



Self-Tracking: Does it Compromise One's Enjoyment of Physical Activity over Time?

Exploring the Effect of Duration of Self-Tracker Use on Enjoyment of the Physical Activity as

Moderated by One's Commitment to Self-Tracking

Leanne Scherff

SNR: 2090555

Master's Thesis

Communication and Information Sciences

School of Humanities and Digital Sciences

Tilburg University, Tilburg

Supervisor: Elçin Hanci

Second Reader: Mincheol Shin

June 2023

Abstract

Enjoyment in the context of physical activity is vital since it has been shown to predict long-term physical activity engagement, which has a favourable impact on well-being and quality of life. Self-tracking devices such as sports watches have been increasingly used to encourage people to engage in physical activity. However, there was no consensus in the existing literature regarding the effect of self-tracking on the enjoyment of physical activity. Some studies demonstrated that monitoring activities harmed one's perceived enjoyment of the activity, whereas others highlighted the positive effect of self-tracking on perceived enjoyment. In the current study, I argued that the duration of use could determine how much enjoyment people derive from physical activity while wearing a self-tracker and that the strength of this effect varies according to one's commitment to self-tracking. Additionally, the direct effect of commitment to self-tracking on perceived enjoyment has been studied. To investigate this, a quasi-experimental study through an online survey was conducted during which participants with different durations of use (1-3 months/4-6 months/7 months-2 years/2 years and longer) had to rate their enjoyment of their last physical activity with which they reached their self-tracking goal. In addition, they had to indicate their level of commitment to self-tracking. The results did not show a significant effect of the different duration of use levels on the perceived enjoyment of the physical activity. In addition, no significant results were found for commitment to self-tracking as a moderator. However, the study showed that higher commitment to self-tracking resulted in higher perceived enjoyment of physical activity. Alternative explanations for these findings are discussed.

Keywords: self-tracking device, enjoyment, physical activity, commitment to self-tracking, duration of use, novelty effect

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Self-Tracking: Does it Compromise One's Enjoyment of Physical Activity over Time?

Enjoyment in the context of physical activity is essential since it has been shown to predict long-term physical activity engagement and to have a favourable impact on well-being and quality of life (Guérin & Fortier, 2012). Karapanos et al. (2016) and Lewis et al. (2016) state that decreased enjoyment is a major obstacle to incorporating healthy behaviours into everyday routines. Physical inactivity harms both physical and mental health, increasing the likelihood of being overweight or obese and the risk of developing depression, anxiety, and stress (Miles, 2007; Ströhe, 2009; Warburton & Bredin, 2016). Hence, enjoying physical activity is essential for people to engage in the activity for the long term and by doing so, they can improve their physical and mental health.

Self-tracking devices positively affect the perceived enjoyment of physical activity (Canhoto & Arp, 2016). These devices allow users to acquire insights into their habits and behaviours by continuously monitoring their daily physical activity levels (Ajana, 2020). Self-tracking aim to raise users' self-awareness and stimulate them to exercise (Dijk et al., 2017; Hanci et al., 2020). Canhoto & Arp (2016) proposed that self-tracking during physical activity can increase the enjoyment of the activity. Gaining awareness of one's physical activity, achieving activity goals, competition and social interaction, and gamification features like rewards and badges are being facilitated by self-tracking devices, and all contribute to making physical activity more enjoyable (Asimakopoulos et al., 2017; Canhoto & Arp, 2016; Chen et al., 2017).

Other studies, on the other hand, show the opposite and argue that self-tracking reduces the enjoyment of physical activity (Etkin, 2016). Hanci et al. (2020) argued that self-tracking might alter the original purpose of the activity. For example, someone who used to enjoy walking outside might instead consider it a way of achieving a certain number of steps after using a self-tracker. Etkin (2016) showed that tracking activities such as step-counting with a pedometer could increase the number of steps one takes while possibly decreasing their enjoyment of the activity. Thus far, the literature has yet to demonstrate an apparent effect of self-tracking on the enjoyment of physical activity (Jin et al., 2020a).

In the current study, I argue that the duration of use can determine how much enjoyment people derive from physical activity while wearing a self-tracking device. The duration of use refers to

the period one uses a self-tracking device. During the first three months of self-tracking, users often think self-tracking is new and exciting; between 4-6 months, the excitement often wears off, and people are hesitant to continue self-tracking (Shin et al., 2019). Six months of self-tracking is considered long-term, and when self-tracking for longer than two years, users might see self-tracking as part of their identity (Meyer et al., 2020; Shin et al., 2019). The current study aims to investigate how these different durations relate to the perceived enjoyment of physical activity.

Users often feel excited about monitoring their physical activity when wearing a self-tracker for the first time (Fritz et al., 2014). This initial excitement is known as the *novelty effect*, which is common when using a new self-tracking device (Fritz et al., 2014; Shin et al., 2019). Using a new device creates a sense of excitement (Hopp & Gangadharbatla, 2016). The excitement about the self-tracking device and its features can facilitate the enjoyment of physical activity in the initial stages (Canhoto & Arp, 2016; Chen et al., 2017).

However, over time, the novelty effect may decrease. Shin et al. (2019) indicated that the novelty effect might last for approximately three months, after which many individuals may lose some interest in the data they are collecting. Several studies have shown a high dropout rate around six months of using a self-tracking device (Clawson et al., 2015; Shin et al., 2019). Despite this loss of interest and this high dropout rate, some individuals continue to wear self-tracking devices. One reason for this could be that wearing a self-tracker became a feature of their daily lives. As Fritz et al. (2014) and Ajana (2020) suggested, after wearing the self-tracker for some time, people may feel they miss something when not wearing it. This feeling presupposes that once people start using a self-tracker, they are inclined to continue using it because they got accustomed to it (Lazar et al., 2015). The question arises of how this continued use of self-trackers relates to and influences the enjoyment of physical activity.

The current study aims to fill this knowledge gap by investigating the perceived enjoyment of physical activity of people with different durations of use of the self-tracking device, varying from one month to two years and longer. The purpose is to study how the perceived enjoyment of physical activity may change over time. Therefore, the following research question has been formulated:

RQ1: What is the effect of the duration of use of self-tracking devices on the enjoyment of physical activity?

The perceived enjoyment of physical activity in different durations of use of a self-tracking device may also be determined by how committed users are to self-tracking. Commitment to self-tracking refers to the level of involvement with the self-tracking device, the degree of personal investment in the practice, and the extent to which self-tracking is a principal factor in the social identity of the self-tracking device user (Hanci et al., 2020). This commitment to self-tracking varies between users of self-tracking devices. Some people continuously check their activity levels, share data with others, make extra effort to reach their goals, recommend self-tracking to others, and update their goals whenever required (Hanci et al., 2020). This indicates a high commitment to self-tracking. However, others wear a self-tracking device but only sporadically check their progress and do not feel the urge to achieve their goals. They do not update their goals or share data with others (Ajana., 2016; Fritz et al., 2014; Shin et al., 2019). This implies a lower level of commitment to self-tracking.

Ajana (2020) proposed that high commitment to self-tracking can force users to a certain level of physical activity. Consequently, high commitment to self-tracking might foster the shift in focus from engaging in physical activity because one enjoys it to engaging in physical activity to reach a certain number of steps or burn a certain number of calories. Engaging in an activity for the latter reason may impair the ability to enjoy the activity (Ajana, 2020; Etkin, 2016). Nevertheless, if users have a lower commitment to self-tracking, the impairment of enjoyment may be less severe.

One's commitment to self-tracking may also change over time. For instance, users may be highly committed in the early stages of self-tracking due to the novelty effect (Fritz et al., 2014). However, the commitment to self-tracking also may change when the novelty has worn off (Fritz et al., 2014; Lazar et al., 2015). Thus, one's commitment to self-tracking is considered to improve comprehension of the effect of the duration of use of a self-tracking device on the enjoyment of physical activity over time. Therefore, the second research question is:

RQ2: To what extent does one's commitment to self-tracking moderate the effect of duration of use of a self-tracking device on the enjoyment of physical activity?

Theoretical framework

Enjoyment of Physical Activity

Physical activity enhances one's well-being and reduces the risk of developing diseases (Biddle & Mutrie, 2008). High levels of well-being can be experienced physically and emotionally and are considered an essential determinant of one's quality of life (Biddle & Mutrie, 2008). Regular exercise plays an essential role in reducing diseases, obesity, anxiety, and stress, while also promoting weight loss, improving overall health, and enhancing mental well-being (Biddle & Mutrie, 2008; Consolvo et al., 2006; Ströhle, 2009). When people engage in physical activity that they enjoy, their brains release endorphins which makes them feel good (Miles, 2007). Endorphins can reduce stress and increase well-being, improving mental health (Dinas et al., 2011; Miles, 2007). This indicates that physical activity can result in various psychological and behavioural enhancements (Guérin & Fortier, 2012).

Enjoyment of physical activity is a crucial factor for people to benefit from these psychological and behavioural improvements, as enjoyment determines the longevity of physical activity (Biddle & Mutrie, 2008). It has been shown that enjoyment of physical activity is a predictor of engaging in physical activity in the long term (Biddle & Mutrie, 2008). When people experience no enjoyment during physical activity, they are more likely to stop engaging in the activity. Hence, decreased enjoyment causes problems with engagement in physical activity (Karapanos et al., 2016; Lewis et al., 2016).

Self-tracking and Enjoyment

Self-tracking devices are electronic devices that keep track of an individual's daily activities (Clawson et al., 2015). The devices have become popular due to the technique it uses: self-monitoring (Karapanos et al., 2016). Through self-monitoring, people can create awareness of their everyday behaviour, including steps taken, calories burnt, distance, speed, heart rate, hours slept, etcetera (Karapanos et al., 2016; Shin et al., 2019). By tracking their activities and health patterns over time, users can create activity goals, evaluate their progress, and understand their lifestyles (Lomborg & Frandsen, 2016). Self-tracking devices are available in various forms, including phone applications, armbands, rings, and sports watches (Lomborg & Frandsen, 2016).

Asimakopoulos et al. (2017) and Canhoto & Arp (2016) proposed that self-tracking boosts the enjoyment of physical activity. Self-tracking devices provide features such as supportive messages, data-sharing, gamification, competition, rewards, and badges. The study by Canhoto & Arp (2016) showed that these features make physical activity perceived as enjoyable. Particularly data-sharing and the competitive and rewarding features of self-tracking devices are thought to have a beneficial impact on how much enjoyment one has while using it and, in turn, how much enjoyment one has while engaging in physical activity (Canhoto & Arp, 2016).

Asimakopoulos et al. (2017) highlight the positive effect of goal setting with the self-tracking device on the perceived enjoyment of physical activity. Goal fulfilment is seen as an element that increases motivation to exercise, and it increases the enjoyment of physical activity as it is seen as fun and entertaining (Asimakopoulos et al., 2017).

Etkin (2016) and Karapanos et al. (2016), on the other hand, suggested that when monitoring the activity, the emphasis of the physical activity changes from enjoyment to performance. People adhere to the measurable quantified standard they set for themselves and have a quantitative perspective on their activity and health instead (Etkin, 2016). Consequently, the focus may be on monitoring and measuring one's performance, making the activity no longer enjoyable (Ajana, 2016; Etkin, 2016). To give an example, one enjoys dinner with close friends. The social interaction and overall experience contribute to the enjoyment. However, when simply registering the caloric intake of the meal, it may appear similar to consuming a fast food menu alone on a regular weeknight. The experience is reduced to numbers, and the multidimensionality of the enjoyable event is diminished, while the limitations of quantifying subjective experiences in a one-dimensional manner are emphasised (Van Dijk et al., 2015).

Duration of Use and Enjoyment

The duration of use of a self-tracker can be an important factor when determining the effect of self-tracking on the perceived enjoyment of physical activity. Previous studies have shown that people experience a novelty effect when using a self-tracking device (Fritz et al., 2014; Shin et al., 2019). This novelty effect refers to the initial excitement and enthusiasm experienced by users (Hopp & Gangadharbatla, 2016). An important underlying mechanism of this effect is heightened self-

awareness regarding one's activity levels (Shin et al., 2019). As individuals become more aware of their activity levels through self-tracking, they often experience a sense of curiosity and eagerness to increase their activity levels. The novelty of the device and its features further enhances this curiosity and eagerness, fostering an exploratory attitude on how to use the device (Lazar et al., 2015; Hopp & Gangadharbatla, 2016).

This curiosity and enthusiasm during the novelty effect encourage people to start self-tracking, and according to Chen et al. (2017) and Lazar et al. (2015), it seems to affect the enjoyment of the activity experience positively. The enjoyment of the physical activity might be explained by the influence of the self-tracking device and its features that facilitate enjoying the physical activity, such as providing feelings of accomplishment and the focus on goals and progress (Hassan et al., 2020; Jin et al., 2020a; Stiglbauer et al., 2019). When people receive these feelings, it enhances their perceived aptitude for physical activity, and that enhances their perceived enjoyment of the physical activity (Jin et al., 2020a). According to Canhoto and Arp (2017), features of self-tracking devices such as competition and data-sharing positively influence the enjoyment of physical activity as it makes the experience of the activity more fun (Canhoto & Arp, 2017).

When the novelty has worn off, generally between the first and third month of using a self-tracking device (Shin et al., 2019), the excitement level declines (Hopp & Gangadharbatla, 2016). The enjoyment that the self-tracking device adds to the experience of physical activity diminishes (Chen et al., 2017). According to Chen et al. (2017) and Hassan et al. (2020), gamification in self-tracking increases the enjoyment of physical activity by creating enjoyable experiences. However, the perceived enjoyment decreases once the novelty has worn off (Chen et al., 2017).

After the novelty effect has worn off, 4-6 months, users often decide if they want to continue wearing the self-tracking device (Meyer et al., 2020). Karapanos et al. (2016) mentioned that more than a third of users of self-tracking devices stop using the device within six months. Clawson et al. (2015) and Shin et al. (2019) indicated that people stop using the self-tracking device due to a lack of interest in the data that the device provides. Another reason for them to stop using the devices lies in the device being a mismatch between the users' expectations and the device's capabilities (Clawson et al., 2015). In the study of Lazar et al. (2015), participants even mentioned that it felt like a relief to

stop using the self-tracking device as they did not have the feeling that they had to work out anymore. This could also imply that self-tracking is considered fun in the short term but not necessarily in the long term.

Despite this loss of interest in self-tracking and its high dropout rate, many individuals continue to wear self-tracking devices after six months. One reason for this could be that wearing a self-tracker became a feature of their daily lives. As Fritz et al. (2014) and Ajana (2020) suggested, after wearing the self-tracker for some time, people may feel they miss something when not wearing it. In their study, participants reported that once they started using a self-tracking device, physical activity without the device was less enjoyable because the activity was only perceived as useful with monitoring (Ajana, 2020; Fritz et al., 2014). This feeling emphasises that self-tracking encourages people to focus on the measurable quantified aspect of the activity rather than enjoying the experience.

Etkin (2016) demonstrated that self-tracking reduces one's perceived enjoyment of physical activity due to the focus on performance. I argue that the novelty effect is expected to offset this detrimental impact on the enjoyment of physical activity due to the increased excitement. As Asimakopoulos et al. (2017) and Canhoto & Arp (2016) suggested, the features of the self-tracking device might facilitate the enjoyment of physical activity. Feelings of accomplishment are facilitated by the self-tracking device and increase the enjoyment of the activity (Jin et al., 2020a). However, it is expected that once the novelty effect of the self-tracking devices has worn off, users may experience less enjoyment while exercising due to decreased excitement (Chen et al., 2017; Hopp & Gangadharbatla, 2016). The features that facilitate the enjoyment are familiar and do not provide the excitement level they did in the initial stages of wearing the self-tracker (Chen et al., 2017). Instead, when the novelty has worn off, and the excitement level has decreased, the enjoyment facilitated by the self-tracking will reduce, and the focus will be on the measurable quantified aspect of the physical activity, which will negatively affect the perceived enjoyment (Etkin, 2016; Lazar et al., 2015). People might start to experience the activity as work rather than something enjoyable (Etkin, 2016). Therefore, the first hypothesis states:

H1: *The duration of use of a self-tracking device has a negative effect on the enjoyment of physical activity, with users with a longer duration of use experiencing lower enjoyment than users with a shorter duration of use.*

Commitment to self-tracking

Commitment to self-tracking refers to an individual's relationship with the practice of self-tracking (Hanci et al., 2020). The degree to which people actively engage in and adhere to the practice of monitoring their behaviours, activities, or personal data via self-tracking devices is referred to as their commitment to self-tracking. According to Hanci et al. (2020), commitment to self-tracking is reflected in the way a user behaves toward self-tracking. This behaviour reflects itself in three different ways: the level of involvement with the self-tracking device, the degree of personal investment in the practice, and the extent to which self-tracking is a principal factor in the social identity of the self-tracking device user.

Users of self-tracking devices vary in their commitment to self-tracking (Hanci et al., 2020). Highly committed users of self-tracking devices put extra effort into staying current with the self-tracking technology. They integrate the device into their lives and are, therefore, willing to spend money to get a high-quality self-tracker and purchase accessories for their tracker. The level of involvement and level of personal investment in the self-tracking practice refers to the interaction of the users with the device (Hanci et al., 2020). For example, users with a high degree of personal investment in the practice make extra effort to reach their self-tracking goals, update their goals whenever required, and they would go back home whenever they forget to wear the device (Hanci et al., 2020). Although self-tracking is an individual practice, highly committed users share their data with others for an online competition or to exchange experiences in a self-tracking community (Hanci et al., 2020). Based on those aspects, a distinction can be made between people with a higher and a lower level of commitment to self-tracking.

Studies have indicated that individuals with different levels of commitment to self-tracking differ in their approach towards analysing the monitored data (Ajana, 2020; Hanci et al., 2020). Excessive commitment to self-tracking might lead to users feeling controlled by the self-tracking device, subsequently decreasing the perceived enjoyment of the physical activity (Jin et al., 2020a).

Ajana (2020) also suggested that people who are highly committed to self-tracking experience feelings of pressure due to the self-tracking device as it facilitates the focus on burning a certain number of calories or taking a certain number of steps. Consequently, this high commitment increases the inability to enjoy physical activity. This feeling of pressure is even higher when people share their data with others (Ajana, 2020).

Goalsetting, as fostered by self-tracking technologies, is an essential cause of these feelings of pressure (Ajana, 2016). People often use their self-tracking devices to set goals for themselves, and the type of goal they choose is frequently a performance goal (e.g., taking 10,000 steps per day to live a healthy lifestyle) (Timar-Anton et al., 2021). However, while self-tracking, people can also aim to improve the skills and process of physical activity rather than adhering to a measurable quantified standard they set for themselves (Hanci et al., 2021). Focusing on the process can be understood as having a mastery goal (Timar-Anton et al., 2021). According to Timar-Anton et al. (2021), mastery goals (e.g., improving running skills) rather than performance goals result in higher satisfaction. With a performance goal, people focus on achieving a certain desirable outcome. When one feels that they did not reach the outcome, the satisfaction of engaging in the activity might be reduced (Ajana, 2016; Timar-Anton et al., 2021). In the study of Ajana (2016), however, the focus is on adhering to the measurable quantified aspect of self-tracking. This focus might lead to increased feelings of pressure, negatively affecting the enjoyment (Ajana, 2016).

Not everyone who adopts a self-tracking device is highly committed to self-tracking and achieving their goals, and not everyone remains excited about self-tracking long-term (Fritz et al., 2014; Lazar et al., 2015). According to Shin et al. (2019), users often lose interest in the data after a while and become less preoccupied with tracking their activity. Thus, over time, the commitment to self-tracking might change, which may influence the enjoyment of physical activity.

Jarrahi et al. (2018) and Fritz et al. (2014) suggested that once the information about their physical activity level is gathered and the novelty has worn off, people are not taking extra steps anymore to adhere to the measurable quantified standard they set for themselves with their self-tracking device. Lazar et al. (2017) suggested that, even though they see little use in the self-tracking device, people keep on wearing it because they have grown accustomed to it. Consequently, people

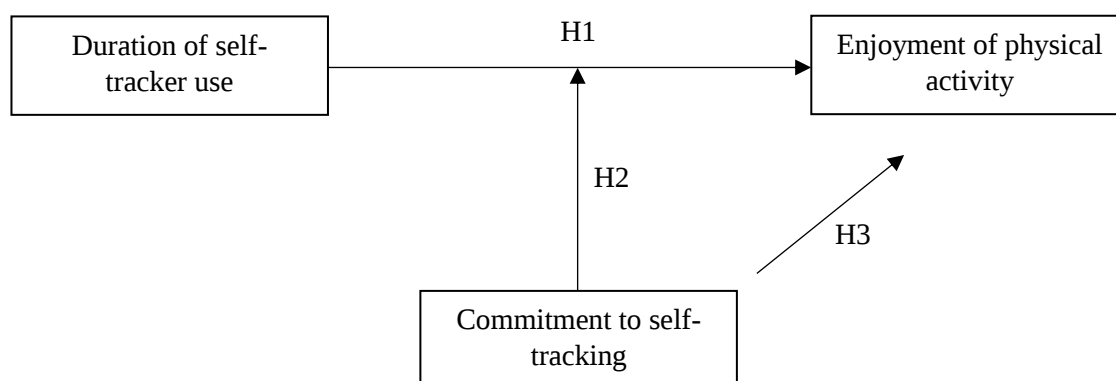
might no longer experience the urgent drive to achieve their goals and utilise the self-tracking device to verify their physical activity (Fritz et al., 2014; Shin et al., 2019). This implies a lower commitment to self-tracking in the long term. A lower commitment to self-tracking might make people continue to monitor their data, but the output of this data has little impact on how they feel because they do not feel pressured to adhere to the measurable quantified aspects that the device provides (Ajana, 2020; Fritz et al., 2014).

Thus, it is expected that the effect of the duration of use of a self-tracking device on the enjoyment of physical activity is moderated by one's commitment to self-tracking such that people who use the device for a long time while also having a high level of commitment to self-tracking experience a lower enjoyment of the physical activity as compared to people with a lower level commitment to self-tracking with a longer time of self-tracking use. Therefore, the following hypothesis state:

H2: *The strength of the effect of the duration of use of a self-tracking device on the enjoyment of the physical activity varies according to one's level of commitment to self-tracking. Specifically, as the duration of self-tracking device use increases, users who have a high commitment to self-tracking experience a more pronounced decline in their perceived enjoyment of the physical activity.*

Ajana (2016) proposed that excessive commitment to self-tracking increases the inability to enjoy physical activity. Thus, it is also expected that higher commitment to self-tracking leads to less enjoyment of the physical activity.

H3: *There is a negative effect of commitment to self-tracking on enjoyment of physical activity, such that the higher the commitment to self-tracking, the lower the enjoyment of physical activity.*

Figure 1*Conceptual model*

Method

Design

A quasi-experimental study through an online survey was used to investigate the effect of the duration of self-tracking device use on enjoyment of the physical activity. The dependent variable was the enjoyment one derives from physical activity. The independent variable was the duration of use which consisted of four levels (1-3 months vs 4-6 months vs 7 months-2 years vs 2 years and longer). One's commitment to the self-track device was the moderating variable, but it was also examined as a dependent variable.

Participants

The participants were recruited through snowball sampling. The survey was distributed to the researcher's network using social media channels (WhatsApp, Instagram, and LinkedIn) and direct personal communication. In addition, the survey was distributed via Survey Circle, an online platform on which researchers can share their survey to gather participants.

A total of $N = 117$ participants started the survey. The data from 26 participants were invalid as they had not completed the survey. This left 91 participants, of whom 42 identified as male and 49 identified as female. The education level of 24 participants was higher than bachelor, while 46 participants were of bachelor level and 21 were of lower than bachelor level.

The inclusion criteria for participation were individuals aged eighteen and older who use a self-tracking device to monitor their physical activity. To ensure that every participant used the same type of self-tracking device, it had to be a smartwatch worn on the wrist. 34 participants used an Apple Watch, 21 used a Garmin watch, 15 used a Samsung watch, 13 used a Fitbit, 3 used a Polar watch, and 6 used another type of smartwatch.

Critical in the recruitment process was that the participants' usage duration of self-tracking devices must vary from 1 month to 2 years and longer to measure the effect of the duration of self-tracking device use and the enjoyment of the physical activity. The participants were divided into levels based on how long they used the self-tracking device; 1-3 months, 4-6 months, 7 months-2 years, and 2 years and longer. 21 participants were gathered for the duration use of 1-3 months, 21 participants for 4-6 months, 26 participants for 7 months to 2 years, and 23 participants for the duration of 2 years and longer.

Measures

Independent variable. The duration of use of the self-tracking device refers to the period a participant has been using a self-tracking device. The duration of use was classified into the following levels: 1-3 months of self-tracking, 4-6 months of self-tracking, 7 months-2 years of self-tracking, and 2 years and longer. These duration levels were chosen to reflect the different stages of using a self-tracking device.

The first level, 1-3 months, corresponds to the first stage of self-tracking when the novelty effect takes place (Shin et al., 2019). The second level, 4-6 months, is chosen since the novelty effect often wears off after three months, and users are still determining if they want to continue wearing the self-tracking device (Meyer et al., 2020). Therefore, the current study argues that the first and the second level represent the short-term usage of self-tracking. The third and fourth levels, 7 months-2 years of self-tracking and 2 years and longer, represent the long-term use of self-tracking devices (Meyer et al., 2020; Shin et al., 2019).

Dependent variable. The enjoyment one derives from the physical activity was measured using the Physical Activity Enjoyment Scale (PACES) developed by Kendzierski & DeCarlo (1991). The scale contains 18 questions on a 7-item semantic differential scale. Two of the 18 items (Item 5, “I

am very absorbed in the activity,” and Item 11, “It’s very invigorating”) were eliminated from the scale due to the content being irrelevant to measure enjoyment (Item 5) or its complexity (Item 11) (Motl et al., 2001). To adapt it to the specific context of the current study, several of the remaining 16 items were rewritten (see Appendix B).

9 Items of the score were reverse coded (Appendix B). Higher scores on the scale indicated a higher level of enjoyment. An example of an item is: “I felt as though I would rather be doing something else” vs “I felt as though there was nothing else I would rather be doing”. The reliability of this measure was $\alpha = .871$, which is a reasonably high level of reliability. Thus, this scale demonstrated good reliability.

Moderating variable. The moderating role of one’s commitment to self-tracking was measured using the C2ST scale developed by (Hanci et al., 2020). One’s commitment to self-tracking can be determined by a person's level of involvement with the self-tracking device, their level of personal interest in the practice, the extent to which users share their data with others, and how much self-tracking has shaped their identity (Hanci et al., 2020). Therefore, the current study uses the Commitment to Self-Tracking (C2ST) scale developed by Hanci et al. (2020) to gain a deeper understanding of what role self-tracking plays in one’s life and how that might determine the strength of the effect of duration of self-tracking on the enjoyment one derives from physical activity. This moderating variable is also examined as a direct effect on the enjoyment of physical activity.

The C2ST scale is a 7-point Likert-type response scale, labelled from strongly disagree (1) to strongly agree (7). Examples of statements in this scale are: “If I forget my device at home, I would go back to get it” and “I make extra effort to reach my goal”. The reliability of this measure was $\alpha = .854$, which also indicates a good reliability score. The scale in its entirety can be found in Appendix B.

Procedure

The Qualtrics software program was used to conduct the online survey. On the initial page of the survey, the participants were provided with a description of the study’s objective. They were informed that the survey would last approximately 7 minutes. In addition, the participants were asked to confirm that they agreed to the informed consent (Appendix A).

After the participants provided their consent, they were asked how long they had been using their self-tracking device and what they monitored with their self-tracking device.

After gathering this information, the participants were directed to the start of the survey. A brief introduction to the survey informs participants that people frequently use their self-tracking device to set goals to keep themselves motivated to be physically active. In addition, an example of such a goal was given. Afterwards, all participants were asked to deeply imagine the last time they reached their self-tracking goal and their physical activity to reach it (Appendix B).

In response, the participants had to reflect on their physical activity by answering the Physical Activity Enjoyment Scale questions. After completing these questions, they had to answer an open question in which they had to describe the goal they reached by doing the physical activity. By asking this open question, it could be explored whether the participant reached a goal focused on improving their skills (mastery) or a goal focused on adhering to a measurable standard (performance). This exploration was included to see whether those who practice self-tracking for a longer duration set different goals than those who practice self-tracking for a shorter period.

After rating their level of enjoyment, the participants had to complete questions about their commitment to self-tracking using the C2ST scale. In addition, the participants had to indicate what type of self-tracking device they used.

Demographic information, such as gender, age, and education level, was obtained in the last series of questions.

At the end of the survey, the participants were thanked for their involvement. In addition, they were given the option to request a summary of the findings. The questions of the survey can be found in Appendix C.

Results

Main analysis

To investigate the effect of duration of use of a self-tracking device on the enjoyment of the physical activity and how one's commitment to self-tracking moderates this relationship, an ANCOVA analysis with enjoyment as dependent variable, duration of use as independent variable and

commitment to self-tracking as covariate variable was performed. Commitment to self-tracking has also been examined as the dependent variable. Both enjoyment of the physical activity and commitment to self-tracking was measured on a scale level. The independent variable consisted of four levels: 1) 1-3 months, 2) 4-6 months, 3) 7 months-2 years, and 4) 2 years and longer.

First of all, the assumptions of the ANCOVA were tested. The boxplot revealed that there were no outliers for commitment to self-tracking. Two outliers were found for enjoyment of the physical activity. However, it was evident that the outliers did not impact on outcomes after performing the ANCOVA, both with and without them. Hence, the outliers were included in the analysis. The Shapiro-Wilk test revealed that for both enjoyment and commitment to self-tracking, the assumption of normality was not violated, $p > .05$. Except for the duration group of 2 years and longer and enjoyment, $p < .05$. Levene's test revealed that there was no significant difference in variance between the groups and the assumption of equal variances is met, $p = .885$.

With a few potential outliers, the histogram of standardised residuals appears to be roughly normally distributed. The range of values for the standardised residuals was between -3.0 and 2.0. There was no clear pattern in the residuals, and they were distributed rather evenly around the horizontal axis in the scatterplot of the standardised residuals versus expected values.

The descriptive statistics for duration of use on enjoyment are presented in Table 1. The results show that although the perceived enjoyment scores differed across the various levels of duration of use, the difference was not significant, $F(3, 83) = .799, p = .498$. This means that hypothesis H1 is rejected. There is no effect of duration of use of a self-tracking device on the enjoyment of the physical activity.

Table 1*Descriptive Statistics for Duration of Use on Enjoyment of Physical Activity*

		<i>M</i>	<i>SD</i>	<i>N</i>
Enjoyment	1-3 months	5.85	0.66	21
	4-6 months	5.31	0.68	21
	7 months-2 years	5.32	0.78	26
	2 years and longer	5.62	0.68	23

Regarding hypothesis 2, the results show that although the perceived enjoyment scores differed slightly when moderated by one's commitment to self-tracking, one's commitment to self-tracking did not significantly influence the effect of duration of use on perceived enjoyment, $F(4,83) = 2.038$, $p = .097$. This indicates that the relationship between duration of use and enjoyment does not differ significantly across different degrees of commitment to self-tracking. Thus, hypothesis H2 is rejected. The strength of the effect of the duration of use of a self-tracking device on the enjoyment of the physical activity does not vary according to one's commitment to self-tracking.

The adjusted $R^2 = .103$, which means that 10.3% of the variance in the variable enjoyment is explained by the variables in this model.

Regarding hypothesis 3, it was assessed whether one's enjoyment of physical activity is affected by one's commitment to self-tracking. This effect was significant $F(1, 83) = 6.94$, $p = .01$. The effect size was medium, $\eta^2 = .077$. This means that the participant's perceived enjoyment differs depending on their commitment to the self-tracking practice. To further investigate the effect of commitment to self-tracking on the enjoyment of physical activity, a regression analysis has been performed with commitment to self-tracking as a predictor and enjoyment as an outcome. The regression analysis showed that enjoyment of physical activity can be predicted by one's commitment to self-tracking $b = 4.740$, $\beta = 0.185$, $t = 17.998$, $p = .003$. The model explains 9,5% of the variance in commitment to self-tracking $R^2 = .095$, $F(1, 89) = 4.539$, $p = .003$. This indicates a significant positive effect of one's commitment to self-tracking on the enjoyment of physical activity. This means that the data did not support hypothesis H3. H3 stated that higher commitment to self-tracking would lead to

lower enjoyment of physical activity. However, the findings suggest a positive relationship between these two variables, indicating that participants who are more committed to self-tracking may also enjoy physical activity more.

Explorative Analysis: Mastery vs Performance Goals

To gain a better understanding of how the participants used their self-tracking device in terms of goal setting and how this differs per level of duration of use, an open question was asked in which the participants had to explain the type of goal they reached by doing the physical activity. They had to answer: “What was the goal you reached by doing the physical activity that day?” The answers to this question were analysed using deductive and inductive content analysis. The main themes used for this analysis were the types of goals (mastery vs performance). Mastery goals in the context of self-tracking focus on the process of the activity, competence, and improvement. These goals are not measurable in terms of self-tracking. In terms of self-tracking, performance goals are specific, measurable goals focused on the outcome (Hanci et al., 2021). The thematic analysis initially focused on identifying the main themes of performance and mastery goals and the subthemes that emerged within each category. Subsequently, the distribution of these goals across different levels of duration of device use was explored, with a particular emphasis on identifying any differences between these levels. The coding scheme can be found in Appendix D.

Performance goals

Performance goals, as opposed to mastery goals, were mentioned by a larger number of participants. The majority of participants had a **straightforward quantitative goal**. These quantitative goals could be further categorised into burning a predetermined number of calories, reaching certain distances, and reaching predetermined step counts. Specific examples of these goals were: “3500 kcal” (P54, 7 months – 2 years), “16 km run” (P31, 4-6 months), and “10.000 steps” (multiple participants). The participants did not provide any context for these goals. Most participants prioritized and focused on the numerical aspects of self-tracking. Their descriptions primarily revolved around quantifiable measures, indicating a preference for measurable outcomes. This emphasises the participants' quantitative approach while self-tracking and their tendency to use specific numbers as achievement indicators in their self-tracking efforts.

In addition to quantitative targets, the participants set goals related to **time for physical activity**. According to the data, the participants believed that the amount of time they spent engaging in physical activity each day was important. Thus, participants set a goal for themselves: to spend some specific amount of time per day exercising (e.g., 1 hour, 45 minutes, 60 minutes of activity). This type of goal was predominantly used by participants who had a duration of use of 1-3 months and 4-6 months.

Mastery goals

A smaller portion of the participants used mastery goals. These participants had no specific target but focused on achieving **progress** (e.g., improving overall fitness level, pushing physical limits). This approach implies a desire for development and personal growth in their physical activities. These goals were predominantly used by participants with a duration of use of 1-3 months. This indicates that participants focused primarily on increasing their activity levels during the first few months of self-tracking.

For mastery goals, the focus was also on the participants' **feelings and well-being**. The participants mentioned that their physical activity focused on reducing stress, re-energising, and being active. The participants using these goals prioritize their subjective experiences and well-being as the primary outcomes of their physical activity. They were more concerned with enhancing their mental and physical health than adhering to specific performance measures. This type of mastery goal was used by participants with a duration of use of 1-3 months and 4-6 months.

Other participants focused on their **bodies** while self-tracking, aiming to lose weight and get in shape. These goals were used by participants with a duration of use of 7 months-2 years and 2 years and longer.

Some participants focused on burning calories or reaching a certain distance but did not mention a specific target. Examples of these goals are: *“running a certain distance”* or *“burning calories”* (7 months-2 years; P80, 2 years and longer). These participants' goals combine performance and mastery goals. Ultimately, the focus is on reaching a certain desired outcome, but the goals can be updated based on the participant's current activity level. There is still potential for individual growth in

their physical activity as these are not precise, measurable goals. This type of goal was used at all levels of use duration.

Duration of Use and Goal Setting

For the analysis, I was predominantly interested in finding out whether there was a difference in the type of goal the participants set for themselves and how this was distributed across the different levels of duration of use. The analysis indicated a greater propensity towards performance goals at each level of the duration of use. For every duration of use, the most frequently used goal was to reach a certain number of steps, followed by burning calories and reaching a specific distance.

In general, mastery goals were used less frequently, but the participants with a duration of use of 1-3 months used mastery goals the most, followed by 4-6 months. Participants who had been using the self-tracker for a shorter duration (1-3 months) were more inclined towards setting mastery goals. Their goals focused on reducing stress, feeling active, and pushing their physical limits. Thus, when the participants started using a self-tracker, there was a greater emphasis on skill development and personal improvement compared to longer durations of use. As the duration of use increases (7 months to 2 years and 2 years and longer), participants seem to shift their focus more towards performance goals, such as achieving specific outcomes—the use of mastery goals diminished over time.

In addition, the time spent on physical activity was more often included in the goalsetting of participants with shorter durations (1-3 months and 4-6 months). The focus was more on engaging in an activity for a specific amount of time per day, such as 60 minutes of physical activity. This illustrates that participants in the early stages of self-tracking emphasised the duration of their activity sessions. The focus on time-based goals indicates a desire to establish consistent habits and ensure a certain level of daily physical engagement. As participants became more experienced with self-tracking over longer durations, their goal-setting may have shifted to other aspects, such as achieving specific outcomes or calorie burn.

Across all levels of device usage duration, there was a notable emphasis on goals related to burning calories and daily step count. However, participants who had been using the device for longer durations (7 months to 2 years and 2 years and longer) tended to set higher quantitative targets than those with shorter durations (1-3 months or 4-6 months). For participants with shorter durations, the

calorie burn goals ranged from 400 to 1000 calories per day, while for those with longer durations, the focus shifted to higher targets ranging from 550 to 3500 calories per day. Additionally, the goal for daily step count increased over time. Specifically, participants with shorter durations had a maximum step goal of 10,000 steps, while participants with longer durations showed a propensity for setting higher step goals, such as 20,000 steps. This implies that users who engage in self-tracking for longer durations are more likely to set more ambitious goals for themselves.

Main findings

The current investigation discovered that the duration of use had no effect on subjective enjoyment. Additionally, one's commitment to self-tracking had no effect on the strength of this effect. However, stronger self-tracking commitment was associated with higher perceived enjoyment of physical activity. The thematic analysis found that, in general, performance goals were used the most by the participants. Mastery goals were utilized more frequently in the early phases of self-tracking than as the duration of use increased. Furthermore, unlike participants with longer durations, early-stage participants commonly concentrated more on time-based exercise goals. Calorie burn and steps taken were the most commonly utilized goals, and participants who used the self-tracking device for a longer period tended to set higher goals than those who used it for a shorter period.

Discussion

Self-tracking has become a popular practice for people to gain insights into their physical activity level, increase their physical activity levels, and monitor their progress. Self-tracking devices have been shown to positively impact users' physical activity levels by promoting awareness and encouraging them to engage in physical activity daily. Self-tracking motivates users to exercise more, but studies also revealed that it alters the physical activity experience. While some studies indicated that it could boost the enjoyment of physical activity, others indicated it could reduce it. The current study aimed to extend on these prior studies by investigating the effect of duration of use of self-tracking devices (1-3 months/4-6 months/7 months-2 years/2 years and longer) on one's perceived

enjoyment of the physical activity and how one's commitment to self-tracking moderates this effect. Additionally, it investigated how commitment to self-tracking is related to the perceived enjoyment.

Regarding hypothesis 1, the results show that the duration of use of a self-tracking device had no impact on how much the participants enjoyed their physical activity, demonstrating that there was no difference in the perceived enjoyment of the physical activity between the different levels of duration of use (1-3 months, 4-6 months, 7 months-2 years or 2 years and longer). This suggests that the initial novelty and excitement associated with self-tracking did not result in a higher level of enjoyment compared to self-tracking for a longer period, when the novelty has worn off. The different phases of self-tracking, in terms of time, did not have a different effect on enjoyment of physical activity.

The current study's findings contrast with the expectations based on the existing literature. A possible explanation for the results could be the categorisation of the levels of duration of use. These levels were based on previous literature (Meyer et al., 2020; Shin et al., 2019). However, it is possible that the levels did not accurately represent the different phases of self-tracking in terms of time. For example, the experience of the novelty of self-tracking, which was expected to affect the enjoyment of physical activity, might vary among the participants. Shin et al. (2019) argued that the novelty effect occurs between the first and third months of using the device. However, it is possible that the novelty effect could be even shorter, two to four weeks (Creaser et al., 2021). Zhou et al. (2017) also argued that people vary in their perception of novelty due to individual differences. For instance, one's interest, familiarity with self-tracking devices and expectations toward self-tracking can influence their perception of novelty (Zhou et al., 2017).

The results of the current study differ from Etkin's (2016) study regarding the impact of measuring activity on enjoyment. Etkin (2016) found that measuring an activity immediately decreases enjoyment, whereas the current study did not find a negative effect on enjoyment. The different methodological approaches could explain this difference. Etkin (2016) focused on momentary enjoyment measured right after the task. The current study, however, focused on the broader experience of self-tracking as it distinguishes between participants with different durations of use. Participants who used the device for over six months will likely have incorporated self-tracking

into their daily routines, making it a habitual practice (Lazar et al., 2015). According to Fritz et al. (2014), when people are used to self-tracking, exercising without it may be less enjoyable because it is regarded as not valuable without monitoring. Thus, over time the participants might view self-tracking as a useful tool for tracking progress and achieving goals as they are used to the practice of self-tracking. The thematic analysis also illustrated that participants focused on increasing their activity levels in the early stages of self-tracking. This was shown through a higher focus on time-based goals and improvement of activity levels (mastery goals). However, participants with longer durations of self-tracking increasingly focused on quantitative goals. Additionally, participants who used the self-tracking device for a longer period (7 months-2 years and 2 years and longer) were inclined to set more ambitious quantitative goals. They might have gained more insight into their habits, which leads to changing goals over the long term (Epstein et al., 2021). Hence, it could be that participants with a longer duration of use of a self-tracking device experienced improvements in their physical activity levels and developed a sense of control over their health, contributing to their continued enjoyment of physical activity while self-tracking (Jin et al., 2020b)

Furthermore, it is probable that achieving the goal has evoked enjoyment, which might have obscured the impact of duration of use on perceived enjoyment of the physical activity, resulting in equal levels of enjoyment across the different durations of use. The participants focused only on the activities that made them reach their goals. When a self-tracking goal is met, it may lead to higher feelings of aptitude (Hanci et al., 2021), which might lead to higher enjoyment (Jin et al., 2020a). Most participants in the study used quantitative goals, and the goals became more ambitious over time. According to Jin et al. (2020b), feelings of competence are even stronger when one achieves a more effortful goal. Therefore, it is likely that the feeling of competence evoked enjoyment. Hence, the focus on goal accomplishment might have skewed the memories of the experience. It could be that the physical activity was not necessarily an enjoyable experience for all participants, but achieving the goal might have provided feelings of satisfaction which might have influenced their memory of the physical activity.

This study investigated the possible moderating role of commitment to self-tracking (H2). However, also for this hypothesis, no significant effect was found. The results showed that

commitment to self-tracking did not affect people's enjoyment of different durations of self-tracking use. Thus, it does not matter how long the participants participated in self-tracking activities; their commitment to the practice did not impact their overall enjoyment.

Fritz et al. (2014) and Shin et al. (2019) suggested that the commitment to self-tracking might be lower when self-tracking for a longer period. As a result, people become less preoccupied with adhering to the measurable quantified aspect of self-tracking. Therefore, the relationship between duration and enjoyment was expected to depend on one's dedication to self-tracking. The current study, however, may have lacked sufficient variability in the level of commitment to self-tracking among participants. If the participants of the different levels of duration of use exhibited similar levels of commitment to self-tracking, no pronounced difference in enjoyment could be observed.

It could also be that other factors, such as one's intrinsic motivation, affect the relationship rather than commitment to self-tracking. Shin et al. (2019) argued that intrinsic motivation, compared to extrinsic motivation, determines why people keep using a self-tracking device even after the novelty effect has worn off. Hidalgo et al. (2022) and Winninger and DeSena (2012) also suggest that the type of motivation influences long-term engagement and relates to enjoyment. When people have a high intrinsic motivation for self-tracking, they enjoy the practice without needing external rewards facilitated by self-tracking devices (Hanci et al., 2021). Thus, it could be that most participants had a high intrinsic motivation for self-tracking, which might have led to higher commitment and a higher perceived enjoyment of the physical activity (Hidalgo et al., 2022; Winninger & DeSena, 2012).

It was expected that high commitment to self-tracking would lead to a lower perceived enjoyment of the activity. The current study also examined this possible effect. However, the data revealed the opposite: higher commitment to self-tracking resulted in higher perceived enjoyment of physical activity, rejecting hypothesis 3. This suggests that increased levels of interaction with the self-tracking device, increased personal investment in the self-tracking practice, and the increased degree to which self-tracking is a salient element in the person's social identity all positively impact the perceived enjoyment of the activity.

This finding is in contrast with the findings of Ajana (2020). However, Ajana's study had a larger sample size and used open-ended questions, providing a deeper understanding of participants'

experiences. In the study of Ajana (2020), participants focused on their overall self-tracking experiences. They explained that their excessive focus on tracking activities sometimes led to diminished enjoyment due to feelings of failure or obsession. However, in this study, the focus was on one specific goal. This focus may have biased the results, as participants reflected on a specific activity that likely induced positive experiences due to goal achievement. Therefore, the current study may not accurately represent the broader range of experiences in self-tracking, particularly regarding participants' feelings toward their commitment to self-tracking and how highly committed self-trackers deal with possible failures during activities.

Theoretical implications

While previous research has looked at the longevity of self-tracking use and user's motivations (Fritz et al., 2014; Shin et al., 2019) and both the positive and negative effects of self-tracking on enjoyment (Canhoto & Arp, 2016; Etkin, 2016), there has been no study that looked at how the longevity of self-tracking use affect overall physical activity enjoyment and whether commitment to self-tracking plays an important role in this relationship.

The current study gained new insights by suggesting that enjoyment of physical activity while self-tracking does not depend on how long people use their self-tracking device, and it is also not moderated by one's commitment to self-tracking. Other factors, such as motivation for self-tracking, may have a stronger influence on the perceived enjoyment of physical activity. Understanding how different types of motivation (intrinsic vs extrinsic) influence individuals' experiences would be interesting to measure to gain valuable insights into why some users may derive more enjoyment from self-tracking than others.

Commitment to self-tracking is a relatively new construct, and the C2ST scale has been recently developed. By incorporating this scale, the study expands the theoretical understanding of self-tracking by examining the moderating role of commitment in the relationship between the longevity of self-tracking and the perceived enjoyment of physical activity. This contributes to the growing body of research exploring the complexity of self-tracking behaviour. The C2ST provides a deeper understanding of how users behave in relation to their self-tracking device and how it is integrated and internalised into their lives. Although it does not serve as a moderating variable

between the longevity of self-tracking and enjoyment of physical activity, the findings suggest that commitment to self-tracking plays a role in shaping individuals' experiences and perceptions of enjoyment. The study emphasises the importance of considering how users interact with their devices to understand the perceived enjoyment while self-tracking.

Practical implications

Based on the findings from this study, some practical implications can be inferred. Self-trackers are valuable tools to promote healthy lifestyles and increase activity levels. The current study suggests that long-term self-tracking should not necessarily be detrimental to the enjoyment of physical activity. Therefore, encouraging the use of self-tracking devices, particularly for long-term tracking, can be beneficial. This can be achieved through providing support and resources for users to enhance their self-tracking experience. Emphasising the potential long-term benefits and highlighting the positive impact on one's activity levels and health may motivate users to sustain their self-tracking practices.

The study underscores the value of encouraging commitment among those participating in self-tracking activities. By considering the commitment-related elements, such as goal-setting, data sharing, online competition, and community interaction, practitioners and developers can design interventions that enhance user engagement, motivation, and enjoyment. This, in turn, motivates users to have a more rewarding and enduring self-tracking experience in order to improve their well-being and achieve their health and activity goals. However, smartwatches should be designed to give users a sense of achievement while exercising. Smartwatches should boost users' feelings of accomplishment that they even engage in an activity by integrating signals during the workout that give them a sense of fulfilment. By providing a message during the exercise, the emphasis is on the activity itself, which may prevent those overly devoted to self-tracking and its quantitative part from perceiving it negatively when they fail to meet a goal.

Limitations and future work

Due to time constraints, it was not possible to conduct the survey with a large number of people. The small sample size of the current study limits the reliability, generalizability and ability to identify small effects. In addition, convenience sampling was used to recruit participants. This is a

limitation in the current study as it calls into question the sample's representativeness and restricts the generalizability of the findings to a larger population.

Furthermore, the open question regarding the goalsetting was coded by only one coder. This increased the likelihood of a subjective interpretation and biases. Therefore, the reliability should be questioned.

In the current study, participants who had only recently started using a self-monitoring device were contrasted with those who had been using it longer. Compared to this online study design, a longitudinal study would allow us to understand the experiences of long-term self-tracking use better. Users' experiences with a self-tracking device can be measured through a longitudinal study from when they first use it to when they have been using it for a longer period. The influence on enjoyment can be measured better and more thoroughly by comparing their short-term experiences to those individuals' longer-term experiences. The perception of the novelty effect of self-tracking and its impact on the enjoyment of physical activity varies among users, along with the user's commitment to self-tracking and how it evolves over time, and its impact on the perceived enjoyment also varies among users. Therefore, future studies could consider longitudinal designs to assess changes in commitment to self-tracking and enjoyment over an extended period. While conducting this longitudinal study, it might also be interesting to investigate the potential moderating role of people's motivation towards self-tracking and physical activity. Shin et al. (2019) argued that intrinsic motivation for physical activity, as opposed to extrinsic motivation, is an essential determinant of why people continue using a self-tracking device and keep engaging in physical activity. This may influence the perceived enjoyment for people with a longer duration of use.

Furthermore, the current study used a survey in which participants had to think about their last physical activity and reflect on that by indicating their perceived enjoyment. Self-reports were used to measure the perceived enjoyment of the physical activity and the user's commitment to self-tracking. The data might be biased due to false answers or unintentional mistakes, which could compromise the validity and reliability of the data obtained.

In addition, the participants might not always be able to recall past events or their feelings at specific moments. When completing the survey, The participants may have been unconsciously

affected by factors such as their environment and mood. It is suggested to investigate the effect of duration of use on enjoyment by conducting interviews. By doing so, more in-depth information can be gathered about the experiences and feelings of the participants about the physical activity.

Conclusion

There is ample evidence that self-tracking motivates people to change their lifestyle by exercising more. However, recent studies also showed that enjoyment decreases over time due to its focus on performance. In this study, this effect was investigated. These results imply that regardless of how long people have been using self-tracking devices, there were no differences in the perceived enjoyment levels. The study also showed that one's commitment to self-tracking does not determine the strength of this relationship. However, the study did show that one's commitment to self-tracking is related to overall exercise enjoyment. Increased levels of self-tracking integration into people's life contribute to higher perceived enjoyment of exercising while self-tracking.

Self-tracking encourages active lifestyles, which is beneficial considering the physiological and psychological advantages of exercising. Self-tracking allows individuals to understand their physical activities better and, as a result, enhances their activity levels. Incorporating self-tracking into daily routines can enhance the overall enjoyment of physical activity, also when self-tracking in the long term. Hence, it is suggested that self-tracking provides opportunities to live a healthier lifestyle while also making this healthy lifestyle more enjoyable.

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Appendix A

Introduction

Welcome, and thank you for participating in this study.

An increasing number of people are using self-tracking devices in the form of smartwatches to monitor various aspects of our lives, such as fitness, nutrition, sleep, and mood. The purpose of this survey is to understand more about your self-tracking behaviour. By gathering your experiences, I hope to gain a better understanding of how people engage in self-tracking and the impact it has on their lives.

Duration of the study

You will be asked to fill in a questionnaire that contains eleven questions. The study will take approximately 7 minutes to complete.

Participation in the study

Your participation is completely voluntary. You have the ability to decline to participate at any time and to skip any question you do not feel comfortable answering without providing a reason. There will be no consequences for declining or withdrawing.

Data use

The responses to the survey will be stored for at least 10 years and may be made available to other researchers. All the information collected in this study will be kept anonymous and confidential.

Ethical approval

This study was approved by the Ethical Review Board of the School of Humanities and Digital Sciences of Tilburg University.

If you have any questions about this study, please feel free to contact the researchers: Leanne Scherff (l.c.scherff@tilburguniversity.edu).

Agreement

By continuing with the questionnaire, you agree that you have read and understood this consent form.

You know that your participation is completely voluntary, and you agree to participate. As a participant, you have the right to decline to answer any questions/items or to quit at any moment for any reason. If you do not agree, please close this window.

- I agree → questionnaire starts
- I don't agree → redirected to the end of the questionnaire.

Appendix B

Message used in survey

“People often set goals with their self-tracking device to keep themselves motivated to be physically active. One such goal could be reaching 10,000 steps per day”.

“Take a moment and deeply imagine the last time you reached your self-tracking goal. Vividly visualise yourself doing the physical activity to reach your goal. Bring the experience of the physical activity to life by imagining what you felt during the activity”.

“Please have this in mind while answering the following questions about the physical activity you were doing”.

Appendix C

Survey

- **Inclusion criteria**
 - **How long have you been using your self-tracker?**
 - 1-3 months
 - 4-6 months
 - 7 months-2 years
 - 2 years and longer
 - **What do you monitor (Ajana, 2020):**
 - Steps taken
 - Calories burnt
 - Distance
 - Speed
 - Heart rate
 - Hours slept
 - Food intake
 - Other, please specify ...

- **Enjoyment of the physical activity**
 - **Please rate how you felt at the moment about the physical activity.**
When you were active. . .
 1. I enjoyed it $\leftarrow$ 1-7 $\rightarrow$ I hated it *
 2. I felt bored $\leftarrow$ 1-7 $\rightarrow$ I felt interested
 3. I disliked it $\leftarrow$ 1-7 $\rightarrow$ I liked it
 4. I found it pleasurable $\leftarrow$ 1-7 $\rightarrow$ I found it unpleasurable *
 5. It was no fun at all $\leftarrow$ 1-7 $\rightarrow$ It was a lot of fun
 6. I found it energising $\leftarrow$ 1-7 $\rightarrow$ I found it tiring *
 7. It made me depressed $\leftarrow$ 1-7 $\rightarrow$ It made me happy

8. It was very pleasant $\leftarrow$ 1-7 $\rightarrow$ It was very unpleasant *
9. I felt good physically while doing it $\leftarrow$ 1-7 $\rightarrow$ I felt bad physically while doing it *
10. I was very frustrated by it $\leftarrow$ 1-7 $\rightarrow$ I was not at all frustrated by it
11. It was very gratifying $\leftarrow$ 1-7 $\rightarrow$ It was not at all gratifying *
12. It was very exciting $\leftarrow$ 1-7 $\rightarrow$. It was not at all exciting *
13. It was not at all stimulating $\leftarrow$ 1-7 $\rightarrow$ It was very stimulating
14. It gave me a strong sense of accomplishment $\leftarrow$ 1-7 $\rightarrow$ It did not give me any sense of accomplishment at all *
15. It was very refreshing $\leftarrow$ 1-7 $\rightarrow$ It was not at all refreshing *
16. I felt as though I would rather be doing something else $\leftarrow$ 1-7 $\rightarrow$ I felt as though there was nothing else I would rather be doing

*Items need to be reverse-scored.

Physical Activity Enjoyment Scale PACES (Kendzierski & DeCarlo, 1991)

- **Open question**

- **What was the goal you reached by doing the physical activity that day?**
 - Open question:

- **Commitment to Self-Track scale (C2ST)**

- 7-point Likert-type response scale, labelled from strongly disagree (1) to strongly agree (7).
 1. If I forget my device at home, I would go back to get it.
 2. I sleep with my device on.
 3. I make extra effort to reach my goal
 4. I share my data with others.
 5. I spread the idea of self-tracking.
 6. I recommend self-tracking to others.

7. I run an analysis of my tracked behaviour (e.g., plot my running speed).
8. I am willing to pay extra for a “good quality” tracker.
9. I interact with a self-tracking community.
10. If someone beats me (in an online competition), I try to conquer my position again.
11. I purchase accessories for my tracker.
12. I update my pre-determined goals whenever required.

- **Type of self-tracker**

- **What type of self-tracker do you use?**

- Apple Watch
 - Garmin
 - Fitbit
 - Samsung
 - Polar
 - Other, please specify

- **Demographic questions:**

- What is your age:
 - Open question
 - What is your gender:
 - Male
 - Female
 - Non-binary / third gender
 - I prefer not to say
 - What is your highest level of education
 - High school
 - Mbo

- HBO
- Wo

Appendix D

Table D1

Coding scheme without duration of use

Main theme	Subtheme	Examples
Performance goal (focused on specific, measurable outcomes)	Quantitative targets	• Burning a specific number of calories (e.g., 550 calories, 1000 calories) • Achieving a certain number of steps (e.g., 10,000 steps, 15,000 steps) • Reaching a predetermined distance (e.g., 10 km run, 100 km cycling)
	Time for physical activity	• Exercising for a specific duration (e.g., 1 hour, 45 minutes) • Meeting self-imposed time for PA (e.g., 60 minutes of activity)
Mastery goal (focused on progress and skill development)	Progress	• Improving overall fitness level • Maintaining condition • Progressing and advancing in physical abilities • Pushing physical limits • Functional strength exercises • Walking many km and making progress at physio
	Focused on feelings/well-being	• Feeling re-energized • Feel active • Reducing stress
	Body	• Losing weight • Getting in shape
	Mastery / performance (based on certain outcomes without specific mentioned measures)	• Burning calories • Burning enough calories • Running a certain distance

Table D2*Coding scheme with duration of use*

Duration of use	Theme	Subtheme	Examples
1-3 months	Performance	Calorie burn	• 400 kcal • 500 kcal • 550 kcal • 600 kcal • 1000 kcal
		Steps	• 8000 steps • 10000 steps (6x)
		Time for physical activity	• 25 minutes • 60 minutes (4x)
	Mastery	Progress	• Walk a lot of kilometres and book progress at physio • Functional strength exercises • Pushing physical limits • Reducing stress
		Performance-related without a specific goal	• PA until desired calories are burned • Burning enough calories
4-6 months	Performance	Calorie burn	• 490 kcal • 750 kcal • 850 kcal
		Steps	• 6000 steps • 8000 steps (2x) • 9000 steps • 10.000 steps (3x)
		Time for physical activity	• 60 minutes • 90 minutes • 3 hours (cycling)
		Distance	• 16 km (run) • 20 km (walking) • 50 km (bike)
	Mastery	Progress	• Feel active
		Performance-related without a specific goal	• Burning calories (2x) • Weekly Intensity Workout Minutes
7 months – 2 years	Performance	Calorie burn	• 550 kcal • 1000 kcal (3x) • 3500 kcal
		Steps	• 6000 steps • 7500 steps • 10.000 steps (7x) • 20.000 steps
		Distance	• 10 km (run) • 41 km (walking per month) • Running certain distance
		Time for physical activity	• 45 minutes
	Mastery	Progress	• Getting in shape
		Performance-related without a specific goal	• Suggested workout
2 years and longer	Performance	Calorie burn	• 500 kcal • 1500 kcal • 2000 kcal

			• 2500 kcal (2x)
		Steps	• 10.000 steps • 12.000 steps • 15.000 steps • 20.000 steps
		Distance	• Half a marathon • 10 km (run) • 13 km hiking • 75 km (cycling) • 100 km (trail run) • 150 km (cycling)
		Time for physical activity	• 45 minutes
	Mastery	Progress	• Losing weight • Maintaining condition
		Performance-related without a specific goal	• 100% activity based on current activity level • Burning calories