The use of fitness-trackers and the role of motivational intermissions to maintain healthy behaviors: an explorative case study on runners

DOI: 10.46932/sfjdv3n6-020

Received in: October 14th, 2022
Accepted in: November 16th, 2022

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ABSTRACT

This study explores a user perspective on fitness-trackers and how they are used to maintain healthy behaviors; and how fitness trackers could be designed to better maintain healthy behaviors. A thematic analysis was conducted on the transcriptions from semi-structured interviews with eight seasoned non-professional runners who regularly used fitness trackers in their exercise regime. The main findings are: (a) the maintenance of healthy behaviors rely more on what happens in the intermission – that is, between healthy behaviors – than during the actual behavior itself; and (b), by visualizing the history of healthy behaviors, intermission feedback help motivate the repetition of healthy behavior in a way that mimics broad choice bracketing and behavioral streaks. Thus, fitness-trackers should focus more on the motivational aspects during the intermission between the healthy behaviors rather than encouraging the performance during the target behavior.

Keywords: behavior change maintenance, healthy behavior, motivation, fitness trackers, physical exercise.

1 INTRODUCTION

Today's media present two contrasting yet complementing pictures regarding lifestyle choices. One shows the consequences of increasingly unhealthy choices, including poor dietary habits and inactive lifestyles. The other promotes an array of different methods for getting (or staying) in shape by means of different diets, exercise regimens, and other types of fitness- and health-promoting behaviors, some more feasible than others. However, most attempts to form new more positive habits to address these issues tend to fail within a year (Bouton, 2014). Choices between healthy behaviors and unhealthy behaviors have been shown to be influenced by a plethora of both related and, seemingly, unrelated circumstances. For instance, the relative healthiness of our food choices can be affected by how hungry we are

(Otterbring, 2019), our time orientation (Tórtora & Ares, 2018), the design of product packaging (Sigurdsson, Vishnu Menon, & Fagerstrøm, 2017), and the proximity of attractive others (Otterbring, 2018). Thus, our lifestyle choices are not only influenced by personal choices, but also by external cues and circumstances. Individuals trying to change their behavior are increasingly relying on fitness technology to quantify and record their fitness regimes. This paper investigates how the motivational power of fitness technology can be harnessed.

1.1 THE BENEFITS OF HEALTHY LIFESTYLE CHOICES

Information alone is clearly not enough to change behavior. If it was, the majority of people in developed countries would already have adopted healthier lifestyles. A report from the World Health Organization (WHO) (World Health Organization, 2017) shows that the leading risks for mortality in the world are high blood pressure, tobacco use, high blood glucose, physical inactivity, and obesity. These lifestyle factors and behaviors raise the risk of chronic diseases such as heart disease and cancers globally (World Health Organization, 2017). A meta-analysis by (Loef & Walach, 2012) concluded that only one-quarter of the studied cohort adhered to healthy lifestyle behaviors similar to the criteria stated by the WHO; that is, they did not smoke, drank alcohol in moderation, ate healthily, exercised regularly, and/or maintained an optimal weight. Similarly, Marteau (2018) stated that 40 percent of all cancer and 75 percent of all diabetes and cardiovascular disease could be avoided if people ate and drank less, gave up tobacco, and spent 150 minutes on exercise each week. In addition, lasting behavioral changes can improve health within four years, and a healthy lifestyle at age 40 may give a person an additional nine years to live (Loef & Walach, 2012).

Apart from the more obvious physical benefits of a healthy lifestyle, several studies on specific diets and regular exercise show positive effects on psychological aspects, such as depression, anxiety, stress responsiveness, and self-esteem, as well as attention-deficit/hyperactivity disorder (ADHD) (Clay, 2017; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). Furthermore, regular exercise seems to enhance or enable the experience of positive events on the same day of the exercise and the following day, thereby promoting psychological health (Young, Machell, Kashdan, & Westwater, 2018). Taken together, despite a growing body of evidence for the positive impact of healthy behaviors, most people find it difficult to change and adopt a healthier lifestyle. In order to change behaviors, we need to understand what drives human behaviors, and information is evidently only a small part of this (Marteau, 2018).

1.2 THE CHALLENGES OF CHANGING BEHAVIOR

Understanding how humans change behavior is an integral part of psychology, and there are numerous theories for behavior change. One of the best-known is Bandura's social cognitive theory (Bandura, 1986), which describes how social forces and modeling influence a person's behavior; and includes both the positive feedback dual-system of self-efficacy (personal and environmental conditions for success and mastery), as well as self-regulatory processes. The former regards a person's belief of success and the effort he or she will expend for this success. The latter refers to self-monitoring of behaviors, which may result in either behavior change or reinforcement, depending on whether or not the behavior is deemed successful.

If behavioral changes are deemed necessary, and the person is willing (that is, motivated) to change his/her behavior, the new behavior is still difficult to both attain and maintain, as people tend to relapse into habitual and effortless behavior (Marteau, 2018). Why behavior changes are so difficult to attain and maintain can be understood by two general conclusions drawn from decades of research (Bouton, 2014). Firstly, even if someone successfully accomplishes a behavioral change by changing or replacing an old behavior with a new behavior, the old behavior is still latent. This means that the so-called extinct behavior is not truly extinct, but merely inhibited, and can cause lapse or relapse under certain circumstances. Secondly, most behaviors are specific to the context or situation in which they occur. Accordingly, people tend to behave and react in a certain way under certain conditions. This means that some newly acquired healthy behaviors will be harder to maintain in some situations or under certain conditions than others. For instance, a new fitness routine is easier is easier to forego under stressful or otherwise disruptive situation than during times of familiar circumstances. In addition, new behavior(-s) seems to be even more sensitive to the context or situation than the extinct behavior; therefore, the new behavior(-s) needs to be learnt in several different contexts and situations in order to accomplish a lasting behavior change (Bouton, 2014).

A similar way of understanding the challenge of behavioral change is through Kahneman's dual-system of heuristics (Kahneman, 2011). System 1 is our fast and automatic way of thinking, feeling, and reacting. It is emotional and unconscious and is basically our default decision pattern. System 2 is slow, controlled, and logical. This is our conscious and informative way of thinking and reasoning; it is normally not the way we think and act in everyday situations. System 2 is not necessarily better than System 1, as the latter may allow for more information to be processed when the decision is complex (Dijksterhuis, Bos, Nordgren, & van Baaren, 2006). Thus, both systems are equally appropriate in different situations. Performing a new behavior demands System 2, as it is a conscious decision that takes effort and conscious thinking – two aspects that are easily surpassed by routine and comfort without even realizing it until it is too late (for example, accepting a second glass of wine at dinner, or driving past the gym on the way home

and then feeling that it is too much trouble to turn around). In other words, we seem to be programmed to go by our old routines, to save our cognitive energy in everyday life and even self-incentives and self-rewards seem to have little effect on behavior change (Brown, Smith, Epton, & Armitage, 2018).

While it is difficult (but not impossible), behavior change takes more than information and pure willpower; it is also about designing an environment in which people are more prone to perform healthy behaviors. The knowledge that the context and situation is imperative for behavior has led several researchers to look at choice architecture and so-called "nudges" (Thaler & Sunstein, 2008); that is, cues in our surroundings that trigger desired behaviors (Marteau, 2018; Saghai, 2013). For example, nudges for healthy lifestyle choices can be related to the way different types of food are placed in the shop, and package lay-outs. Nudges can relate to a variety of different psychological drivers and needs, some emotional and others perceptual. A recent behavior change model that includes the importance of the surrounding environment is the so-called COM-B model (Michie, van Stralen, & West, 2011), which states that behavior comprise of three aspects: capability, motivation, and opportunity. Capability is the individual's psychological and physical capacity to perform the desired behavior. Motivation includes all processes – both conscious and unconscious, analytical and emotional – that direct behavior. Opportunity is the external conditions, or nudges, that may promote or prompt the performance of the desired behavior (Michie et al., 2011). In sum, in order to successfully both attain and maintain behavior changes, several aspects need to be present, both within and outside the individual, and fitness technology can be seen as tools that help motivate or create more opportunity for behavior change (Sullivan & Lachman, 2017).

1.3 FITNESS TECHNOLOGY AND THE MAINTENANCE OF HEALTHY BEHAVIOR

Recent decades have seen an explosion of digital and technical solutions to support behavior change, including mobile technology and wearables, online therapy, and support groups; 2014 was proclaimed to be "the year of the wearable", based on the proliferation of smartwatch startups (Spence, 2013). Wearable fitness technology was among the top fitness trends in 2016, 2017, and 2018 (Thompson, 2017). The different technical solutions are often referred to as behavioral intervention technologies (BIT), designed to reduce distractions from explicit goals and intentions, as well as to simplify choices by means of existing psychological intervention techniques (Mohr, Burns, Schueller, Clarke, & Klinkman, 2013; Parkinson, Eccles, & Goodman, 2014). BITs can range from videoconferences to virtual reality desensitization therapy, and from online social support groups to wearable fitness trackers that help users adhere to set goals by notifications and progress tracking (Mohr et al., 2013).

A fitness tracker is a type of fitness technology that can provide feedback about the quantity and intensity of an activity, and can be paired with an application (Sullivan & Lachman, 2017) that helps track behaviors by means of sensors that record data (Lunney, Cunningham, & Eastin, 2016). The main task of

the BITs seems to be to provide different kinds of feedback that will help users behave in accordance with the prescribed behavior, whether it regards adoption of a healthier behavior or disease prevention (Free et al., 2013). Others readdress behavior change in fitness technology as persuasive design; that is, technology that is designed to persuade the user to adopt a certain behavior without being coercive (Fogg, 2009). Fogg's behavior model includes three of the aforementioned psychological aspects of behavior change: (a) motivation (the person's willingness to change his/her behavior); (b) ability/simplicity (the effort it will take the person to performed the desired behavior); and (c) triggers/timing (basically, the nudges that may stimulate the performance of desired behavior). Regardless of how it is named or framed, the increased use of fitness technology has been followed by a stream of research on the subject (Sullivan & Lachman, 2017), and, as noted by Fritz and colleagues (Fritz, Huang, Murphy, & Zimmermann, 2014), self-monitoring seems to be the most common strategy in fitness technology.

Studies have mainly focused on areas such as the quality of measurements (Bunn, Navalta, Fountaine, & Reece, 2018) and the inclusion of behavior change techniques in the wearables' software (Mercer, Li, Giangregorio, Burns, & Grindrod, 2016; Middelweerd, Mollee, van der Wal, Brug, & te Velde, 2014; Sullivan & Lachman, 2017). The user experience perspective of fitness trackers has also been studied principally regarding the reasons for adoption and usage of fitness technology. Results show that, in general, technological features such as step counters, GPS-based location tracking, and heart rate monitors are key drivers of the adoption of mobile technology and wearables (Adapa, Nah, Hall, Siau, & Smith, 2018) and, more specifically, that the key features used relate to behavior feedback (Dunn & Robertson-Wilson, 2018; Stragier, Vanden Abeele, Mechant, & De Marez, 2016).

However, despite the increase in usage of fitness technology and its claim to support behavior change, research has cast doubts on their effectiveness (Free et al., 2013). For example, a recent study by Bhattacharya and colleagues (Bhattacharya et al., 2018) revealed that while all participants used technology as a tool and reinforcement of their new behavior, only a few accredited their behavior changes to technology. On the same note, Jaharri and colleagues (Jarrahi, Gafinowitz, & Shin, 2018) showed that the motivational aspects of fitness technology usage decline together with the novelty of the technology for users who are not intrinsically motivated. In their review of technology-based "just-in-time-feedback-interventions", Schembre and colleagues (Schembre et al., 2018) showed that only four out of nine studies investigating the efficacy of feedback on behavior change found that behavior change had a significant effect. In addition, as Fritz and colleagues (Fritz et al., 2014) pointed out, behavior change can only be valid if it remains over an extended period of time, which most studies are incapable of proving. Dallery, Kurti, and Erb (2015) suggested that interventions should combine antecedent manipulations, such as text–based prompts, with long-term behavior monitoring, and could benefit from focusing more on various types of reinforcers (Dallery, Raiff, Grabinski, & Marsch, 2019).

Taken together, the quality of the fitness technology and its ability to both attain and maintain healthy behavior changes seem to vary considerably (Brouwer et al., 2011; Free et al., 2013; McMillan, Hickey, Mitchell, & Patel, 2015; Mohr et al., 2013; Olsen & Nesbitt, 2010).

1.4 AIM AND STUDY DESIGN

The purpose of this study was explorative and addressed two main aims: the first was to explore how seasoned runners used fitness trackers to help them maintain a healthy behavior. In other words, how do fitness trackers motivate athletes to sustain an established fitness routine. The second aim was to see how the runners' use of fitness trackers can be utilized to improve the design of fitness trackers to better motivate users to maintain healthy behavior. Taken together, these two aims address the gap in the academic literature between the purpose of fitness trackers and its usefulness for both attaining and maintaining behavior changes (Free et al., 2013), by means of exploring users' experiences of fitness trackers and running.

In this study the term fitness trackers will include all wearable fitness technological devices, such as watches and smart phones that can be used for logging data from an exercise either as an end-feature or by means of an application.

2 METHOD

A convenience sample of volunteer participants was used. Participants were recruited by placing information about the study on notification boards at different fitness centers in mid-Sweden. Apart from the inclusion criterion of being regular runners, all participants were required to use or have used at least one of the following fitness trackers for at least three months: Runkeeper, Weight Loss Running, Endomondo, Runtastic, Nike+ Run Club, Strava, Run Tracker, Garmin Connect, Map My Run, and/or Runmeter. Those who expressed an interest were asked to contact the interviewer for more information so that a suitable time and place for the interview could be agreed upon. No incentives to participate were used.

Before the interviews started, all participants had given their consent to participation in accordance with the principals of the World Medical Association (WMA, 2018); that is, all participants were informed and consented to how data would be recorded, stored, and analyzed, and that participation could be withdrawn at any time. The interviews lasted between 45 and 60 minutes and were conducted in person. All interviews were audio-recorded and transcribed verbatim. All sound files are stored on a protected server, and the transcriptions have been anonymized.

2.1 PARTICIPANTS AND PROCEDURE

The participants in this study were eight non-professional runners (five men and three women) aged between 30 and 65, who ran two or three times a week, ranging from 5 to 25 kilometers, and had used fitness trackers for at least three months on a regular basis. All participants considered themselves athletes, but not all of them considered themselves as runners and their running experience varied from lifelong to a couple of years. Thus, they could all be considered to maintain healthy behavior, rather than to have made a behavioral change. Three of the participants did other forms of exercise during the week or across the year, and considered running a means for a more primary goal, such as cross-country skiing, Enduro, or obstacle course racing. One participant was actively training for a marathon.

As the main purpose of the interviews was explorative, aiming to learn how the participants used a fitness tracker as part of their exercise regimen, the participants were first asked to describe a typical run, and then questions regarding how they used the fitness tracker were applied, with probes such as "tell me more" and "what did you mean by …?". Participants were also asked if they sometimes ran without the fitness tracker and asked why, or to describe what such a run would be like. The follow-up questions regarded three broad themes, the actual exercise routine, use, and user experiences of fitness trackers and fitness technology in general, and use of specific functions in the fitness tracker in question. The interviews did not specifically render a given number of questions and aimed to capture the participants' user perspective.

2.2 DATA ANALYSIS

The data analysis was conducted using NVivo 11 for Mac, with verbatim transcripts of the interviews. The analysis was conducted according to thematic analysis where the semantic/explicit meaning of the interview is analyzed (Braun & Clarke, 2006). The analysis was iterative, but can be described as having six steps. The first step was to get to know the data from an overall, holistic perspective. The second step was extracting meaning from each meaning-bearing unit and coding these according to content. A meaning-bearing unit could range from one to several sentences, representing communalities among the units within the code, and the coding was kept close to the data; that is, the coding did not stray far from explicit meaning of the meaning-bearing unit. The third step was interpretative, with the objective of finding protothemes from the initial coding. Here, the codes were combined or split according to a common theme and checked again for inconsistencies. In the fourth step, the themes were reviewed and reanalyzed according to the emergent protothemes. All themes were examined so as to be distinct and separable, and that they contained coherent data. The fifth step was to further refine and define each theme and give them distinctive and representative labels. At this point, a

unifying understanding of the data emerged from the themes, and a model was created to visualize the data. The sixth and final step was the writing up and reporting of the data and analysis.

The open coding in NVivo was conducted by one of the researchers and the results were discussed with the other researcher throughout all steps of the analysis.

3 RESULT

The analysis generated several different themes that made up two general categories of either *Exercise*, or the time between exercises, labeled here as *Between exercises*. The category Exercise describes a process from the start of the actual running activity until the end. This includes pre- to post-exercise routines, such as getting dressed for exercise and showering after exercise. Between exercises refers to the time interval between one workout and another, and emerged as the time in which the participants used the data from the fitness trackers for motivation. This interval may vary in duration from days to weeks, and seemingly even months in some cases, as in the case of those who do not run during winter (see Appendix 1).

As this study focuses on maintaining behavioral change and how fitness trackers can be used for this, we only briefly outline categories related to the actual exercise routine.

3.1 EXERCISE

The first category, Exercise, comprised of three broader themes: *Pre-exercise, During exercise***,** and *Post-exercise*. The first theme concerned the time just before the participant starts running and contained the following sub-themes: *Pre-routine, Calibration,* and *Hassles*. Pre-routine was the preparations before the run (for example, “Well, I prepare while I change and put on my workout wear, and the best is to [run] first thing in the morning /…/”). Part of this is the Calibration of their fitness tracker, getting the right music, or calibrating the chip in their shoes or heart-rate monitor chest strap. This is also where the Hassles may occur, for example, when the technology requires too much effort to function or fails to function entirely. The latter is depicted in the following examples: “Sometimes I can’t find [the fitness tracker] … It takes a while to start it” and “At that point I found [the fitness tracker] difficult to wear on my arm, when I had a small bag on my arm and it was a hassle to put it in there”.

The second theme, During exercise, enclosed three sub-themes: *Feelings and thoughts, Real-time monitoring,* and *Failure to register*. The first of these was the participants’ descriptions of how they felt when they ran, how their mind became occupied by thoughts, or how this time was spent planning the day, solving problems, etc. (for example, “I think a lot while I run. I listen to music and so. It’s not like I sing, that would be hard. I think a lot. It’s stress relieving somehow. I enjoy that moment a lot”). The other two sub-themes, Real-time monitoring and Failure to register, were related to the use of fitness trackers,

mainly the ability of the fitness trackers to accurately monitor and register data from the exercise activity, in terms of time, pace, location, and so on (for example, "Since I wear my wristwatch on my arm and I run after …, I keep checking it every other second, both heart rate and time, to see how I well I am doing"). If the fitness tracker failed to monitor or register accurately, either due to faulty GPS signals or because the participant accidentally reset the wearable (that is, Failure to register), the participants describe this as "devastating". Accurate registration of the exercise activity is a key aspect of why the participants use fitness trackers during exercise, as illustrated by this quote:

> *Technology! … if you just want to delete or update something … You start over, or you accidentally turn it off. That is the same. Usually it is the watches that give me the most trouble. I unintentionally touch the buttons.*

The final theme, Post-exercise, encompassed four sub-themes: *Feelings after*, *Routines after*, and *Faulty feedback*. Feelings after regarded how the participants felt after having completed the run; some were pleased with their performance if they had improved, and some were just pleased with themselves for having concluded another run, regardless of their actual performance (for example, "Yes, but it feels good when your heart rate increases and you can feel your head pulsing. And after a workout, well I'm never as verbal and clear-headed as after a workout"). Routines after were straightforward descriptions of what the participants did directly after their run; for example, if they stretched or just sat down at the kitchen table and looked at the registered data on their fitness tracker.

Faulty feedback comprises statements on how the participants felt and reacted if they discovered that the fitness tracker had failed to register the run, either in part or entirely. Faulty feedback can be divided into sub-themes in terms of temporal consequences when the feedback fails: *Long-term effects* and *Short-term effects*. The short-term effects were the participants' immediate reactions and feelings at discovery. These feelings and reactions passed and the participants were dismissive of them, as depicted in: "No, I suppose you can trust it to 98 percent, but sometimes you can see it has made an obvious detour, which makes me skeptical. But that's only on that occasion that I don't trust it". The Long-term effects sub-theme concerned the impact of failure to register activities on the possibility of evaluating an activity as part of reaching a certain goal, and can be illustrated by: "… when you have finished the run and you press 'Save' or 'Delete', whether you want to save this run or not. And it doesn't save you become a bit… if it was a good [run]"; and:

> *But I know from the times I have forgotten to start the watch when I am running. I get a bit angry with myself because it is like I haven't done it at all. It's like working without logging your work time. Like being at work for free.*

Thus, the Faulty feedback sub-theme, with its own sub-themes, was closely connected to both Feelings after and Feedback, where the latter regarded how they described the registered data from the completed run, and is exemplified by: "Yes, I suppose it is to know if I improved somehow or if I was lazy."

3.2 BETWEEN EXERCISES

The second category, *Between exercises,* concerns the time between different workouts (here: between one run and the next). Two themes emerged: the *Planning* of workouts and descriptions of the wearable as a crucial *Motivator*. Planning comprised sub-themes regarding how the participants planned their workouts, and *Exercise variation*, which included both the variation of each run, such as what route to take, and when and how often they ran. Careful planning and variation were ways of maintaining motivation and goal attainment. Planning also included strategies for staving off slacking; that is, how the participants identified and neutralized *Threats to exercise,* which could be by going out running first thing in the morning before anything else came up, not having to shower, dress and put on make-up twice a day, or because this was less intrusive on the rest of the family. Some just decided to run on specific days after work, while others ran during their children's activities. Creating a permanent weekly routine was a common way to overcome Threats to exercises, as exemplified by: "… No since I'm very intent, it is Tuesdays and Thursdays straight out after work. So, it is very preplanned when I'm running". Another way to stave off slacking was by using *Reminders,* or nudges, such as putting out their running gear and training watch on the kitchen table to avoid forgetting their plans once they come home from work. Others used an application on their smartphone to make them aware if they need to go for a walk or run at the end of the day. This strategy of nudging was often used in combination with the above-mentioned strategies to neutralize the Threats to exercise.

The second theme, *Motivator,* was connected to six sub-themes regarding the use of the wearable: *Self-worth of wearables, Simplicity, External feedback, Ambivalence, Utility,* and *Lacking functions*. The theme Motivator contains descriptions of how the participants were motivated by the wearable and its different functions, as illustrated in: "I would probably not run this much or frequently without the app, because I, as a person, like to compare regardless of what [is compared] I always want to compare time or performance", "I want to know the distance and this is when what is motivating becomes an obsession. I think. … Of course, I could [run without it], but I choose not to. … It's simply not motivating"; and:

> *[The routine] would probably look pretty similar I think, it is mostly for myself, I want a confirmation on 'yes now it went this fast' or 'yes but I felt that'; I can be pleased with myself if it went faster than the time before. A little carrot and stick to improve myself.*

The first sub-theme, Self-worth of wearables, represents an expressed inclination and interest of technical gadgets regardless of performance. Just being able to look at the data was fascinating enough, as illustrated by the following quote: “More functions in [the app] that I can lose myself in.” The second sub-theme, Simplicity, regarded the participant’s choice and use of wearable, both of which were often due to a design of straightforwardness, promptness, and usability. The next sub-theme, External feedback, comprises statements regarding both social media and more closed groups within the specific wearable, where a group of friends (real or digital) can train or compete in a private group. This shows how the participants feel about taking the use of logging to the social sphere and having other people give encouragement and positive feedback. It could be about becoming motivated, as depicted by the quote: “I get really psyched when I see people running, and I feel like, ‘ooh, great, I have to run too’.” But it can also be about encouraging others or wanting to show off: “Yes, but you can see if someone has shared something … some do it all the time and then you can’t be bothered. … But those who run and push, I think that is good and I try to like”, and:

> *I guess you always try to share, especially if it is a run that went well. Then you want to share to brag about having been [active]. Some don’t even go for a walk. And show that I have done something that is good and healthy. It’s extra fun if it went well, if you can show that you had a good run, ran far.*

Ambivalence regards the participants’ conflicting thoughts and feelings towards their use of wearables. In this fourth sub-theme, the participants could express a compulsive need for the wearable to give them feedback about their performance, but at the same time claim that they know their body well enough to know how fast they are running and how long they have run for. This can be illustrated by one participant, who stated that, “It is never going to happen that I run without the app”, but at the same time talks about knowing himself well enough to know how fast he is running. Ambivalence can also be about admitting that the pleasure of running would be greater without the wearable as it exerts some type of pressure to always improve, as depicted by the following quotes: “Maybe I would train better without an app as I would then have to listen to my physiological clock instead of a ticking clock. But because I like comparing [data] I run with [an app]”; “When exercise becomes a ‘have to’ and you have this shadow partner in the watch you’re supposed to outrun, it is more stressful than ever”; and “There are few runs when I don’t use it, but it happens and then it’s pretty nice to escape. It’s like when before [the apps] existed and you just left your watch at home and just ran. Really good.”

The fifth sub-theme, Utility, refers to descriptions of what functions in the wearable the participants use and appreciate. This includes keeping track of time, distance, and pace, helping with interval training, or pulse-monitoring, as illustrated by this quote: “… I use it to check that I’m on track,

that I will reach the goal for the workout". Additionally, deficiencies of Utility were coded in the sixth and final sub-theme: Lacking functions. Here participants expressed displeasure with certain functions or missing the availability of other functions. Examples include problems with the GPS, not being able to turn of the timer register, and other pieces of information that were considered unwanted and not unrequested, such as: "But you're being put into context like the average person in my age, that's why I reacted, and [the information] is there first thing, it would be different if I had looked for it."

This sub-theme was also connected to another sub-theme, Long-term effects of Faulty feedback from the theme Post-exercise (see Section 3.1.2.). The long-term effects of faulty logging may affect the motivational use of the wearable between runs by having a deteriorating effect of the Utility of the wearable in terms of Lacking functions, as illustrated by:

> *It shows that I ran on a lake or something like that, when in reality I ran around a lake. That part could be improved, be more exact in receiving GPS signals to more accurately show where you have run, so you can really stand for that round. Of course, it can be local poor signals. It does not happen often, but it happens and when it does, and it is simply not correct, I become displeased.*

4 DISCUSSION

The aim of the current study was twofold. One aim was to explore how fitness trackers are used to maintain healthy behaviors; here, sustain a physical activity. The second aim was to see whether and how the usage can be utilized in the design of fitness trackers to better support the maintenance of healthy behavior.

The results from the first aim revealed that the participants' exercise behaviors were maintained and sustained in two ways. One way regarded the motivational aspects during the actual exercise, as depicted in the general category Exercise; in other words, the real-time influence of the fitness tracker on the ongoing activity, where the fitness tracker helped the runner to keep track of the time and distance, route, and sometimes heart rate, depending on their personal goal(s) with their training. However, as stated by Stragier and colleagues (2016, p. 39) "[d]ata collection in itself is not the innovative part of the story"; this is something that people have done throughout history by different means. A statement confirming that the participants' knowledge of being on track for their set goal, regardless of whether it relates to time, distance, or just having worked out, is perceived as a central aspect of the participants' running routine. The information the fitness tracker provided during the workout, related to the user's personal goals, gave an immediate reward that is motivational (see (Fritz et al., 2014; Kim, 2013) and creates a feelings of wanting to do it again for the sake of the positive experience in itself (Deci & Ryan, 1985) and an increase in self-efficacy (Bandura, 1986; Fogg, 2009). The 'can do' motivates repeat behavior.

The second way the participants maintained their healthy behavior was by means of the data recorded by the fitness tracker. It was not only important that the participants knew how they had performed and if they had improved, but above all, *that* they had performed. Thus, the fitness tracker' ability to record and save the data from the run was vital, regardless of performance, and failure to download and save the data was considered almost disastrous. Fritz and colleagues (2014) found similar results and reasoning, with many of the participants in that studying feeling that the recording of the activity was more important for both enjoyment and motivation than the activity itself. One reason for this seems to be that not having a record of the run would mean that it could not help for continued motivation. The saved data from the fitness tracker, which was hopefully both reliable and valid, was an important motivator for the next run. While most participants were motivated by other runner's social media posts, there were hardly any mentions of sharing one's own activities. Thus, while impression management is often thought of as a motivator to share one's accomplishments (Vandenbroele, Van Kerckhove, & Geuens, 2019), our results indicate that social media is more often used as an external motivator than a venue of (self-)expression. It is interesting to note that while the participants were seasoned runners, they were still vulnerable to everyday threats to exercise. This is in line with previous research on behavior change showing that the old behavior is only latent, and not extinct, which is why it is so easy to fall back to old habits (Bouton, 2014; Kahneman, 2011; Marteau, 2018).

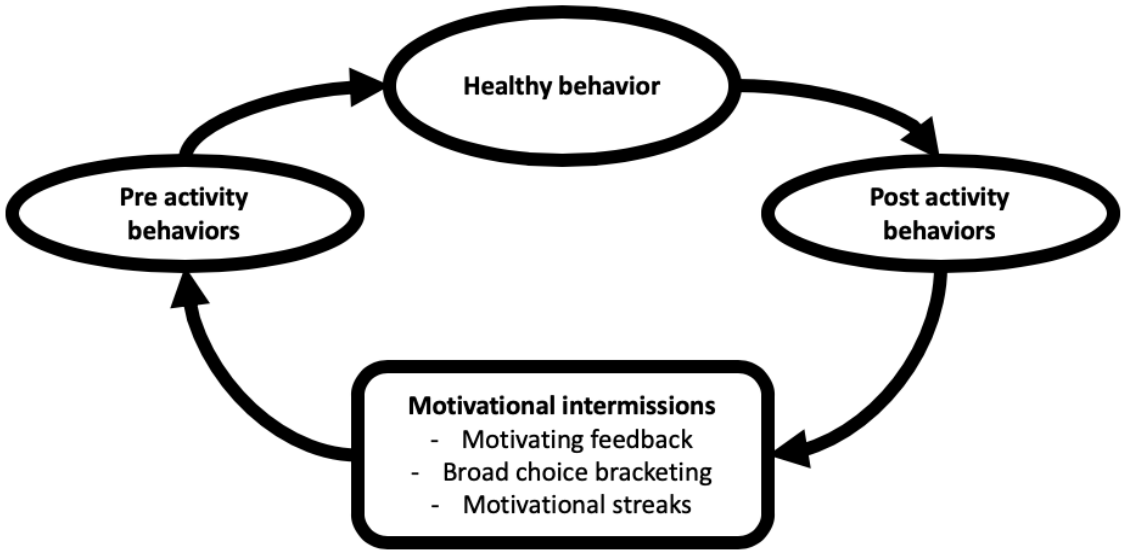
Thus, behavior change is an ongoing, conscious activity that needs both intrinsic motivation and environmental support, such as nudges and reminders (Fogg, 2009; Michie et al., 2011; Saghai, 2013). The importance of correctly recorded and saved data as confirmation of the actual run is similar to the claim that it is the feedback that is key for behavior change (see for example Stragier et al., 2016). The current study shows that a lot of motivational work is done between workouts. One participant described how he used to go back to his data from the previous season and reminisce, when the current cold weather did not allow for outdoor running. Data from their previous runs helped them evaluate their actual performances, improvements, and perhaps helped them set new goals. Data history seems to increase self-efficacy by providing proof of success and thereby motivating the participants to continue their healthy behavior between exercises. In other words, the history is used to show and enable progress. This result is in line with Fritz and colleagues (2014), who found that fitness trackers helped motivate users in the long term, and also noted that the recording of activity – that is, the actual data – seemed to be an objective in itself, rather than the activity or the benefits of the activity.

Taken together, the results from the participants' usage show that the motivational force of modern fitness trackers is twofold: firstly, what happens during the activity, and secondly, what happens between activities. What happens during the activity relates to real-time performance information that entices users to put in the extra effort necessary to enhance the effect of the workout. However, since any level of

activity is better than no activity at all, getting people to exercise is a far more important task than maximizing training effects. Consequently, motivating users to reengage in healthy behavior during the intermission between activities should be a priority in fitness trackers. All participants in this study talked about intermissions. An intermission could last from a day (a rest between workouts) to months (during winter, for example), and it was during this period, however long or short, that the participants planned, evaluated, and got themselves motivated for their next workout. This relates to the second aim of this study, which is to identify how the runners' use of fitness trackers can be utilized to improve the design to maintain healthy behavior.

Previous studies have shown that fitness trackers do not initiate behavior changes; at best, they reinforce new behaviors (Bhattacharya et al., 2018; Jarrahi et al., 2018; Schembre et al., 2018). However, the results of our study clearly show that the participants use fitness tracker data for motivational purposes during the intermission. By focusing more on this aspect of the behavioral cycle, fitness trackers can be used to create *motivational intermissions* (see Figure 1). Motivational intermissions are intermissions between performances of healthy behavior that increase the probability that the user will reengage in the healthy behavior. In fitness trackers, this could be accomplished by using any type of influencing strategy.

Figure 1. The model of motivational intermissions between the healthy behaviors.



Based on the model of motivational intermissions, the need to record history can be understood in terms of the theory of choice bracketing, where a decision is made either in relation to a history of decisions (broad choice bracketing) or in isolation (narrow choice bracketing (see, for example, (Kahneman & Lovallo, 1993; Read, Loewenstein, Rabin, Keren, & Laibson, 1999; Webb & Shu, 2017). Depending on which perspective the decision is based on, the assessment of its outcome will also vary.

Broad choice bracketing is rarer than narrow bracketing, but will probably be a more realistic estimate (Kahneman & Lovallo, 1993), and will also change the perception of losses and gains, with an overall more positive view of its outcomes (Webb & Shu, 2017). In other words, by being able to keep a broad choice bracket perspective on our exercise routines and performances, we are able to make better decisions repeatedly. However, basing decisions on broad choice bracketing is difficult. Studies have shown that we tend to base our decisions on isolated cases, ignoring important realities (Kahneman & Lovallo, 1993), but they also show that this kind of decision can be promoted by graphics that help give a more comprehensive view (Webb & Shu, 2017). Thus, while the gain from the pending run, as an isolated event, may sometimes not feel worth the exertion, having a run history on the fitness tracker enables users to overlook the current state of mind and reassume a long-term perspective. This is combined with experiences of knowing that once the workout is completed we feel better, and that this state of mind (tiredness, for example) will pass once we have started running. Having "the bigger picture", both in terms of memories and past experiences, and hard data from the fitness tracker, helps users sustain their healthy behavior. The power of motivational intermissions can be illustrated by a statement from a participant who becomes motivated and empowered by going back and looking at previous runs and seeing that he/she performs well regardless of whether he/she feels a bit off or tired; and that data can help him/her understand and improve his/her overall health. Skipping one exercise activity is not especially problematic from a health perspective, but by framing the choice to exercise or not into a broad bracket, the accumulated effect of the series of choice becomes clear. Thus, the motivational intermission can help the participants make broad choice bracketing decisions, where healthy behavior can prevail over threats to exercise in everyday life.

Motivational intermissions can also utilize recorded data by focusing on the accumulation of successful accomplishments, often referred to as streaks. Sports streaks are probably the best-known types of streaks and refer, for example, to how many wins/successes a team has had, where three seem to be the lowest number to describe a winning streak (Vergin, 2000). From a motivational perspective, a streak builds on the same principle of consecutive performances, but here it is the performance itself that counts and not the outcome of the performance. Once a user has started a streak, it develops into a fixation to not break it, and the longer a streak continues, the more obsessive it is likely to become. If you had achieved a 364-day streak of healthy eating, would you not want to make it to a 365-day – that is, full-year – streak? Users of Duolingo, a language learning application, have the opportunity to purchase "streak repairs" (Duoling.com, 2018); that is, pay a monetary fee to repair a broken streak if they missed logging in and training on a language for a day or more. Users are also allowed to freeze their streaks so that they do not lose the streak in case they know beforehand that they will be unable to log in. A streak will result in a flame icon, together with the number of days they have practiced a language and languages learnt next to

their avatar, which makes the streak visible to the user and to others. These types of streaks are probably closely related to the need to visualize past behaviors (here: running history). We have not found any studies regarding streaks as motivators, but Fritz and colleagues (2014) found "a game-like phenomenon which [they] termed 'number fishing', in which participants reportedly engaged in activities explicitly for the system rewards" (p. 7). System rewards refers to explicit rewards for achievements or target goals, such as badges or numerical goals. The motivational aspect of the system rewards worked even if the participants knew that the reward was a false representation of their activity. Therefore, it was concluded that fitness technology should not only reward the number of steps, for example, but also how many days in a row the number of steps was achieved (Fritz et al., 2014). Thus, this use of external rewards and its increased importance seems to be in line with that our reasoning of motivational intermissions. As the streak seems to hold an enhancing quality that indirectly boosts a specific (and hopefully healthy) behavior, we refer to this as a *motivating streak*. A motivating streak is a series of actions or events that occur at specified intervals, where the upholding of the series becomes a means in itself. In other words, at some point you strive to uphold the streak in itself even more than the behavior in question.

Taken together, the participants in this study used the fitness tracker mainly for recording their performances, whether the performance referred to a specific time or distance or exercise in general; and the recorded fitness tracker data enabled the participants to use broad choice bracketing and/or motivational streaks to help them maintain their healthy behavior. The motivational intermissions are the time when the feedback will help the users stay motivated, as this is the time when the everyday hassles and routines may derail a healthy behavior, even for the most seasoned runners.

From a theoretical perspective, the present study pinpoints the role of fitness technology for maintaining behavior changes. In addition to motivate users during activities, fitness technology also serves as reminder of past activities. While several previous studies have acknowledged the feedback feature (Dunn & Robertson-Wilson, 2018; Stragier et al., 2016), they have not explicitly pinpointed how this promotes future activities. It is noteworthy that the results of the current study show that users themselves actively seek to use the stored data for reinforcing and motivational purposes, as opposed to being subjected to prompts generated by the intervening system, as has previously been proposed (Dallery et al., 2015; Dallery et al., 2019).

This understanding of the ability to motivate oneself by looking at previous performances helps bridge the current gap between the purpose of supporting behavior changes that fitness technology claim, yet repeatedly seems to fail at (Bhattacharya et al., 2018; Free et al., 2013; Fritz et al., 2014; Jarrahi et al., 2018; Schembre et al., 2018). Above all, it may help create fitness technology that supports lifestyle changes that lead to sustainable healthy behaviors.

From a practical perspective, a fitness tracker needs to be able to remind its user of past behaviors in order to create motivation for future behaviors. This could be accomplished by showing the user's chosen goal and goal attainment; for example, by badges representing short-term and long-term goals, as noted earlier (Fritz et al., 2014), thus, clearly visualizing previous accomplishments during the motivating intermission.

4.1 LIMITATIONS AND FUTURE RESEARCH

The main weakness of this study is the small sample size and its implications for representativeness. Even though the model in itself is well grounded in the data, the small sample size raises questions regarding its stability. All participants in the current study were seasoned runners who considered themselves athletes, and this might have had an impact on their use and experiences of fitness trackers. In order to investigate possible boundary conditions of the model, it would be interesting to replicate the study on other types of samples, such as more novice runners and how they use fitness trackers to stay motivated, but also studies regarding other types of target behaviors, such as dieting or recycling. In other words, the healthy behavior discussed here could be replaced by a more general goal activity, and signify any activity that is strived to maintain.

In addition to validating the model in itself, the results merit further research into moderating factors such as time orientation (se for example Otterbring, 2019; Tórtora & Ares, 2018) and mediating factors such as self-efficacy (Bandura, 1986). Finally, given the model's potential to promote a healthy lifestyle, future studies should investigate the relative effectiveness of various motivating intermissions, utilizing elements such as gamification (Högberg, Hamari, & Wästlund, 2019) or motivational streaks, by adding quantitative data regarding the causal effects through experimental design.

5 CONCLUSIONS

The present study made two main findings. Firstly, the maintenance of healthy behaviors relies more on what happens in the intermission – that is, between healthy behaviors – than during the actual behavior itself. Secondly, by visualizing the history of healthy behaviors, fitness tracker data helps motivate the repetition of healthy behaviors in a way that mimics broad choice bracketing and behavioral streaks. Thus, fitness trackers should focus more on the reinforcing and motivational aspects during the intermission than encouraging performance during the target behavior. In addition, fitness trackers need to include features that create motivational intermissions that increase the likelihood of repetition of healthy behaviors; for example, by means of gamification or motivational streaks.

DECLARATIONS OF INTEREST

None

FUNDING

This study was funded by Region Värmland through the DigitalWellResearch project (grant number: HNT 2017/279).

RUNNINGHEAD

Motivational intermissions for the maintenance of healthy behaviors

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