


# Opportunities and Challenges of Using Mobile Applications for Workplace Health Promotion: A Qualitative Study


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## ABSTRACT

Workplace health promotion (WHP) needs be adjusted to the new ways of working and improved in terms of participation rates. As mobile applications (apps) have proved to be effective in various health areas, it might also be a solution for WHP. However, there is a lack of knowledge about the requirements employees would have on such an app for WHP. Therefore, 29 semi-structured interviews were conducted with employees and experts of an IT company. Most employees were rather positive about such an app. Concerns were stated in terms of added value and data security. Variations were found in preferred functionalities. Apps might thus be effective for WHP but would need to add value compared to apps available for private usage. Additionally, clear communication about data privacy would be expected.

## KEYWORDS

Health Technologies, mHealth, Qualitative Study, Workplace Health Promotion

## INTRODUCTION

In the last decades, employers started to further invest in the well-being of their employees. It is understood to improve productivity, self-perceived health, work ability as well as reduce absenteeism (Rongen, Robroek, van Lenthe, & Burdorf, 2013). Health promotion is one determinant of occupational health that “deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards” according to the WHO (World Health Organization, 2016). Most programs established at the workplace yet focus on life-style related diseases e.g. lack of physical activity, poor nutrition and unhealthy weight gain (Rongen et al., 2013). For physical activity, a

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literature review of Malik and colleagues (2014) for instance indicates general effectiveness, even though they argue, that more well-designed studies are necessary (Malik, Blake, & Suggs, 2014). Besides considerations on effectiveness of the program itself, the participation rate in workplace health promotion (WHP) programs is rather low and thus poses a problem for implementations and overall effectiveness. A study reveals a median of only 33% of the employees participated in those programs (Suzan, Robroek, Van Lenthe, Van Empelen, & Burdorf, 2009).

Furthermore, developments such as mobile working, global traveling, and flexible working hours might influence the health of employees (Nijp, Beckers, van de Voorde, Geurts, & Kompier, 2016) and might include need for new health promotion measures. As mobile health (mHealth) is a growing field of research, it can be discussed whether it is effective in ameliorating the low participation rate and including the modern way of working in workplace health promotion (WHP).

However, little is known on the potential effectiveness and usage of mHealth as a means for WHP and more investigations are needed as supported by a literature study on WHP apps (Dehkordi, Breitschwerdt, & Fellmann, 2017). Up to now, some experimental studies have already been conducted on mhealth at the workplace, mainly in the areas of stress management and physical activity, but also among different target groups, such as airplane pilots and healthcare workers. Most of the studies seem to demonstrate effectiveness in decreasing stress and negative effects of shift work and increasing satisfaction (Ahtinen et al., 2013; Guertler, Vandelanotte, Kirwan, & Duncan, 2015; Ly, Asplund, & Andersson, 2014; Paschou et al., 2015; van Drongelen et al., 2014).

However, although most studies demonstrate a high effectiveness, the workplace health apps sometimes do not meet the needs of end-users and participation levels remain low (Muuraiskangas, Harjumaa, Kaipainen, & Ermes, 2016). Still, studies mainly focus on the evaluation of health status improvement as the outcome, whereas the end-user perspective and preferences and eventually the participation rate and reach of the intervention remain unclear.

In order to tackle this lack of information in WHP using technologies, a detailed view of the end-users needs to be evaluated using qualitative research methods (Dunkl & Jiménez, 2017).

In order to provide an overview of end-user's preferences and needs as a guideline for the decision-making process for stakeholders, the following research questions are investigated:

1. What benefits and obstacles do employees see when considering whether to use a workplace health app provided by the employer?
2. What functionalities would employees prefer to have in such an app?

## Background

Some investigations have already been made towards mHealth for WHP and show promising results, but also support the urge for further investigations. So far, studies have been conducted in the area of general health, stress, nutrition, but also weight loss, mindfulness, physical activity and sedentary behaviour and showed mostly positive results (Ahtinen et al., 2013; Bond et al., 2014; Giddens, Leidner, & Gonzalez, 2017; Gilson et al., 2017; Guertler et al., 2015; Lappalainen et al., 2013; Ly et al., 2014; Mattila et al., 2013; Möltner, Leve, & Esch, 2017; Morris et al., 2010; Shahrestani et al., 2017; Simons, Foerster, Bruck, Motiwalla, & Jonker, 2015). Furthermore, besides office workers, airplane pilots, truck drivers and shift workers were in focus (Greenfield et al., 2016; Paschou et al., 2015; van Drongelen, Boot, Hlobil, Smid, & van der Beek, 2016).

A literature review on mHealth studies for physical activity supported the positive findings revealed that most paper report a general positive influence, however often the sample sizes are rather small and thus effect sizes are limited (Buckingham, Williams, Morrissey, Price, & Harrison, 2019). Advantages as the adjustability to the individual needs of the employees, but also the potential integration of different functionalities, health aspects, and preferences present in workplaces are expected (Bardus, Blake, Lloyd, & Suzanne Suggs, 2014; Broding, Kiesel, Lederer, Kötter, & Drexler,

2010). Moreover, studies reveal that the technologies are independent of time and location, are available for usage, and can integrate private and professional lives (Suzan JW Robroek, Lindeboom, & Burdorf, 2012; Simons et al., 2015). This potentially provides a competitive advantage compared to ordinary location-based program for workplace health promotion. Also, even small companies, which usually struggle to implement health and safety measures (Champoux & Brun, 2003), might be able to implement such a mobile intervention with less resources.

However, even though mHealth is theoretically and among pilot studies effective, the general acceptance and participation needs to be guaranteed. Theoretical frameworks were only assessed for general mHealth (independent of the WHP sector) to explain acceptance. One of them is the Health Information Technology Acceptance Model (HITAM); however, it has not been evaluated in the WHP sector (Kim & Park, 2012). Furthermore, only general theories on technology acceptance in health interventions, like the Unified theory of acceptance and use of technology (UTAUT), which is often used in health interventions, can be applied to the field of workplace health. Until now, the UTAUT was used for mobile psychological self-management, for instance (van der Vaart, Atema, & Evers, 2016). Additionally, studies on fitness trackers use the UTAUT/UTAUT2 (Yoganathan & Kajanan, 2014; Yuan, Ma, Kanthawala, & Peng, 2015). However, the acceptance of the general population is yet to be researched (Kenny & Connolly, 2015). General behaviour change theories like the theory of planned behaviour, the health belief model, and the social-cognitive model can be applied.

Whilst only few qualitative studies were conducted to complement that knowledge with WHP specific factors. Dunkl et al. (2017) already quantitatively evaluated the view of employees in leading positions on WHP apps. The study shows that younger leaders in particular support WHP apps, as well as those with a positive attitude towards WHP in general (Dunkl & Jiménez, 2017). This is crucial as they represent the future leaders and people who are used to technologies.

De Korte et al. (2018) have further used qualitative methodologies to evaluate mHealth acceptance in a workplace. They list four main points to be considered: system performance, relevancy and benefits based on characteristics of the users, tailoring to the work context, and privacy and data-related topics (de Korte, Wiezer, Noortje, Janssen, Joris H., Vink, Peter, & Kraaij, Wessel, 2018). Jimenez et al. have further developed a life-cycle for eHealth measures at the workplace. In their study they especially emphasize the need for investigations on quality and regulatory assessment also in terms of privacy of those measures, as well as the involvement of different stakeholders (Jimenez & Bregenzer, 2018).

Still, more qualitative, but also experimental research is necessary in order to comprehensively understand the end-users view (Buckingham et al., 2019). This knowledge is necessary in order to build a practical framework for the implementation decision process and the development of such an app in WHP. Additionally, qualitative research is needed to allocate resources in the most effective way before implementing such an intervention or developing such an app.

## Methods

In this qualitative study, semi-structured interviews were carried out based on the grounded theory. Predefined question catalogues were utilized to conduct the interviews and execute qualitative content analysis. This method was chosen based on the lack of knowledge regarding users' preferences, needs, and potential obstacles of the usage of mobile applications in the WHP setting and its potential for gathering deep insights into the opinions of the end users. The study was conducted following the consolidated criteria for reporting qualitative research (COREQ). The study design included semi-structured interviews with employees of a German IT company. In total, 29 open-ended interviews were conducted between September 2016 and May 2019. The interviews were audio-recorded and were afterwards transcribed.

## Participants

The study population consisted of potential end-users—i.e. employees in the field of IT. All interviewed subjects worked in the same company. The recruiting took place via a personal email

containing information on the approximate interview duration, the general topic of occupational health management, but without mentioning any technology or further information. Except of four candidates that were not able to take part in the interview due to time issues, no one refused to take part in the interview. Therefore, it is expected that no bias is included as non-participation was not explained by having no interest in sharing their opinions.

Eventually, the study group consisted of participants of different age groups, gender distribution, perceived health status, educational backgrounds, and job positions. Furthermore, five external consultants were included to represent the modern working environment, which entails multiple locations and flexible working hours. Further, two company doctors, a recruiter, an IT security expert, and two workplace health experts were included to obtain insights into the professional view of this topic.

The details of the study population, including preferences in physical activity and nutrition behaviour, are shown in Table 1.

**Table 1. Demographics of participants**

Characteristics	N	%
Age in years (N =29)		
- ≤ 30	7	24.1
- 31-40	8	27.5
- 41-50	10	34.5
- 50 - 60	3	10.3
- ≥ 61	1	3.4
Gender (N =29)		
- Male	18	62.1
- Female	11	37.9
Perceived health status (N =26)		
- Under average	2	7.7
- Average	19	73.1
- Above average	5	19.2
How much do you like exercising? (N =26)		
- Reluctantly	2	7.7
- I like it	9	34.6
- very much	15	57.7
Do you prefer healthy food? (N =26)		
- No	4	15.4
- Moderately	7	26.9
- Yes	15	57.7
Children (N =27)		
- yes	11	40.7
Usage occupational health means (N =27)		
- Never	7	25.9
- I used to use them, but not anymore	5	18.5
- I use a few means occasionally	13	48.1
- I actively participate on a regular basis	2	7.4
Usage health app (N =27)		
- Never	5	18.5
- I tested it, but don't use it anymore	8	29.6
- Sometimes	5	18.5
- Usage on a regular basis	9	33.3

## Data Collection

The data was collected through semi-structured interviews, which are defined as interviews with a pre-determined catalogue of open questions that builds a framework for the interview. The advantage of this qualitative methodology is to get deep insights into the opinion and preferences of the end-user and stakeholders involved in the decision-making process of workplace health. Within this study, all 29 interviews were conducted in separate rooms at the participants' workplace to make it as convenient as possible for the participants as well as to avoid disruptions, interactions, or group consensus. One female researcher (MSc) with a background in health sciences conducted all interviews. Mostly, a second scientist was present to review and evaluate interview style. In order to give the participants the opportunity to speak freely in their mother tongue and to capture all relevant aspects all, but one interview were held in German. The statements in this paper were therefore translated from German into English by the authors.

The structure of the interview was equal of all interviews. It started with a short introduction of the people present and the information on the interview procedure and data usage. Prior to the start of the recording, the interviewees signed the informed consent form. The subjects were informed that they can withdraw any information at any time. Detailed information on the study aim and objectives were only provided after the interview to avoid prior influences of the interviewees. After the introductory part, the interviewer mainly followed four main question blocks. These included first some demographic questions, as shown above (Table 1). Following that, the second block focused on definition, usage, and opinion of occupational health measures in the company. The third block comprised questions concerning private health apps usage. In details this included questions on initial motivation for download, experiences, and wishes for the future. At last, the topic of using mobile applications for WHP was addressed. The structure was consciously chosen in order to receive some basic information of the usage and background of the participants, before diving into the main topic of WHP apps. Obviously in most interviews, the last part took the most time.

For the latter questions on WHP apps, the interviewer started with broad questions, asking the participants to imagine a poster with a company health app in the entrance hall and requesting their first thoughts and opinions. Afterwards, preferences for functionality, willingness to share data, and potential usage behaviour were evaluated. On average, the interviews took 20–50 minutes.

## Data Analysis

Transcriptions of the interviews were done by three different researchers. All transcriptions were again read by the interviewer to complement the transcriptions with notes, made during the interview, about body gestures. Furthermore, participants' names, the company name, or names of health promotion initiatives, if mentioned in the interview, were replaced by anonymous wordings like 'company x'.

The transcriptions and the audio files were imported to NVivo (by QSR International). and coded therein. Coding means that text passages were subordinated to codes or "nodes" e.g. reasons for initial usage of a health app. The nodes were predefined tuned to the interview guide. The node tree is demonstrated in Figure 1. Additionally, cases (interviews) received classifications regarding their demographics and other characterises.

The individual quotes subordinated to the nodes were then analysed by the researchers. The number of coded text passages per nodes differed between 3 and 71.

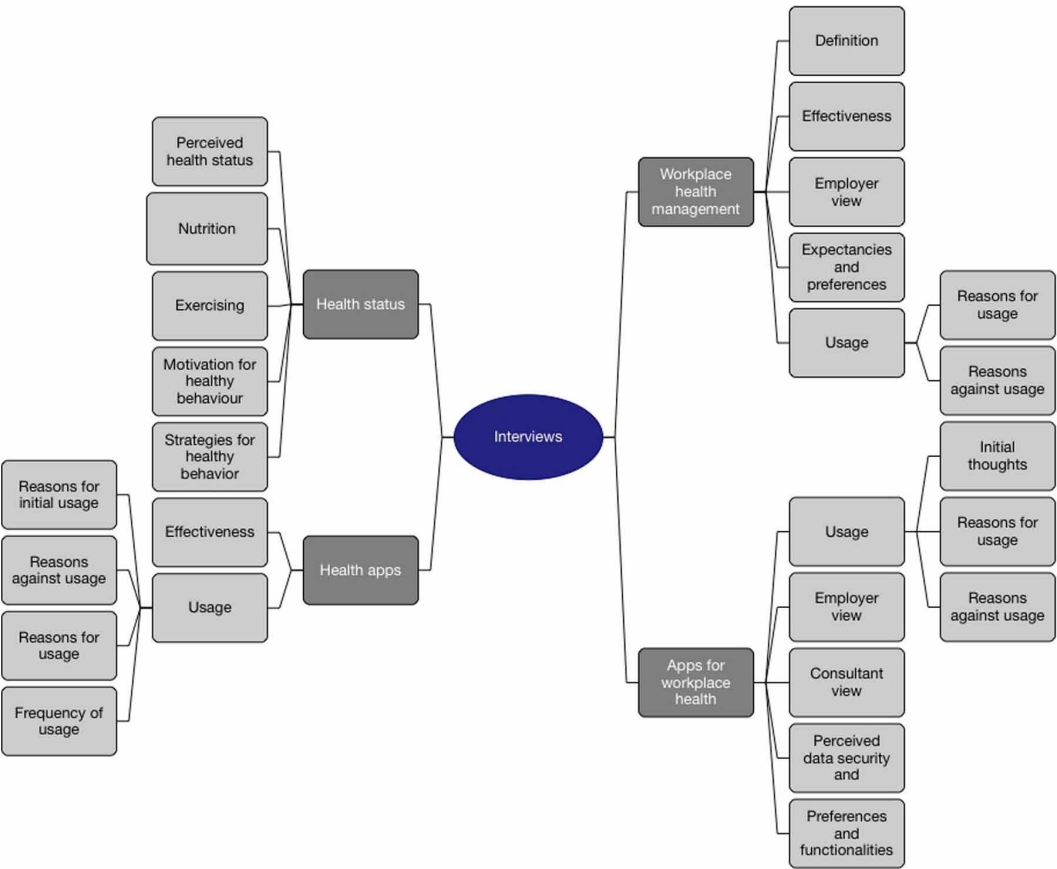
The targeted goal of the analysis is to identify factors and relations that influence the acceptance of health technologies in WHP, therefore the study is based on the grounded theory.

Due to the limited number of participants and the qualitative focus of the study, no statistical analyses of the results were done, only demographics and the number of quotes were compared.

## Results

Based on the coding of the interviews, some main results can be described. In total, 1,124 quotes were coded. In the following section, the findings are structured according to the blocks and codes shown

Figure 1. Coding tree



in Figure 1. First, general health status of the participants will be described, followed by the answers on workplace health promotion usage questions and their health apps usage. Lastly, the results of the questions on WHP apps will be demonstrated.

### Health Status

In Table 1 a detailed description of the individual expression of the demographic are demonstrated. Most participants described their health status as average and claimed to enjoy physical activity. While 16 stated that their health is very important to them, another four states that its importance has increased over the years as they got older. Two said that they try to be aware of their health but are sometimes not strict about it. Participants' motivation to stay healthy were mainly (in % of participants who mentioned it): to feel fit (44.8%); weight control (27.6%), experiences of health issues in the social environment or past own health issues (13.8%), stress reduction (6.9%), long healthy life (10.3%), increasing age (3.4%). Individual participants also stated the need to have fun, play with their children, feeling bad about their poor health, and wanting to go back to a certain fitness status. Reasons that hindered the participants on investing even more into their health were mainly: time, as also supported by literature as being the most common reason for not participating in health measures (Kruger, Yore, Bauer, & Kohl, 2007), the canteen, unstable weather, not seeing the consequences of unhealthy behaviour immediately, and laziness.

## Workplace Health Promotion

The results on the perception of WHP show variations. In total, 18 participants knew about WHP interventions and eight said that they do not know what it is, even though they imagined the right interventions when asked. Still, it became clear that often the individual initiatives were seen separately by the participant and not necessary assigned under the umbrella of WHP even though a dedicated name for those programs even existed in the company. As demonstrated in Table 1, only two respondents participated on regular basis in WHP measures, while 13 participants use initiatives irregularly.

Reasons for non-usage of measures were mainly time rosters of activities (34.5%), separation of private and work activities (24.1%), lack of knowledge (17.2%), lack of the right offer (17.2%) culture (10.3%), and not wanting to embarrass oneself in front of colleagues (13.8%). Additionally, lack of communication, information flouting, fear of diagnosis, need for more fun, need for acceptance of others, practical reasons like showering and carrying cloths to work, and mismatch of offers and needs were mentioned. Furthermore, three consultants and a part-time employee mentioned that participation is unrealistic due to flexible working arrangements and new ways of working.

Reasons in favour of the use of WHP measures were time savings, location in general, networking, targeting of the right needs, culture, and cost savings.

From the employer's perspective, represented by expert on the topic, WHP is a means for keeping the employees productive. Further, the company doctor stated that there are governmental regulations to adhere to and any other means are seen as a benefit for the employee. From the point of view of the employer, as represented by the recruiter and the doctors, it is further seen as an important means of image cultivation, which has gained importance over time. The employees responsible for WHP further mentioned that the target group needs to be studied and interventions need to be evaluated regularly.

*[...] if you don't have high participation rate in the WHP you have done something wrong [...]. Because I think that generally speaking, people have the interest to do something for their health. Either way a majority. Of course, there are those 20–25% whom you can't reach, but I am convinced that you can reach two-third of the employees with the right means.*

Participants were further asked to state their expectations for the future as well as address topic most relevant to them. The most commonly mentioned ones were stress management, nutrition, ergonomics, and more communication on the topic to emphasize the seriousness.

*What I expect is mostly already provided, general things as for instance ergonomic working places, that we have good chairs, that the monitor is correctly adjusted, that I have modern working equipment, etc. Further that I have sufficient opportunities for healthy nutrition, that the canteen is offering healthy food or some vegetarian days etc. Those things I do expect.*

## Health Apps

The distribution of the health app usage demonstrates that the participants represented all user habits: Five have never used a health app, eight have used them but stopped, five use the apps from time to time, and nine use it on a regular basis. The used functions were mainly step-counting and activity tracking (34.5%). Six used fitness wristbands and six used apps for nutrition and weight management. Sleep, meditation, and cycling were also mentioned.

Six interviewees state that they used the app for the first time based on the advice of a friend or colleague. Other initial motivators were advertisement, app presence on the phone at time of buying, or just interest in trying it out.

The functions most mentioned as valuable were self-monitoring, individual time schedule, comparison with friends, and integration of various functions in one app. Furthermore, the participants stated the following reasons for usage: self-monitoring and tracking (37.9%), motivation (13.7%),

as well as reflection, the possibility to connect with other apps, and the low effort needed. Reasons against usage were tracking and data (24.1%), a lot of effort in individual typing (17.2%) perceived pressure (10.3%), no interest (10.3%), and technical reasons like battery life, storage, and small screens and factors like fear of frustration, disruption in sports due to calls or messages, and having to carry around one's phone.

# Workplace Health Apps

As described in the method section, the last and more comprehensive block of questions, included questions regarding the potential of WHP apps. As an introduction, interviewees were asked to imagine a poster at the entrance hall and their first thoughts and ideas about it. Only after that, they were specifically asked on preferred functionality, advantages and disadvantages.

As mostly advantages and disadvantages were discussed, those are demonstrated in Table 2. In total 135 references were coded for advantages and disadvantages. It revealed, that most participants had rather positive associations. One participant even proposed apps as a new means during the questions about WHP in general. Eight further wished to download the app and then evaluate on its value.

**Table 2. Advantages/disadvantages of WHP apps**

Advantages (mentioned by N participants)	Disadvantages (mentioned by N participants)
<ul style="list-style-type: none"> <li>- Condensed and fast information provision (9)</li> <li>- Positive social pressure (6)</li> <li>- Great for technically affine people, especially younger generation (5)</li> <li>- Incentives (4)</li> <li>- Independent of location, applicable for home office (4)</li> <li>- Overview on activities (4)</li> <li>- Added value (3)</li> <li>- Integration to other private and professional platforms (3)</li> <li>- Positive image for the company (3)</li> <li>- Possibility of personalization (3)</li> <li>- Low effort for company (3)</li> <li>- Low effort for employees (2)</li> <li>- Enhanced motivation (2)</li> <li>- Easy to use (2)</li> <li>- Competition (1)</li> <li>- Possibility to integrate more functions over time (1)</li> <li>- Cost savings (1)</li> <li>- Usage of technical possibilities (1)</li> </ul>	<ul style="list-style-type: none"> <li>- Data security (11)</li> <li>- No added value compared to private apps (9)</li> <li>- Already flood of information (4)</li> <li>- Social pressure and stress (4)</li> <li>- Blending of work and private life (4)</li> <li>- Short-term usage (3)</li> <li>- Lack of quality checks (2)</li> <li>- No control on the execution of proposed exercises by colleagues (1)</li> <li>- Lack of regulations (1)</li> <li>- Only fit people would be interested (2)</li> <li>- Additional media (6)</li> <li>- Dependence on technical components e.g. battery (3)</li> <li>- Only for technically affine people (1)</li> </ul>

*I would think it's a good initiative and would be more interested in looking at it and understanding what exactly it checks and if it's beneficial, I would like to use it.*

Only seven stated their general opinion against the app, even though they would still have a look at the app. Rejection of the app were based on their concern about data security in four cases and because interviewees did not see the value in three cases.

*First, I would say uhh great, I like it. And then I would be worried about my personal data*

Added values were generally mentioned rather frequently. Even though participants were positive in general, they stated that they would only continue using it if it adds value compared to private apps.

*This is relatively easy for both sides, for the company and for the employee. You really have the opportunity, with little effort, to give your employees such a small help and to do something good for them. On the other hand, you as an associate are doing it or you are not doing it or you are interested in it or leaving it. But I think that's pretty cool that way.*

Besides general analysis of the quotes, some analysis of the argumentations given were compared among the different demographics' characteristics. These reveal interesting results, even though interpretation is difficult, due to the fact that the number of quotes coded by the research does not include information on the assigned weight of the argumentation by the interviewee. Differences were for instance found among men and women. Whereas for women more quotes were coded as advantages of WHP app usage, for men more disadvantages of mHealth usage for WHP were coded. When comparing the different age groups, the age group of interviewees aged 40-50 and those aged 60 or older stated more disadvantages of usage of WHP apps. The same applied for those, who use mHealth privately on a regular basis (25 versus 19 quotes). Additionally, it seems as those participants with children provided more quotes against usage compared to quotes towards (48 compared to 33).

When evaluating, the functionalities proposed by the participants, further interesting results could be withdrawn. The proposed and preferred topics and functionalities mentioned in the interviews as aspects of interests are shown below, along with the numbers of interviewees who expressed interest (Table 3).

**Table 3. Proposed functionalities of apps for workplace health promotion**

Topic	(mentioned by N participants)
Condensed information on local WHP and health topics	15
Nutrition information	12
Challenges/competitions	7
Physical activity tracking	7
Linkage to company's other portals/ platforms	6
Ergonomics and sitting	6

During the interviews, it became obvious that different impressions came to the minds of the participants. Eight explicitly mentioned that the app should be personalized. Six additionally said that it needs to be tailored to the company and job requirements. Furthermore, two suggested that the app should include both a possibility to provide information only and deactivate data gathering and a possibility to make it more sophisticated and integrate more personal data. Therefore, both user groups would be served. Additionally, different requirements were mentioned, including full integration of various tracking functions with information, incentives, bonus systems, benefits, and communities, although some participants also mentioned that they don't like games, reminders, or incentives.

It was further emphasized by the interviewees that the app needs to be easy, intuitive, and lively, so that something is happening daily. Often, the added value compared to other apps was mentioned.

*[...] it depends on the functionalities with data tracking, without data tracking in any form. I do have full trust in the company when it comes to data integrity, but often these services are being bought or need to be bought and then[...] it depends on what the topics are [...] I actually cannot come up with a health app that the company can offer that does not exist yet.*

Further proposals for drinking water, travel information, hints for stress, reminder to take breaks, sleeping cycle, and blood pressure tracking were made. In particular, the wish for aggregated information on the WHP program reflects the previously reported need for more information on WHP within the company. From an employer's perspective, WHP apps might also have a positive effect on the recruiting process. Additionally, it was mentioned twice that it should fit the company values and workers (in this case, an IT Company).

*'I personally think, this might not be bad, you would have everything on the app, the most important information and this might make the colleagues more sensitive to the topic. There is always the problem that the bosses also need to support it [...] there is no value if there is only the app, but it needs to come from above, a certain approach needs to be lived in the company.'*

Contrary to our expectations, the recruiter, employee representatives, and the employees responsible for WHP were rather positive concerning usage of such technologies and personally showed no concern about data disclosure. This might be explained by a gap of knowledge between those working in departments, where they experience data handling, and employees who have never been in touch with the handling and thus assume the worst.

## Data Security

Generally, an overall judgment of data security and privacy perception were difficult to grasp. Most participants expressed that their perception is highly dependent on the outcome and combination of data required. Seven claimed to trust the company and to expect only positive outcomes when sharing the data in an app. Interestingly, three participants preferred to rather share data directly with the employer than via an external company.

*'I personally think that I have more trust in the company than in any other external provider.'*

Interviewees further emphasized the need to make an informed decision, meaning that sharing of data would not be a matter of concern if the process of data analysis and sharing is clearly stated. Participants further often stated that they are personally not worried but could imagine others being worried about misuse. Often, participants were torn concerning the data questions—they claimed to trust the company but were still worried. Most probably, this uncertainty arises from a lack of information.

*With my real name, [...], even though I fully trust the company, I would have concerns, but on the other hand, there is so much personal data here about me. They know exactly when I work and when I don't work. There are so many regulations, which is why I think I would still use it.*

When considering, the experts on WHP, mhealth, and IT Security all affirmed that the company is generally not allowed to save health-related data of employees; thus, the app would need to be externally hosted and only anonymized information would be provided to employers. Additionally, according to data security expert, the app needs to be adjustable according to the willingness to share personal data in order to integrate most employees. However, they all agree that laws and regulations required to successfully implement it are currently not in place.

## Consultants

In order to evaluate the impact of these technologies on the modern way of working, consultants currently working in the same company were interviewed. Of course, they recognized their special situation and had a positive view of technological support to receive more information concerning health issues—especially information adjusted to the needs of a consultant, like information about the current workplace or information which can be used independently from the working slot is considered as important. One participant, however, clearly stated his concern about data.

*I mean of course, you would need to find out what the particularities are, when people are often commuting, there are small aids, like 'how can I do something' ... for fifteen minutes, something to feel better, ... how can I do exercises for relaxation, if I know there will be something stressful ... And thus, a small hint, a small guidance. So, in this direction especially, I am sure that helps.*

This information provides a direction for future research and practice, as the increasing global interaction and modern way of working enhance the need for those kinds of measures.

## Overall

Conclusively, it was retrieved that employees are generally open for WHP apps, provided they are able to control their data-sharing and the app can be tailored to their own needs and preferences. Experts emphasize the future development of such apps and the formation of habits around technologies and thus believe that the working population will be better at coping with the information flood and the usage of such technologies. The health experts further expressed the need for personal contact and for regulation concerning data and usage during working hours. Further, it became clear that the app would not be the only initiative or measure for cultural change and that a convenient working environment needs to be established. As the last point, the researchers notice no difference over time—especially for data security, which seems to depend on personal opinion.

## Discussion

This study is among the first to qualitatively evaluate the usage of mhealth for WHP. Previous studies have emphasized the need for this qualitative evaluation of the perception of end-users (de Korte et al., 2018; Dunkl & Jiménez, 2017). Often, the interventions of WHP do not meet the needs of the end-consumers, thus limiting the reach; hence, end consumer evaluations are extremely important (Rongen et al., 2014).

The study comprises 29 semi-structured interviews with employees in order to receive a comprehensive view of the topic in one company. The demographics varied and thus represents a common working force in regards to age, health status, and interest in health technologies. Additionally, the usage of health apps in private lives differed. Most of the employees have tried those apps, but only few used it on a regular basis. As in most other companies, the need for investigations in WHP was supported by the interviews, as most employees were not aware of the program and just knew several independent initiatives.

Barriers to participation were mainly reported to be lack of information, lack of time, and lack of interest as it did not meet their preferences or they preferred doing personal activities without using technology, as already supported by other studies (Bardus et al., 2014; Suzan JW Robroek et al., 2012).

In terms of WHP apps, a high level of interest was demonstrated. Most employees would try the app despite having concerns about the added value and the data security. The overall trust thus seems to play a big role in acceptance, as discussed by Mettler et al. (2019). However, it seems that the app needs to be well-developed in order to convince users (Mettler, T & Wulf, J, 2019). This positive opinion about apps for WHP was reported by employees who had various previous experiences with WHP and health apps. Furthermore, the answers showed no direct links to age, gender, or health

status, implying that apps are useful for different characteristics even though differences in the number of quotes including advantages and disadvantages were found.

When considering the proposed functionalities, it became obvious that the lack of information concerning WHP was one of the most important points. Additionally, physical health and nutrition tracking were favoured. Apart from this, challenges and competition were discussed. Many employees were in favour of it, whereas others did not want to share their personal data with colleagues to avoid social pressure. Those kinds of incentives and gamification have already been discussed in the literature and often shown effective results. Although they have not yet been tested in the workplace, their effect can be deduced from contexts like chronic disease management via apps (Miller, Cafazzo, & Seto, 2016). Again, these functionalities would need to be voluntary in order to reduce negative social pressure. A previous study on workplace health apps supports the tailoring to the work context. In our study, however, the added value compared to other privately used apps was more often mentioned (de Korte et al., 2018).

In terms of perceived data security, a lack of research is identified. Even though it seems to be a big issue of concern, little about it is found in the literature. Additionally, an interesting finding during the interviews is that employer representatives—like recruiter, WHP experts, employee representatives, and the IT expert—were less concerned about sharing the data as they had sufficient knowledge about the handling of the data and regulations concerning data handling compared to other employees.

This is further supported by Dunkl et al. (2017), who report positive opinions of leaders towards mhealth apps for WHP (Dunkl & Jiménez, 2017).

In conclusion, it can be stated that providing detailed information on the data handling process might enhance the acceptance of such a technology (Dockweiler & Razum, 2016).

## **Limitations of the Study**

The study is limited by the chosen methodology. First, it needs to be stated that the interviews were conducted in only one company in order to compare results on the basis of the current status of WHP. Furthermore, the interviews only included German-speaking participants, limiting the generalizability to Germany, even though the company operates globally. The general positive view of technologies among the participants might also be because they are employed at an IT company. Besides those limitations, common limitations for semi-structured interviews also apply to our study. Due to the small sample size compared to quantitative studies, no statistical tests were conducted. Therefore, results rely on the interpretation of the researchers and the study population rather than on objective results. Besides, the sample cannot be tested for representativeness on another sample. Still, this method allows deep dive insights into the opinions of potential users and thus provided advantages compared to quantitative results. Of course, statistical validation of our found results is desired for the future.

## **Future Work**

Based on the findings described above further investigations into mHealth for workplace health promotion are necessary. Obviously, potential user groups show a general interest in using these media for health measures. Further scientific studies would therefore be necessary to evaluate acceptance factors, potential effectiveness and eventually actual usage of mHealth. In order to complement the methodology utilized in this study, quantitative studies as well as comprehensive field tests or RCTs on effectiveness would be necessary to research that field. As the field of data disclosure seem to be of high relevance among the study group, investigations into that field would further be appreciated.

## **CONCLUSION**

The initial decision to download an app seems to arise from a general interest in technologies, data security perception, perceived value, and support from supervisors.

For a practical implication, it is thus recommended to prepare a comprehensive communication about the app, data usage, and the added value. The app would need to integrate various functionalities and contents, which can be adjusted to the needs and preferences of the end-users in order to add value for many employees compared to private apps. Despite the limitations of the methodology, the study gives directions for future usage of mhealth as WHP as well as research. Generally, most participants were positive about mhealth, even though doubts concerning added value compared to the current market and data security concerns were shared. Additionally, the data security concern seems to arise from a lack of information, as representatives of the employer and experts were less concerned.

Future research should deal with acceptance, preferences, practical testing, and incentives to further increase interest.

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