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The Paradoxical Impact of Mobile Health Applications: Why People Stop Using Them.

Master's Thesis in Marketing
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Abstract

The objective of this study was to gain insight into what paradoxes users of mobile health applications (mHealth apps) experience and why people stop using mHealth apps. The results of the interviews and Sentence Completions Method among 12 respondents who stopped using mHealth apps revealed five main paradoxes were experienced and showed several reasons why these people stopped using the apps. Furthermore, the results indicated different phases when using mHealth apps. The first phase consists of the initial motivation, whereas respondents value receiving support of mHealth apps and receiving factual self-tracking information. Hereafter, respondents experienced positive and negative aspects of the apps that resulted in the paradoxes that were identified. These five paradoxes are integration/ disintegration, self-control/ external control, confirmation/ disconfirmation, individual/ community, and motivation/ demotivation. When the dark sides of mHealth apps dominate, and the wrong side of the paradox has the upper hand, people stopped using the mHealth apps. Moreover, the results indicate respondents had experienced several negative aspects before they stopped using the apps. The most prevalent were frustration, pressure, and the time-consuming aspect.

Keywords: *paradox, stopping behavior, self-tracking, dark sides.*

Preface

First of all, I would like to take this opportunity to thank Csilla Horváth for her guidance and feedback during my Master's thesis. Especially in the beginning, she helped me with finding a suitable topic of my interest. Besides, during the process of writing this thesis, she challenged me and pushed me to the limit to get the best result possible. Also, I would like to thank Olga Tsoumani for being my second examiner. Furthermore, I want to thank my respondents for participating in my research. Lastly, I would like to thank my family, boyfriend, and friends who always supported me and motivated me while finalizing this Master's thesis.

Table of contents

1 Introduction	6
<i>1.1 Problem description</i>	<i>6</i>
<i>1.2 Relevance of the topic</i>	<i>7</i>
<i>1.3 Objective of the thesis</i>	<i>8</i>
<i>1.4 Thesis outline</i>	<i>9</i>
2 Theoretical background.....	10
<i>2.1 The paradox concept.....</i>	<i>10</i>
<i>2.2 Paradoxes in the usage of smartphones.....</i>	<i>11</i>
<i>2.3 Self-tracking applications</i>	<i>12</i>
<i>2.4 MHealth applications.....</i>	<i>13</i>
<i>2.5 Paradoxes in mHealth applications</i>	<i>13</i>
3 Methodology.....	16
<i>3.1 Research methods</i>	<i>16</i>
<i>3.2 Sample characteristics</i>	<i>17</i>
<i>3.3 Research design</i>	<i>17</i>
<i>3.4 Data analysis</i>	<i>19</i>
4 Results.....	20
<i>4.1 Introduction.....</i>	<i>20</i>
<i>4.2 Initial motivation.....</i>	<i>20</i>
4.2.1 Helping hand	21
4.2.2 Getting insight	21
<i>4.3 Key positive aspects</i>	<i>22</i>
<i>4.4 Key negative aspects.....</i>	<i>23</i>
<i>4.5 Paradoxes</i>	<i>25</i>
4.5.1 Integration/ Disintegration.....	26
4.5.2 Self-control/ External control	27
4.5.3 Confirmation/ Disconfirmation	28
4.5.4 Individual/ Community	29
4.5.5 Motivating/ Demotivating.....	30
<i>4.6 Dynamics</i>	<i>33</i>
<i>4.7 Future perspective.....</i>	<i>34</i>
5. Discussion.....	36
<i>5.1 General discussion</i>	<i>36</i>
<i>5.2 Conclusion.....</i>	<i>41</i>
<i>5.3 Theoretical contribution</i>	<i>42</i>
<i>5.4 Managerial implications</i>	<i>43</i>
<i>5.5 Limitations and recommendations for further research</i>	<i>44</i>

References	46
Appendices	55
<i>Appendix A: Interview Guide English</i>	55
<i>Appendix B: Interview Guide Dutch</i>	58
<i>Appendix C: Category Definition</i>	61

1 Introduction

1.1 Problem description

In recent years, digital technologies are progressing rapidly in industries and society. As of March 2019, 56.8% of the world's population used the internet, and it is forecasted that by 2025 38.6 billion smart devices will be used (Galov, 2021). These digital technologies are changing industries and society at large (Vial, 2019). Moreover, they are affecting our daily lives and became part of it (Poola, 2017). On top of that, they are especially influencing the healthcare industry (Oliver, Mossialos, & Robinson, 2004).

According to a survey of Mobile Health News, one in three internet-connected people tracks their health (Comstock, 2016). Since this survey was conducted in 2016, it can be expected to be even more five years later. Overall, the tracking of health can be seen as a growing aspect nowadays and is, therefore, an interesting subject to further explore. The most popular aspect among consumers is to monitor themselves through applications on smart devices, which refers to "self-tracking" (Neff & Nafus, 2016; Lupton, 2014, 2017). Self-tracking can be performed through mobile health applications (shortened to mHealth apps) on a smartphone or another (wearable) smart device (e.g. a smartwatch). MHealth apps differ widely from measuring the number of steps a day to apps with diagnostic tools. These apps can constantly monitor the user (Smahel, Elavsky, & Machackova, 2017) and produce personal data as a consequence of the monitoring.

Digital technology is one of the most intrusive technologies in our daily life (Rotondi, Stanca, & Tomasuolo, 2017), especially since the number of smartphone users is enormously rising in the past few years. In 2020, even 3.5 billion smartphones were used worldwide (O'Dea, 2020), and owners use their smartphones approximately 5 hours a day (Andrews, Ellis, Shaw, & Piwek, 2015). Although digital technologies increase communication with other human beings (Xia, Yang, Wang & Vinel, 2012) can be seen as a bright side of technology (Zolfagharian & Yazdanparast, 2017), these may simultaneously create challenges for human beings, which are referred to the dark side of technology (Zolfagharian & Yazdanparast, 2017). Even though digital technologies positively affect people's lives by making them more connected with other human beings and more flexible (Ter Hoeven, van Zoonen, & Fonner, 2016), it may simultaneously negatively affect people's lives by making them feel distancing from other humans or even cause addiction to the smartphone (Coleman & Shane, 2011; Panova & Carbonell, 2018; Lee, Chang, & Cheng, 2014). Reid, Reid, and Vigil (2018) refer to

paradoxical experiences when pointing to these contradictions that people are experiencing when using smartphones.

Past studies argue that simultaneously experiencing positive and negative consequences of technology arise in paradoxes (Mick & Fournier, 1998; Reid et al., 2018; Jarvenpaa & Lang, 2005). In line with this, Mick and Fournier (1998) have highlighted the aspect of paradoxes in technology. They found eight paradoxes when using technology, such as both having control over the technological device and experiencing chaos, and the feeling of fulfilment due to technology and the creation of needs.

Even though the paradoxes that were introduced in the literature (Mick & Fournier, 1998) are applied to different fields of research like psychology, it is scarce in the literature of consumer behavior. Moreover, since mHealth apps are frequently used and still upcoming nowadays, it is an interesting field to further explore the paradoxes, especially because the literature lacks in this domain. The little literature in this specific domain focuses on the users of mHealth apps (Klintwort, 2018; Vaghefi & Tulu, 2019; Zhu et al., 2021; Guo, Cheng, Zhang, Ju, & Wang, 2020). Those are the ones for whom typically the benefits and/ or expectations of using the mHealth apps are higher than the costs and/ or the negative sides of using these apps. However, there is no literature found about the people who used to use mHealth apps but decided to stop using them. These people may give more insights into their negative experiences with mHealth apps and the dark sides of the apps (Zolfagharian & Yazdanparast, 2017; Greist, 2010). Therefore, this thesis will focus on what paradoxical tensions people experienced who stopped using mHealth apps and explore why these people stopped using mHealth apps, especially the self-tracking apps. Hence, the following research question will be answered:

Which paradoxical tensions did people who used to use mHealth applications experience and why did these people stop using the applications?

1.2 Relevance of the topic

This Master's thesis is relevant for theory and practice. First, as pointed out in the introduction, digital technology has a great impact on our daily lives. Besides, it is expected that the use of digital technology and smart devices will increase over the years (Galov, 2021; O'Dea, 2020). Since mHealth apps are part of the digital technology development (Poola, 2017), it is a highly relevant domain to further explore these topics.

Furthermore, the concept of the paradoxes is still of high relevance these days. This can be deduced from the high amount of literature referring to the study of Mick and Fournier in 1998 (see Oliver, 2014; Zeithaml, Bitner, & Gremler, 2018; Jarvenpaa & Lang, 2005). Besides,

Mick and Fournier (1998) implied further research should investigate the paradoxes in several domains to expand and/ or develop the literature. This thesis will address the positive as well as the negative side of the paradoxes in a fairly new domain, namely the domain of mHealth apps. Prior research in this domain focused only on the users of mHealth apps (Klintwort, 2018; Vaghefi & Tulu, 2019; Zhu et al., 2021; Guo et al., 2020), but not on people who stopped using these apps. Hence, this Master's thesis will contribute to the existing literature in this domain by researching the paradoxical experiences of people when using mHealth apps and exploring why these people stopped using the apps.

Additionally, this Master's thesis is relevant for practice and contributes to knowledge. While the literature typically focuses on the positive aspects of technology, it has been argued in the academic literature by Mick and Fournier (1998) and followers as well as in the practical world by Deloitte (2017) that it is important to have a complete picture and thus also take the negative aspects into account. Therefore, this Master's thesis focuses on identifying the positive as well as the negative sides of using technology, especially self-tracking apps, in the mHealth app domain. Furthermore, it is relevant to research this topic from a consumer point of view (Lupton, 2017) to explore the reasons behind the stopping behavior of mHealth apps. Subsequently, these findings can be used by giving suggestions to mHealth app developers and mHealth app developing companies. Insights in the experience and feelings of people who stopped using mHealth apps can be used by developers and companies to improve and/ or (re)design the applications that may mitigate negative consequences and feelings that were experienced by consumers. Subsequently, this may prevent people from stopping to use mHealth apps.

In general, the literature about this topic is scarce, especially on the experiences of the people who stopped using mHealth apps. Hence, this Master's thesis will contribute to the little existing literature by researching how the paradoxical tensions of using technology in the relatively new domain of mHealth apps may lead to stop using mHealth apps.

1.3 Objective of the thesis

As mentioned above, this Master's thesis is aimed at gaining insights into both the positive and negative sides of the paradoxes within the use of mHealth apps and to explore why people stop using these apps. Since this has not been researched before, this Master's thesis aims at filling this knowledge gap. These insights will be gathered through qualitative research to answer the research question.

Finally, after gaining insights into the paradoxes that are experienced when using mHealth apps and the exploration of why people stop using mHealth apps, this Master thesis aims to propose practical implications to mHealth app developers and mHealth app developing companies based on the findings in this research.

1.4 Thesis outline

In the following chapter, key concepts and underlying theories will be discussed. This chapter is divided into five paragraphs that address the following concepts: the paradox concept, paradoxes in the usage of smartphones, self-tracking applications, mHealth applications, and paradoxes in mHealth applications.

In chapter three, there will be elaborated upon the research methodology. The main question will be answered by findings gained through qualitative research methods that are described in this chapter. Besides, the sample characteristics, research design, and data analysis will be described.

In the fourth chapter, the most relevant results of this study will be presented. Different phases in the usage of mHealth apps will be explained. Moreover, the paradoxes, derived from simultaneously occurring of positive and negative aspects, will be depicted. In order to illustrate the findings, quotations from the interviews and the Sentence Completion Method will be used.

The discussion of the results can be found in the final chapter. Here, the results are interlinked with prior literature and a conclusion of the key findings of this Master thesis is given. Subsequently, the results are used to suggest theoretical and practical implications. Finally, the limitations of this research are shared and avenues for further research are presented.

2 Theoretical background

2.1 The paradox concept

The paradox concept is used over hundreds of years and in several domains such as psychology (Smith & Lewis, 2011). In recent years, the paradox concept is increasingly used in studies with an organisational context (Lewis, 2000; Smith & Lewis, 2011; Ter Hoeven et al., 2016). Furthermore, it is perceived as a concept of high interest by managerial and organisation studies (O'Driscoll, 2008). Although the paradox concept is perceived as highly relevant in many domains (Mick & Fournier, 1998), it is still relatively scarce in the literature within the field of consumer behavior

Over the years, the paradox concept is defined in many different ways. Lewis (2000) defines a paradox as “contradictory yet interrelated elements – elements that seem logical in isolation but absurd and irrational when appearing simultaneously” (p. 760). Moreover, the contradiction may occur in a situation, an act, or behavior (Jarvenpaa & Lang, 2005). Although there are many definitions of the paradox concept and it has been elaborated over the years, it always refers to a concept with “opposite conditions (that) can simultaneously exist, or at least can be potentiated, in the same thing” (Mick & Fournier, 1998, p. 124; Fonner & Roloff, 2012; Rennecker & Goldwin, 2005). Following Smith and Lewis (2011), the paradox concept in this thesis will be defined as “contradictory yet interrelated elements that exist simultaneously and persist over time” (p. 386).

Over 20 years ago, paradoxes were applied to household technology for the first time (Mick & Fournier 1998). Their study can be considered as a starting point as many researchers further explored the paradox concept in other domains and used the study of Mick and Fournier (1998). Many of these studies were in the technological and the organisational domain (e.g. Lin, Shih, & Sher, 2007; Jarvenpaa & Lang, 2005; Bitner & Brown, 2000; Curran & Meuter, 2005; Smith & Lewis, 2011).

Although the paradoxes are frequently used in the technological and organisational domain, the literature lacks in the domain of consumer behavior and especially in combination with the mHealth apps (Klintwort, 2018). This Master's thesis is concerned with paradoxes that may occur when using smart devices for self-tracking, specifically mHealth apps. Therefore, its focus is within the technological domain and the domain of consumer behavior.

2.2 Paradoxes in the usage of smartphones

Smartphones are the most intrusive devices we know nowadays and “by far the world’s most popular” (Rotondi et al., 2017, p. 25). Smartphones are implemented in our daily lives and we spend approximately five hours a day using them (Andrews et al., 2015). As stated in the introduction, around 3.5 billion smartphones were used in 2020 (O’Dea, 2020), and it is forecasted that this amount will even grow further (Galov, 2021). However, previous studies highlighted paradoxes when using a smartphone.

Jarvenpaa and Lang (2005) used the paradoxes introduced by Mick and Fournier (1998) in the domain of mobile technology. As a result, they identified eight paradoxes in mobile technology that have a great influence on the behavior of consumers and their experiences. Most of the paradoxes overlapped with the earlier findings of Mick and Fournier (1998). Furthermore, they found the experience of consumers using mobile technology could be described as ‘determined by conflict situations’ and could therefore be seen as paradoxical (Jarvenpaa & Lang, 2005, p. 7).

Besides, Roberts et al. (2014) also applied the paradox concept by Mick and Fournier (1998) to the smartphone. They have found patterns of addiction to the smartphone. The addiction was in line with the urge to be connected with family and friends (Roberts et al., 2014). Other studies interpreted the constant checking of the smartphone as “habit-forming”, however, it was not seen as addiction (Oulasvirta, Rattenbury, Ma, & Raita, 2011, p. 105), and were therefore not seen as problematic.

Several paradoxes of the smartphone have been identified in different studies. On the one hand, a smartphone allowed people to be in touch with each other and stay in contact, even if they were not close to each other. Here, the smartphone is associated with freedom and mobility (Borges & Joia, 2015). On the other hand, when staying in contact with many people, the quality of the relationship may decrease and therefore even create more distance (Hall & Baym, 2011). Subsequently, it may negatively affect the well-being of consumers (Rotondi et al., 2017).

Lastly, the personalisation/ privacy paradox is of enduring concern within the world of the smartphone (Sutanto, Palme, Tan, & Phang, 2013; Wang, Duong, & Chen, 2016; Utz & Kramer, 2009; Barnes, 2006). To personalise aspects or information within (the use of) a smartphone (Xu, Luo, Carroll, & Rosson, 2011), marketers exploit consumers’ data. At the same time, this raises privacy concerns among the consumers of smartphones (Sutanto et al., 2003). In line with this, Kokolakis (2017) supported the privacy paradox and claimed that internet and smartphone users are ‘highly concerned about their privacy and the collection and

use of their personal information' (p. 122). Nevertheless, consumers are willing to share their data for convenience (Kokolakis, 2017).

2.3 Self-tracking applications

“The permanent gathering and evaluation of self-related data in one’s daily life ... by using digital technologies” (Heyen, 2019, p. 125).

Self-tracking apps, or “sensor mania” (Swan, 2012, p. 217), have become a mass phenomenon nowadays and are frequently downloaded in the Appstore. These apps are increasing due to the more upcoming Quantified Self (QS) movement (Heyen, 2019). This QS movement obtains insights into one’s health and/ or daily performance by collecting personal data through self-tracking apps (QS, 2019). One can use apps such as tracking the number of steps taken a day, a fitness/workout app, a yoga app, a measuring blood pressure app, or an app for measuring blood sugar levels (frequently used by diabetes patients). QS is being present in domains such as the physical state, psychological state, social interactions, and the environmental context (QS, 2019). These four domains can be measured through self-tracking data derived from (wearable) smart devices.

Furthermore, using self-tracking apps can help self-regulation. Self-regulation includes self-monitoring and evaluative judgement (Bandura, 1991), which are characteristics of self-tracking (Swan, 2012). In order to regulate oneself, one should use self-monitoring which nowadays can be easily achieved by self-tracking apps (Swan, 2012). Hereby, personal data will be shared with and monitored by the mHealth app. Hence, one could evaluate one’s performance.

Moreover, when self-tracking users have insights into their data, they will experience more self-control. Self-control has several benefits, including better adjustment, developing personal skills, and more optimal emotional responses like happiness (Tangney, Baumeister, & Boone, 2004). Besides, self-optimisation is salient when it comes to the physical appearance of people. The body is that which one can express the true self. Therefore, there is growing popularity of self-trackers, specifically fitness-trackers (Asimakopoulos, Asimakopoulos, & Spillers, 2017).

Lastly, self-knowledge is possible due to personal data derived from self-tracking apps as well as comparison with other self-tracking users. The comparison is upcoming since most apps enable connecting and sharing personal data with other people, and this causes control from the side (Zolfagharian & Yazdanparast, 2017). Here, the paradox of individual/ community can be identified (Klintwort, 2018).

2.4 MHealth applications

MHealth apps are one of the fastest-growing categories in the app market (Research2Guidance, 2021). In 2015, the mHealth app market was valued at \$10 billion and was expected to grow by 15% to \$31.3 billion by 2020 (Jahns, 2017). Besides, in 2017, almost 260,000 mHealth apps offered by 58,000 mHealth publishers were available on the app market, and it is expected to grow even further (Jahns, 2017). These mHealth apps are designed in the first place to help consumers improve their health and conditions, which is followed by making revenue (Jahns, 2017).

MHealth apps can be defined as the “medical and public health practice supported by mobile devices” (Martínez-Pérez, de la Torre-Díez, & López-Coronado, 2013, p. 2). These mHealth apps are available on smartphones and other smart devices. In this thesis, the focus is on self-tracking apps. Therefore, mHealth apps are here defined as apps on the smartphone or smartwatch used for self-tracking of the consumer.

In 2020, 3.8 billion smartphones were used and the number is expected to rise. Besides, the use of smartwatches is also increasing. In 2018, 51.9 million adults were using a wearable device. Furthermore, it is expected that the number of wearable devices (e.g. smartwatches) would grow to 67.1 million by 2022 (eMarketer, 2019).

More than fifty percent of the developers of mHealth apps design their apps while targeting chronically ill people. However, as research points out, most people are interested in fitness apps (Research2Guidance, 2019). This is in line with the apps that were most popular in the Appstore, namely fitness-related apps and weight loss apps (Research2Guidance, 2017). Although consumers benefit from the fitness and weight loss apps, studies show that this mostly holds for only a short period (American Heart Association, 2015).

Some people are sceptical about self-tracking apps. They are concerned about the safety and reliability of the mHealth apps (Swan, 2013). Especially in this domain, personal data is highly sensitive (Lupton, 2017). Therefore, the app should be keeping this data safe. Here, the paradox personalization/ privacy comes forward. Overall, the security of data and privacy concerns are crucial for the usage mHealth apps (Swan, 2013).

2.5 Paradoxes in mHealth applications

Recent studies focused on the paradoxes in the domain of consumer behavior in combination with the mHealth apps (Klintwort, 2018; Bol, Helberger, & Weert, 2018). The study of Klintwort (2018) has identified five paradoxes that were most salient among its respondents:

integration/ disintegration, self-control/ external control, confirmation/ disconfirmation, individual/ community, and motivating/ demotivating.

The first paradox, integration/ disintegration, concerns how easily one has adopted the mHealth app in one's life (Mick & Fournier, 1998; Klintwort, 2018). Integration refers to an easy adoption in one's life, whereas disintegration means that a mHealth app has not easily been adopted or is not adopted at all. When a mHealth app is not easily adopted into one's life, there is a greater chance one will stop using the app.

Secondly, the paradox self-control/ external control is about to what extent you have control over yourself while using a mHealth app versus to what extent the app is controlling your life(style). The feeling of external control by the app may occur more powerful when one is receiving push notifications (Bidargaddi et al., 2018). As a result, people may experience too much external control by the mHealth app they decide to stop using it.

The third paradox that has been identified in the mHealth domain is confirmation/ disconfirmation (Klintwort, 2018). This paradox concerns whether the mHealth app gives one the feeling of what one was already expecting, confirms one's thoughts versus that the mHealth app shows something that one wasn't expecting in a good or bad way. When one is satisfied with the results the app shows, it is more likely one will keep using the app. However, when the mHealth app shows negative results that one wasn't expecting over and over again, one may be more inclined to stop using it.

Individual/ community is the fourth paradox that was found. This paradox is about sharing one's achievements through the mHealth app with family, friends or share it on social media versus keeping them to oneself. In the case of sharing one's results, this may lead to a positive feeling where one is receiving compliments (Klintwort, 2018). However, it could also lead to a negative feeling where one might get rivalry feelings with friends and family (Mick & Fournier, 1998; Jarvenpaa & Lang, 2005).

Lastly, the paradox motivating/ demotivating has been found (Klintwort, 2018). The motivating aspect of the paradox concerns how a mHealth app helps to motivate one to keep on using the mHealth app. This could happen when the app shows a negative result or a positive result. When a negative result is shown, one might work harder to receive a positive outcome, whereas a positive result is shown in the mHealth app, one may still be motivated since it went well that day. On the contrary, the demotivating aspect may cause one to stop using a mHealth app (Jarvenpaa & Lang, 2005), especially when people are more demotivated than motivated by a mHealth app.

Although the study of Klintwort (2018) identified several paradoxes that fit the mHealth domain, it focused only on users of mHealth apps. For the users of mHealth apps, the benefits and/ or expectations of using the apps are higher than the negative sides of using these. Therefore, this Master's thesis will focus on the people who stopped using mHealth apps. Hence, this research will gain insights into the experiences and feelings people have had when using mHealth apps and explore why these people eventually stopped using these apps.

3 Methodology

3.1 Research methods

To answer the research question “*Which paradoxical tensions did people who used to use mHealth applications experience and why did these people stop using the applications?*”, the paradoxes people experienced while using mHealth apps have to be explored first. Since the literature on this topic is relatively scarce, this Master thesis relies on qualitative methods to get an in-depth understanding (Hammersley, 2003). Furthermore, this research aims to gain insight into people’s experiences who had stopped using mHealth apps. By using qualitative research, more insights can be obtained to learn about the stopping behavior of people in-depth (Boyce & Neale, 2006). In this Master thesis, a combination of semi-structured interviews and the Sentence Completion Method is used to gain a comprehensive understanding of why people stopped using mHealth apps.

The approach of the semi-structured interviews is abductive, which is adequate for this research since new aspects have to be explored in a domain where the literature is still scarce (Myers & Myers, 2013). By using this approach, new insights and theories may arise for this fairly new domain by making use of logical reasoning (Bleijenbergh, 2015). Furthermore, using semi-structured interviews is well suited for explorative researches like this Master thesis’ research since, on the one hand, these interviews are relatively flexible in a way that interviewees can talk about their experiences and feelings. On the other hand, these interviews are not fully flexible since they are semi-structured (Detering & Waters, 2018). As a result, the interviewer can stay close to the research and will therefore not deviate too much which causes that the results of the interviews will be easier to compare (Fontana & Frey, 2005).

Before conducting the interviews, the interview guide is pre-tested to detect any difficulties, and to test its structure and its duration (Fontana & Frey, 2000). Based on the results of the pre-test, the interview guide is improved.

Before conducting the interview, the interviewee will be asked to complete two sentence beginnings regarding mHealth apps. The Sentence Completion Method is popular for measuring personality functioning since it is generally used to assess respondents’ perception of themselves and/ or others in ‘an indirect, semi-structured manner’ (Rogers, Bishop, & Lane, 2003, p. 236). For this study, it is highly relevant to gain insight into the feelings and experiences of people who have stopped using mHealth apps and to eventually understand these. Therefore, by using the Sentence Completion Method beforehand, it may alleviate the respondent to express their feelings since this method contains indirect questions (Rabin &

Zltogorski, 1985). Moreover, it is essential to gain insights from more than one single viewpoint to apprehend the real situation, preferably from three different viewpoints (McFee, 1992). However, in this Master thesis, two different viewpoints are used since the semi-structured in-depth interview and Sentence Completion Method are most suitable for this research, as explained above.

3.2 Sample characteristics

The sample in this research exists of people who have used mHealth apps but stopped using these for at least one month, to make sure one is consciously stopped using mHealth apps and not just forgot to use them. In order to understand the experiences and feelings of the people who stopped using mHealth apps, the ‘information power’ is more relevant in contrast to the size of the sample (Malterud, Siersma, & Guassora, 2016, p. 1754). In this way, the sample represents the relevance and power through the experiences of the people who stopped using mHealth apps (Malterud et al., 2016).

For qualitative research, the sample size should strive to saturation. This refers to the point in data collection where no new information is gained (Deterding & Waters, 2018; Malterud et al., 2016; Boddy, 2016). According to Boddy (2016), a sample size of twelve is most suitable when considering the time frame to plan, conduct, transcribe and analyse the interviews. Besides, saturation occurs within the first twelve interviews in a homogenous population (Boddy, 2016). To find suitable respondents, the convenience criteria came into play. The respondents are recruited from the author’s circle of acquaintances. Besides, the snowballing technique was applied since respondents recommended people they knew who also stopped using mHealth apps and thus are relevant for this research. The sample in this research consisted of twelve respondents who stopped using mHealth apps. All respondents were female with an age range between 22 and 54 years.

3.3 Research design

The sample consisted of prior users of mHealth apps and thus these people have had experiences with these apps. However, the concept mHealth apps might not be defined the same by all the respondents. To guarantee a common understanding, the concept mHealth apps is explained before conducting the interview. Besides, respondents were asked before the interview whether they had any questions regarding the interview process (Solarino & Aguinis, 2021). To obtain honest responses and let respondents open up during the interview, it is emphasised both before

and during conducting the interview anonymity is guaranteed and responses will be used for scientific research only (Solarino & Aguinis, 2021). Furthermore, the respondents were asked whether they agree with the interview being tape-recorded.

Before conducting the interviews, the respondents are invited to complete two sentence beginnings regarding mHealth apps (see Appendix A). These two incomplete sentences were inspired by the ISB method (Rotter, Rafferty, & Schachtitz, 1949) and were phrased in a way that the respondents had the freedom to complete these intuitively (Rogers et al., 2003). The respondents were given the instructions to express their feelings and complete the sentences entirely intuitively. Besides, no other instructions were given since this could affect the respondents.

The questions for the interview guide were developed by using theories of paradoxes in mHealth apps and were inspired by the interview guide of Klintwort (2018). The questions in the interview guide are divided into a general part and the main part of mHealth apps, and a closing part of demographical characteristics. The general questions focus on the respondents' prior usage characteristics and their expectations of the usage. The main part contains questions regarding the respondents' feelings and experiences while using mHealth apps to find out why they stopped using the apps. In the last part of the interview, the respondents' demographics will be asked, and the respondents are asked whether their ideal self overlaps with their actual self, regarding healthy behavior (Bergkvist & Bech-Larsen, 2010). By gaining insight into the respondent's identity-overlap regarding healthy behavior, there can be deduced that it may influence the stopping behavior of the respondent. All in all, the interview questions are aimed at exploring and understanding both positive and negative effects mHealth apps may cause and why this could lead to stopping using these apps. Depending on the respondent's preference, the semi-structured interviews will be conducted online via Zoom or face to face.

The interview guide is provided in two languages, English and Dutch (see Appendix A and B) since most of the respondents are Dutch native speakers. It is highly relevant to translate the interview guide accurately to ensure the equivalence of both interviews. Hence, the Dutch interview guide was back-translated into English by another person to make sure the translation contains no inaccuracies and/ or to improve the translation (Brislin, 1970).

3.4 Data analysis

The data collected through the Sentence Completion Method and the semi-structured interviews were analysed by using content analysis. Content analysis is a research technique in which data can be inferred to context by using replicable and valid inferences (Krippendorff, 2018).

The interviews were tape-recorded, with the consent of the respondents, to stay close to the reality when analysing the data. The audio data of the interviews were transcribed by following simple transcription rules. To ensure easy readability, any empty words and nonverbal sounds are omitted from the transcript if the key message of the respondents would not change (Oliver, Serovich, & Mason, 2005).

In this research, an abductive approach was used, as mentioned before. This approach can be seen as “a mixture of deductive and inductive approaches” (Dubois & Gadde, 2002, p. 559). In other words, the results of this research can be a combination of existing literature and new insights gathered from the interviews.

Before using the content analysis for the interviews, the context-mapping technique was performed. This technique aims at finding underlying structures in the data (Visser, Stappers, Van der Lugt, & Sanders, 2005). After finding structures in the data, these were divided and combined into categories with overarching themes. These categories can be found in Appendix C. Relevant and meaningful quotations are marked and used in chapter 4. Furthermore, to be able to answer the research question, the data of the interview was structured by applying content analysis and was formed into a basis of information (Neuendorf & Kumar, 2015). This basis of information was then filtered and structured into categories by following preconceived coding criteria (Saldaña, 2021).

First of all, the researcher read all the data derived from the interviews to receive an overview of the material. Besides, notes were taken on relevant statements. After finding underlying structures in the data using the context-mapping technique, categories were formed, which is a key aspect of the content analysis (Krippendorff, 2018). While following an abductive approach, the categories were both gathered from previous literature and the data of the present research. The definitions of the categories are transferred into a table, which can be found in Appendix C. Furthermore, meaningful quotations were marked and later used to strengthen the results of this study and to deepen the understanding of the reader (Spradley, 2016). The data of the Sentence Completion Method were included as well.

4 Results

4.1 Introduction

In this chapter, the results from the analysis of the interviews and the Sentence Completion Method will be presented. During this research, the paradoxes experienced by the respondents were examined. Moreover, it was investigated why these paradoxical experiences eventually led to stop using mHealth apps. The results show that the usage behavior of the mHealth apps by the respondents evolved. Linking to this, three phases can be distinguished, namely a beginning phase, a phase where the paradoxes are experienced, including positive and negative aspects, and a phase where respondents choose to stop using mHealth apps.

First, respondents were asked why they started using the apps and therefore expressed their initial motivation for using the apps, as can be seen in Table 1. Hereafter, respondents expressed their positive and negative experiences within the course of using mHealth apps. Both key positive and negative aspects of the apps have been analysed to investigate why respondents stopped using the apps. Besides, the five paradoxes that were identified beforehand were all experienced, which can be seen in Table 2. Lastly, the third phase dealt with how the respondents experienced the process right before stop using the mHealth apps and when they eventually stopped using these.

The results showed that some paradoxes were more prominent than others. Nevertheless, every respondent had experienced paradoxical tensions within the course of using mHealth apps. Moreover, the results showed some overlaps between the paradoxes, and some of them were closely related to each other.

Analysing the interviews revealed that all respondents used a specific type of mHealth apps, namely activity trackers as Strava, Fitbit/ Apple Watch, or a pre-installed step counter on their phones, often Health app by Apple. A few respondents used sleep trackers on Fitbit or Apple Watch. The calorie-counting apps, often MyFitnessPal, were sporadically used by respondents in this study. Lastly, three-fourths of the respondents gave themselves a high score (≥ 5 on a 7-point Likert scale) when they had to assess the overlap between their actual self and their ideal self.

4.2 Initial motivation

Table 1 provides an overview of the users' initial motivation to start using mHealth apps. The mHealth apps were initially used as a helping hand to achieve personal goals. Besides, respondents wanted to get insights into their performances by using the apps.

4.2.1 Helping hand

The data showed that seven respondents started to use their mHealth apps to receive support from their apps. The apps were considered as a big stick by the respondents, as stated by one respondent: *“Of course it has been a motivation in all these years, it has been a big stick for me” (10, f, 22)*. Besides, the apps were described as supportive to achieve their personal goals: *“My goal was to take 10,000 steps a day, and then I received notifications when I needed to take a few more steps before the ending of an hour. It helped me a lot.” (12, f, 23)*.

Moreover, the mHealth apps were primarily used for self-improvement to increase for instance their activity performances through self-tracking: *“I thought the app was a good incentive to walk and exercise more as I wanted to. For instance, I really take the bike more often.” (1, f, 54)*.

4.2.2 Getting insight

Gaining insight into personal performances was another reason to start using mHealth apps. The analysis of the Sentence Completion Method, as well as the interview, revealed that five respondents were curious about their performances and therefore started using these apps: *“I was quite curious about what it was like to use this app.” (2, f, 46)*. Besides, respondents valued the factual information they received about their performances: *“What I really liked about the app was that I could see my statistics of each day.” (12, f, 23)*. Especially receiving black and white numbers was valued by respondents and has therefore been mentioned by a few respondents: *“It is an app that gives me black and white numbers.” (2, f, 46)*.

Linking to this, the black and white numbers made the behavior of the respondents more salient, which made respondents more aware: *“The app showed me the statistics of my runs were very good.” (11, f, 23)*. Although this can be positive, one respondent experienced the negative side and highlighted she got insights in what she did not achieve: *“... it showed me very clearly what I did not do.” (2, f, 46)*.

Concept	Definition	Quote
Helping hand	Users perceive the app as a helping hand to achieve their personal goals.	<i>For myself I wanted to be healthier and more wanted to have an extra push to move toward living healthier. (2, f, 46)</i>
Getting Insight	Users start using the app since they want to get insight in their performances. <ul style="list-style-type: none"> • Curiosity 	<i>I: mHealth apps are Respondent: apps that just give me black and white numbers. (2, f, 46) I was just curious about my number of steps a day, since it was an upcoming trend in the beginning of COVID-19. (12, f, 23)</i>

Table 1. Initial Motivation

4.3 Key positive aspects

Especially in the beginning of using mHealth apps, respondents experienced several positive aspects of the apps. The key positive aspects found during this research are the easiness to use the app, many options of the app, notifications, and the motivational aspect. These can be found in Table 2.

The results showed that four respondents did value the apps' easiness to use. One respondent highlighted that she valued the easiness to track herself while running with the Strava app: *"The positive aspects were that it was quite easy to use because I had to push one button when I started running and one button to stop and then I had insights in all my statistics of my run."* (4, f, 23). In line with this, another respondent mentioned the easiness of My Fitness Pal: *"Yes, very easy. For example, you could type in low-fat yoghurt and it would immediately give you suggestions of those products from different supermarkets, so the right one was always there."* (11, f, 23).

Furthermore, a few respondents mentioned the apps had many options, which they valued. Especially the options of the Strava app were mentioned and these were valued since respondents believe the tracking was then more specific: *"The two basic things are walking and running, but you can also indicate that you are going to inline skate or cycle in the Strava app. I found that a big advantage as well, because then it was more specific."* (7, f, 23). Moreover, one respondent highlighted she perceived the app as more reliable when using these different options: *"Yes indeed, I could choose another option like cycling in the app, so I found that more reliable. I could also choose what kind of workout I was going to do."* (9, f, 23).

Another aspect of the mHealth apps that was perceived as positive is the notifications. One respondent especially valued the notifications she received while running: *"I turned on the*

app when I started running and every five minutes the app would call out how I was doing, how far I was, and how fast I had run. I found it an incentive to know how I was doing while running, so these notifications were very nice.” (10, f, 22). However, the notifications were only experienced as positive in the beginning phase of using the apps. Then, the notifications were perceived as stimulating: “In the beginning I found it stimulating” (1, f, 54) and motivating: “The notifications first helped me motivate myself” (1, f, 54).

Overall, the majority was motivated by the app at the beginning: “I noticed that it was very motivating in the beginning.” (1, f, 54). One respondent highlighted she perceived the app as an extra push: “For myself, I wanted to be healthier and wanted to have an extra push to move toward living healthier.” (2, f, 46). Moreover, because of the app, respondents were triggered to walk more: “If I had the time, then I would just walk an extra round. I do not know if I would have done that without an app.” (6, f, 23).

Concept	Definition	Quote
Good notifications	Users receive notifications that causes positive feelings.	<i>I found it an incentive to know how I was doing while running, so these notifications were very nice.” (10, f, 22).</i>
Motivating	The app motivates the users to perform better.	<i>“I noticed that it was very motivating in the beginning.” (1, f, 54)</i>
Easy to use	The app is easy to use.	<i>Very easy to use, you could type in low-fat yoghurt and it would immediately give you suggestions of those products from different supermarkets. The right one was always there. (11, f, 23)</i>
Many options	The app has got many options for self-tracking.	<i>The two basic things are walking and running, but you can also choose for inline skating or cycling. It was more specific. (7, f, 23)</i>

Table 2 Key positive aspects

4.4 Key negative aspects

Whereas many respondents experienced positive aspects of the mHealth apps, all respondents experienced negative aspects of the app as well after using the app for a while. Within the course of the apps’ usage, the paradoxes came up by the respondents. The key negative aspects that were experienced include the respondents’ privacy concerns, the unreliability of the apps, notifications, and the pressure that came along when using the apps (see Table 3).

A few respondents mentioned they were concerned about their privacy when using the apps and how much the apps knew about its users: *“I think that the idea of how much the Fitbit knows about you scared me a bit, maybe more than I thought.”* (1, f, 54). In line with this, one respondent highlighted that the apps store all kind of information about its user without being aware of it: *“I think these apps could be or are an invasion of one’s privacy because it tracks all kind of information about you, like when you are moving a lot, at what times you sit down, and when your pulse is raising etcetera. Not everyone is aware of this.”* (12, f, 23). Moreover, the privacy concern aspect came particularly apparent in the Sentence Completion Method, where it was mentioned several times:

*“I: The mHealth apps are
Respondent: an invasion of privacy”.* (5, f, 22)

Furthermore, the reliability of the apps was questioned by ten respondents. Especially respondents who used the Fitbit and the Health app mentioned they had experienced unreliability: *“And when you move your arm when you soap your hair, for instance, the Fitbit also counts this as steps. So, it is not reliable I think.”* (3, f, 22). Moreover, the unreliability of the app can cause feelings of disappointment as respondents mentioned: *“That when you achieve your goal you are not happy because the Fitbit is not reliable. While the goal is already quite high, and you can be proud of it, but here you are still disappointed.”* (3, f, 22).

Within the course of using mHealth apps, half of the respondents mentioned they had experienced pressure by the apps: *“I was so much struggling with my life and there was this extra pressure of the mHealth app that I really did not have time for.”* (2, f, 46). One respondent highlighted that the extra pressure was one of the reasons she stopped using the app: *“So the fact that the app gave me so much pressure and that I got annoyed and then disappointed in myself for not achieving goals, that was the turning point for me to decide to stop using the app.”* (10, f, 22). In addition to this, nine respondents mentioned using the apps was time-consuming, which led to extra pressure: *“First it costs so much time when you want to achieve the 10,000 steps. Second, walking is added as an extra task in my opinion and that is on top of all my other tasks. So, I was already very busy and then I had to do that walk as well, I could not do that.”* (6, f, 23).

Lastly, all respondents mentioned the notifications of the apps became annoying when using the app for a while: *“I found the notifications in between very annoying.”* (9, f, 23). One respondent highlighted she received the notifications quite often, which was not desired: *“You get notifications very often and I find that irritating.”* (7, f, 23). In addition to this, respondents even felt frustrated sometimes after receiving notifications: *“So that frustrated me, receiving*

those notifications.” (6, f, 23). Moreover, respondents mentioned obsessive behavior was fuelled by the many notifications they received during the day: “The Fitbit just pushes you the whole day to look at it” (3, f, 22), even when it was not convenient: “The Fitbit distracted me from work, daily. I received notifications when I was in a meeting, and it forced me to look at it.” (5, f, 22).

Concept	Definition	Quote
Privacy concerns	Users are concerned about their privacy in connection with the app.	<i>I got a little panicky because people could see where I ran, but then they could also see where I live since that is my starting and ending point of course. (11, f, 23)</i>
Unreliability	Users find the app unreliable and inaccurate (sometimes).	<i>I think the apps are unreliable in a way of not tracking correctly what you have done. For instance, when I walked the same round as my mom, my mom her Fitbit tracked a greater number of steps than my health app on iPhone. (12, f, 23)</i>
Obsessive behavior	Users are too much focused on the app, sometimes they even become obsessed with it.	<i>I was too busy with the app in my opinion. Maybe a bit obsessive. (1, f, 54)</i>
Pressure	The app gives an extra pressure to the users.	<i>The number of steps is added as an extra task in my opinion on top of all my other tasks. I already was very busy, so it felt like an extra pressure. (6, f, 23)</i>
Gives frustration	Users get frustrated by (features of) the app.	<i>It gave me this extra pressure and made me feel frustrated and bad and sad about showing me very clearly what I did not do. (2, f, 46)</i>
Bad notifications	Users receive notifications that causes negative feelings.	<i>“I found the notifications in between very annoying.” (9, f, 23).</i>
Time consuming	Users experience using the app is time consuming.	<i>I made a few times the 10,000 steps, but it really took too much of my time which I hardly have. (2, f, 46)</i>

Table 3 Key negative aspects

4.5 Paradoxes

The results showed for certain things, both positive and negative aspects exist at the same time. These are called paradoxes. Table 4 provides an overview of the most salient paradoxes which were found in this research.

4.5.1 Integration/ Disintegration

The integration/ disintegration paradox was most experienced by the respondents. This paradox contained two sub-paradoxes, namely easy to use/ time consuming and helpful notifications/ annoying notifications.

The integration part of the paradox entails how easily the mHealth apps are integrated into one's life. The majority argued that in the beginning they checked their apps every day and mostly several times a day: *"I used the health app on iPhone for tracking the number of steps several times a day in the beginning, maybe a bit too much if I look back. I think like 20 times a day."* (4, f, 23). Moreover, some respondents even mentioned using the app had become a routine: *"Using the Fitbit was some sort of routine."* (3, f, 22).

The aspect 'easy to use' consisted of the easiness of the app itself and that the only thing they had to carry was a phone or a smartwatch to track themselves: *"It was so easy to use, you had to push one button when you started and one button to stop and then you got insights in all your running statistics."* (4, f, 23). Moreover, respondents valued the fact that some apps were tracking their performances in the background without pushing a start button which made the app even easier to use: *"It tracked all my steps during the day, even if I sometimes forgot about it. I only had to do the checking of the number of steps myself."* (1, f, 54).

Another aspect of the integration part of the paradox that was reflected by the respondents was helpful notifications. Especially in the beginning phase of using the app, some respondents valued the notifications they received by the app, which often were push messages of the app. Few respondents valued that the app reminded them by sending them notifications: *"I got a notification every night at 10 p.m. because then it was bedtime according to my Fitbit. I liked that very much, since it kept me from staying awake longer and that in turn resulted in a better night's sleep than I had before."* (5, f, 22).

The other side of the paradox, disintegration, was experienced by most of the respondents. They argued the apps were not easily integrated into their lives: *"The app did not adapt to my lifestyle"* (1, f, 54). Few respondents even mentioned they forgot about the app or smartwatch sometimes, which shows that these were not integrated into their lives, as stated by one respondent: *"It was not integrated into my life. I have had days when I forgot to wear the Apple Watch and did not even notice it."* (7, f, 23).

The paradoxical aspect 'time consuming' is mentioned by almost all respondents. This aspect was reflected in statements about users' urge to achieve goals and the complicatedness of using mHealth apps: *"I made a few times the 10,000 steps, but it really took too much of my time which I hardly have."* (2, f, 46). It was repeatedly mentioned by respondents that they were

too fixated on the apps and therefore it was time consuming: *“I realized it demanded too much focus. I was too busy with the steps and the active minutes and I thought about it all day long, that is not what I wanted.”* (3, f, 22).

Whereas a few respondents perceived the notifications of the app as helpful, especially in the beginning, most of the respondents had bad experiences with them. They described the notifications as stressful: *“In the beginning I found the notifications stimulating, but the longer I used the app, the more confronting the notifications were to me and that gave me stress. Some days I just could not live up to the demands.”* (1, f, 54). Besides, it was repeatedly mentioned the notifications were experienced as annoying: *“I found the notifications during the day very annoying.”* (9, f, 23) and also frustrated the respondents: *“I often got notifications like ‘come on, go outside, walk your lap again’. And that is meant to motivate me, but I decide for myself when I go, and those notifications only made me frustrated.”* (10, f, 22).

Lastly, technical issues were mentioned as a facet that caused the disintegration of the apps in the respondents’ lives. The respondents described situations in which the apps did not save performances or did not track performances properly even as they did not synchronize with other apps sometimes: *“What I sometimes experienced which I found extremely annoying, was that I turned on the Strava app on Wi-Fi and when I got home and turned the app off on 4G it would not save my results, since I activated in on Wi-Fi. It made me feel a bit frustrated.”* (4, f, 23).

4.5.2 Self-control/ External control

The paradox self-control/ external control was also frequently experienced by the respondents. This paradox had a strong influence on the respondents’ feelings, especially the paradoxical aspect external control. Besides, the aspect ‘obsession’ was mentioned regularly by respondents in combination with this paradox.

The aspect ‘self-control’ was mentioned by a few respondents, especially in the beginning phase of using mHealth apps. Respondents started using these apps to track themselves, receive information about their performances, and be able to control themselves: *“I really liked being able to track myself how many miles I had run, what my speed was that lap, and how my heart rate was that lap. This gave me more insight into my run and motivated me for the next one.”* (9, f, 23). One respondent emphasized using the app for herself and not for others to have control: *“I always wanted to run to relax and clear my head, and no other than I can control that.”* (10, f, 22). However, respondents also experienced negative sides of self-control. One respondent highlighted these insights could be confronting when these do not

meet one's expectations: *"It really frustrated me to get insights in my statistics and then see that I did not achieve my goal. I think it was very confronting when you get to see it in black and white."* (4, f, 23).

The other side of the paradox, the aspect 'external control', was repeatedly mentioned by most of the respondents, especially in a later phase of using the apps. Respondents experienced being controlled by the app and felt they should live up to the apps' rules: *"I found it annoying that an app urged me to take a lot of steps and that it was actually going to take over and control a part of my life."* (5, f, 22). Moreover, to live up to the apps' rules, respondents mentioned they had been experiencing pressure from the apps: *"This really felt like an extra pressure on top of all the pyramid of things to do that were going on in my life."* (2, f, 46).

Furthermore, an aspect that has been mentioned many times during this research was the influence the apps have had on the respondents' mood and feelings: *"So I checked my number of steps, and it said 10,000, so it made me feel really happy that I already had reached the goal of that day."* (2, f, 46). However, the respondents mentioned they had mostly experienced negative feelings, especially when they had not achieved their goals: *"I got frustrated when I could not meet the expectations of the app."* (9, f, 23).

Finally, the last aspect that has been mentioned by respondents was the involvement of the app in the respondents' activities, that sometimes was experienced as being obsessed with the apps. During this research, one respondent highlighted the feeling of disappointment when forgetting to wear the Fitbit with her: *"When the Fitbit was charging, and I forgot it when I went out for a walk, I could be really disappointed that I did not wear it and my steps would not be tracked."* (3, f, 22)

4.5.3 Confirmation/ Disconfirmation

The paradox that was described regularly by the respondents is confirmation/ disconfirmation. A paradoxical feeling that was experienced is proud/ surprised, whereas surprised could be positively or negatively. These feelings emerged as a consequence of confirming or disconfirming respondents' feelings and expectations.

The first side of the paradox is confirmation and entails that the app confirms the expectations and feelings about the users' performance, such as the distance they had walked or ran, and the number of calories they had burned or consumed: *"I got satisfied when the app showed me I had reached my goal of 10,000 steps."* (9, f, 23). Moreover, a few respondents mentioned they felt proud after having reached their performance goal and that it was confirmed

by the app: *“When I ran and afterwards saw that my performance was very good, I felt even more proud than before seeing the statistics.”* (11, f, 23).

In contrast to this, the findings of this research showed that respondents experienced disconfirmation of their expectations and feelings. On the one hand, these disconfirmations could be positive when the statistics were better than expected. Respondents then were surprised: *“Sometimes I thought I ran very slow and afterwards I checked my statistics and it showed me it was actually a very good run. I was surprised, but I felt really good and proud. Without these statistics, I would probably have felt way worse.”* (11, f, 23). On the other hand, these disconfirmations could cause negative feelings as well when the statistics are worse than one has expected: *“I walk a lot with my kids, but I saw most of the time a lower number of steps in the app than that I was hoping for. I felt really bad about that”* (2, f, 46). Moreover, these negative disconfirmations could cause feelings of disappointment and frustration: *“It made me feel frustrated and I was disappointed when the results in the app showed me worse statistics than I was expecting.”* (4, f, 23). Furthermore, few respondents stated they sometimes felt embarrassed when they found out the statistics were below their goals and expectations: *“I checked the app in the evening and it showed me such a little number of steps that I felt a bit embarrassed by myself.”* (6, f, 23).

4.5.4 Individual/ Community

Another paradox that was found during this research is individual/ community. This paradox contained the paradoxical aspect compare to self/ compare to peers.

The first aspect of the paradox ‘individual’ entails the respondents’ statements about using the app only for themselves and to check their statistics. The Sentence Completion Method showed how one respondent felt about the sharing option of the apps:

“I: mHealth apps are not

Respondent: these are not meant to share its results with others.” (11, f, 23).

Moreover, the majority of the respondents emphasized they did not share their results through the app: *“I saw I could share my results with other people if I add other people on the app, but I did not want that”* (1, f, 54) and mentioned they used the app purely for themselves: *“I did not follow anyone, and no one followed me. I really used the app purely for myself.”* (11, f, 23).

The paradoxical aspect ‘compare to self’ was mentioned by a few respondents. The respondents stated they compared their former running results or the former number of steps a day with their new results: *“Sometimes I checked my older runs and then compare the results with my last runs.”* (10, f, 22).

On the contrary, the paradoxical aspect ‘community’ was mentioned by a few respondents, and the option to share the results with peers and allow to connect with them was perceived as valuable: *“With Strava you can also share your runs with other people, so that makes it fun too and could be extra motivating.”* (7, f, 23). However, when the results did not meet the desired goals, the respondents stated they did not share these ‘failing’ results with others: *“Well, I only shared my excellent moments, because I did not want people to know that I failed myself sometimes.”* (8, f, 22).

Furthermore, five respondents stated they questioned their privacy when using the apps’ sharing function: *“I got a little panicky because then people could see where I run, but then they could also see where I live because it is my starting and ending point of course.”* (11, f, 23). In addition, none of the respondents was willing to share their results on social media platforms: *“I only shared it with the people I followed and who thus followed me, I did never share something on social media.”* (7, f, 23). However, some respondents did share their results via messages to their peers: *“I wanted to take more steps than my husband. So, in the evening we compared the number of steps, or if I already had achieved the 10,000 steps I sent him a screenshot.”* (1, f, 54).

Whereas a few respondents said they liked the sharing option, especially in the beginning phase of using the apps, some respondents experienced negative aspects of sharing with peers: *“And I could share my results with my friends, but then I started comparing myself to my friends and that was not always motivating nor gave me a positive feeling.”* (3, f, 22).

4.5.5 Motivating/ Demotivating

The last paradox that was identified in this research was the paradox motivating/ demotivating. All the respondents had experienced motivating and demotivating aspects during their usage of the mHealth apps. This was highlighted by one respondent through the Sentence Completion Method:

“I: mHealth apps are

Respondent: motivating but sometimes also a bit frustrating at the same time.” (1, f, 54)

Moreover, respondents were motivated to improve their behavior and performances by using the apps. The majority mentioned their mHealth apps motivated them to be more active during the day: *“Due to the app I became aware I had been sitting still for almost an hour, so receiving a notification reminded me to go for a walk and encouraged me to do so. I found the notifications motivating in the beginning.”* (12, f, 23). The respondents were motivated by receiving positive results: *“The Fitbit organizes a little party on the screen with disco balls and*

birds, so that was really motivating.” (3, f, 22) and by receiving negative results: “I was motivated to walk more than the day before when I had not walked that much” (6, f, 23). The goal of 10,000 steps a day was mentioned regularly by the respondents and motivated them to walk more: “I wanted to reach the 10,000 steps a day, that motivated me to take more walks”. (3, f, 22).

In contrast, the results show that within the course of the usage of the app by respondents, the majority stated they were demotivated by the apps: “In the beginning, I found it stimulating, but the longer I used it, I found it confronting and sometimes frustrating. Some days I just could not live up to it.” (1, f, 54). Respondents were demotivated, especially when they did not achieve their desired goals: “When you do not achieve the goal it may be a bit frustrating. And then for me it was more counterproductive, it was actually demotivating because I would not have made it anyway.” (3, f, 22). One respondent highlighted she stopped using the mHealth app since it was demotivating her too much: “I could not achieve the goals and that demotivated me, and it ended up frustrating me so much that I quit using the app.” (6, f, 23).

Concept	Definition	Quote
Integration	Users have (easily) adopted the mHealth apps into their lives. <ul style="list-style-type: none"> • Easy to use • Helpful notifications 	<i>It had become a very important part of my daily life in the beginning. (1, f, 54)</i>
Disintegration	Users do not have (easily) adopted the mHealth apps into their lives. <ul style="list-style-type: none"> • Time consuming • Annoying notifications • Technical issues 	<i>I have had days when I forgot to wear the Apple watch. I did not even think about it. (7, f, 23)</i>
Self-control	Users of the app have control about themselves and their lifestyle.	<i>I always wanted to run to relax and clear my head and no other than me can control that. (10, f, 22)</i>
External control	Users feel controlled and influenced by the app (to some extent). <ul style="list-style-type: none"> • Pressure • Influences mood 	<i>I got a little frustrated because I could not meet the expectations of the app. (9, f, 23)</i>
Confirmation	The app confirms the users’ positive or negative feeling. <ul style="list-style-type: none"> • Proud 	<i>I felt satisfied and proud when noticing that I had reached a goal. (3, f, 22)</i>

Disconfirmation	The app disconfirms the users' feeling, negatively or positively. <ul style="list-style-type: none"> • Surprised 	<i>Actually, I found out that I was moving a lot lesser than I thought I did. (2, f, 46)</i>
Individual	Users use the app and its information for themselves. They do not share or connect with others. <ul style="list-style-type: none"> • Compare to self 	<i>I did not follow anyone, and no one followed me. I really did it purely for myself. (11, f, 23)</i>
Community	Users use the app and its information to connect with others and share their experiences. <ul style="list-style-type: none"> • Compare to peers 	<i>I was able to share my performances with my friends. But then I started comparing myself to other people and that was not always motivating or positive. (3, f, 22).</i>
Motivating	The app helps users to motivate them to perform better.	<i>When you reach the 10,000 steps a day, the Fitbit organizes a little party on the screen with disco balls and birds so that is really motivating and nice to see. You have a little party with your Fitbit. (3, f, 22)</i>
Demotivating	The app could demotivate users by showing negative results.	<i>When I got to see the statistics, which did not meet my expectations, my motivation was also a lot lower as a result, since I thought I had done a good job. (4, f, 23)</i>

Table 4 Paradoxes

4.6 Stopping process

At the beginning of using the mHealth apps, respondents mentioned they primarily experienced positive aspects of the apps. However, within the course of using the apps, the negative aspects of the apps outweighed the positive ones, according to almost all the respondents: *“In the beginning I got enough satisfaction from it, but when I did not reach my goals over and over again, the negative aspects outweighed the positive ones”* (3, f, 22). A few respondents started ignoring features of the apps: *“After a while, I thought it was nonsense, and I had no time and no desire for it, so I just ignored it from then on.”* (7, f, 23).

Respondents mentioned several reasons why they stopped using the apps. One respondent highlighted one of the reasons she stopped was since she achieved her goal what she started using the app for: *“Besides, I have achieved the goal I had bought the Fitbit for, because I know now that my sleep rhythm is just normal or at least average.”* (5, f, 22). However, other respondents stopped using the apps since they could not achieve their goals: *“I could not achieve the goals, and that demotivated me and ended up frustrating me so much that I quit using the app.”* (6, f, 23) or could not meet the expectations of the apps: *“I got frustrated when I could not meet the expectations of the app.”* (9, f, 23). Overall, the majority stopped due

to an accumulation of negative aspects that were experienced while using the apps: *“Over time, the negative aspects outweighed the positive ones for me, and that is why I eventually stopped doing it.”* (12, f, 23). This accumulation consisted of the key negative aspects which are explained above.

Furthermore, respondents were asked how they felt when they eventually stopped using the apps. The majority mentioned they felt relieved: *“I felt relieved in a way, for sure.”* (3, f, 22). However, sometimes they felt defeated on top of it: *“I felt relieved in a way, I think it was the right choice, I also felt a bit defeated.”* (2, f, 46). Overall, the respondents felt relieved and relaxed when they stopped using the apps: *“After I stopped using the app, I felt relieved and much more relaxed.”* (6, f, 23).

4.6 Dynamics

Figure 1 shows the dynamics of the feelings and aspects that were most experienced by the respondents when using the mHealth apps. These feelings and aspects consist of curiosity, excitement, frustration, and pressure.

The results show respondents were curious about their performances and statistics at the beginning of using the mHealth apps: *“Just curious about the numbers.”* (6, f, 23). However, the feeling of curiosity faded after respondents had used the apps for a short period of time: *“Now I know the distance of my laps and that was what I was curious about.”* (11, f, 23), which is visualized in Figure 1. Additionally, the feeling of excitement was high in the beginning phase: *“So, in the beginning there was much joy and excitement”* (2, f, 46). Respondents highlighted the feeling of excitement was only experienced in the first half of using the apps and was increasingly declining after having increasing feelings of frustration and experiencing pressure, which is depicted in Figure 1.

Furthermore, the feeling of excitement was gradually replaced by the feeling of frustration and pressure due to the apps: *“Yes, at the beginning I really was excited about the app and it motivated me a lot because I wanted to perform. But later I started to annoy myself more and more and I felt a lot of pressure by the app.”* (10, f, 22). All respondents mentioned they had experienced feelings of frustration when using the app and that these feelings increased the longer they used the apps: *“When I did not achieve the goal, it was a bit frustrating. When this happened more frequent, it frustrated me more and more.”* (3, f, 22). The incrementally increasing visualization of the aspect frustration can be found in Figure 1. Besides, respondents felt pressure when using the app for some time: *“At the beginning I was so excited to use the*

smart watch, but after some time I just felt so much pressure every time I received a notification.” (9, f, 23). Figure 1 depicts the visualization of the aspect pressure, which gradually increases while the feeling of excitement decreases.

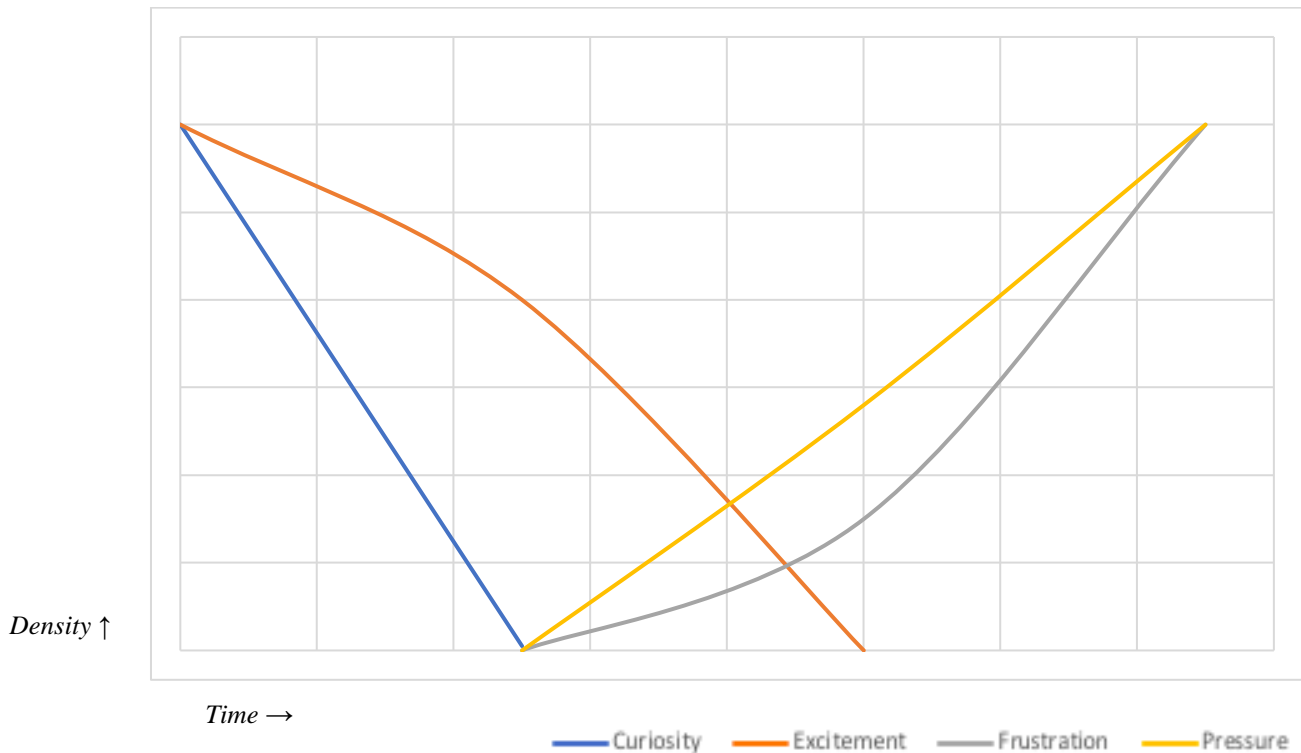


Figure 1 Dynamics of Feelings and Aspects

4.7 Future perspective

When respondents were asked about their opinions of using mHealth apps again in the future, they mentioned not excluding to use the apps again in the future: “I do not have any ideas right now about what app I might use in the future, but I am open to it.” (8, f, 22). Both apps they used before: “Maybe I will use the Strava app again someday.” (4, f, 23) as other (non-) similar mHealth apps: “I do not think I am going to use the health app again, but maybe if I will ever go cycling, for example, I may want to use a suitable app for that” (6, f, 23). Further, few respondents mentioned they only consider using the Fitbit and Apple Watch again when the appearance could be more feminine: “A narrower band and a smaller clock, so that it is also suitable for a woman’s wrist.” (8, f, 22). Moreover, one respondent highlighted she would consider using the app again if the app could adjust to her circumstances:

I: What could trigger you to start using mHealth apps again?

Respondent: Maybe some empathy, I do not know. Some kind of that could make it adjust to the circumstances more, that would work for me.” (2, f, 46)

Furthermore, some respondents believed these apps will gain in importance in the future: “However, I believe that these apps may gain in importance over time.” (3, f, 22).

However, respondents are sceptical about the data the apps collect, they perceive this as a potential risk. Moreover, respondents have privacy concerns and if the apps gain in importance then there may be more risks involved: *“All these data are going to the internet and I do not want people to be able to read mine, I think it is risky.”* (5, f, 22).

In the following chapter, the results of this research will be discussed and integrated into the literature. Subsequently, the conclusion will be given, and the contribution to existing knowledge as well as the practical implications will be presented. Lastly, the limitations of this study and ideas for further research will be given.

5. Discussion

5.1 General discussion

While the usage of mHealth apps is increasing, the number of people who stopped using the apps is increasing as well (Vaghefi & Tulu, 2019). Besides, prior research on mHealth apps in combination with paradoxes is focused on the users and not on people who stopped using mHealth apps. Therefore, the objective of this study was to gain insight into why these people stop using mHealth apps and what paradoxes they have experienced.

First, the initial motivational aspect in this study consists of perceiving the apps as a helping hand and getting insights into personal performances by self-tracking. This self-tracking option is perceived as a handy tool that assists its users to become healthier. This corresponds with the “self-management” aspect, which implies the user of mHealth apps can manage and change their behavior since it becomes more salient through the apps (Schnall et al., 2016, p. 243). In line with this, the present study revealed respondents became more active when using the apps, especially at the beginning of using the apps, which is in line with the findings of Lupton (2017) who stated digital technologies are used to receive detailed information about own performances to improve themselves.

Furthermore, this study advanced the existing literature of Mick and Fournier (1998) by identifying paradoxes that have been experienced by the respondents. The findings revealed five most salient paradoxes, namely integration/ disintegration, self-control/ external control, confirmation/ disconfirmation, individual/ community, and motivating/ demotivating. These paradoxes are not in line with the research of Mick and Fournier (1998), who described the paradoxes control/ chaos and freedom/ enslavement as most salient. However, the paradox freedom/ enslavement is slightly similar to the paradox self-control/ external control in the present study. Both paradoxes consist of whether one has control over oneself and therefore has freedom, and whether one is controlled by a device and experiences feelings of enslavement. Furthermore, the findings are in line with prior research in the mHealth domain (e.g. Klintwort, 2018). This leads to the first propositions regarding paradoxes:

P1a. Users of mHealth apps experience the integration/ disintegration paradox.

P1b. Users of mHealth apps experience the self-control/ external control paradox.

P1c. Users of mHealth apps experience the confirmation/ disconfirmation paradox.

P1d. Users of mHealth apps experience the individual/ community paradox.

P1e. Users of mHealth apps experience the motivating/ demotivating paradox.

Whereas mHealth apps are mostly fully integrated into users' lives according to the study of Klintwort (2018), the apps were not integrated into most respondents' lives in the present study. Especially due to the time-consuming aspect of the app, which applies mainly to the step counter apps to reach the 'standard' of 10,000 steps a day, and the notifications, which were mostly perceived as annoying and stressful, the apps were not integrated into the respondents' lives. Hence, the following research proposition regarding notifications:

P2. Notifications of mHealth apps are perceived as stressful and annoying rather than helpful.

Furthermore, the integration of the apps was also hindered by technical issues. Linking to this, Jarvenpaa and Lang (2005) have found that non-functioning of technical devices leads to dissatisfaction and even frustration, which is in line with the present study.

Another result that has been found and is not in line with the previous literature is the routine of constantly checking and constantly being concerned with the number of steps. This has been identified as addiction and obsessive behavior in the present study. Whereas the respondents perceive this behavior as obsessive, it is contrasting to the previous literature where constantly checking is not seen as an addiction (Oulasvirta et al. 2011). In line with this, some respondents revealed feeling frustrated when not recording their performances with the app which is identified as a "crisis of disconnection" by Lomborg (2015, p. 50).

In addition, the paradox individual/ community also contrasts with the previous literature. The majority in this study revealed they used mHealth apps for individual purposes. Most respondents are not willing to share their performances through the apps, and no one is willing to share results that are negatively perceived. Moreover, none of the respondents want to share their information on social media. This is in contrast to the literature, which implies users value the sharing options in mHealth apps (Lupton, 2017). Lupton (2017) argues that users of mHealth apps find support when sharing their data through apps and/ or social media. However, this study revealed that respondents did not have positive feelings by comparing themselves to their peers' data. This leads to the following research propositions:

P3a. People use mHealth apps for themselves rather than to share results with others.

P3b. mHealth apps' users are more likely to share their positive results only than sharing both their positive and negative results.

Furthermore, privacy concerns were one of the key negative aspects of this study. In line with this, previous research argued users were highly concerned about what happens with their shared personal data (Kokolakis, 2017). However, Kokolakis (2017) also stated consumers are willing to share their data for convenience, which contrasts with the present study. This

study revealed that most of the respondents were not willing to share any data with others and are careful with providing the app personal data apart from the self-tracking aspect.

In the present study, the respondents' identity overlap is quite high (≥ 5 on a 7-point Likert scale). However, this could also be a cause for stop using mHealth apps. According to Yim and Park (2019), people are demotivated and less interested in technological resources (e.g. mHealth apps) when their actual self already closely resembles their favourable and ideal self. Since the actual self and the ideal self largely overlap, the respondents might be less interested and motivated to continue using the mHealth apps. Hence, the following research proposition regarding identity overlap:

P4. The greater one's identity overlap, the more likely one will stop using mHealth apps.

The results of this study showed four salient dynamics, namely curiosity, feelings of excitement, feelings of frustration, and pressure. These dynamics are once again depicted in Figure 2. Whereas curiosity and feelings of excitement were experienced in the very beginning of using mHealth apps, the other two aspects were only experienced when curiosity and feelings of excitement decreased. This is in line with the study of Lee, Han, and Jo (2017), who found people try mHealth apps to satisfy their curiosity. However, curiosity is satisfied within a short period of time. Furthermore, the decrease of the feelings of excitement as seen in the present study was in line with previous studies (Klintwort, 2018). An explanation could be when noticing not achieving goals over and over again, users of mHealth apps get demotivated, and hence their level of excitement decreases. This might also be a reason the users experience feelings of frustration and feeling pressured by the apps, which increases over time when not achieving their goals. Moreover, users of the app try to meet the app's expectations as best they can and try to achieve their goals. However, when experiencing feelings of frustration and pressure over and over again, people find it not worthwhile to use the apps anymore since it negatively affects their wellbeing. Hence, this resulted in the following propositions:

P5a. When curiosity and feelings of excitement decreases, feelings of frustration and pressure of the mHealth apps arise.

P5b. When often experiencing feelings of frustration and pressure by mHealth apps, people will stop using the apps.

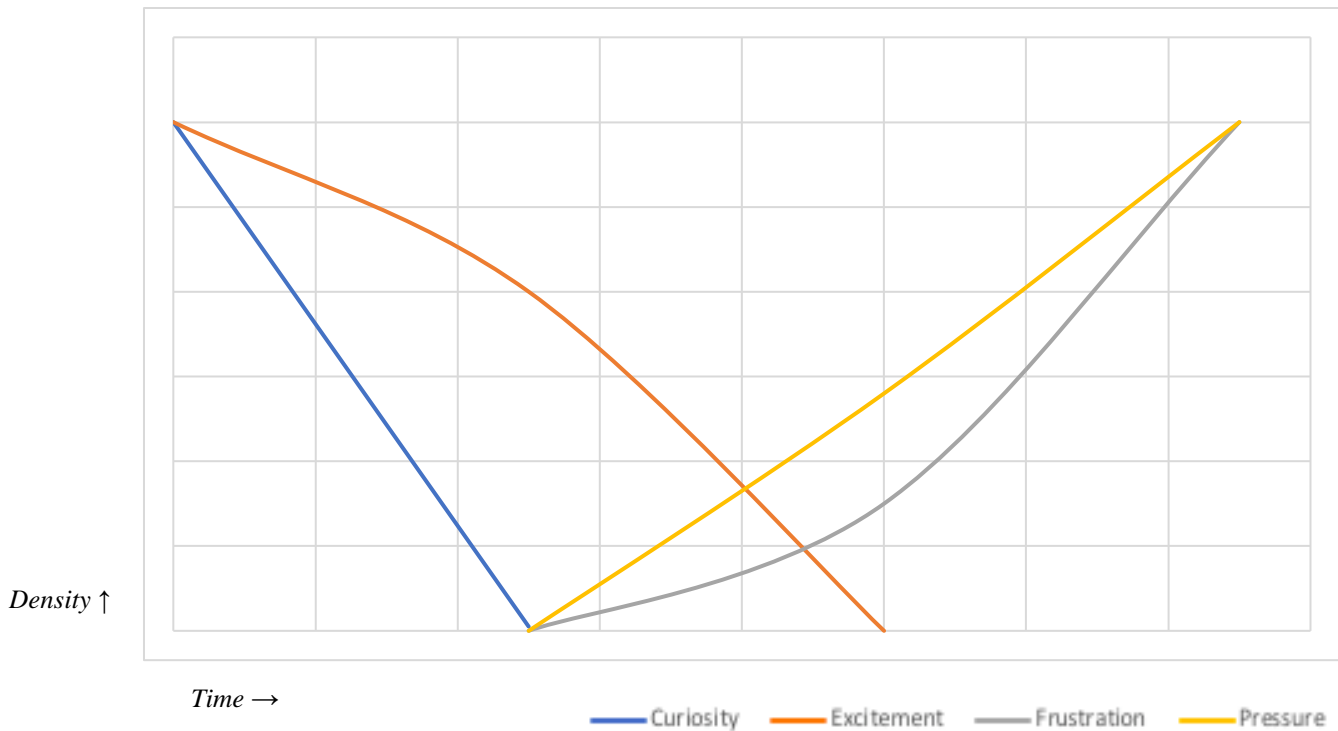


Figure 2 Dynamics of Feelings and Aspects

Whereas some people will stop using mHealth apps because of their costs (Krebs & Duncan, 2015), none of the respondents in the present study even mentioned the costs of the apps. In this study, the main reason why people stopped using mHealth apps is an accumulation of negative aspects. First, people stopped using the apps because they felt too frustrated due to not achieving goals and constant receiving notifications. Second, respondents felt pressure from the apps, which was an extensive culprit. Another reason mentioned is that respondents are no longer interested in the apps. Only the last reason is in line with the findings of Krebs and Duncan (2015), and the frustration aspect is in line with the results of Klintwort (2018). However, experiencing pressure by the apps has not been identified by previous research. Therefore, further research could take this into account. Hence, the research propositions regarding frustration, pressure, and the lack of interest:

P6a. Experiencing feelings of frustration by mHealth apps leads to stop using the apps.

P6b. Experiencing pressure by mHealth apps leads to stop using the apps.

P6c. Lack of interest in mHealth apps leads to stop using the apps.

Although respondents wanted to control their behavior with the apps, they could not always meet the expectations of the apps and therefore could not achieve their goals. Moreover, all respondents experienced feelings of frustration and disappointment as a consequence of the present study. An explanation why these feelings were experienced could be that the respondents were not (entirely) resilient (Masten & Reed, 2002) and were, therefore, over and over again negatively affected by not achieving goals (Coutu, 2002). Moreover, these negative

experiences were considered as one of the reasons to stop using mHealth apps. Hence, the following propositions regarding achieving goals and resilience could be tested in further research:

P7. mHealth apps' users who do not achieve their goals are more likely to get frustrated by the apps and more likely to stop using the apps.

P8. mHealth apps' users who are less resilient are more likely to stop using mHealth apps than mHealth app users who are more resilient.

This study revealed that eight respondents do not exclude start reusing mHealth apps in the future. Whereas the main reason in this study was to have more time to start using these time-consuming apps again, other studies revealed the motivational aspect was the main reason to continue using or reuse the apps (Krebs & Duncan, 2015). Besides, it was indicated respondents would like to try using the apps again if these could be more adapted to their current life, which has not been addressed in previous studies (e.g. Klintwort, 2018; Krebs & Duncan, 2015) and therefore might be a practical implication for app developers.

Figure 3 provides a conceptual model to visualize the findings of this research. First, when using mHealth apps, positive and negative aspects are experienced by its users. When these positive and negative aspects occur simultaneously, paradoxes arise (Mick & Fournier, 1998). When the negative side of the paradoxes is more salient than the positive side, feelings of frustration and pressure were experienced by the respondents that led to stopping using mHealth apps. Additionally, when people achieve their initial goal to start using the apps, they will also stop using them. Whereas the positive side of the paradoxes is more salient than the negative one, people will experience feelings of satisfaction (Mick & Fournier, 1998; Jarvenpaa & Lang, 2005), which causes the continuance of using mHealth apps. However, when continuing to use mHealth apps, people might experience positive and negative aspects as well as paradoxes again, which eventually might lead to feelings of frustration and pressure and nevertheless causes stopping behavior of mHealth apps. This leads to the following propositions regarding the (dis)continue of mHealth apps:

P9a. When the negative aspects of mHealth apps outweigh the positive aspects, one will stop using the apps.

P9b. If people experience positive feelings caused by mHealth apps, they are more likely to continue using the apps than when experiencing negative feelings.

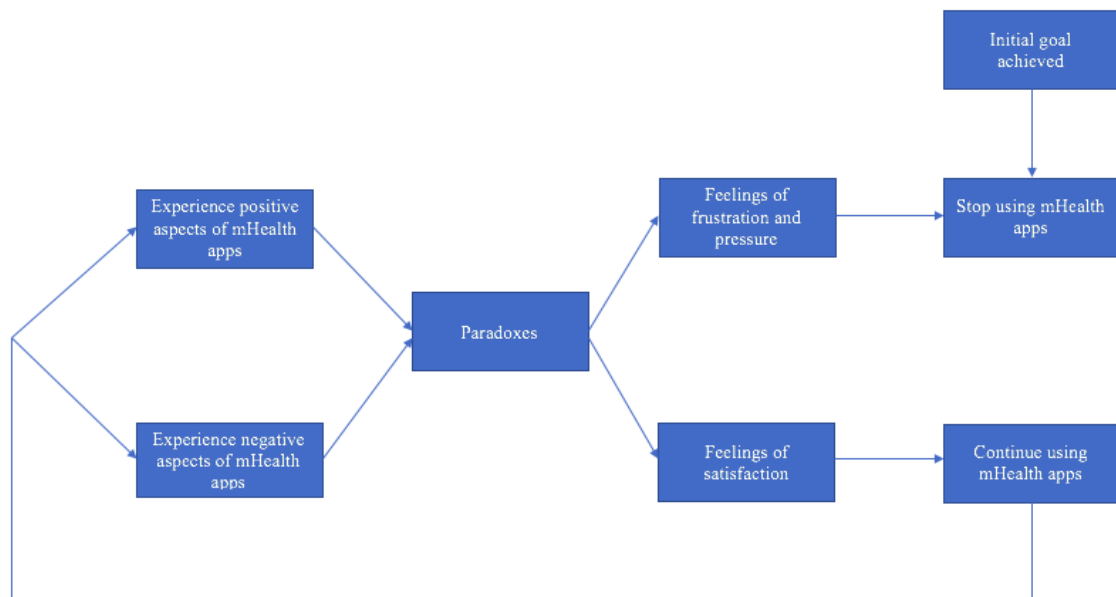


Figure 3 Conceptual model

5.2 Conclusion

Although research on mHealth apps is increasing lately, there is no research on why people stop using mHealth apps yet. Therefore, this study aimed to answer the research question: “Which paradoxical tensions did people who used to use mHealth applications experience and why did these people stop using the applications?”. The results from this qualitative research were conducted via the Sentence Completion Method and interviews.

In this research, five paradoxes were identified which were most salient. These paradoxes arise from the positive and negative aspects of mHealth apps, which were experienced by the respondents. The most prevalent positive aspects were easy to use and the motivating aspect of the app, whereas the most prevalent negative aspects were privacy concerns, the unreliability of the app, pressure, and notifications. Moreover, the paradoxes trigger both positive and negative emotions by users of the apps, such as pride and feelings of frustration. The main reason why people stop using mHealth apps is an accumulation of negative aspects that outweigh the positive ones. The most salient reasons are the pressure that comes along with using the apps including the feelings of frustration that occur when one is not achieving their goals. Besides, the notifications which are received throughout the day are also a salient reason as well as the time-consuming aspect since the ‘standard’ of 10,000 steps takes quite some time.

In conclusion, whereas consumers can be positively affected by mHealth apps, they can be negatively affected by these simultaneously, which is defined as a paradox. The apps facilitate motivation to improve its users' healthy behavior, especially in the beginning phase.

However, they also provide feelings of pressure and frustration and therefore threaten people's wellbeing. Due to the several risks of mHealth apps, such as privacy concerns and obsessive behavior, and the rapid developments of mHealth apps, the future of these apps is not clear. The future depends on various actors, such as app developers, health institutions, and of course consumers. Thus, whether people will continue or will start using the app (again) depends on which side of the paradoxes is most strengthened and how the perceived risks will be handled by app developers and consumers.

5.3 Theoretical contribution

From a research point of view, the present study at hand contributes to the existing literature through various aspects. Despite the increasing amount of research on mHealth apps, there is a lack of research on the stopping behavior of people who used to use mHealth apps. Through qualitative research in the form of interviews and the Sentence Completion Method, in-depth data are gained concerning the experienced paradoxes by users of mHealth apps and why people stop using mHealth apps. Moreover, the paradox concept, introduced by Mick and Fournier (1998), is applied to the domain of mHealth apps and is used in this study to investigate the stopping behavior of mHealth apps' users. Thereby this study fills a gap in the existing literature and expands theories about paradoxes.

In the study of Mick and Fournier (1998) they suggested further research of the paradoxes in different domains. Moreover, they came up with questions on to what extent users experienced the paradoxes in these different domains. This study contributes to the knowledge to expand the research in the mHealth app domain which, despite it is increasing, is still scarce yet. Furthermore, the present study identified additional subordinated paradoxes, which were not found by other researchers, such as simple to use/ time-consuming of the paradox integration/ disintegration in the context of the execution of the performances.

Besides, no attention has been paid to people who stopped using mHealth apps, since the focus was usually on the usage behavior of mHealth apps' users (e.g. Klintwort, 2018; Kokolakis, 2017). Therefore, this research contributes to theory by focusing not only on the initial motivation and the behavior after the adoption of technology but also on why people stop using mHealth apps. Previous literature suggested empirical research should study people who stopped using self-tracking devices (Sharon, 2016). Therefore, this study's sample consisted of respondents who all stopped using mHealth apps.

Furthermore, relevant findings of why people stopped using mHealth apps are that respondents find using the apps highly time-consuming, they experience a lot of pressure, and

they get frustrated after using the apps for a while. Thereby, it expands the existing knowledge that indicated people just stopped since they were experiencing negative aspects (Klintwort, 2018). This is based on the theory of Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) that indicated people want to relieve themselves from negative moods and bad incidents.

During this research, it is discovered that the respondents had privacy concerns not only when providing the app with personal data (Kokolakis, 2017) but also when data were stored by the app when using self-tracking options. Thereby, this study expands the findings of Klintwort (2018) on consumers' perceptions of data privacy even further. This study shows people want to control their data and that privacy concerns can even lead to stop using mHealth apps.

Lastly, this study considers both positive and negative aspects of mHealth apps and experiences by its users, as previous studies (e.g. Mick & Fournier, 1998; Jarvenpaa & Lang, 2005; Klintwort, 2018). Moreover, it is shown that the paradox concept is still highly relevant in the technology domain and is a cause of the stopping behavior of mHealth apps' users.

5.4 Managerial implications

This study identified paradoxes and negative aspects of mHealth apps that have the potential to cause damage to the experiences of its users and, therefore, may cause people to stop using the apps. Accordingly, it is important for developing companies of mHealth apps to be aware of the paradoxical emotions and experiences of its users, to provide them with the best product which will not cause stopping behavior. To understand the users' behavior and experiences, it is suggested to these companies to implement an algorithm in the apps. Hereby, the companies can gain insights into the users' behavior and preferences of the apps. Such an algorithm could be focusing on the usage frequency of the users to adjust the app to its users' preferences, which will possibly lead to less stopping behavior.

Moreover, the above-advised algorithm can be used to gain insights into how often users click on the notifications which they receive very often. Whereas some respondents perceived the notifications as helpful, the majority perceived them as annoying and stressful that often was one of the reasons for quitting. When app developers have insights into how much a user clicks on the notifications and how often the app's demand through the notifications is met, they may adjust the number of notifications per user so that these notifications might be perceived as less annoying and/ or stressful. Another piece of advice could be to let users indicate beforehand how often they want to receive notifications instead of choosing between the options receiving notifications or not receiving notifications at all.

Furthermore, it was highlighted users wanted the app, especially the step counter apps, to be more adjusted to their lives. For instance, when they have a day full of meetings and therefore cannot take many steps that day. As for advice, mHealth app developers could develop an additional function for the step counter apps in which users could indicate they have a busy day or that they have already done another workout or a yoga session. In this way, the app will show that they have already been active that day, even when users have not taken as many steps as other days. So, when users then want to view a monthly overview, they see that on certain days they took a few steps in contrast to other days but still had enough exercise since the app tells them they did yoga that day. Moreover, app developers could also develop an additional app or an additional feature to existing apps to which all other mHealth can be linked. That will offer users a handy overview of all their activity performances.

In order to reduce privacy concerns of mHealth apps' users, the app development companies should be more transparent regarding their privacy policy and provide it in an, for all people, understandable language (Krebs & Duncan, 2015; Swan, 2012). Furthermore, the results showed none of the respondents wanted to share their results on social media, and most of the respondents do not share their results at all. App developing companies should take these preferences into account by changing the default settings into keeping the results to yourself by default and the option to share it, instead of the default setting to share results and the option to keep it to yourself. This might also reduce the occurrence of users accidentally sharing their results when they did not intend to.

Lastly, few respondents indicated they would consider using the Fitbit or Apple Watch again when the appearance of these smartwatches could be more feminine. They suggested a narrower band that fits a woman's wrist, and it should be a piece of jewellery itself, in colours of gold and silver that would match other jewellery. If these adjustments on the smartwatches will be followed through, it is plausible that more women would purchase a smartwatch.

5.5 Limitations and recommendations for further research

This Master's thesis bears some limitations and provides suggestions for further research. First, it has to be mentioned that the generalizability of this study might be questionable since the data from the interviews was retrieved from only twelve respondents. Besides, the sample was gathered through snowball- and convenience sampling methods. As a consequence, the demographical and geographical characteristics are very limited. Moreover, the sample is not balanced regarding gender since all respondents who were interviewed were women. Since the present research consists of only female respondents, future research could investigate whether

gender influences the results of this study. Further, the respondents' age range was between 22 and 54 years, whereas ten respondents 22 or 23 years old. Therefore, it might not be valid to generalize this study's results to Generation X (40 – 60 years). Moreover, the results neither can simply be transferred to other age groups than 22 and 23. Hence, it is recommended to replicate this study with different age groups, particularly with older people (≥ 40 , Generation X) than the present group, since these groups were not examined during this research. Moreover, age could be a possible moderator that could be added to the conceptual model (Figure 3) and could be interesting for further research. Besides, it can be assumed that the majority of the respondents had a fundamental understanding of the mHealth apps they used and other smart devices since the majority was aged 22 or 23 and grew up with these applications and devices. Concluding, this study is based on people who are capable of using these apps and devices, which might cause the results to do not apply to people who lack these skills. Furthermore, all respondents lived in the Netherlands, were all highly educated, and were almost all Dutch native speakers except for one. Since the study was conducted with only Dutch residents, these findings cannot easily be transferred to other countries or cultures. Future research could use a sample with other demographical and geographical characteristics to make generalizability easier.

Second, respondents might be extra negative about using mHealth apps since they have stopped using these, while if they were asked at the beginning of using the apps they might have reacted more positively. Therefore, it could be the reason more negative than positive aspects have been mentioned. Furthermore, the results might not reflect the actual incidents since respondents need to recall past emotions and experiences. Besides, the interviews might be subjective to a certain amount since these were carried out by only one person, the author. Moreover, since the interviews were semi-structured, it allowed the interviewer to ask questions with a certain amount of freedom, which caused the interviews not to be completely congruent. Further research could investigate the present findings again using quantitative methods that might make this research's results more congruent.

Thirdly, only a few different mHealth apps were examined during this research which consisted of step counter/ running apps, one calorie tracking app, and the smartwatches. However, apps intended for medical purposes were not discussed in this study. Therefore, it would be interesting if future research focuses on these medical apps and investigate if these apps would have the same results as the set of mHealth apps in the present research. When researching medical apps, it would be also interesting what roles healthcare institutions might have and if they can support patients while using medical mHealth apps.

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Appendices

Appendix A: Interview Guide English

Master Thesis – Interview (ENG)

First of all, thanks in advance for participating in my research for my Master thesis.

This interview is about your experience with the use of *mobile Health applications* (mHealth apps). These apps are used on a smart device (e.g. smartphone) in order to track yourself.

When answering the questions, please keep in mind that there are no wrong answers. Your answers will be treated confidentially and to ensure complete anonymity, your name will be re-coded. The data will only be used for scientific reasons in this Master thesis.

The results of this Master thesis will be used by providing suggestions to mHealth app developers and companies to improve their applications. Feel free to inquire about the results of this research, I will be happy to share them.

Before the interview starts, you will be given two sentence beginnings to complete. Ideally, you complete these with the first thoughts that come to your mind. Afterwards, the interview will be conducted. This will take around 40 minutes.

Lastly, if you agree, the interview will be tape-recorded.

Once more, thanks in advance for your participation.

Sentence Completion Method:

I would like to start with two sentence beginnings and I'll ask you to complete these sentences with the first things that come to your mind.

1. MHealth app(s) are...
2. MHealth app(s) are not...

General

You mentioned that you used to use a mHealth app but stopped with it. I would like to ask you some questions about this/ these mHealth app(s) and the usage of it/these.

- Which mHealth app(s) did you use?
- What was your purpose with the app(s) when you started using it?
- Was using the app any different from what you expected it to be? If yes, in what way was it different?
- How long have you been using it/them?
- When you were using the mHealth app(s), how many times a week did you typically engage with the app(s)?
 - Was the app integrated into your life?

Experiences

- Can you tell me what it was like to use the app? When you were engaging with the app, what did you have to do?
- Can you tell about the feelings you have had when you were using the app(s)? Did it make you feel happy or was it stress relieving or did it frustrate you? Anything else? More?
- Did the app(s) has/have some positive aspects? What were these? Anything else?
- Were there some specific moments linked to these positive aspects? When? Can you think of more?
- From your point of view, what were the key positive aspects of the app(s)? More?
- Did the app(s) has/have some negative aspects as well? What were these? More?
- Were there some specific moments linked to these negative aspects? When? Can you think of more?
- From your point of view, what were the key negative aspects of the app(s)?

- You mentioned both positive and negative aspects of the app(s). How do these aspects interact for you? Does the one outweigh the other for you?
 - Was there any difference between the beginning and at the end?
- You told me that you stopped using mHealth apps, now I would like to understand this process a bit more of how and why you stopped. What was/were the main reason(s) to stop using the app(s)?
 - Can you describe what you did during the stopping process? Did you stop immediately with all the apps or did you gradually reduce it? Why?
 - Have you deleted all the apps or just stopped using them? Why?
 - Can you describe how you felt during this process?
 - And how did you feel after you stopped using the apps?
- Did you already have breaks in using the app before you stopped using it? When and why?
- Looking into the future, do you think that someday you will start using the app again or another similar one? Another non-similar maybe? Why? Why not?
 - If no: What has to change in your opinion that will make you start using the app again? What could trigger you to start using the app again or start using another app?
- Is there anything you like to add?

Background information

- If you compare your ideal self with yourself at this moment regarding healthy behavior, how much do these two overlaps on a scale of 1 to 7 where 1 is not overlapping at all and 7 is fully overlapping?
 - If these do not overlap (that much): What do you want to improve?
 - Did you want to achieve this with the use of the mHealth apps you've used?
 - If yes: did it take you closer to your ideal self?
 - If these do overlap: did the mHealth apps help you to accomplish these goals for yourself?
- Gender:
- Age:
- Occupation:

Appendix B: Interview Guide Dutch

Master Thesis – Interview (NL)

Allereerst, hartelijk dank voor het meedoen aan mijn onderzoek voor mijn Master thesis.

Dit interview gaat over uw ervaringen met het gebruik van mobile Health applicaties (mHealth apps, in het Nederlands: mobiele gezondheid apps). Deze apps worden gebruikt op een smartphone of smartwatch voor self-tracking doelen.

Houd er bij het beantwoorden van de vragen rekening mee dat er geen foute antwoorden zijn. Uw antwoorden worden vertrouwelijk behandeld en om volledige anonimiteit te garanderen, wordt uw naam opnieuw gecodeerd. Uw antwoorden worden alleen voor wetenschappelijke redenen gebruikt in deze Master thesis.

De resultaten van deze Master thesis zullen gebruikt worden om suggesties geven aan ontwikkelaars van mHealth apps en bedrijven om hun apps te verbeteren. Voel je vrij om te informeren naar de resultaten van dit onderzoek, ik deel ze graag.

Voordat het interview begint, krijgt u een begin van twee zinnen om te voltooien. Idealiter vult u deze aan met de eerste gedachten die in u opkomen. Daarna wordt het interview afgenomen. Dit duurt ongeveer 40 minuten.

Als u akkoord gaat, zou ik het interview graag willen opnemen.

Nogmaals, hartelijk dat voor uw deelname.

Sentence Completion Methode:

I would like to start with two sentence beginnings and I'll ask you to complete these sentences with the first things that come to your mind.

Ik zou graag willen starten met twee begin stukjes van zinnen en dan zou ik je willen vragen deze zinnen aan te vullen met de eerste gedachten die in je opkomen.

1. MHealth app(s) zijn...
2. MHealth app(s) zijn niet ...

Algemene vragen

Je zei dat je bent gestopt met het gebruiken van mHealth app(s). Ik zou je graag een aantal vragen willen stellen over deze mHealth app(s) en het gebruik ervan.

- Welke mHealth app(s) heb je gebruikt?
- Wat was jouw doel van de mHealth app toen u startte met het gebruik?
- Was het gebruik van de app anders dan u van tevoren had verwacht? Zo ja, op welke manier verschilde het?
- Hoe lang heb je de app(s) gebruikt?
- Toen u de app(s) gebruikte, hoe vaak per week was je normaal gesproken met de app bezig?
 - Kun je zeggen dat het geïntegreerd was in je leven of denk je daar anders over?

Ervaringen

- Kun je vertellen over je ervaringen tijdens het gebruik van de app(s)? Over hoe het gebruik van de apps voor jou was? Kun je vertellen wat voor gevoel je hierbij had? Nog iets anders? Nog meer?
- Had/hadden de app(s) positieve aspecten? Wat waren positieve aspecten? Nog iets anders?
- Kun je specifieke momenten koppelen aan de positieve aspecten? Wanneer waren deze momenten? Kun je er wellicht meer bedenken?
- Wat waren voor jou de belangrijkste positieve aspecten van de app(s)? Nog meer?
- Had/hadden de app(s) ook negatieve aspecten? Wat waren negatieve aspecten? Nog meer?
- Kun je specifieke momenten koppelen aan de negatieve aspecten? Wanneer waren deze momenten? Kun je er wellicht meer bedenken?

- Wat waren voor jou de belangrijkste negatieve aspecten van de app(s)? Nog meer?
- Je noemde zowel positieve als negatieve aspecten van de app(s). Hoe verhouden deze positieve en negatieve aspecten zich met elkaar volgens jou? Weegt het een op tegen het ander voor jou?
 - Was er een verschil tussen het begin en het einde van het gebruik van de apps?
- Je vertelde dat je bent gestopt met het gebruiken van de app(s). Ik wil graag het proces onderzoeken van hoe en waarom je gestopt bent. Wat was/waren de belangrijkste reden(en) om te stoppen met de app(s)?
 - Kun je beschrijven wat je deed tijdens dit proces? Ben je meteen gestopt of ben je gaan minderen met de app en uiteindelijk gestopt?
 - Heb je de apps verwijderd of ben je gewoon gestopt met het gebruiken?
 - Kun je beschrijven hoe je je voelde toen je overwoog om te stoppen?
 - En hoe voelde je je toen je uiteindelijk was gestopt?
- Ben je al eens eerder gestopt met het gebruiken van de app(s)? Wanneer en waarom?
- Denk je dat je de app(s) ooit nog gaat gebruiken? Of wellicht een vergelijkbare app? Of juist een heel andere app? Waarom? Waarom niet?
 - Zo nee: wat moet er naar jouw mening veranderen zodat jij de app weer gaat gebruiken? Wat zou je kunnen triggeren om de app weer opnieuw te gaan gebruiken of een andere app te gaan gebruiken?
- Is er nog iets dat je wilt toevoegen?

Achtergrond informatie

- Als je je ideale zelf vergelijkt met jezelf op dit moment wat betreft fysieke gezondheid, in hoeverre overlappen deze twee elkaar op een schaal van 1 tot 7 waar 1 totaal niet overlappen is en 7 perfecte overlapping?
 - Als ze niet (veel) overlappen: wat zou je willen verbeteren?
 - Wilde je dit bereiken met de app(s)? Zo ja, heeft de app je dichterbij je ideale zelf gebracht?
 - Als ze wel veel overlappen: heeft de app hierbij geholpen?
- Geslacht:
- Leeftijd:
- Arbeidssituatie:

Appendix C: Category Definition

Category	Definition	Anchor Example
Initial motivation		
Helping hand	Users perceive the app as an helping hand to achieve their personal goals.	<i>For myself I wanted to be more healthy and wanted to have an extra push to move toward living more healthy. (2, f, 46)</i>
Getting Insight	Users start using the app since the want to get insight in their performances.	<i>I: mHealth apps are CH: apps that just give me black and white numbers. (2, f, 46)</i>
Curiosity	Users start using the app since they are curious about it.	<i>I was just curious about my number of steps a day, since it was an upcoming trend in the beginning of COVID-19. (12, f, 23)</i>
Positive key aspects		
Good notifications	Users receive notifications that causes positive feelings.	<i>I found it an incentive to know how I was doing while running, so these notifications were very nice.” (10, f, 22).</i>
Motivating	The app motivates the users to perform better.	<i>“I noticed that it was very motivating in the beginning.” (1, f, 54)</i>
Easy to use	The app is easy to use.	<i>Very easy to use, you could type in low-fat yoghurt and it would immediately give you suggestions of those products from different supermarkets. The right one was always there. (11, f, 23)</i>
Many options	The app has got many options for self-tracking.	<i>The two basic things are walking and running, but you can also choose for inline skating or cycling. It was more specific. (7, f, 23)</i>

Negative key aspects		
Privacy concerns	Users are concerned about their privacy in connection with the app.	<i>I got a little panicky because people could see where I ran, but then they could also see where I live since that is my starting and ending point of course. (11, f, 23)</i>
Unreliability	Users find the app unreliable and inaccurate (sometimes).	<i>I think the apps are unreliable in a way of not tracking correctly what you have done. For instance when I walked the same round as my mom, my mom her Fitbit tracked a greater number of steps than my health app on iPhone. (12, f, 23)</i>
Obsessive behavior	Users are too much focused on the app, sometimes they even become obsessed with it.	<i>I was too busy with the app in my opinion. Maybe a bit obsessive. (1, f, 54)</i>
Pressure	The app gives an extra pressure to the users.	<i>The number of steps is added as an extra task in my opinion on top of all my other tasks. I already was very busy, so it felt like an extra pressure. (6, f, 23)</i>
Gives frustration	Users get frustrated by (features of) the app.	<i>It gave me this extra pressure and made me feel frustrated and bad and sad about showing me very clearly what I did not do. (2, f, 46)</i>
Bad notifications	Users receive notifications that causes negative feelings.	<i>"I found the notifications in between very annoying." (9, f, 23).</i>
Time consuming	Users experience using the app is time consuming.	<i>I made a few times the 10,000 steps, but it really took too much of my time which I hardly have. (2, f, 46)</i>
Paradoxes		

Integration	Users have (easily) adopted the mHealth apps into their lives.	<i>It had become a very important part of my daily life. (1, f, 54)</i>
Helpful notifications	Notifications of the app are perceived as helpful and/ or fine.	<i>I also liked the notifications in the beginning, because then the Fitbit reminded me to move enough during the day so I did not have to go for an extremely long walk in the evening. (12, f, 23)</i>
Disintegration	Users do not have (easily) adopted the mHealth apps into their lives.	<i>I have had days when I forgot to wear the Apple watch. I did not even thought about it. (7, f, 23)</i>
Time-consuming	It is time-consuming to use the mHealth app.	<i>I made a few times the 10,000 steps, but it really took too much of my time which I hardly have. (2, f, 46)</i>
Annoying notifications	Notifications of the app are perceived as annoying and/ or stressful.	<i>I often got notifications like “come on, go outside, walk!”. And that is meant to motivate, but for me it was not nice. I decide for myself when I go and those kind of messages only made me cranky. (10, f, 22)</i>
Technical issues	Sometimes the app has technical issues that cause it to not work properly.	<i>What I found really annoying was the time when I finished my round and got home, I turned off the Strava app, but then it did not save the results, because I did activate it on Wi-Fi instead of 4G. (4, f, 23)</i>
Self-control	Users of the app have control about themselves and their lifestyle.	<i>I always wanted to run to relax and clear my head and no other than me can control that. (10, f, 22)</i>

External control	Users feel controlled by the app (to some extent).	<i>I got a little frustrated because I could not meet the expectations of the app. (9, f, 23)</i>
Influences mood	The app influences the users' mood.	<i>Normally you notice if you are waking up still tired or if you are rested, but when the app shows that you have slept terrible and too short, I automatically felt tired that whole day. (6, f, 23)</i>
Confirmation	The app confirms the users' positive or negative feeling.	<i>I think that I got satisfied when noticing that I had reached a goal. (3, f, 22)</i>
Proud	Users can be proud of their achieved results.	<i>I can still very well remember saying to people proudly that I had taken 15,000 steps that day. (6, f, 23)</i>
Disconfirmation	The app disconfirms the users' feeling, negatively or positively.	<i>Sometimes I had walked half a day and still had not taken many steps. But sometimes I was surprised how many steps I had taken in just one evening. (6, f, 23)</i>
Surprised	Users can be surprised by the results in a positive or negative way.	<i>It was really surprising that I had to take a walk of 1,5 hour to reach the number of 10,000 steps. (2, f, 46)</i>
Individual	Users use the app and its information for themselves. They do not share or connect with others.	<i>I did not follow anyone and no one followed me. I really did it purely for myself. (11, f, 23)</i>
Community	Users use the app and its information to connect with others and share their experiences.	<i>With the Strava app you can also share your laps with other people, so that makes it fun too. (7, f, 23)</i>

Compare to peers	Users compare their experiences and results with their peers’.	<i>I wanted to take more steps than my husband and in the evening we compared the number of steps to check if I really took more. (1, f, 54)</i>
Motivating	The app helps users to motivate them to perform better.	<i>When you reach the 10,000 steps a day, the Fitbit organizes a little party on the screen with disco balls and birds so that is really motivating and nice to see. You have a little party with your Fitbit. (3, f, 22)</i>
Demotivating	The app could demotivate users by showing negative results.	<i>If I had taken less than 10,000 steps, I did not feel like it anymore. It was very demotivating for me. (8, f, 22)</i>
Stopping process		
Ignoring	Users ignore (some parts of) the app.	<i>After a while I thought it was nonsense and I had no time and no desire for it, so I ignored that notification. (7, f, 23)</i>
Discontinuing	Users stop using the app.	<i>So the fact that the app gave me so much pressure and that I got annoyed and then disappointed in myself for not achieving goals, that was the turning point for me to decide to stop using the app. (10, f, 22)</i>
Relieving	Users felt relieved after stopping to use the app.	<i>I think I felt so relieved, because I felt I was no longer monitored and that I no longer need to be constantly busy with the number of steps. (5, f, 22)</i>

Future		
Planning on reuse	Respondents do not rule out using a mHealth app in the future.	<i>I do not have any plans to use another app yet, I think that the moment requires too much of my concentration for my graduation internship. Maybe later, when I have a good rhythm at work. (5, f, 22)</i>