Critical Experiences with Sport and Wellness Technology Digital Coach – A Study among University Students with Low Levels of Physical Activity

Completed Research Paper

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Abstract

University age students have been found to be in a high risk of disengagement with physical activity and therefore exercise promotion to this target group is important. Since today's students are familiar with different kinds of digital technology, it is worth including personal wellness devices in physical activity promotion. This study explores critical experiences occurring during the implementation phase of a sport and wellness technology digital coach among university students with low or sedentary physical activity level. This study uses qualitative methods and is based on a thematic analysis of 30 interviews combined with the critical incident technique. The study reveals the experiences that the users consider crucial during the first phases of usage of digital coaching devices, which offer guidance and feedback on how to improve aerobic fitness. The findings highlight the importance of these critical experiences to the overall usage experience as well as their influence on the motivation to improve fitness with a sport and wellness technology digital coach.

Keywords: Digital Coach, Sport and Wellness Technology, CIT, Critical Experiences, Students

Introduction

University age students have been found to be in a high risk of disengagement with physical activity (Cocca et al. 2014). Furthermore, physical inactivity is a major global problem due its detrimental effects on health (WHO 2017). Thus, different kinds of methods to prevent disengagement from physical activity have been introduced. One potential method is using different kinds of physical activity promotions accompanied with personal sport and wellness technologies that can provide

feedback to the users. During the past years, there has been a tremendous increase in the use of such technologies. As a result of sport and wellness technology devices becoming less and less expensive, they have become more appealing to regular exercisers rather than just athletes. Research has shown that feedback sources are considered more effective and relevant during the beginning of a skill acquisition process and that their importance decreases as skill level increases (Winstein and Schmidt 1990). Therefore, sport and wellness technologies are not only relevant for athletes but also for recreational exercisers whose skill and knowledge level regarding exercising is not yet that high and who are in the initial level of skill acquisition (Liebermann et al. 2002).

While sport and wellness technology has the possibility to increase the quality of physical activity and training by giving personalized feedback, using technology may also lead to inappropriate adjustments to training, particularly as a result of misinterpretation (Duking et al. 2016). Therefore, the focus should be on information that is easy to understand and implement and matches the user's level of understanding. Providing unnecessary information, too much information, or inadequate information might also cause the user stress and anxiety (Halson et al. 2016).

According to previous studies, sport and wellness technology can increase motivation by increasing the level of awareness of personal physical activity. (e.g., Chan et al. 2004; Faghri et al. 2008; Kang et al. 2009; Kari et al. 2016a; Kari et al. 2017a; Wang et al. 2016). However, while personal sport and wellness technologies raise awareness towards exercise and physical activity, a mere "number crunching" activity can also lead to exercise feeling like work (Hassenzahl et al. 2016). Indeed, the increased awareness regarding one's physical activity alone may not lead to maintaining the use of sport and wellness technology (Miyamoto et al. 2016) which might subsequently also affect the maintenance of physical activity routines (Warraich 2016). Therefore, increasing adherence to using sport and wellness technology by adding personalized achievable goals, sufficient usage guidance, and clear and easy to understand information may help the users maintain their overall wellness routines. Receiving feedback on how to enhance or maintain overall wellness and physical activity can make users more goal oriented (e.g., Kari et al. 2016b; Kari et al. 2017b), which can lead to increased motivation (Locke and Latham 2002; Shilts et al. 2004). However, a typical problem in many current sport and wellness devices and applications is that they only focus on giving feedback data from past performances and do not necessarily focus on giving instructions or personalized feedback on what to do next.

One solution for this problem is digital coaching, which refers to a "*service on a technological device that not only gives feedback but also offers advice, suggestions and future steps for a user to follow in the pursuit of their wellness and fitness goal*s" (Kettunen and Kari 2018, p.3). While typical sport and wellness technology devices and applications only give feedback on performance data and increase awareness, a digital coach goes one step further by creating a personalized training plan. A digital coach can potentially identify the weaknesses and strengths of a user, and based on the collected data, create a personalized training plan and update it based on the user's actions (Schmidt et al. 2015). The potential a digital coach has in a physical activity and exercise setting has also been recognized in other previous research (Kari and Rinne 2018; Kettunen and Kari 2018; Kettunen et al. 2018; Kettunen et al. 2019; Kranz et al. 2013).

Research Questions

Interest toward digital coaching devices and solutions related to personal wellness is increasing. However, since these commercial solutions and devices are still relatively new, there are only few studies that have focused on the usage experiences or the influence of sport and wellness technology digital coaches. Therefore, there is a growing need to investigate the usage experiences with digital coaching solutions.

This study continues the important investigation on the usage of digital coaches, more specifically concentrating on the critical incidents the users faced during the implementation phase. The purpose of this study is to find out critical incidents concerning the use of sport and wellness technologies with digital coach. The aim is also to find out how these incidents influence the overall usage experience as well as their influence on the motivation to improve fitness with a personal wellness technology

digital coach. This paper aims to contribute to IS research by seeking to answer to the following research questions:

1) What are the central critical incidents the users of sport and wellness technology digital coach experience?

2) How these critical experiences affect the overall usage experience and the motivation to become more physically active with the help of a digital coach?

The focus of the study is on the critical incidents of the users that occur during the implementation phase. A critical incident is an experience that the person "perceives or remembers as unusually positive or negative" (Edvardsson and Roos 2001, p. 253). The importance in investigating critical incident is in that these incidents and experiences are generally highly powerful in terms of human behavior (Flanagan 1954) and can thus have significant impact on the use. Implementation phase, as described by Rogers (2003), refers to the phase where the user implements the technology (innovation) into use and determines its usefulness. Hence, the implementation phase is crucially important in the adoption process (Rogers 2003).

The study is exploratory in nature and follows a qualitative approach. It is based on a thematic analysis of data collected from 30 users of sport and wellness technology digital coach through interviews used together with the critical incident technique (CIT) (Flanagan 1954). The study participants were users of the Suunto 3 Fitness training watch and the accompanied application.

This study contributes by increasing the understanding on the usage experiences of these kinds of sport and wellness technologies with digital coaches. It also supports the developers in their efforts to design better sport and wellness technology digital coaches and in providing the users with meaningful and positive experiences with sport and wellness technologies and related solutions. The findings can also aid the developers in supporting users' positive incidents and in avoiding the negative ones.

Theoretical Background

Critical Incidents

Critical incident is an experience that the person "perceives or remembers as unusually positive or negative" (Edvardsson and Roos 2001, p. 253). Critical incidents generally are particularly influential for human behavior (Flanagan 1954). For example, a single critical negative incident may overrule a set of average positive incidents and lead to unwanted behaviors, such as discontinuance with the product or service (Cenfetelli 2004). Research has shown that critical incidents have a substantial role in forming user perceptions towards products, services, their providers, and thus, in forming customer relationships (Edvardsson and Strandvik 2000; Payne et al. 2008). Studying critical incidents potentially pose important implications for both research and practice. Previous research has examined critical incidents in several IS related contexts, for example, online shopping (Holloway and Beatty 2008), mobile applications (e.g., Salo and Frank 2015) and mobile services (e.g., Gummerus and Pihlström 2011; Salo et al. 2013), augmented reality (Kari 2016), and self-service technologies (Meuter et al. 2000), but to the authors' best knowledge, not of digital coaches. This study reveals central critical incidents occurring with sport and wellness technology digital coaches, which poses important implications regarding not just the investigated solution itself but also sport and wellness technologies and digital coaches in general.

Implementation Phase

Implementation phase is a stage of the innovation-decision process introduced by Rogers (1962; 2003) in the innovation diffusion theory (IDT). Implementation in itself has been widely included component in different models and theories concerning information technology (c.f. e.g., Ely 1990; 1999; Ensminger et al. 2004). Roger's (2003) innovation-decision process reflects the decision-making process related to the adoption of an innovation and is defined as "the process through which an individual passes from first knowledge of an innovation to forming an attitude toward the

innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision" (Rogers 2003, p. 475). It involves five stages: 1) knowledge; 2) persuasion; 3) decision; 4) implementation; and 5) confirmation. The process begins with the knowledge stage, where the individual becomes aware of the innovation. It continues with the persuasion stage, where the individual seeks information regarding the innovation. This forms an attitude towards the innovation. In the next – decision – phase, individual makes an initial decision to either adopt or reject the innovation, that is, either start using it or not. This is influenced by the attitude and perceived characteristics of the innovation. Next, in the implementation phase, the individual implements the innovation into use (thus becoming a user) and determines its usefulness. Following the initial adoption decision and the implementation phase, the user makes the final confirmation and decides whether to continue or discontinue using the innovation. If the user's positive perceptions of using the innovation are strengthened, for example through positive experiences, the use probably continues. If the individual faces conflicts with the initial decision to adopt, for example in the form of negative experiences, it can turn into rejection. The less conflicts there are, the more likely the individual continues the use. Sometimes the initial decision to reject can be overruled and lead to later adoption, if the perceptions affecting the decision are positively strengthened. Overall, the innovation-decision process consists of a number of choices and functions, which can extend to a longer period of time (Rogers 2003). In addition to the different stages, Rogers (2003) defines prior conditions that affect the process. These are related to the decision maker (individual user) and include previous practice, felt needs, innovativeness, and norms of the social system. Rogers (2003) also presents five perceived characteristics of the innovation that influence the individual user's evaluation of the innovation: a) Relative advantage – "the degree to which an innovation is perceived as better than the idea it supersedes"; b) Compatibility – the "degree to which an innovation is perceived as being consistent with the existing values, past experiences, and need of potential adopters"; c) Complexity – the "degree to which an innovation is perceived as difficult to understand and use"; d) Trialability – the "degree to which an innovation may be experimented with on a limited basis"; and e) Observability – the "degree to which the results of an innovation are visible to others" (Rogers 2003, p. 15-16). Innovations that are perceived having greater relative advantage, compatibility, trialability, and observability and having less complexity will more likely to be adopted.

While this study is not focusing on adoption per se, it is obvious that critical incidents during the implementation phase can have a significant influence on adoption as well. For example, Kari et al. (2016b) found that critical incidents during the implementation phase of a self-tracking technology can indeed influence the final adoption decision. They also found that positive experiences concerning the technology's usefulness in self-improvement and ubiquitousness in daily life during the implementation phase are particularly important for the users implementing a self-tracking technology. Many studies (e.g., Lazar et al. 2015) indicate disengagement with sport and wellness technologies within the first months of use, that is, during the implementation phase.

We refer the reader interested on reading more about implementation to the study by Ensminger et al. (2004). In addition to examining prior literature on different variables related to implementation and factors contributing to the successful implementation of technology innovations, they provide an investigation into the conditions that facilitate the implementation of instructional innovations in different settings.

Methodology

The Digital Coach Used in the Study

The wellness technology device with a digital coaching feature used in the study was the Suunto 3 Fitness. It is a fitness watch created by Suunto Oy. The key features of this particular device include wrist-based heart rate detection, fitness level estimation, stress and recovery measurements, 24/7 activity tracking including sleep monitoring, step and calorie counting, in addition to other features, all of which can be synced with Suunto's mobile app. The device does not have an integrated GPS but can receive this data from a paired smartphone through the mobile app. One of the relatively unique

features of the Suunto 3 Fitness is the digital coach, an adaptive training coach that provides instructions for training directly on the watch.

The creation of a personalized training plan involves a user first receiving an estimation of their fitness level. The device may use previous exercises or provide a guided session to calculate fitness level using the device's heart rate monitor and the GPS tracking from a paired smartphone. The user may then select a fitness goal from three options, "maintain", "improve", and "boost", where "boost" aims to enhance fitness level quicker than the "improve" program. The choice affects the amount of training load the watch will recommend.

Based on the user's fitness level and training history, the device's digital coach will create a 7-day training program. The program will recommend to either take a rest day, or provide a training load target, typically in a measure of time (in minutes) along with a recommended intensity, presented as either "easy", "moderate", or "hard". The watch will show the recommended schedule for the upcoming 7 days, both graphically and with a list showing the workouts. For example, it may say "Tuesday – Hard – 0:30, Thursday – Easy – 0:40, Saturday – Moderate – 0:30".

The watch also provides real-time guidance when performing the recommended workout. The real-time guidance is based on staying in the correct heart rate zone. The watch has visual indicators showing if the user is training in the appropriate zone. A progress bar also shows the progress through the workout. If, during the workout, the user's heart rate leaves the recommended zone, the watch will provide notifications in the form of sounds, watch vibration, and messages on the screen instructing the user to speed up or slow down. The user will also be notified when they have successfully completed the workout. It is to be noted that in this study, the participants used the device's wrist heart rate measurement instead of using a heart rate belt.

The resulting data from the workouts may be used to adjust future workouts, making them easier or harder based on the changing fitness level of the user. If the user performs a different workout than the one that is recommended, the watch will adjust the following workout to maintain appropriate training loads.

Data Collection and Analysis

The study included 30 participants who were using a sport and wellness technology digital coach for 10-12 weeks. The study was conducted in Finland during autumn and winter 2018-2019. The target group of the study was university students whose level of physical activity was low or sedentary but wanted to increase their level of physical activity. The invitation to take part in the study was sent to all students studying in the authors' University via the student online magazine. In the invitation, students who categorized themselves as being either sedentary or currently non-regularly active exercisers but who felt the need to increase their level of physical activity were invited to join. After signing up to the study, the potential participants were asked to further explain their current physical activity and exercise habits to make sure they did fit to the target group based on their current physical activity level. In total, 49 students expressed their interest in taking part. The students who met the criteria of low or sedentary physical activity level were taken into the study until 30 participants were recruited. The reason for limiting the number of participants to 30 was due to the number of available digital coach devices. The devices were provided to the participants by the authors for the use period of the study, that is, the 10-12 weeks.

To conduct the study, a qualitative research approach was chosen. Qualitative interviews were chosen as the data collection method. More precisely, we chose a semi-structured interview, as we wanted to collect critical experiences related to the use of the application. Semi-structured interview is the most used type of interview in qualitative research in IS. A semi-structured interview includes an incomplete script, but typically a pre-formed structure that the interviewer follows is prepared (Myers and Newman 2007). This was the case also in this study. The interview script comprised of several sections, one of which concerned the critical incidents. Some of the other sections gathered information outside the purpose of this study. The sections used for this study included the background of the participants and the critical incidents. To collect the critical incident descriptions, we used the critical incident technique (CIT) (Flanagan 1954).

CIT has been widely used as a research method in different research disciplines (Butterfield et al. 2005). It is a well-established research method that enables the researcher to "collect, content analyze, and classify observations of human behavior" (Gremler 2004, p. 66). Flanagan (1954) notes that CIT is not a single rigid set of rules leading such data collection, but rather "a flexible set of principles which must be modified and adapted to meet the specific situation at hand" (Flanagan 1954, p. 336). CIT has been proven to be a sound research method and is suits well for gaining insights on a previously undiscovered phenomenon (Gremler 2004; Meuter et al. 2000). Thus, CIT fits our purpose of collecting critical experiences well. In planning the interviews, we followed other prominent and widely cited papers utilizing CIT (Bitner et al. 1990; Meuter et al. 2000). Following the CIT, the participants were asked to describe one single critical incident that occurred during the use period in as much detail as possible. The participants were first asked to "think of a time when you had an outstandingly positive or negative experience [when using the device], and then asked: "Was this a positive or a negative experience?" We used the following open-ended questions to let the participants describe the incident in their own words (translated from Finnish to English): 1) Describe in as much detail as possible: what were you doing and what happened?, 2) What exactly caused the positivity/negativity of the experience?, 3) Why do you feel that this was a significant experience for you?; 4) As an outcome of the experience, how did you feel?.

After having had 10-12 weeks of usage experience, all 30 participants were interviewed separately. In total, the interviews lasted between 36 and 69 minutes, average interview length being 48 minutes. The data analysis started by getting familiar with the data and transcribing the relevant parts of the interviews. The analysis method used was thematic analysis. This method is used for "identifying, analyzing and reporting patterns within data" (Braun and Clarke 2006, p. 79) and is the most widely used analysis method in qualitative research (Guest et al. 2012). In this research, using thematic analysis enabled studying and comparison of the occurring themes found from the data set. Thematic analysis describes and organizes the data in rich detail and also interprets various aspects and exceptions related to the research topic. During the analysis phase, we followed the guidelines by Braun and Clarke (2006). These guidelines were applied in a flexible manner to fit the research question and data. In the analysis process, we did not follow a linear phase-to-phase process but used a recursive process, which allowed us to move back and forth between the analysis phases and to reach a deeper understanding and more detailed analysis of the research data. The analysis started by categorizing all reported critical incidents between positive and negative categories. After that, the focus was on searching for recurring themes and similarities in participants' related critical experiences. This was done separately between positive and negative incidents. As themes and tendencies emerged, they were reflected upon previous themes. After careful examination, the report highlighting the central themes and their features was produced.

Results and Findings

Background information of the participants

This study included 30 voluntary university student participants who considered themselves being either sedentary or low on physical activity level. The participants were aged between 20 and 53 having an average age of 31 years old. 20 of the participants were female students and 10 were male students. The students were either doing their undergraduate, graduate, or doctoral degree. A more detailed description can be found from the Appendix 1.

None of the students had previous experiences related to digital coaching. However, 80 % of them had some kind of previous experience related to sport and wellness technology but for most of them the usage experience was mostly limited to trialing. The most used sport and wellness technologies were activity trackers and applications as well as heart rate monitors. The biggest motivators for the participants to do physical activity and exercise were maintaining or improving their health and also the instant positive feeling experienced while exercising. For almost all participants, exercising and physical activity was not goal oriented meaning that they were not aiming to get into better shape for a particular purpose. Most of the participants said they had a decent knowledge related to overall

health, training, and aerobic training but most participants estimated their background knowledge being average or poor.

During the interviews, the participants were asked to recall one single critical experience as described in the methodology section. Out of all the 30 critical incidents, 13 were positive and 17 were negative. In addition to the open ended questions, all the incidents were asked to be rated on their criticality in a scale of 1-5 where 1 represented no particular feelings and 5 represented very strong positive or negative feelings. Both the positive and negative critical incidents got an average of 3.8, suggesting their criticality. The positive and negative experiences are presented in more detail in the following two sub-sections.

Positive critical experiences

Out of all the reported critical incidents, 13 were described as positive. Most of these experiences happened during the early stage of the usage. One central theme concerned the perceptions of fitness level. Four participants' positive experience was related to a situation where they were able to find out more about their own physical activity and current state of their aerobic fitness level. With three participants, the fitness score turned out to be more positive than they had expected, whereas one participant believed their aerobic fitness level should have been better than what the digital coach told. Regardless, in all of these experiences, becoming more aware about the current state of own personal fitness was considered to be the positive factor.

Another common theme from four critical incidents was the feeling of overcoming one's own expectations. These participants described a situation where they had made themselves to do something that did not feel comfortable for them at that point, and the reason for doing this was that the digital coach informed them that they have a training session they need to do on that day. In two of the cases, the training was done at a time that the participants would have not normally trained at all, and even though it had felt hard to start the exercise, they experienced feeling proud of themselves afterwards. In the two other experiences, the participants had went out of their comfort zone by doing something new and different they had not done before. In one case, the training scheme of a regular running session was changed into a more intense interval session due to the real time feedback received from the digital coach. In the other case, suggested by the digital coach a participant decided to try running, which was a new form of exercise for the participant. Typical to these cases, the participants did not at first have an idea whether they could actually perform the training session the digital coach instructed them to do, but they had a positive experience when they realized not only could they finish the training but also continue longer than expected. In all of these four incidents, it was described that the feedback received from the watch after the exercise was closely associated with the positive feeling.

Other positive incidents were related to the data received from the watch. One participant reported it was exciting to follow the heart rate during a public speaking session whereas another participant felt pleased after realizing how long her normal walking route is and with what speed she was able to walk the route. One positive experience was related to realizing how commuting can be tracked as physical activity and how physical activity can also be connected to other daily routines, such as walking to school or to the movies.

Only one reported positive incident concerned the functionality of the digital coach. A participant explained being very reserved about the digital coach concept in general, but once the device updated the personalized training plan for the first time, the participant got a feeling that this device is able to give personalized instructions and therefore can be useful.

Overall, most of the positive incidents were associated with feelings such as satisfaction, excitement, or being positively surprised. When asked how these positive incidents influenced the participants' intentions to continue using the watch and the digital coach after the incidents, the participants in general reported having received more motivation not only to use the device but also motivation for being physically active as well as increased belief in their capability to do progress and get physically into better shape.

Negative Critical Experiences

Unlike with the positive critical incidents, most out of the 17 negative experiences – 10 in total – were related to the functionality of the watch or the digital coach. A negative issue that was most commonly reported was experiencing a lack of trust in the data. In most of these cases, participants reported that the watch was not able to accurately measure their heart rate (heart rate measurement was done from the wrist), and since most of the other information received from the digital coach was connected to the heart rate, they did not feel related information to be reliable anymore. After most of these incidents, participants reported not continuing to follow the heart rate based information anymore or even stopped using the digital coach feature entirely. Other negative elements related to the functionality of the watch were difficulties with starting the training session recording as well as not being able to modify the form of received training data.

Some of the negative incidents were related to the real time feedback participants received during their exercise. Some participants tried to use the real time feedback during human-guided group sessions such as instructed gym or horseback riding where it was not possible to adjust your own intensity level according to the digital coach's instructions as the instructions were coming directly from the instructor. In these cases, the digital coach was perceived as bothersome, and after these experiences the participants decided not to use real time feedback during similar group training sessions in the future. There were also couple of negative incidents related to real time feedback where participants felt that the information received from the digital coach was more interruptive and stressful than helpful. These participants felt they would have liked to listen to their own body and own feelings rather than get interrupted by the digital coach. These participants stopped using the real time feedback after their negative incidents. They felt that the digital coach should have been better in detecting when was a more appropriate moment to give feedback and when it would have been better to be left alone without any external pressure to modify exercise.

Two participants reported that their negative incident was related to using the watch and the digital coach in the first place. For them, having a technological device during exercise seemed to take away the enjoyment of exercising and therefore the motivation to use the watch decreased. These participants realized that they preferred to do physical activity without sport and wellness technology, or at least without this particular device.

Most of the negative incidents were associated with feelings of being angry, disappointed, frustrated, distressed, frustrated, or annoyed, the last two feelings being the most common. Similar to positive critical incidents, most of the negative incidents happened during the early stages of the usage period.

Conclusion

This study explored the critical experiences occurring during the implementation phase of a sport and wellness technology digital coach. The main research questions were: 1) What are the central critical incidents the users of sport and wellness technology digital coach experience? and 2) How these critical experiences affect the overall usage experience and the motivation to become more physically active with the help of a digital coach? The main theoretical contribution of the study comes from answering these questions, and thus, increasing the understanding on these critical experiences. These critical experiences may further affect the overall experience of using the digital coach and subsequently affect how well the sport and wellness technologies are able to motivate people towards more physically active lifestyle.

The central positive and negative critical incidents have been categorized in Table 1. The types of incidents are presented in the order of how common each category of incidents was among the participants. The central positive incidents were mainly related to learning new things through seeing one's own exercise data or to feeling proud of accomplishing something hard. The central negative incidents were mainly related to the functionality or usability of a digital coach. By providing meaningful information about training data and personal improvement and by giving positive encouragement, a digital coach can increase the awareness of the user's current physical activity level,

create positive user experiences that encourage for further usage, and increase motivation towards physical activity and exercise.

Table 1. Summary of Critical Experiences

Type of positive incident	**The role of the digital coach**	**Feeling after the incident**	**The effect on future usage**
Becoming more aware of own physical activity level	Educating the user	Excited, surprised	Increasing the motivation to use the digital coach
Being able to overcome one's own believes about themselves	Showing proof of an achievement important for the user. Giving positive feedback	Satisfied, proud, successful	Increasing the motivation to use the digital coach
Being able to receive detailed information about daily physical activity (distance, steps, seeing the improvement)	Showing detailed data about the training performance and providing training history for tracking the development	Happy, satisfied	Increasing the feeling of usefulness of the digital coach. Encouragement to keep on improving
Being able to see the digital coach modifying instructions based on the user's data	Showing personalized feedback and instructions	Delighted, surprised	Increasing the feeling of reliability for the digital coach
Type of negative incident	**The role of the digital coach**	**Feeling after the incident**	**The effect on future usage**
Perceiving received data as unreliable	Watch not being able to measure heart rate correctly leads to false instructions from the digital coach	Disappointed, annoyed, frustrated	Decreasing or even stopping the usage for exercise purposes
Perceiving the watch / digital coach as difficult to use	Being too complicated	Anger, distressed, frustrated	Continue exercising without the watch / digital coach
Being disappointed and interrupted by real time feedback	Causing inconvenience during the training	Annoyed, stressed, frustrated, helpless	Stopping or modifying the use of the real time feedback feature of the digital coach

The findings are in line with some previous critical incident related research in the field of IS. As highlighted in the study by Salo and Frank (2017), there are high risks and rewards for innovative technology. They explain that by ensuring the readiness, quality, and functionality right from the start, the application providers decrease the chances for negative critical incidents and increase the odds for positive critical incidents. This study supports this argument since most of the critical negative incidents happened in the early stages of the usage and were related to technical difficulties. According to Tay and Ang (1994), the adoption process of information technology depends on the abilities and skills of the users, and experiences related to learning to use new technology are often combined with positive and negative feelings. For the participants in this study, using sport and wellness technology digital coach was a new experience. When examining the feelings derived from the positive critical incidents, the experience of learning something new or being able to overcome oneself seemed to be most important ones for the participants. In the case of negative incidents, the feeling of not being able to trust the data stood out as the most crucial one.

From a practical point of view, the findings and implications of this study assist sport technology companies in improving the design and functionality of sport and wellness technology digital coaches and thus improve the reception of these solutions in the market. The findings indicate that being able to provide reliable data is one of the main elements that affect the usage experience. Thus, it would be imperative for digital coach developers to implement them into equipment that are highly accurate in measuring relevant data. For those who are not experienced with training or do not possess a lot of knowledge about improving aerobic fitness, it is important that the instructions and feedback are easy to understand and that the digital coach is easy to use. It is also important that the training session given by a digital coach are not perceived as too difficult or too demanding, which can maximize the possibility of creating positive feelings of success and may increase the motivation to continue using the device or application. Considering these implications could benefit the developers in reaching the desired positive incidents and in avoiding the negative ones. Furthermore, the findings are valuable to professionals working in the field of physical activity by giving insight how critical experiences related to sport and wellness technology can affect the overall usage experience and subsequently the users' motivation towards physical activity and exercise.

Limitations and Future Research

This study has some limitations. One limitation is that in this study, the participants only used the device's wrist heart rate measurement instead of using a heart rate belt, which could have influenced the perceptions of data reliability and lead to negative critical incidents. However, it is still an important finding as perceptions of data reliability are important independent of the used measurement technology. Another limitation that should be acknowledged is that the particular target group used in the study were university students who were all familiar with and interested in using technology. The findings might have been different if the participants would have represented a different target group such as elderly people, athletes, or teenagers. Thus, future research should focus on investigating critical incidents with digital coaches also in other user and age groups. Furthermore, the average age of university students in Finland can be higher compared to many other countries (Virtala et al. 2014). Therefore, the participants in this study represented a wide age range with an average age of 31 years, which can make the comparison with studies done among (younger) university students in other countries less direct. Potentially, younger population may experience less learning curves and have more positive experiences with this kind of technology, which is something future research could investigate in more depth.

Researchers can draw from this study and its findings in doing future research on the topic. It would be interesting to do a similar study with not only people from different age and user groups but also with people of different physical activity backgrounds. Based on our findings, it can be seen that digital coaching is potential in supporting people in getting more physically active, but also that more research should be done in this field to increase understanding of digital coaching and its possibilities in physical activity promotion. More research on digital coaching is warranted.

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Appendices

Appendix 1

	Male	Female	Total
N	10	20	30
Age			
<25	1	7	8
25-30	1	7	8
31-35	4	2	6
36-40	3	2	5
40<	1	2	3
Physical activity background *			
Physically active for health	1	3	4
Active in commuting and non-exercise	6	11	17
Occasionally active	3	6	9
Sedentary	0	1	1
Degree under study			
Bachelor's degree	3	5	8
Master's degree	6	14	20
Doctoral degree	1	1	2
Study mode			
full-time student	6	15	21
part-time student	3	4	7
other	1	1	2

*The physical activity categories were derived from the Finnish National Sport Survey (Finnish Sports Federation, 2011) and include, ordered from the highest physical activity level to the lowest physical activity level, the following: competitive athlete, recreational sportsman, physically active for fitness, physically active for health, active in commuting and non-exercise, occasionally active, and sedentary.