



UNIVERSITY OF TWENTE.

How to reduce the arousal in daily life by means of the Sense-IT ambulatory feedback app?

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March 2019

Master's thesis (10EC)

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Abstract

Background: Everyone knows the feeling of anger or anxiety in daily life. Often, we do not recognize these feelings consciously. The ambulatory biofeedback app Sense-IT is aimed to encourage emotional awareness. Till now, the app was only tested with people which are struggling detecting their own emotional arousal. But this problem does affect people of the broader population, too. To find new application areas for the Sense-IT app a qualitative study was carried out.

Objective: The aims of this study are (1) to find new application areas of the Sense-IT app, (2) to find specific user characteristics, (3) to examine the use of the app in daily life and (4) to analyse the users experiences regarding the system usability of the app.

Methods: A qualitative evaluative study was used with a semi-structured interview. The study was conducted with six participants, who got the task to use the app over a period of time in their daily life. Afterwards they had to fill in a questionnaire and were interviewed regarding their experiences.

Results: Nearly all participants benefitted from the use of the Sense-IT app, and the app seemed especially helpful in situations with some sort of responsibility or with a conflict. During the study, specific user characteristics could not be found. Some participants reported technical problems whereby the usability in daily life and the system usability were restricted.

Conclusions: The use of an ambulatory biofeedback app can be useful for people with mental disorder but also for people without. It requires that the person knows how and why to use the app. In the study some new application areas were found especially situations regarding uncontrollability. The Sense-IT app seemed to have some technical gaps that should be improved. Nevertheless, the app is a useful tool for people to learn better emotional regulation in daily life.

Samenvatting (Dutch abstract)

Achtergrond: Iedereen kent het gevoel van kwaadheid of angst in het dagelijks leven. Vaak nemen wij deze gevoelens niet bewust waar. De ambulante biofeedback app Sense-IT is ontwikkeld om het emotionele bewustzijn te bevorderen. Tot nu, de app wordt alleen met mensen getest die moeite hebben om hun eigen emotionele opwindingsniveau te nemen. Maar dit probleem betreft ook mensen uit de brede populatie. Om nieuwe toepassingsgebieden voor de Sense-IT-app te vinden, werd een kwalitatieve studie uitgevoerd.

Doelstelling: De doelen van deze studie zijn (1) nieuwe toepassingsgebieden voor de Sense-IT-app te vinden, (2) specifieke karakteristieken van gebruikers te vinden, (3) het gebruik van de app in het dagelijks leven te onderzoeken en (4) de ervaringen van de gebruikers met betrekking tot de systeem-gebruiksvriendelijkheid van de app te analyseren.

Methode: Er werd een kwalitatieve evaluatieve studie met een semigestructureerd interview gebruikt. De studie werd doorgevoerd met zes proefpersonen, die de opgave hadden om de app in hun dagelijks leven over een bepaalde periode te gebruiken. Daarna vulden ze een vragenlijst in en werden geïnterviewd met betrekking tot hun ervaringen.

Resultaten: Bijna alle proefpersonen profiteerden van het gebruik van de Sense-IT-app, en de app bleek vooral behulpzaam in situaties met een soort van verantwoordelijkheid of met een conflict. Tijdens de studie werden geen specifieke karakteristieken van gebruikers gevonden. Sommige proefpersonen vertelden dat ze technische problemen hadden wat de gebruiksvriendelijkheid in het dagelijks leven en de systeem-gebruiksvriendelijkheid beperkte.

Conclusie: Het gebruik van een ambulante biofeedback app kan nuttig zijn voor mensen met een mentale stoornis maar ook voor mensen zonder een mentale stoornis. Het vereist dat de personen weten hoe en waarom ze de app gebruiken. In de studie werden enige nieuwe toepassingsgebieden gevonden vooral oncontroleerbare situaties. De Sense-IT-app blijkt enige technische gaten te hebben die moeten worden verbeterd. Echter, de app is een bruikbaar hulpmiddel om een beter emotieregulatie in het dagelijks leven te leren.

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Introduction

Our everyday life is ever more determined through digitalization. In the age of smartwatches and fitness trackers people have lots of possibilities to measure many aspects of their life. Nowadays it is not only possible to report what they do or like, but they can measure their number of steps, heartbeats and pulse, calorie expenditure, body temperature or monitor their sleep rhythm (Moll, Schulze, Rusch-Rodosthenous, Kunke, & Scheibel, 2017), to name just a few potential applications. The generic term for such technologies is wearables. According to Kressbach (2018) wearables are “lightweight devices that can be worn as a bracelet, watch or clip, designed to track an individual’s movements among other vital features”. The so called wristwear is especially popular. As the name says, wristwear are wearables which are worn at the wrist (Moll et al., 2017). These includes smartwatches (e.g. Apple watch) or fitness trackers (e.g. Fitbit). Most people use them to monitor or optimize their fitness or health. For example, through the controlling of their heartrates during their training. A term for the use of wearables for the improvement of health, is mHealth (mobile health). According to Kedar (2015, p. 992) mHealth is “the intersection between Electronic Health (eHealth) and smartphone technology. The coverage of mHealth includes the acquisition, manipulation, classification, and transmission of health-related information.” There are several apps on the market, which support the improvement of health or fitness. With these apps you can set your personal goals which you want to reach. The apps in return support the user with, for example reminders or little praise when reaching a goal.

These technologies can also be used for the monitoring of internal states as a form of biofeedback. Biofeedback is in psychotherapy used as “a treatment technique in which people are trained to improve their physical and/or mental health by using signals from their own bodies.” (Dinut, 2017). Originally a therapy with biofeedback needed different machines to measure several body functions as muscle tension or brainwaves (Dinut, 2017). By means of wearables and mHealth apps, biofeedback reaches a new area for application. This opens the possibility to help people to pay more attention to their body signals. In a study from van Dijk, Westerink, Beute, and Ijsselsteijn (2015) “it was found that when participants are given feedback about their heart rate, their estimates of their stress level become more in tune with their heart rate.” This shows that mHealth can help people get a better understanding and estimation of their own body and consequently deal better with their emotions.

These facts were picked up in the development of the ambulatory biofeedback app “Sense-IT” (Derks, Klaassen, Westerhof, Bohlmeijer & Noordzij, 2019). It is “ambulatory”, because the app is connected to a smartwatch, which measures the heart rate of the user. When the heart rate reaches a certain level, the user gets tactile feedback. By that, they used biofeedback not as isolated treatment, but as a support of self-management in daily life of the user. In another study, the app RELAX was used to help veterans with PTSD diagnosis to deal with their aggression (Mackintosh et al., 2017). The user of RELAX has the possibility to monitor their heart rate but gets no tactile real-time feedback as well it is the case with the Sense-IT app.

In their design study, Derks et al. (2019) used the app to help patients with a borderline personality disorder to learn how to better monitor their emotional arousal. So, the aim of Sense-IT is to increase the user’s level of emotional awareness (Derks et al., 2019). Emotional awareness „is the ability to recognize emotions in oneself and others” and is crucial for emotion regulation (Novick-Kline, Turk, Mennin, Hoyt, & Gallagher, 2005). Emotion regulation is “the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one’s goals” (Thompson, 1994; pp. 27–28). According to Berking et al. (2008) deficits in emotion-regulation skills contribute to the development and maintenance of psychopathology. Even more, emotion-regulation skills are involved in maintaining mental health and related life aspects (Richardson, 2017). There are different strategies of emotion regulation. One of them, is called “response-focused emotion regulation strategy”. Which means that an intervention takes place before an emotional response is expressed behaviourally (Richardson, 2017). This is the point where Sense-IT can be used, namely, it cues the user that his heart rate is increased (emotion awareness) and gives him the chance to calm down or to think about his reaction (emotion regulation).

This study

The Sense-IT app was until now only examined with people who are known that they have difficulties to regulate their emotions. But some people of the broader population have a problem to regulate their emotions at stressful life events in their daily life, too, for example staying with the car in a traffic jam. Furthermore, it is stated that stressful life events in daily life have a greater impact on psychopathology than major life events (Pillow, Zaubtra, &

Sandler, 1996). Because of the great impact on mental health, it is also important to support people without mental problems in regulating their emotions in daily life.

This study aims to answer four research questions. The first research question is, in which situations do people experience the Sense-IT app as helpful or with other words, what are new application areas?

The second research question is if there are specific user characteristics regarding previous experiences, use of adjustments or intended use. This is relevant to understand for which target group the app would be suitable.

Because the users must use the app the whole day, it would be worth knowing how they experience it that the app accompanies them in their daily life. So, the third research question is, how the Sense-IT app fits in the daily life of the users.

The last research question refers to the system usability of the app. Because the app is still in development, it would be worth knowing how the users experience the usability of the app. So, the fourth research question is, what are the experiences of the users regarding the system usability of the app.

Thus, the research questions are:

1. 'In which situations do people use the ambulatory biofeedback app Sense-IT?',
2. 'Are there specific user characteristics regarding previous experiences, use of adjustments or intended use?',
3. 'How does the app fit in the daily life of the users?',
4. 'What are the experiences of the users regarding the system usability of the app?'

Method

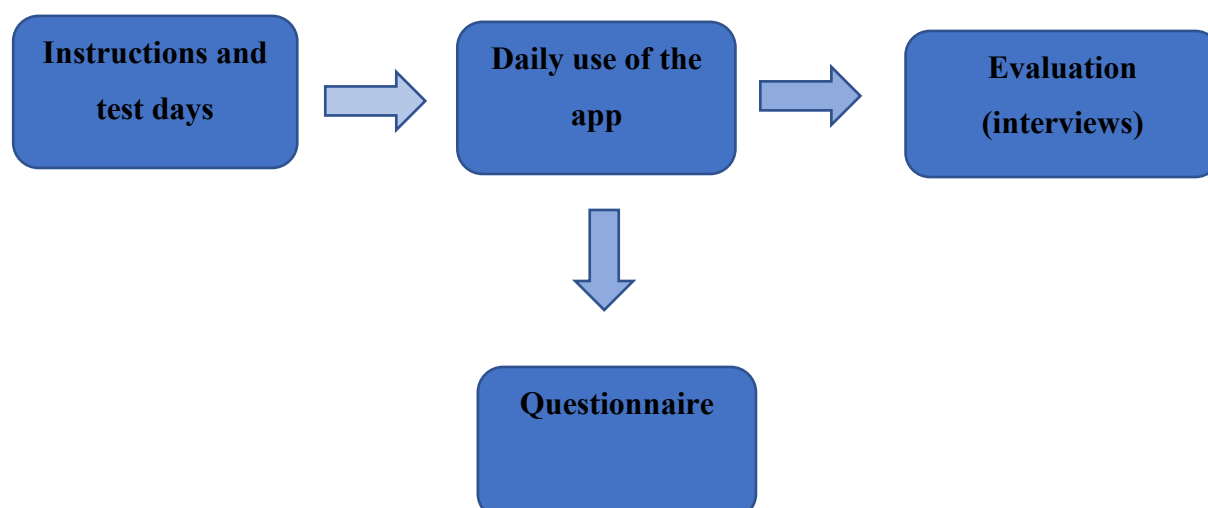


Figure 1. Research design

Study design

A qualitative evaluative study was used with an interview survey design in form of a semi-structured interview for the data collection.

Qualitative studies are used to emphasize an interpretive approach that both poses and resolves research questions (Kaplan & Duchon, 1988). Whereas quantitative research is often used to further refine already very narrow and well-studied constructs or to test strong and pre-determined hypotheses, qualitative research can generate novel insights into phenomena which are broader and more difficult to measure quantitatively (Marshall, 1996). Because experiences of the user, which is the main focus of this study, requires a lot of contextual information and very nuanced and sophisticated descriptions in a variety of different situations, a qualitative study design was administered.

Procedure

The study consisted of three phases (see Figure 1 for the study design): the instructions and test days, the daily use of the app and the evaluation through the interview.

For the first phase of the study the researcher met one time with every participant. At this meeting every participant got one smartwatch and, in case the participant owned no smartphone with an Android software, one smartphone. The participants got an informed consent to sign with all important information about the study and the processing and handling of their data (see Appendix A). The researcher answered all left questions and explained the procedure and how the smartwatch and the app work. Furthermore, she helped with the installation of the app on the smartphone and the smartwatch. The participants got the password for the setting menu, so that they could change the adjustments at any time. Additionally, the researcher wrote a standard text which were displayed whenever the heart rate reached a certain level. When the technical details are clarified the researcher explained and practiced the relaxation exercise with the participants. After that, a short interview was conducted about several user characteristics (see materials). The interviews were recorded by a smartphone. Finally, the participants got two questionnaires (see materials).

After that the participants had two days to get familiar with the app and the smartwatch (test days). Then the daily use of the app began. This phase last five days for each participant. Within these days they had the possibility to adjust the settings, so that it fitted to

the respective situations. The participants were asked to make a few notes at the end of each day, over the adjustments that were made and the respective situations (first questionnaire). Whenever they got a cue for the relaxation exercise, they were supposed to do the exercise. At the end of the five days the participants were asked to fill out a usability questionnaire and send both completed questionnaires per mail to the researcher, so that she could evaluate the answers for the interview.

The interviews were conducted one week after the end of the research phase. It was chosen for one week so that the researcher had enough time to evaluate the daily answers and the usability questionnaire. The interviews were conducted in German language. Furthermore, every interview was recorded by a smartphone. At the beginning of the interview the researcher explained the procedure of the interview (the aim of it, duration, recording, etc.). Then the interview questions were asked.

Participants

To find the participants, a combination of convenience sampling and purposive sampling was used. Convenience sampling and purposive sampling are both nonprobability sampling methods meaning that subjective methods are used to determine which elements are included in the sample. In other words, these two techniques are such in which not all potential participants have the same, non-zero chance of being selected into the sample. The sample consisted of people who were within the circle of friend and acquaintances of the researcher. Furthermore, they were selected to match certain criteria like reliability or generally a rather high level of arousal. Additionally, they should be easily accessible for the researcher because of the interviews and the if there are technical problems or questions. With this combination of two sampling methods the sample was gathered in an efficient, affordable but also purposefully manner.

The final study sample consisted of six participants, four women and two men. The participants were all Germans. The ages ranged from 23 to 57, with a mean age of 31,5 years ($SD = 12,24$). Two of the participants reported that they used no measurement of their physiology, two reported that they used smartwatches or fitness tracker to monitor their physical state while they worked out and two reported that they used sometimes smartwatches or fitness tracker. Three of the participants had a fulltime job and one participant worked as author at his own place. The other two participants were students with a side-job.

Materials

For the study were different materials used. For the research phase were used hardware (smartwatches and smartphones), software (application Sense-IT) and a relaxation exercise. For the data collection the researcher made use of interview questions and a usability questionnaire (SUS). These materials are presented below:

Hardware (smartwatches and smartphones)

For the study smartwatches (ticwatch E from Mobvoi) and the smartwatch application Sense-IT were used. The smartwatches were provided from the University of Twente for this study. They ran with Android OS. First, the smartwatch had to be connected to a smartphone. This worked only with smartphones that were running with a version of Android OS. To connect the two devices, the application “Wear OS” had to be installed on the smartphone. The both devices were connected via Bluetooth and optionally via Wi-Fi. Furthermore, on the smartphone had to be the GPS turned on. The participants who owned no Android-Smartphone got one borrowed from the University of Twente.

Software (Sense-IT)

The Sense-IT app was developed by Scelta, University of Twente, VUmc, Arkin and Pluryn. The aim of it is to recognize changes in emotional arousal and to learn to deal with them. The aim of it is to recognize changes in emotional arousal and to learn to deal with them. The language of the app is Dutch. For the installation of the app it is required to open a weblink. There is a handbook with all steps of the installation process explained. In Figure 2 is shown the start screen of the app.

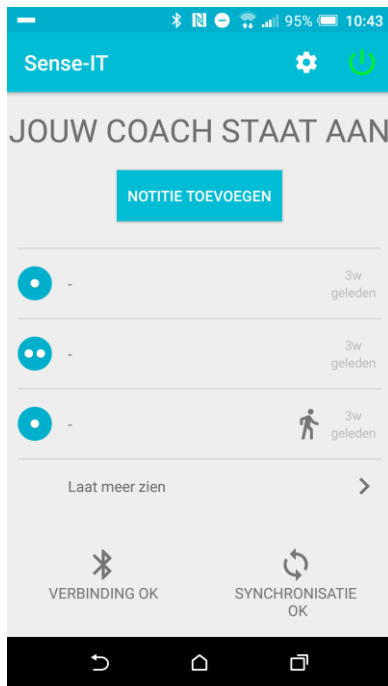


Figure 2. Start screen

In the middle of the start screen the last measured data are shown and there is a button for further notations. On the upper side are two buttons, the right one is the power button, is the other one is leads to the setting menu. On the bottom of the screen is on the left side shown if the app is connected with the smartwatch and on the right side is displayed if the data are synchronized. Before the settings menu is opened, a password must be entered. The setting menu consists of six different setting options (see Figures 3a to 3c).



Figure 3a. First part of the setting menu

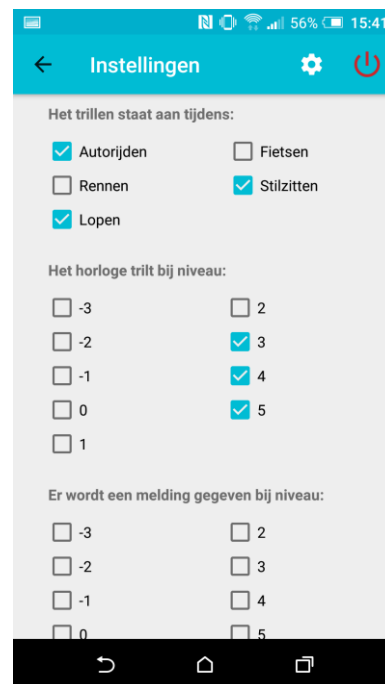


Figure 3b. Second part of the setting menu

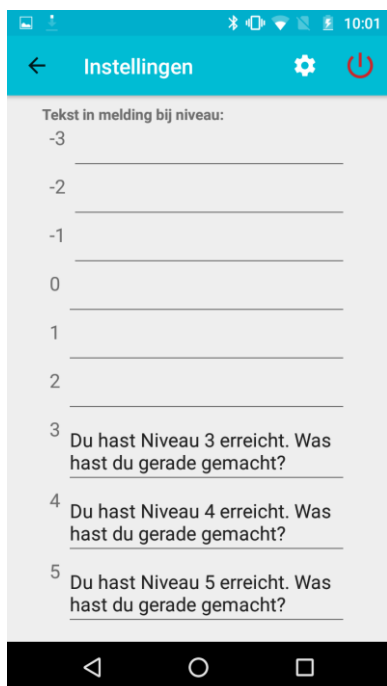


Figure 3c. Third part of the setting menu

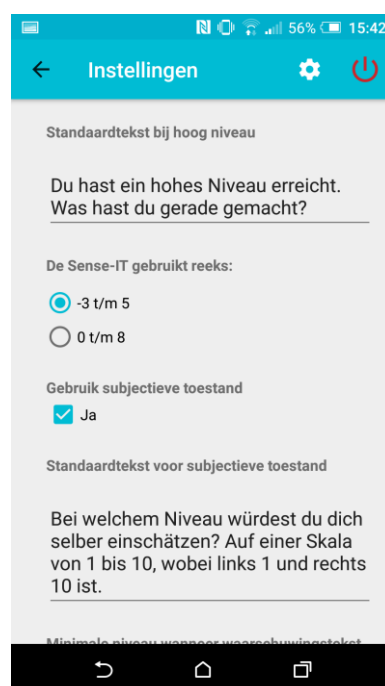


Figure 3d. Fourth part of the setting menu

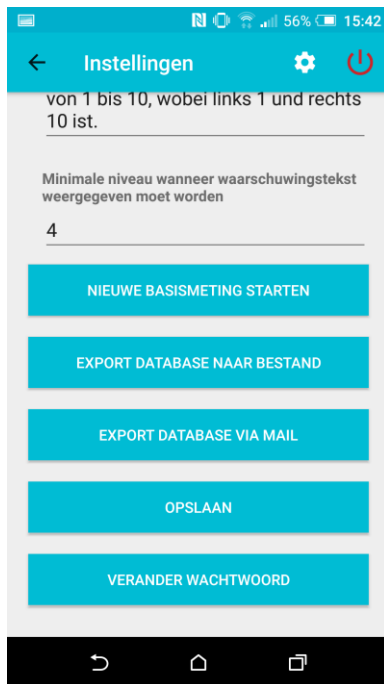


Figure 3e. Fifth part of the setting menu

These setting options are explained below:

1. User settings (Figure 3a): The user can enter his average heart rate and the standard deviation. The standard deviation indicates when a higher level is reached. Example: if the average heart rate is 70 and the standard deviation is 15, the smartwatch vibrates whenever the heart rate rises about 15 beatings. Furthermore, it is possible to adjust the sensitivity of the system. The user can choose between low, normal and high. Low means that the smartwatch vibrates whenever the heart rate rises about 30 beatings, and high whenever it rises about 7,5 beatings.
2. Seconds between measurements (Figure 3a): The user has the possibility to adjust the seconds between the measurements. The default setting is 20 seconds.
3. Number of measurements of the base measurement (Figure 3a): Hereby, the number of measurements of the base measurement can be adjusted.
4. The vibration is turned on ... (Figure 3b): The user can adjust at which activities the vibration is switched on/off. The different activities are: driving, running, walking, cycling and sitting calm.
5. The watch vibrates at level ... (Figure 3b): It can be adjusted at which level the smartwatch vibrates. The range is from -5 to 5.
6. Text in message at level ... (Figure 3c): The user can write a text message that will be displayed at the start screen whenever the respective level is reached.

7. Standard text at high level (Figure 3d): A text message can be formulated which is displayed whenever the heart rate reaches a certain level.
8. The Sense-IT uses ranges ... (Figure 3d): It can be adjusted which range should be used.
9. Use of subjective state (Figure 3d): The user can indicate their subjective state on a scale and write a text which should be shown at this scale.
10. Minimal level at which the text message must be displayed (Figure 3b): The minimal level at which the text message is shown, can be adjusted, too.

At the bottom of the screen are four buttons (see Figure 3e). The first one is to start a base measurement. The second and the third are to export the database. With the fourth one the new settings can be saved. The last one is to change the password.

When the smartwatch is connected to the app, the following watch design is displayed (see Figure 4). The circle in the middle grows with the rising of the heart rate. It reflects the different levels that can be adjusted.



Figure 4. Dial of the Sense-IT app

Questionnaires

There were two kinds of questionnaires used in the research phase. The first questionnaire consisted of three questions. Namely, which adjustments the participants used at that day, why they chosen these settings and in which situations they used the app. The participants were supposed to answer the questions at the end of each of the five days during the research phase. The researcher sent a document per mail to the participants. In this document were the questions for each day written with a few lines for the answers (see Appendix B).

Next to the functionality of the app, it was decided to examine the system usability as well. Usability is an important component of every mobile device and software. For this research, it was useful to know in which way the system usability possibly influenced the functionality of the system. Therefore, the System Usability Scale (SUS) from John Brooke in 1986 was used. The SUS consists of ten questions, which are based on a 5-point Likert scale. Because the participants were all Germans, a German version of the SUS was used (SAP User Experience Community, 2018). According to Bangor et al. (2008) the SUS has several advantages. First, the questionnaire is flexible and can be used for several “interface technologies”. Second, it is “quick and easy to use” and to analyse (Bangor, Kortum, & Miller, 2008). Finally, it is free available. The final scores range from 0 to 100. The higher the value, the better the usability. Five questions (1,3,5,7,9) are positive and five are negative (2,4,6,8,10) formulated (Liang et al., 2018). For the evaluation a document was provided at the same website. For this study, the word “system” in the questions was replaced with “the app” (see Appendix C).

Interview

The interviews were conducted in German language. All questions were conducted from the researcher. Since the 1990s the semi-structured interview diversified and evolved from a research strategy to an independent research method, which is increasingly used by a multitude of disciplines. The semi-structured interview is commonly used to ascertain subjective responses from study participants regarding a particular situation or phenomenon they experienced (Morse & Field, 1995). Regarding this study a semi-structured is advantageous due to the flexibility it gives the interviewer to further iterate certain aspects of the experiences of the users. In addition, the open-ended questions, which are the main characteristic of a semi-structured interview, give the participants the freedom to emphasize certain experiences over others which in turn leads to a well-rounded overview, subsuming highly individualized positive and negative user-feedback, while still being predicated upon theoretical assumptions and the points of emphasis the researcher has identified to be most relevant. Most of the time, open questions were used to avoid that the participants were directed in a certain direction. The interview questions consisted of twelve main questions with a few minor questions. The questions were subdivided into three parts (see Appendix B).

The first part referred to the user characteristics respectively if the participant had previous experience with self-tracking before the research started. This was used to answer

the second research question. To avoid that they mixed this previous experience with the experiences obtained during the research phase, the questions were asked at the beginning of the research. Other user characteristics that were asked, are the age of the participants and if they own a job. The age of the participants is relevant to see if there are differences between different age groups. Furthermore, there were some questions asked about the life circumstances of the participants to understand what stressful events in their life could be.

The second and third part of the interview took place at the second meeting with the participants. The second part referred to the first three research questions. This part started with a very broad question about the general experiences of the participant with the app. The question was used as opening question to make a smooth start of the interview. The succeeding questions were more specific. After the opening question, the interviewer asked about the situations in which the app was used. The participants were invited to describe the situations accurately as possible, so that the researcher gets a good impression of it. Further, it was asked what the participants did with the cueing. This question should clarify if the participants used the app as it was intended. From the first questionnaire it was known which adjustments the participants used at the five days. To answer the second research question, it was asked why they used the relevant adjustments. The fourth question of this part was about the experiences of the participant with using the app in their daily life. This should answer the third research question. Finally, it was asked about the experiences with the relaxation exercise. This question is not for answering any of the research questions, but it is still important to know if it had some added value to the participants.

The last part was about the system usability of the app Sense-IT and the hardware that were used. This was mainly explored through the questionnaire SUS, but the questionnaire only consisted of closed questions and there was no place for any suggestions for improvement. For this reason, two questions about the system usability was added to the interview.

Relaxation exercise

One way to regulate emotions is by doing a relaxation exercise. So, for this study a relaxation exercise was used as technique to calm down in stressful situations. It was chosen for a short breathing exercise that it is easy to perform for everyone and takes less time (“3 Deep Breathing Exercises to Calm Down From Every Stressful Situation.”, 2018) (see Appendix E).

Data analysis

The recorded interviews are transcribed by the researcher with the transcription program “f4”. The transcriptions were then analyzed with the program “Atlas.ti”. The analysis was made per research question. The interviews were analyzed per research question. Therefore, different codes were used. Based on the grounded theory, an inductive approach was used. This means that no underlying theory or structure was used to find codes or categories but based on the codes and categories a structure was found and described (Glaser & Strauss, 1967).

To analyze the situations in which the Sense-IT app was useful for the participants, the different situations were listed per participant and through comparative analyses the commonalities and differences between these situations were identified. There were some situations which fitted in more than one category. Furthermore, for this study, only situations with high arousal were of interest. Because of that, situations where the heart rate rose as a consequence of physical exertion were excluded.

For the answering of research question two, it was looked up which adjustments were used by the participants. Then the same adjustments got the same codes and at the end it was calculated, how often the same code appeared to see how often each of the adjustments were used. Furthermore, it was checked which participant used which adjustment, how often and why.

The analysis of the question how the app fits in the daily life of the participants, was similar to the analysis of research question two regarding the coding. First, the interviews were checked for things the participants experienced as burdensome or as no burden. Then, the findings were assigned to additional codes referring the features which were experienced as burdensome or not.

To answer the fourth research question, it was searched in the interviews what the participants said about the positive and the negative things of the app, especially the design and technical aspects.

To get the score of the SUS a specific calculation was required. This was explained in the article “A “quick and dirty” usability scale” from John Brooke (1996). Therefore, the answer options got a range from 0 to 4 assigned. For the items 1,3,5,7 and 9 the scale position must be calculated minus 1. For the items 2,4,6,8 and 10 it must be calculated 5 minus the scale position. Then, the sum of that score must be multiplied with 2.5. The resulting score is

a value between 0 and 100. The single scores are not meaningful, so they must be summarized to a Total SUS Score.

The quality of the system usability is “low marginal” with a score above 50 and “high marginal” with a score above 62. With a score above 70 the system usability is “passable” (Bangor, Kortum, & Miller, 2008). Figure 5 shows the different subdivisions of the SUS Score.

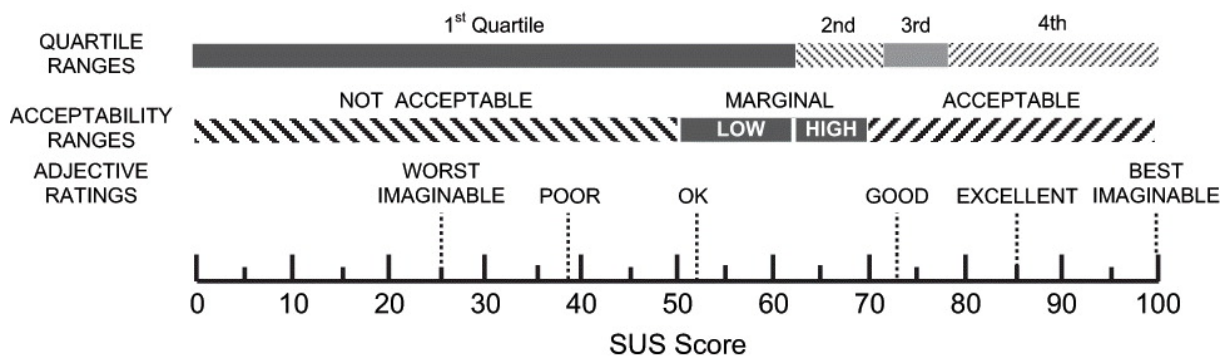


Figure 5. Subdivisions of the quality of the SUS Score (Bangor, Kortum, & Miller, 2008).

At the end, the different characteristics of the participants were combined with their experiences and it was checked about patterns.

Results

In the following section the results of the study will be presented. Each research questions will be answered separately. To get a first impression of the six participants and how they experienced the study, this section starts with the second research question.

User characteristics

The second research question was whether there are specific user characteristics could be regarding previous experience, used adjustments and the intended use. Therefore, Table 1 shows a short overview of the characteristics of the participants. Then follows a description of each participant. This starts with the person who had the most benefit of the app and ends with the person who benefited at least, whereby participant 3, 4 and 5 are similar regarding their benefits. Additionally, Table 2 shows the different adjustments per participant.

Table 1

Overview of the characteristics of the participants

	P1	P2	P3	P4	P5	P6
Age	23	57	36	23	25	25
Gender	Female	Male	Male	Female	Female	Female
Profession	Fulltime job	Fulltime job	Fulltime job	Student + Next job	Fulltime job	Student + Next job
Relationship	Relationship	Married	Married	Relationship	None	Relationship
Children	None	Two (25, 27)	None	None	None	None
Previous experience	Fitness tracker + Smartwatch	None	Fitness tracker	None	None	None

Notes. P = Participant

Table 2

Number of adjustments per participant

Settings	P1	P2	P3	P4	P5	P6	Total number of adjustments
Standard deviation	1						1
Sensibility		1					1
Seconds between measurements			1		1		2
Activities	2		3	2	1		8
Levels			3				3
Messages					1		1
Total	3	1	7	2	3		16

Notes. P = Participant

Participant 1

Participant 1 is a 23-year-old woman with a relationship. She lives with her parents and her younger sister. This participant has a fulltime job as preschool teacher and had some previous experiences with wearables. She used a fitness tracker for about three years and a smartwatch for three months. Since she owned the smartwatch, she did not use the fitness tracker anymore

because the smartwatch had the same functions and more as the fitness tracker. Primarily, she used the smartwatch to monitor the time and the running track while jogging, and for counting her steps in daily life.

Participant 1 was the only person who experienced the app not only as interesting for monitoring the bodily reactions, but as useful, especially at her workplace. Because of her previous experience with mindfulness and relaxation exercises through psychotherapy, she seemed to be more open to the use of the app. She reported that she used the app in stressful situations to calm down and to reflect on herself. Therefore, she made use of relaxation exercises she learned at her psychotherapy.

Three times she adjusted the settings of the app. She reduced the value of the standard deviation and switched the activities “Walking” and “Running” off and on.

I once changed the standard deviation one time. (...) Because for the one which was set before, there was no vibration. (...) That was way too high (P1).

Because she was sick and noticed that the watch vibrated during little physical activities, she wanted to know if this because of illness and switched the vibration of the two activities off. When she was well again, she switched it on, and the watch vibrated less.

Furthermore, she told that she found it good to have the possibility to adjust the settings.

I found it interesting to see that there are many possibilities ... so that you can try out on your own what is best for you. (...) That it isn't a prefabricated thing where one person had determined what is important, but that you can decide for yourself where, when and what is important (P1).

Participant 2

The second participant is a 57-year-old man who is married and has two sons, who are 27 and 25 years old. He works in a fulltime job. Furthermore, he told that he had no previous experiences with smartwatches or fitness tracker. The use of the smartwatch and the Sense-IT app was a new experience for him, and he dealt with such information of self-monitoring for the first time. During the two meetings it seemed that he was technically not so much advanced and with little confidence in the handling of the app and the smartwatch. He had a

few situations in which he became attentive about his own arousal. At one occasion he tried out the relaxation exercise with the success of calming down.

The main insight he gained through the study was the fact that his heart rate rises much when he is physical active, even if it does not seem or feel exhausting to him. Because of that, he thought about to let this check by a doctor.

Well, it confused me that such a physical exertion ... that this has so much effect on the heartbeat. I wouldn't have thought that. I don't know if I should think about that. Maybe, I should talk to a doctor (P2).

In Table 2 is shown that participant 2 only adjusted one time the settings. After the two test days, he set the sensibility from “normal” to “high”, because the watch vibrated barely.

Participant 3

Participant 3 is a 36-year-old man and works as author from his home office. He is married and has no children. For about two years he owns a fitness tracker, which he wears 24 hours a day and uses it especially for monitoring his heart rate and his running track while jogging. Participant 3 reported several situations where he noticed the vibration of the smartwatch, from watching an exhausting thriller up to the stressful shopping of Christmas presents. In two situations he tried out the relaxation exercise, whereby it helped him only at one situation to calm down. His conclusion of this study is that he experienced the use of the app as interesting, but he would not use it longer than two weeks. The most interesting fact for him was to see how his body reacts to external factors, although his subjective feeling differed from it. There were several situations where the watch vibrated because of a high level, but the participant felt relaxed.

But that my pulse was so high, I would not have thought that. Well, my subjective relaxation was much higher than it was actual (P3).

In his opinion, the app would be useful for people with problems like heart problems, but he did not see any reason for himself to use the app currently.

It is noticeable that he made the most adjustments of all participants (see Table 2). Most of the adjustments he did because the smartwatch vibrated too much.

I: You increased the seconds between the measurements. Because it was too often or why?

P: Yes, exactly. That was too often for me. (...) It vibrated too often and that ... I had ... I did not feel like it anymore. And then, I set it less (P3).

At one day he switched several functions of the app off because he was physically active much and the vibration was disturbing. Therefore, the possibility to adjust the settings to the needs of the user, was important for him.

I: Did you think it is important that you can change the settings on your own?

P: Yes, definitely. That was really important. (...) Because otherwise it (the smartwatch) would have vibrated in situations where it should not. And this would annoy me a lot (P3).

Participant 4

The fourth participant is also a 23-year-old woman. She is in a relationship and lives with her parents and her two younger brothers. Furthermore, she studies and works as a waiter in a coffee shop. Participant 4 told that she had no previous experiences with smartwatches or fitness tracker. She reported four situations where the smartwatch vibrated. These were especially stressful and emotional situations. She experienced the use of the app as interesting insight, but there were some technical or practical things that she perceived as disturbing. These were, for example, the size of the smartwatch. She was not used to wear any watch, especially not such a big watch, and it was disturbing at her next job when she had to carry several plates.

She had one situation where she used the app to calm down. This was when she got upset about an unfriendly bus driver. She recognized the vibration of the watch and was surprised that her heart rate was so high. Then, she took a few deep breaths and regulated her heart rate.

Participant 4 switched two activities off in the settings because the watch vibrated too much while her work as a waiter. She said that she experienced it as positive to have the possibility of adjusting the settings to her own needs.

You could adjust everything. I think it has a good range. You could adjust when it measures or when it does not. If it only vibrates at a high pulse or at a low pulse, too. I found it actually good (P4).

Participant 5

The fifth participant is a 25-year-old woman who works as at a health insurance in fulltime. She is single and lives alone in a flat. Furthermore, she told that she had no previous experiences with wearables. The Sense-IT app was interesting for her in situations in which she had responsibilities or had to assert herself. Participant 5 told that she experienced the use of the app mainly, as interesting, but reported from a situation where she became attentive to her arousal through the vibration and used it to calm down a little bit.

She used possibility of adjustments three times because the smartwatch vibrated too often.

I: And then, you wrote that you changed the time between the measurements from 30 to 90 seconds.

P: Yes, exactly. Yes, because it vibrated quite often. (...) when I was walking ten minutes, then it vibrated somehow ten times (P5).

Furthermore, she reported that she would not use the app in the future because she experienced the continuously vibration as disturbing.

Because somehow ... it is disturbing when it vibrates all the time (P5).

Participant 6

The sixth participant is a 25-year-old female student who has a next job with 20 hours per week. She is in a relationship and lives together with her boyfriend in a flat. Regarding previous experiences with smartwatches or fitness tracker, she told that this is the first contact with it. This participant experienced the app neither as useful nor as interesting instrument for monitoring, because her heart rate raised only in situations with physical activities.

Nevertheless, the participant did no adjustment of the settings because she thought they were good as they were. She reported that she found the structure and the intended use of the app good but had no benefit of it.

I think actually, that it (the app) isn't something for my person. I had no added value from the usage of the app (P6).

In summary, there is only one participant who used the app not only to monitor the heart rate but who used the Sense-IT app consciously to calm down or concentrate on herself.

Noticeable is that she is the only person who had experiences with psychotherapy. Therefore, she seems to be more open for such tools. Nearly all participants have benefitted of the use of the app. Only participant 6 had neither any benefit nor any insight by the use of the app. The possibility to adjust the settings was not used so much. Participant 3 was the only one who adjusted the settings several times depending on his needs. But all participants reported that it is important to have the possibility of adjustments. They found it important to determine themselves about the settings and what would be best for them.

Situations

The first research question referred to the different situations in which the participants would use the Sense-IT app. Participants together reported a total of 20 situations of interest. These could be categorized into six categories the app seemed useful or somehow interesting to the users, e.g. situations with responsibilities. The situations of the categories “conflict situations” and “situations with pressure to perform” overlap with the category “situations with responsibilities”. As mentioned before, participant six was the only one who had no situations reported where her heart rate increased because of any arousal.

In the following the six situation categories are described in more detail with excerpts from the interviews to support findings. Table 3 gives an overview of the six categories with a short definition and an example. Additionally, the number of codes and the number of codes per participant are shown.

Table 3

Overview of the categories per participant with definition and example.

Categories	Definition	nc	np	Example
Situations with responsibilities	Situations where the participants had a high heart	10	4	<i>He (a man with a car) stood in the middle of the street in the bend to (place) and first, we watched and slowed down (...)</i>

	rate because they were responsible for something.			<i>Then, we drove further and then he waved. In this moment I realized how my adrenaline shot up. (...) And then he came up to us bowed (...) and collapsed. We got out of the car and called the ambulance. (...) (P1)</i>
Conflict situations	Situations where the participants had a high heart rate because of a conflict with another person.	4	3	<i>I got out of the tram and then the bus came directly, and I started loading the ticket (on an app for driving with public transports). And the loading takes a little longer. So, I said to the bus driver that it takes a little longer. And he answered that I had to do it earlier. He said that really unfriendly and I recognized that I had to calm down. (...) I showed him my ticket very friendly and sat down and took a deep breath. (P4)</i>
Situations with leisure activities	Situations where the participants had a high heart rate because of a leisure activity.	3	1	<i>I watched a thriller and put up my feeds on the couch (...) And actually my pulse increased. I felt completely relaxed (...) Yes, in the thriller were exciting situations (...) (P3)</i>
Waiting situations	Situations where the participants had a high heart rate because they were forced to wait.	2	1	<i>Because I had time pressure. Because you hope that you get the right present (...) And, of course, it was overcrowded, just before Christmas. (...) and then you must wait at the level crossing. Yes, I experienced this as stressful. (P3)</i>
Situations with pressure to perform	Situations where the participants had a high heart	2	2	<i>Well, mostly I am very nervous at home when I have a performance and I know that I must sing alone. And this was a</i>

	rate because they had to perform.			<i>special situation for me because noon accompanied the first song. So, I had to sing alone without music and was on my own. (...) And I was totally scared because it was a little bit soprano (...) and my voice was not entirely as it should be. (P4)</i>
Emotional situations	Situations where the participants had a high heart rate because emotions.	1	1	<i>We were at the accident together. (...) and I told that my grandmother. That it happened to me. (...) and I noticed that (...) the pulse increased a little bit (...) Yes, and when I told my grandmother I got a signal from the watch. (P4)</i>

Note. nc = number of codes; np = number of persons who told such a situation

Situations with responsibilities

There were ten situations with responsibilities mentioned by four participants. This refers to situations where the participants were responsible for something or someone. Five out of the ten situations are situations at the workplace. Hereby, the participants were responsible for something to be done or to avoid anyone to get harmed. In these situations, the Sense-IT app made the participants aware of their high heart rate. Participant 4 told that she had a high arousal when many people came at the same time at her job as a waiter.

P: Yes, I think ... when ... sometimes all people come at the same time. (...) But then I think: "Oh, I must hurry up." Even though the people did not wait so long and then I stress myself. I: Because you are responsible therefore that everyone gets his coffee or meal? P: Exactly. (P4)

Participant 1 is responsible at her job that the children did not harm each other or that they get solved their conflicts.

The other five situations of this category are all situations which refer to car driving. Hereby the participants were responsible driving the car and to avoid an accident. Participant 2 had a situation where he had to slam on the breaks because the cars that were driving in front of him stopped suddenly.

I drove home in the evening (...) suddenly the cars in front of me stopped and I had to slam on the breaks. And at this emergency stop (...) my heart beat extremely fast. (P2)

In this situation participant 2 tried out the given relaxation exercise which actually helped him to decrease his arousal.

Conflict situations

As second category was chosen for situations in which the participants had a conflict with one or more persons. Four situations from three participants were assigned to this category. Most of these situations were frustrating for the participants because they were treated unfriendly or had to assert themselves.

I recognized it (the arousal) when I, for example, was solving conflicts with the children. And when my voice was growing louder, and I realized that I am annoyed. And then, when the watch vibrated, I said to myself: "So, maybe you think about it if your reaction is necessary or if you calm down now." (...) This was something that helped me at my job, that you realize that you reflect on yourself and how the children then react to that. (P1)

The app helped the participants to notice that they have an increased heart rate and in most of these situations they tried to calm down. They did not use the given relaxation exercise, but they took a deep breath or just relaxed by the recognition of their arousal.

Whenever something was difficult or someone who was rude on the phone, the pulse increased. (...) Well, then I said to myself: "Oh, the pulse is actually high, now you have to wait a moment and relax." (P5)

Situations with leisure activities

Participant 3 had three situations where he was surprised that his heart rate increased. This were all leisure activities. An example is (as shown in Table 3) when he was watching an exciting thriller on the sofa. Noticeable is that he felt in most of the situations completely relaxed nevertheless his heart rate was increased. Only when he was watching a football match of his favorite football club, he felt his arousal.

Waiting situations

For these category two situations were found at one participant. In these situations, participant 3 was forced to wait in his car but wanted to go on because he had time pressure (see Table 3). That made him restless and let his heart rate rise, so that the watch vibrated. At both situations he tried the given relaxation exercise. The first time, it helped him to calm down, but in the second situation he could not relax.

Yes, at the first time I felt that it helped a little bit. Because you focus on it (...) When I was getting the presents, I was too stressed to get engaged, I think. (P3)

Situations with pressure to perform

Two of the situations, already mentioned, could be assigned to another category, namely “situations with pressure to perform”. This means that the participants were under pressure to perform well in front of other people. Through this pressure their heart rate increased, so that the smartwatch got them a cue. Table 3 gives an example of participant 4. But both participants had not the possibility to calm down. In the case of participant 4, she was extremely nervous and had much time pressure, so she was neither in the constitution to calm down nor had she the time to do so.

Emotional situations

There was one situation of participant 4 that did not fit in any of the other categories. So, it was summarized under “emotional situations”. This was because her heart rate increased as reaction to her very emotional narration to her grandmother about the accident she saw (see example in Table 3). She recognized the vibration of the smartwatch but was not in the position to relax.

All in all, the participants found the app useful in situations where they were confronted with responsibilities and conflicts. To calm down, they had some sort of calmness necessary, most of the time, this was after a stressful event. Only one participant took the time to calm down during a stressful situation.

Use in daily life

The third research question referred to the experiences with the app in the daily lives of the users. The codes were divided into “no burden” and “burdensome”. Each of them is subdivided in three or four other codes. Table 4 represents the found codes per participant.

Table 4

Number of codes per person regarding the use in daily life

Codes	P1	P2	P3	P4	P5	P6	Total
No Burden	3	1	1	1	1	1	8
Wearing smartwatch		1			1		2
Vibration	1		1	1		1	4
Helpful	2						2
Burdensome		2	3	2	4		11
Wearing smartwatch				2			2
Vibration			1		2		3
Carrying smartphone		2			1		3
Connection lost			2		1		3

Notes. P = Participant

During the analysis there were eleven codes found referring burdensome experiences in daily life and eight codes referring no burden in daily life. Following Table 4, there were two people who found the use not burdensome at all. The aspects that were experienced as burdensome are unequally distributed. To wear the smartwatch was only for participant 4 unpleasant, because she was not used to wear a watch.

Because I never wore any watch before, it was quite ... I had to get used to it, because it was so ... pretty large for my wrist. I noticed it at work. When I was carrying plates, I had to juggle a little bit. (...) but because it was so large and slipped off my wrist, I had to make it really tight and that hurt a little bit, sometimes (P4).

Two participants mentioned that it was no problem to wear the smartwatch. One of them was a man who wears a watch every day. The other person has had a smartwatch herself and was used to wear one.

The continuous vibration of the watch was burdensome for two participants, against which four participants said that it was no burden for them. It is noticeable that participant 3 mentioned the vibration one time as burdensome and one time as no burden.

Yes, when you have found the right adjustments then it is pretty relaxing. You must find for yourself how often you want to get a cue, how intensive you want to do it. But when you have the adjustments as you want, then it is a nice thing. Definitely (P3).

I don't know, if I would completely integrate it in my daily life, because it would distract me too much, it would be too annoying. (...) It is ... the vibration ... I wouldn't integrate it in my daily life ... I don't think so. Let us say too stressful, too annoying. It would rather wake me up more (P3).

The other participants who experienced it as no burden, reported that they did recognize the vibration but not as something disturbing.

But at the end I did not ... I perceived it, but no longer as ... I did not experience it as disturbing (P4).

Another aspect that was burdensome for two participants was the fact that they had to carry the smartphone the whole time with them. Both reported that they were not used to it and forgot it sometimes.

P: (...) This combination of smartphone and watch is for me difficult, as someone who has barely or nothing to do with smartphones.

I: You mean, to carry the smartphone the whole time with you or nearby?

P: Exactly, always to have it in the jacket or wherever. This is not me (P2).

Another big problem during the use of the app was the loss of the connection between smartphone and smartwatch and two participants said that they found it annoying.

I was bothered that it constantly lost the connection. It was always interrupted, and I think for almost a whole day it didn't work at all, and I had to shut down the smartphone and the watch

and start them again. And it still did not work so then I charged it. Then, it worked again, but then, again, it did not work. (...) (P5)

One really positive thing that must be mentioned, was the statement of participant 1 who experienced the app as really helpful in her daily life, especially at her workplace with the children.

Yeah, because it somehow ... well, it reminds you. In my opinion. So, it lets your mind focus on the situation, (...). Somehow it brings mindfulness. (P1)

System usability

The experiences of the user regarding the system usability of the app was answered with two instruments. On the one hand, there was the questionnaire SUS which gives a quantitative statement. On the other hand, there were the interview questions which give more detailed information.

The single scores of the participants are shown in Figure 5 with the Total SUS score as green bar. So, the participants evaluated the app very similar. But as mentioned above, the single scores are not convincing on their own. The analysis of the SUS gave a Total SUS Score of 67.5. This means that the quality of the Sense-IT app is in the higher marginal subdivision of the scale in Figure 5.

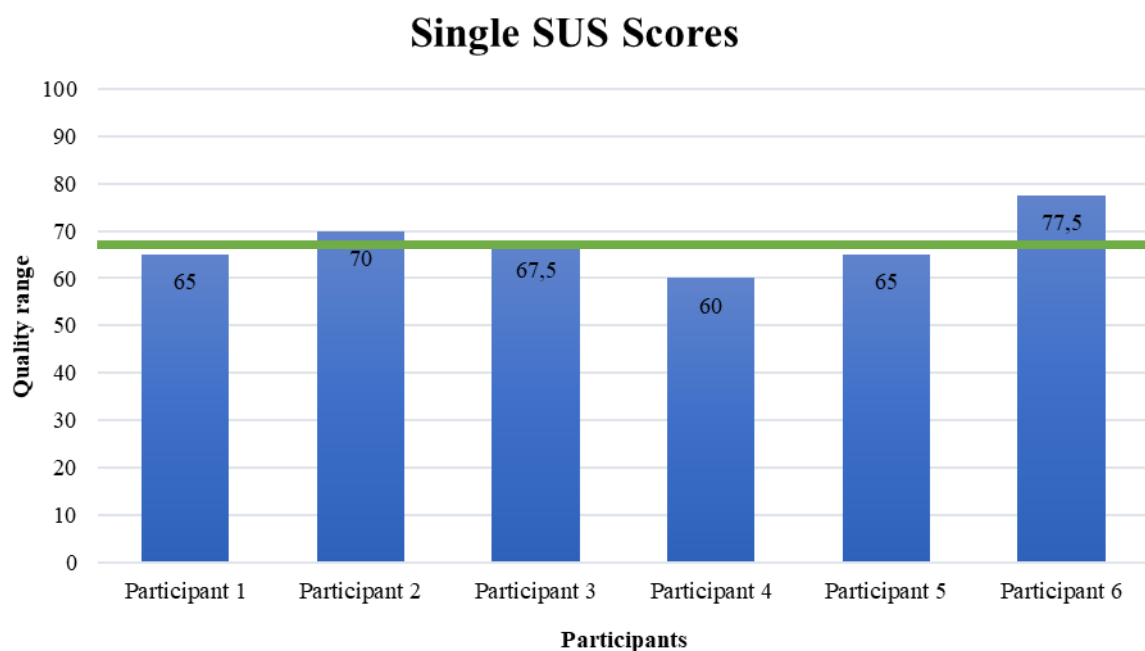


Figure 5. Single SUS Scores of the participants with the Total SUS Score drawn (green bar)

From the analysis of the interviews can be seen that all participants have had technical problems. In total there were 18 codes found regarding technical problems. Twelve codes were found regarding the simple usability of the Sense-IT app. Hereby, all participants were represented, too. Two participants had problems with the overview of the measurements. The number of codes per participant is shown in Table 5.

Table 5

Number of codes per participant regarding the system usability

Codes	P1	P2	P3	P4	P5	P6	Total
Technical problems	3	6	3	2	2	2	18
Levels		1				1	2
Synchronization/Connection	2	1	1	1	1	1	7
Battery	1	1		1	1		4
Other		3	2				5
Simple usability	3	1	1	1	4	2	12
General	1	1	1	1	2	2	8
Adjustments	1				1		2
Handling	1				1		2
Overview measurements	1	1					2

Notes. P = Participant

As it can be seen in Table 5, participant 2 had the most technical problems with the app. All participants have had problems with the synchronization or the connection between the smartphone and the smartwatch.

Sometimes I had the impression that it not synchronized enough. Sometimes were the synchronization off and it had no connection to the watch. Then I had to open the app, switch it off and on, then it was connected again. This was annoying a little bit, because it happened 20 or 30 times per day and the watch vibrated each time (P3).

Furthermore, another big problem for most of the participants were the battery life. The battery lasted only approximately five hours. So that the participants had to charge it several times a day.

Well, it (the smartwatch) was actually after five hours empty. And then I had to, I think, I had to charge it two or three times per day. This was annoying. I found it interesting to use the app, but I think, in the long run, I wouldn't do that (P5).

Two of the participants had problems with the levels. The levels that were shown on the watch were different than that ones shown in the app.

Then, I was confused about the different levels. That means, when on the watch was shown a 1, but in the app, it was 4 points (P2).

There were five single technical problems that were summerized with “other technical problems”. For example, participant 2 had the problem that in the overview of the measurements were only the last three days shown. And two times were the dial automatically changed.

The participants reported eight times that they experienced the use of the app as simple and two participants found the handling and the adjustments simple.

It was actually simple. I think, the app is for the daily use good, because I had the impression that you can use it well and the usage is very simple (P6).

The overview of the measurements should be more structured for two persons.

Well, what I experienced as difficult ... you just had the start screen and there were all messages from the watch. (...) Well, this could be more structured, because you can't reconstruct for example ... when there is written “a week ago”, but you can't reconstruct which day or time that was (P1).

Conclusions and Discussion

The purpose of this study was to examine whether the Sense-IT app could be useful in the daily life of people of the broader population and how they experienced the usage. The answers to the four research questions will be discussed separately with a general conclusion at the end.

The aim of the first research question was to clarify in which situations the broader population would use the Sense-IT app. There were some situations in which the heart rate of the participants increased, but there was no need to calm down, for example when watching a thriller. In the other situations the participants were all under some kind of pressure when the smartwatch vibrated. This happened especially in situations in which the participants were responsible for someone or something or in which they had a conflict. Another aspect of the situations with responsibilities is that there was some sort of uncontrollability. These findings agree with the results of the Trier Social Stress test, which also contains the components “social evaluative threat and uncontrollability “ which induce stress (Zimmer, Buttlar, Halbeisen, Walther, & Domes, 2019). This leads to the conclusion that the Sense-IT app probably is suitable for people which are often confronted with situations containing uncontrollability or conflicts such as executives or people with social anxiety. For further research, it could be interesting to examine if these groups could have some added value by the usage of the app.

The second research question was aimed to find specific user characteristics. In response to that question, nearly all participants reported to have benefitted somehow from the app and could calm down themselves at one or more times. To accomplish this, most of them used their own technique and not the given relaxation exercise. Perhaps, it is necessary to practice the exercise for a successful usage in stress situations. But participant 1 had the most benefit by the Sense-IT app. She is the only one who described the app as helpful and would use it in her daily life. As mentioned before, a reason for that is possibly that she was more open for such tools through her previous experience with self-reflection and mindfulness. In total the participants did not make much adjustments of the settings. A possibly reason could be that the research periode was too short, so that the participants had not enough time to get familiar with the technique and dare to try out more different settings. Another reason could be that they just did not need any adjustments because the settings were good as they were. Participant 3 was the only one who exploited the possibility of adjusting the settings. Maybe, because he feels more comfortable with technical things through his

previous experience with fitness tracker and likes to try out technical things. It is notable that all participants reported that they experienced it as good and important to have the possibility to adjust the settings based on their own needs. That means that personalization is an important aspect of the Sense-IT app. This can be confirmed through Lentferink et al. (2017) who wrote in their article that personalization of technical features is important for the usability of an eHealth intervention. It must be mentioned that there were too less participants to find significant user characteristics. It can only be speculated which characteristics a user of the Sense-IT app must own. The question remains what exactly people of the broader population need, to be able to use the app successfully. Because of the possible greater openness of the participant with psychotherapy experience, another subject for further research could be to what extent the app would be useful regarding other mental problems such as anxiety disorders or people with aggression problems.

The results of research question three about the daily use of the app showed that most of the participants experienced the use of the app at some point as burdensome. Two participants mentioned no burden by the app or the smartwatch. Overall there were not so many features of the app that the participants experienced as disturbing, even though they reported more negative things than positive. A reason for that could be that people tend to recognize more the negative things than the positive ones (Liebrecht, Hustinx, & van Mulken, 2019). Furthermore, the feedback strongly depends also on the questions of the interviewer. In some of the interviews some new questions regarding the daily use or the usability came up out of the conversation. For the participants, it was important that the connection between the smartwatch and the smartphone should function without any disruption. This was also one of the outcomes of the design study of Derks et al. (2019). To wear the smartwatch and to carry the smartphone with you, are two things that cannot be changed when using the app. Only the technical features as the continuous vibration of the watch and the loss of connection could be improved. So, with some improvement the Sense-IT app could be a good tool in daily life.

Following the SUS Score, the system usability of the app is “ok” (see figure 5) but not “acceptable”. Therefore, this aspect could be improved but on the positive side the handling of the app was evaluated as simple by all participants. This could be explained by the fact that the app is still in development. When the technical problems are resolved it would be worth investigating if the system usability gets a better evaluation.

To the already mentioned criticism about the app, there are some additional points which should be discussed. One participant mentioned that her friends recognized the

vibration of the smartwatch and wanted to know what it is. It can be embarrassing for people when their social environment knows that their heart rate increased when the watch vibrates. According to Gilmartin et al. (2018) there is some risk that “devices that constantly record health parameters may result in patients developing increased anxiety through noting slight non-pathological deviations from their baselines”. On the other hand, people could become attentive to any physical problem for example heart issues.

All in all, the participants had all some kind of benefit by the use of Sense-IT, except one participant. New application areas for the app were found such as uncontrollable situations, but with the limitation that people must be informed before the usage, when and how the app could be helpful for them. These findings suggest that in addition to current therapeutic applications of mHealth in the context of mental disorders smartwatch applications can have wider relevance for people without mental health problems in everyday life. The app helps the user to focus on the situation and to reflect their emotions and their behaviour which is important for coping with stressful situations and could enhance resilience (Crane, Searle, Kangas, & Nwiran, 2018). The study also showed that the handling of the app is seen as simple but there are some improvements of the technical aspects are necessary. Despite the technical weaknesses of the app, it is a useful tool to learn better emotional regulation in daily life.

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Appendix A: Informed consent

Einverständniserklärung

Projekttitel

Wie reduziert man Anspannung im täglichen Leben mithilfe einer e-coaching App?

Ziel der Studie

Diese Studie wird durchgeführt von Sabine Kern. Das Ziel dieser Studie ist es zu verstehen in welchen Situationen die Nutzung der App „Sense-IT“ sinnvoll ist und wie diese in den Alltag passt. Das allgemeine Ziel dieser Studie ist es neue Anwendungsgebiete zu finden für „Sense-IT“ und die App für den Nutzer zu verbessern.

Durchführung

Du wirst an einem Interview teilnehmen, das etwa eine Stunde dauert. Von diesem Interview wird eine Audioaufnahme gemacht als Hilfe für die spätere Auswertung. Bei dem Interview werden dir Fragen gestellt über deine Erfahrungen mit „Sense-IT“. Ein Beispielfrage ist: „In welchen Situationen war die App für dich relevant?“

Mögliche Risiken und Beschwerden

Es bestehen keine offensichtlichen physischen, rechtlichen oder wirtschaftlichen Risiken bei der Teilnahme an dieser Studie. Du musst keine Fragen beantworten, die du nicht beantworten möchtest. Deine Teilnahme ist freiwillig und du hast die Möglichkeit deine Teilnahme zu jeder Zeit zu beenden.

Vertraulichkeit

In der Studie werden keine persönlichen Informationen genannt, die eine Identifizierung möglich machen. Nur geschultes Forschungspersonal wird Zugang haben zu deinen Antworten. Bei Anfrage hast du die Möglichkeit die Resultate dieser Studie einzusehen.

Zu Beginn der Untersuchung wird dein Name codiert. Wie bereits erwähnt, die Untersuchung beinhaltet Audioaufnahmen des Interviews. Es ist möglich, dass transkribierte Teile dieser Aufnahme veröffentlicht werden (z.B. Zeitungsartikel). In diesem Falle werden Pseudonyme verwendet. Alle Dokumente, Aufnahmen oder Daten, die als Teil dieser Studie erstellt oder gesammelt werden, werden an einem sicheren Ort in der Universität Twente oder auf einem passwortgesicherten Computer aufbewahrt und werden nach zehn Jahren gelöscht.

Rücktrittsrecht und Fragen

Deine Teilnahme an dieser Untersuchung ist völlig freiwillig. Du kannst jederzeit von der Teilnahme zurücktreten. Die Daten, die bis dahin gesammelt wurden, werden jedoch in dieser Studie verwendet.

Wenn du dich entscheidest deine Teilnahme an der Studie zu beenden, Fragen, Bedenken oder Beschwerden hast, kontaktiere bitte:

Dr. Anneke M. Sools (a.m.sools@utwente.nl)

Einverständnis

Mit deiner Unterschrift bestätigst du, dass du mindestens 16 Jahre alt bist, diese Einverständniserklärung gelesen hast, deine Fragen zu deiner Zufriedenheit beantwortet wurden und du freiwillig an dieser Studie teilnimmst. Du erhältst im Anschluss eine Kopie dieser Erklärung.

Ich erkläre mich einverstanden an dem Forschungsprojekt, geleitet von Sabine Kern, teilzunehmen.

1. Ich habe ausreichend Informationen über das Forschungsprojekt erhalten. Der Zweck meiner Teilnamen als Interviewpartner in diesem Projekt wurde mir erklärt und ist für mich verständlich.
2. Meine Teilnahme ist freiwillig. Es besteht kein expliziter oder impliziter Zwang zur Teilnahme.
3. Die Teilnahme beinhaltet, dass ich durch einen Untersucher der Universität Twente interviewt werde. Das Interview wird ungefähr 60 Minuten dauern. Ich stimme zu, dass während des Interviews Notizen gemacht werden und das Interview (durch eine Audioaufnahme) aufgenommen wird. Mir ist klar, dass ich zu jeder Zeit ohne Begründung von der Teilnahme zurücktreten kann, wenn ich nicht möchte, dass das Interview aufgenommen wird.
4. Ich habe das Recht keine der Fragen zu beantworten. Wenn ich mich während des Interviews unwohl fühle, habe ich das Recht dieses zu beenden.
5. Mir wurde versichert, dass der Untersucher alle meine Daten und Informationen unkenntlich macht, wenn ich dies wünsche.
6. Mir wurde versichert, dass dieses Forschungsprojekt von Dr. Anneke M. Sools und dem BMS Ethics Committee überprüft und genehmigt wurde. Für Probleme oder andere Fragen bezüglich dieses Projekts kann das Secretary of the Ethics Commission of the faculty Behavioural, Management and Social Sciences at University Twente (ethicscommittee-bms@utwente.nl) kontaktiert werden.
7. Ich habe die Aussagen dieses Formulars gelesen und verstanden. Alle Fragen wurden zu meiner Zufriedenheit beantwortet, und ich stimme freiwillig der Teilnahme an dieser Studie zu.
8. Mir wurde eine Kopie dieser Einverständniserklärung ausgehändigt.

Name Teilnehmer

Unterschrift

Datum

Name Untersucher

Unterschrift

Datum

Appendix B: Interview schema

First part: User characteristics (research question 2)

1. What is your age?
2. What do you do for a living?
3. Are you in a relationship or married?
4. Do you have children? How old?
5. What are your experiences with smartwatches or fitness tracker till now?
 - a. For what did you use the smartwatch or fitness tracker?
 - b. How long did you use the smartwatch or fitness tracker?
 - c. How did you experience the use of the smartwatch or fitness tracker?

Second part: Situations, adjustments and use in daily life (research questions 1-3)

1. What was your experience with the Sense-IT app? (opening question)
2. In which situations was the app relevant for you? (research question 1)
 - a. Could you describe the situation as if a camera runs with you?
 - b. What did you do with the cueing?
3. Are there any situations that we did not talked about?
4. Why did you choose these adjustments? (research question 2)
5. How did you experience ... (research question 3)
 - a. the use of the app in your daily life?
 - b. the cueing in your daily life?
 - c. the functionality of the app in your daily life?
6. Did you use the relaxation exercise?
 - a. In which situations?
 - b. What was your experience when you used the exercise?
 - c. What was your experience to use the exercise in your daily life?
 - d. What was missing about using the exercise?
 - e. What did you like about using the exercise?

Third part: System usability (research question 4)

1. What could be improved or was there something that you missed ...
 - a. about the functioning of the app?
 - b. about the handling of the smartwatch and the app?

2. Which strengths did you find ...
 - a. about the functioning of the app?
 - b. about the handling of the smartwatch and the app?

Appendix C: Questions about the daily use

Fragebogen zum täglichen Gebrauch der App

Name:

Datum:

1. Welche Einstellungen in der App hast du heute benutzt?

a. Warum hast du diese Einstellungen benutzt?

2. In welchen Situationen heute hast du auf das Vibrieren der Smartwatch geachtet bzw. war dir bewusst, dass dein Puls erhöht ist?

Appendix D: System Usability Scale (SUS)

Fragebogen zur System-Gebrauchstauglichkeit

Name: _____

Bitte lies jede Frage aufmerksam durch und kreuze jeweils die für dich zutreffendste Antwort an. Bei diesem Fragebogen gibt es keine richtigen oder falschen Antworten, es geht um deinen Eindruck.

Achte bitte darauf, dass du keine Aussage auslässt.

1. Ich denke, dass ich die App gerne häufig benutzen würde.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Ich fand die App unnötig komplex.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Ich fand die App einfach zu benutzen.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. Ich glaube, ich würde die Hilfe einer technisch versierten Person benötigen, um die App benutzen zu können.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Ich fand, die verschiedenen Funktionen in dieser App waren gut integriert.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Ich denke, die App enthielt zu viele Inkonsistenzen.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Ich kann mir vorstellen, dass die meisten Menschen den Umgang mit dieser App sehr schnell lernen.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Ich fand die App sehr umständlich zu nutzen.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Ich fühlte mich bei der Benutzung der App sehr sicher.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. Ich musste eine Menge lernen, bevor ich anfangen konnte die App zu verwenden.

Stimme überhaupt nicht zu 1	2	3	4	Stimme voll zu 5
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix E: Breathing Exercise

1. Inhale for a count of four.
2. Hold for a count of four.
3. Exhale for a count of four.
4. Wait for a count of four.
5. Repeat until you feel calm and centered again.