Adoption and Use of Health-related Mobile Applications: A Qualitative Study with Experienced Users

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Abstract: Mobile health-related applications (apps) such as physical activity apps and diet apps can help users to implement a more active and healthier lifestyle. This qualitative study investigates experienced users' triggers to initially download mobile health apps, the drivers that keep them using these types of apps, and the barriers that hinder them from an extended engagement with the apps. Thirteen factors were inductively identified and matched with constructs in theories of technology adoption and use. Also, results from previous studies on mobile health apps were used in the discussion. Life situation, Relevant statistics, and Perceived satisfaction with first health app were identified as initial triggers. Price value, Simplicity, Personalisation, Guidance and Progress based on data, Flexibility, and Social encounters were identified as drivers for continuous use. Perceived risk of personal data, Time-consumption, Limited understanding of health data and Adaption to new routines were identified as barriers for greater engagement with the apps. Managerial implications and further research are also discussed.

1 INTRODUCTION

According to WHO (2018; 2020), an unhealthy diet and physical inactivity are becoming a part of people's lifestyle. Thus, an unhealthy and less physically active lifestyle is one of the most important public concerns. Healthy eating and regular physical activities can significantly decrease the risk of obesity and diseases such as diabetes and heart disease (WHO, 2018; 2020). Today, digital technologies can provide users with a wide range of options to manage a healthier lifestyle (Akbar et al., 2020). Mobile health-related applications (apps) that run on smartphones and other types of mobile devices have become popular. There are many mobile health-related applications on the market that help to track an individual's physical activity routines and food nutrition diets (Wang et al., 2016). These types of mobile apps empower and engage users in different ways (Akbar et al., 2020). Murnane et al. (2015) divided different mobile health apps into six categories: physical activity, medical, weight-loss, food, sleep, and well-being. According to Google Play data, used by Murnane et al. (2015), physical activity apps were the most popular. In a large-scale European survey (N=4000), 27% of the respondents stated that they had used a health app (Incisive Health International, 2017). The same study, however, concluded that there is an unrevealed potential with mobile health apps to impact the health of citizens positively. Therefore, it seems important to understand better how to encourage more people to use mobile health-related applications and how to inspire existing users to keep using them. It is important for developers, researchers, and educators to understand better why health apps are downloaded and used on smartphones by individuals (Kanthawala et al., 2019). There are studies on users' perception of mobile health-related apps (Yuan et al., 2015; Peng et al., 2016), users' perceived effectiveness of diet and physical activity apps (Wang et al. 2016), evaluations of quality and credibility of health apps (Kanthawala et al., 2019), digital imbalance in the use of self-tracking diet and fitness apps (Régnier & Chauvel, 2018), users' desire to continue using a fitness app (Beldad & Hegner, 2018), health app use among mobile phone users (Krebs & Duncan, 2015), and individual differences in mobile health app use (Bol

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et al., 2018). All these studies contribute from different perspectives to individuals' adoption and use of mobile health apps. Nevertheless, there seems to be limited research that focuses on experienced users of mobile health apps. Experienced users are critical as they can provide detailed insights into the reasons why they initially adopted mobile health-related apps, what keeps them continuing to use these types of apps over time, and what may hinder them from a greater engagement with these apps. The adoption of new types of technological services (innovations) is a long-term process (Rogers, 2003). Learning from this adoption process can also give providers of mobile health apps a better understanding of how to promote and design health apps from a user perspective. Therefore, this study aims to expand understanding of the reasons for the adoption and use of mobile health-related applications among experienced users. The focus will primarily be on physical activity apps such as sports trackers and fitness guides and diet-related apps such as calorie counters and food trackers.

2 ADOPTION AND USE OF TECHNOLOGY

There are several models and theories that can be used to improve the understanding of individuals' adoption and use of technology (Taherdoost, 2018). Diffusion of innovations (DOI) theory by Rogers (2003) focuses on understanding the adoption of new innovations such as new technological solutions. There are five variables that anticipate the adoption rate of innovations: relative advantage, compatibility, complexity, trialability, and observability. Innovation resistance theory (IRT) explains resistance to adoption based on five variables: value barrier, usage barrier, risk barrier, tradition barrier, and image barrier (Ram & Seth, 1989). Another model that has been extensively used to explain the use of different types of information technologies is the technology acceptance model (TAM) by Davis (1989), which is based on the theory of reason action (TRA) by Fishbein and Ajzen (1975), with roots in social psychology theories, and its extension, the theory of planned behaviour (TPB) by Ajzen (1991). The two determinants describing intentions to use technology in TAM are perceived ease of use and perceived usefulness. Other theories are the unified theory for the acceptance and use of technology (UTAUT) by Venkatech et al. (2003) and the unified theory for users' acceptance and use of technology (UTAUT2) by Venkatech et al. (2012). In UTAUT and UTAUT2, both DOI and TAM have been used as a base along with some other models and theories such as the model of PC utilisation (MPCU) (Thompson et al., 1991) and social cognitive theory (SCT) (Bandura, 1986). UTAUT consists of performance expectancy, effort expectancy, social influence, and facilitating conditions as determinants for technology acceptance, and in UTAUT2, three more determinants are added: hedonic motivation, price value, and habit.

The aim of the present study is to expand the understanding of reasons for adoption and use of mobile health-related applications, and thus we raised the following three research questions. Rq1: What triggered experienced users' initial download of mobile health related apps? Rq2: What drive experienced users to continue using health-related apps? Rq3: What hinders experienced users from greater use of health-related apps? Qualitative data analysis is usually inductively conducted and, thus, we are not using a model or theoretical framework as a lens in the data analysis. Instead, we are going to match and discuss our results with the described theoretical frameworks and models and with the results of the previous studies related to individuals' adoption and use of mobile health-related apps.

3 METHOD

For this study, participants were selected based on who had been using relevant health-related apps regularly for at least three years. The selection of participants having long-term engagement with health apps is critical since these users are more likely to have a broad experience of adoption. Thus, five male and five female participants who have used health-related mobile apps for at least three years were selected. Potential participants were asked in advance how long and how regularly they used these types of apps. Thus, participants were aware of the topic of discussion and were also willing to share their experiences. The participants were younger users, between 25 to 35 years old. See Table 1.

The data were collected through semi-structured face-to-face interviews. The questions related to the three research questions but were flexible, which allowed for considering individual differences and taking advantage of the iterative nature of interviewing. Each interview was conducted by the same author, lasted between 45 to 70 minutes, and was audio-recorded. One pilot interview (not included in the sample) was also made by the

Table 1: Participants.

Code	Age	Description	Health apps	Years of usage
P1	32	Male professional working with Risk analytics	Exercising, Yoga	5 years
P2	29	Female university student	Yoga, Exercising, Diet, Meditation	3 years
P3	29	Male professional business consultant	Yoga, Running, Exercising, Diet	3 years
P4	28	Female nutritionist professional	Diet, Exercising	5 years
P5	35	Male professional working with management	Diet, Exercising	8 years
P6	25	Female university student	Diet, Exercising	3 years
P7	31	Male professional dentist	Diet, Exercising, Running	5 years
P8	28	Female professional project manager	Diet, Exercising, Running	3 years
P9	29	Male professional sales manager	Diet, Exercising, Yoga	5 years
P10	29	Female project manager	Diet, Exercising, Running, Yoga	3 years

interviewing author to develop the interview guide and to gain improved insights on the procedure.

The interviews were manually transcribed in MS Word™ by one of the authors. By manually transcribing the results, an initial understanding of the results was achieved. Next, the transcriptions were read thoroughly by another author, and the data was converted and structured in the software QDA Miner Lite™ v. 1.4.1. Two of the authors came up separately with codes and labels of themes by using inductive thematic reasoning. In total 36 codes (1st order codes) were generated by identifying underlying ideas and characteristics in the transcribed texts (Miles et al., 2014). The codes were then reassessed by the two authors and, based on similarities, merged into 2nd order themes. For example, the 1st order codes "Free trial", "Free app" and "Affordable" formed the 2nd order theme "Price value". The final themes are presented next.

4 RESULTS

The results are presented according to the three research questions. Direct quotations from the participants are included in the review of the results.

4.1 Triggers for the Initial Download (Rq1)

Life Situation: Seven of the participants felt like they needed a change to the life situation they were in and that triggered their interest in health-related apps. Stress, an unhealthy lifestyle, and not enough exercise, due for instance, to a new job or a crisis in a personal relationship, were sources that trigged the initial decision to try health-related apps.

'I started using an app during a stressful time. I just changed my job, and I was overloaded with new tasks, so I started sleeping fewer hours, stopped exercising, and did not care what I ate… Then I heard my friends talking about an app, and I decided to try it.' (P1)

'*I downloaded my first yoga app because I wanted to become more focused on myself. I mean, at that, time I was very stressed. I just broke up with my boyfriend, and it was a very difficult time*.' (P10)

Relevant Statistics: Six of the participants also referred to data and statistics as their initial triggers to start using a health-related app. Measurements and calculations of sports data and calories were perceived as useful data that technology can provide.

'*So, I downloaded an app because I wanted to check my running speed and distance. It is actually very useful because it helps to get statistics*.' (P2)

'*So, I downloaded a diet app. I wanted to check nutrition consumption patterns*.' (P4)

Perceived Satisfaction with First Health App: P4, P5, and P7 stated that their first health app supported them only to count calories. The participants wanted to improve the balance of their diets in general without setting a concrete goal. Being delighted with the first app and the gained insights, the participants, after some time, also downloaded another app for tracking physical exercise. Perceived satisfaction with one app can lead to the download of another app.

'*Basically, I took the first app which sounded reasonable and downloaded it. And I really liked it… Well, I also downloaded an app for running*.' (P10)

4.2 Drivers for Continuous Use (Rq2)

Price Value: Free trial periods were positively referred to by two participants, but once the app has been paid for, there is a higher barrier to stop using it.

'*You can have [a] one-month free trial, and if you like, you can buy it. It is probably another thing that makes me keep using the app. I paid money for it, and of course, I want to use it*.' (P1)

Five other participants also expressed satisfaction with affordable prices of apps and that there is a supply of completely free apps.

'*It is quite cheap to use. Some of the apps are even for free; it is quite convenient. You can try different apps, chose the one which works for you the best, and in case you do not like it, you can easily find another app*.' (P3)

'*I like that it is free. There are so many apps that ask for money, but I see no differences. Yes, maybe there are more advanced functions.'* (P5)

Simplicity: Eight of the participants mentioned ease of use or simplicity (not too many features) of the app as a criterion for continuous use.

'*I'm happy about my app because it is simple and easy to use, and I value this quality*.' (P1)

'*I guess I would not like if the app would be too complicated. I know that some apps have a lot of functions and some other things, which I even do not know how to use. But I do not need it.*' (P10)

Personalisation: Personalisation was also mentioned by five participants as a key feature for continued use of the app.

'I like that it is personalised… I mean that the app can adjust to your needs.' (P3)

'*That there are different ways of exercising, for example, and you can choose the way which will work for you.'* (P9)

Guidance and Progress based on Data: All the participants mentioned statistical data as a way to receive guidance, follow up on the progress, and reach goals, which in turn can lead to improved self-esteem and pushes to a more systematic way of conducting physical activities.

'*It is easier to exercise when I am using the app. I always know what to do and how to do. When I go to the gym, I do not need to think what I should do there, the app will tell me… And that you can see the results later, statistical data*.' (P9)

'*I like checking the statistics from previous years and see how everything has changed. It shows that you are doing good and achieving something. At least, it increases my self-esteem.'* (P5)

The statistics also improve if the app was used continuously and on a long-term basis.

'*The statistics help in a way to control yourself. I mean, you see how you are eating for a long time.'* (P8)

Flexibility: Flexibility provided by the apps was also mentioned by five participants. This aspect was related to independence from teachers or personal trainers, their style of teaching and when and where the lessons are taking place.

'*If you are going to the lessons, you have to follow a teacher. I do not mean it is a bad thing, but the way how you are going to be taught will [have] influence on your willingness to continue to exercise. I think it is actually a big advantage of apps, that you are very independent; not only you decide your time table, but you also decide on a way how you want to exercise*.' (P3)

Social Encounters: Especially three participants expressed that they are inspired by meeting like-minded persons and that they are able to exercise together and share achievements with each other. This motivates them to use the apps.

'*Also, an app helps to find like-minded people... You can see people who also do yoga, and you can send a notification as [a] thank you for doing it with me. And when you do it often, you get notifications, and you enjoy it. It is like a bonus, extra support, that inspires you*.' (P10)

4.3 Barriers for Increased Use (Rq3)

Perceived Risk of Personal Data: The perceived risk of entering and storing personal data in the health apps does not necessarily hinder their use, but it seems to especially bother six of the participants and, thus, it may increase intentions to stop using some types of health-related apps.

'*I think many people are sceptical about health apps because they are doubting the security of private data. I think it is a big issue, which could be improved*.' (P7)

The perception of risk level can depend on the type of app and what it is used for.

'*I know that many people complain about security… But I think it is probably more relevant to those kinds of health apps where you have all information about different health indicators. Like different illnesses and to which doctors you are going... That is very personal information and people do not want to share it*.' (P2)

One participant also perceived that unnecessary data is registered.

'*But I understand why some of the services need that kind of data [personal data] and I cannot avoid it. But some services should not requite it. I mean, it is very unnecessary*.' (P8)

Time-consumption: Nine participants perceived that it is time-consuming to register data such as food eaten during the day. In the long run, this can become a burden, which may lead to neglect of the app or its less frequent use.

'*Because it [is] required to register something all the time. You have to insert something and then click*

again, insert and click, and I like to save my time.' (P6)

'*I know many people gave up using the apps because it is time-consuming, and I partly agree. So, I like that I am stubborn in that way and continue using the app.*' (P5)

Limited Understanding of Health Data: Some of the apps require quite extensive knowledge of health-related data and may thus be perceived as complex to use. Especially, a need for proper understanding of nutrition was mentioned by eight participants.

'*So, if I want to eat healthier, it means that I should actually understand what it means in terms of food. I just find it way too complicated***.'** (P3)

'*Why I think it [a diet app] is complicated, because it would require some knowledge. I read literature about healthy food, but to start using the app, I should read more.*' (P9)

Adaption to New Routines: Despite the advantages of flexibility with apps (as presented above), six of the participants mentioned that using the apps also requires discipline and new routines or changes in habits over-time. It was noted also that there is no physical person there to push them.

'*It [the app] also requires more self-control. I mean, you have to decide yourself when you want to exercise and get into a certain routine. It is actually quite hard because nobody is pushing you*.' (P1)

'*Because when you follow the same routine for many years, it becomes a habit and it is difficult to change the habit. It does not happen in one week or even one month*.' (P7).

5 DISCUSSION

In this study, we raised three research questions. We identified 13 possible reasons for the adoption and use of mobile health-related apps. Next, we will discuss the results of previous research on the topic and the theoretical frameworks of adoption and the use of technology. Similar mapping against constructs in theoretical frameworks was conducted by Peng et al. (2016) and Kanthawala et al. (2019).

According to Rogers (2003), in the initial phase of adoption, individuals lack knowledge or are unaware of new types of services (innovations) and, therefore, triggers are needed. Here, we identified three possible triggers to the initial download of mobile health-related apps. The first trigger was Life situation: stress, an unhealthy lifestyle, and not enough exercise—due, for example, to a new job—seemed to trigger the participants' initial decision to try health-related apps. Other studies have highlighted that the absence of need (Peng et al., 2016) or interest (Krebs & Duncan, 2015) are important deterrents to the adoption of mobile health apps. Consistency with existing values and individual needs have been referred to as compatibility by Rogers (2003) and an attribute for adoption. Here, the life situation clearly created a need and interest to try mobile health-related apps.

The second trigger was Relevant statistics. Some participants were intrigued by measurements of sports data and calorie calculations that could enhance their physical activities and diets. This is in line with TAM that perceived usefulness (Davis, 1989) is a key variable in intentions to use technology. In diffusion theories, this aspect is referred to as relative advantage over other options (Rogers, 2003).

The third trigger, Perceived satisfaction with first health app, shows the importance of trying technological solutions and generating a positive attitude towards health apps. Trialability—the convenient ability to test new technologies—is an attribute in DOI (Rogers, 2003). Here, satisfaction with one app meant that other mobile health-related apps were also downloaded. Additionally, Wang et al. (2016) identified that the apps were perceived as more effective if the user used several of them.

The adoption process is an ongoing process in which the individual can continue to use or reject an innovation at any time (Rogers, 2003). We identified six possible drivers for the continuous use of mobile health-related apps. The first one was Price value. The participants referred positively to free-trial periods, to the supply of free apps, and if they decided to purchase an app, they mainly perceived the prices to be affordable. Monetary value is a key determinant to explain users' use of technology-based services (Venkatech et al., 2012). Yuan et al. (2015) concluded that users perceive a positive price value regarding paid health-related apps. On the other hand, the cost of mobile health apps has also been identified as a barrier (Krebs & Duncan, 2015; Kanthawala et al., 2019; Peng et al., 2016). Here, the price value was perceived mainly positively.

The second and third drivers were Simplicity and Personalisation. Simplicity, such as not too many features, was mentioned as an important reason for continuous use by some participants, but also the possibility to adjust the app to fit personal needs was pointed out. Perceived ease of use has been highlighted as a key determinant in technology acceptance (Davis, 1989), and likewise, the level of innovation complexity and compatibility with

individual needs are key attributes in individuals' adoption processes (Rogers, 2003). Wang et al. (2016) stated that more personalisable health apps are needed, and Beldad and Hegner (2018) concluded that perceived ease of use is important for continuous use of fitness apps.

The fourth driver was Guidance and progress based on data. Peng et al. (2016) identified a similar driver, tracking for awareness and progress, for mobile health apps. The same authors argued that this refers to self-observation in social cognitive theory (SCT) (Bandura, 1986). Here, data was used as reference points for self-regulation and goal setting. This type of self-observation clearly seems to contribute to the participants' dedication to use the apps, which is not surprising as this ought to be a core feature of mobile health-related apps.

The fifth driver was Flexibility. This aspect related to the participants' perceptions of unattachment from teachers or personal trainers, their style of teaching and when and where the lessons are taking place. Users' perceived usefulness (Davis 1989) and relative advantage over other options (Rogers, 2003) are relevant explanations for the adoption and use of technology. It is more probable that individuals are using physical activity apps if they perceive that the apps could support their training efficiently (Beldad & Hegner, 2018).

The sixth driver was Social encounters. Some of the participants were very inspired by meeting people with the same interests and ambitions. The social network using the app influenced them to keep using the apps, exercise together, and share, for example, progress data. Social factors (Thompson et al., 1991) and social influence (Venkatech et al., 2003; 2012) are key determinants for technology use. Likewise, the subjective norm has a positive effect on behavioural intention (Arjzen, 1991; Fishbein & Ajzen, 1975). Also, previous studies of mobile health apps highlight social factors as important for using health apps (Beldad & Hegner, 2018; Peng et al., 2016). Régnier and Chauvel (2018) concluded that some diet and fitness app users are highly motivated by participating in digital communities.

We identified four possible barriers to greater engagement with mobile health-related apps. The first one was Perceived risk of personal data. The participants were concerned with possible unauthorised use of personal data that is collected by some of the apps. It seemed that, for some of them, the concern hindered a greater engagement with some apps. Perceived risk is a constraint in adoption processes (Ram & Seth, 1989), and previous studies have highlighted users' privacy concerns (Bol et al., 2018) and collection of personal data (Krebs & Duncan, 2015) as constraints for the uptake of mobile health apps. Lack of trust in health apps was as well a major concern pointed out in a study by Incisive Health International (2017).

The second barrier was Time-consumption. The input of food-related data was perceived burdensome by some participants. They acknowledged that some of this data is needed for the app to function properly, but in the long-run, this may hinder them from taking greater advantage of the app. Users' effort expectancy has been found to be a significant determinant for the use of technology (Venkatech et al., 2012). Likewise, in IRT, usage barrier refers to obstacles in innovation functionality that hinder use (Ram & Seth, 1989). Peng et al. (2016) also found lack of time (and effort) as a factor that hinders the use of mobile health apps.

The third barrier was Limited understanding of health data. Some of the apps may require quite extensive knowledge of health data such as nutrition, which may increase the users' perceptions of complexity and decrease their perceptions of ability to use the app. Individuals' perceptions of their ability to perform a specific behaviour are referred to as perceived behavioural control (Ajzen, 1991). In technology acceptance theories, it is referred to as facilitating conditions, that is, the user's perception of possessing the required resources or infrastructure to use the technology (Venkatech et al., 2003; 2012). Previous studies have also highlighted individuals' lack of app literacy (Peng et al., 2016), e-health literacy skills (Bol et al., 2018), and need for clear information (West et al., 2012) as obstacles in the use of mobile health-related apps. Concerns have also been raised that the apps do not provide sufficient or correct information (Akbar et al., 2020) and are not necessarily based on evidence and professional medical involvement (Higgins, 2016). People are also unsure about what is a quality and credible health app (Kanthawala et al., 2019). Therefore, limited e-health literacy skills can also raise safety concerns for users of health apps.

The fourth barrier was Adaption to new routines. Flexibility (as discussed above) can be a driver to use the apps; however, it may also be a constraint. There is not necessarily a physical person to push the user to perform, for example, physical activities. Thus, the use of the app requires some degree of personal discipline and routines that last over time. This was admitted not to be easy, and it may be tempting to fall back on old habits, which could lead to a rejection of the app. Habit has been identified as a significant indicator of technology use (Venkatech et al., 2012) and, likewise, in resistance theory, the tradition

barrier is relevant to explain the rejection of innovations. Also, in studies on health app use, habit was determined to be significant (Yuan et al., 2015); individuals' lack of discipline is a constraint (Peng et al., 2016), and users need to engage actively with the apps to benefit (Higgins, 2016).

5.1 Managerial Implications

To create initial awareness among non-adopters of health apps, the focus could be on the three triggers identified in this study. Mass promotion of mobile health apps could focus on peoples' life situation (such as having a 'stressful job') and communicating the usefulness of statistics provided by the apps. As suggested by Peng et al. (2016), medical professionals could have an active role in these types of promotional activities to encourage more use. Enlisting people to try a quality and credible health app is important (Kanthawala et al., 2019) because, if they are happy with it, then the barrier to try other ones is likely to be lower.

To encourage users to continue to use health apps, both the identified drivers and barriers should be considered. The results indicated that free-trial periods and free apps are important in the adoption process. Users often prefer free apps, as it gives them the possibility to try different apps, and if they are not satisfied, they can easily erase them and try another one (Kanthawala et al., 2019). Nevertheless, affordable prices did also keep the participants using the purchased apps. As pointed out by Peng et al. (2016), paid apps should have features that are not included in the free apps. Thus, mixed pricing principles with free-trial periods, free versions of apps, and purchasable apps (subscription fees, one-time fees, etc.) are important to keep different types of users satisfied.

Despite being experienced users, some participants perceived simplicity (limited number of features) as important. Also, better possibilities to personalise the apps were mentioned. These two aspects are important to notice when designing health apps. Simple but customisable apps ought to be appreciated by many users.

For some participants, social encounters such as meeting like-minded people and sharing data with other users are very important app features. However, at the same time, concerns were raised regarding the registration of personal health-related information. This could, to some degree, be solved by better allowing the user to control options for data registration and sharing by clearly informing users about actions taken to secure data and providing transparent privacy policies in compliance with directives such as the General Data Protection Regulation in the EU (Intersoft Consulting, 2020).

The extensive effort to continuously register data, such as food-related data, was also perceived as a barrier to the use of some apps. The engagement with the apps requires discipline and new routines, as discussed by the participants. These issues are not easy to overcome as many health apps' performance is based on continuous activities and updates of, for example, nutrition data. Guidance and progress based on data were perceived by the participants as a major driver to use the apps. Apps need users to interact actively with them (Higgins, 2016). Therefore, reducing the time spent on manual feeding of data seems crucial to enhance continuous use. One solution could be to focus more on developing synchronisations between apps, devices, databases, and different types of sensors.

Some participants felt that diet-related apps can be hard to use because they do not have enough knowledge about nutrition. According to Kanthawala et al. (2019) health app literacy is a broad area that is underexplored, but education about health-related apps should focus on telling users what criteria is relevant when selecting and using apps.

6 CONCLUSION

By interviewing a sample of experienced users, this study identified three triggers to the initial downloading of mobile health apps: Life situation, Relevant statistics, and Perceived satisfaction with first health app. Six drivers for continuous use were identified: Price value, Simplicity, Personalisation, Guidance and progress based on data, Flexibility, and Social encounters. Four barriers for greater engagement with the apps were as well identified: Perceived risk of personal data, Time-consumption, Limited understanding of health data, and Adaption to new routines. We discussed these possible determinants together with previous studies on the use of mobile health apps and matched them against constructs in theories of technology adoption and use. Hence, we see that we contributed to existing theory by confirming and specifying previous results on the adoption and use of mobile health-related apps. The findings can be used to develop a more fine-tuned set of adoption factors to conduct a larger survey study.

We should note that the participants in this study may have other perceptions of health-related apps than older users and people with chronic diseases (Yuan et al., 2015). This study primarily focused on

physical activity and diet-related apps. Thus, the results may not reflect the perceptions of health consumers who participate in medical care programs and use health apps targeted towards specific diseases.

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