ich leide häufig unter Kopfschmerzen.	O	O	O	O
Ich grüble oft über mein Leben nach.	O	O	O	O
Ich bin oft traurig.	O	O	O	O
Ich habe oft zu nichts mehr Lust.	O	O	O	O
Ich habe stark ab- oder zugenommen (mehr als 5kg).	O	O	O	O
Meine Lust auf Sex ist deutlich zurückgegangen.	O	O	O	O
Ich ziehe mich häufig in mich selbst zurück und bin dann so versunken, dass ich nichts mehr mitbekomme.	O	O	O	O
Ich habe Zuckungen im Gesicht, die ich nicht kontrollieren kann.	O	O	O	O
Ich kann mich schlecht konzentrieren.	O	O	O	O
Ich habe Alpträume.	O	O	O	O

Inwieweit haben Sie sich in den letzten drei Monaten durch tatsächlich eingetretene negative Ereignisse belastet gefühlt?

	Nicht eingetreten / belastet						sehr stark belastet
Verlust von finanziellen Mitteln (mehr als 50.000 EUR)	O	O	O	O	O	O	O
Verlust von Wohnung oder Haus / Umzug / neuer Wohnort	O	O	O	O	O	O	O
Verlust von Arbeitsplatz, Ausbildungsplatz, Studienplatz oder Verweis von der Schule	O	O	O	O	O	O	O
Verlust von Familienangehörigen oder Freunden	O	O	O	O	O	O	O
Verlust oder Trennung vom Partner	O	O	O	O	O	O	O
Verlust von Gesundheit oder Handlungsfähigkeit	O	O	O	O	O	O	O
eigenes Scheitern in wichtigen Lebensbereichen	O	O	O	O	O	O	O