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## Healthier Life and More Fun? Users' Motivations to Apply Activity Tracking Technology and the Impact of Gamification

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**Abstract.** As being fit and physically more active has become more important in today's society many people start to use fitness trackers to achieve this goal. To find out if fitness trackers and their gamification elements (here, challenges and achievements) motivate users to be more physically active, a survey was conducted. The survey builds on the *Uses and Gratifications Theory*, the *Self-Determination Theory*, and on information gathered during interviews with users of fitness trackers. The investigation contains 689 adequately filled-out online surveys. The participants are looking for information and were intrinsically as well as extrinsically motivated. 61% of all 689 participants take part in competitions and 89% of them recognize achievements. The results show that users apply fitness trackers to get information. The investigation shows that the integrated gamification elements do not only support people to be more physically active but are rewarding them as well.

**Keywords:** Gamification · Activity tracking technology · Self-Determination Theory · Uses and Gratifications Theory · Motivation

### 1 Introduction

Today, being fit and active is a goal many people want to reach. Especially, since according to the World Health Organization (WHO) [1], the obesity of people has reached epidemic proportions. People who are obese or overweight have a major risk of getting chronic diseases like type 2 diabetes, a stroke or cardiovascular disease. More and more people are trying to live a healthier way of life by doing regular sports and exercises. The internet as well as social media is helping the being-fit movement, be it through users who share their daily run in Facebook groups or getting the best yoga shots with many likes on Instagram. Fitness trackers give visual feedback through corresponding applications and are equipped with gamification elements to motivate the users to achieve their goal.

Ilhan and Fietkiewicz investigated ten activity tracking technology brands considering the integrated game mechanics (e.g., challenges, points, leaderboards, badges, and so on). The investigation linked to different theories, Flow-Theory, Goal

Orientation Theory, and the Self-Determination Theory to understand the effectiveness and usefulness of different game mechanics [2].

Buchem et al. [3] investigated how gamification elements will help and support elderly people to improve their physical activity. They implemented a project called fMOOC (fitness Massive Online Learning Course) equipped with the use of fitness trackers and integrated gamification elements. Participants enjoyed the gamification elements and as a result, it supported them to be more physically active.

Considering the fact that gamification should motivate users to reach a desired behavior or change a behavior, could people be dependent on gamification elements integrated into activity tracking technologies? Do users lose motivation if those elements would not exist anymore? The results of one research showed that the motivation for physical activity decreased in situations where the fitness tracker was not available, especially for users who were highly extrinsically motivated [4].

Fitness tracker applications are equipped with behavior change techniques. Middelweerd et al. [5] found out that most apps had at last five behavior change techniques. The most common were self-surveillance, setting goals, and getting feedback.

Apart from investigations on activity tracking technologies considering gamification and motivation, research about activity tracking technologies, for example, accuracy [e.g., 7, 8], acceptance, perceived service quality, usage, and impact [e.g., 6, 9, 10], sprouted.

But to our knowledge, research concentrating on activity tracking technology and using the Self-Determination Theory (SDT), Uses and Gratifications Theory (U&GT), and consideration of challenges and achievements to investigate users' motivation and their impact is not investigated yet. To offer new and further insights in this research area, first semi-structured interviews with users of fitness trackers were made to find out why people use fitness trackers. The SDT and the U&GT is applied to understand the needs of users and their motivation. The U&GT is known as the theory to understand why people use a specific medium. Here, it is used to understand first, why people use activity tracking technologies, and second, what gratifications they are searching for and obtaining. The SDT is used to be able to understand if the use of those technologies is caused through intrinsic or extrinsic motivation. Further, apart from these two theories, the reaction-based device functionalities, such as the daily goal or the feedback function are considered as well. At latest, the gamification elements challenges and achievements are part of this research as well.

First of all, the paper will give an overview of the applied theories. Subsequently, methods, including interviews, construction and distribution of the survey, data preparation, and used measurement are presented. The research questions are answered in the result section, followed by a discussion.

## **2 Theoretical Background**

### **2.1 Gamification**

According to Deterding et al. [11], Gamification describes the use of game elements in a non-game context. Gamification has not ultimately one definition. For example,

Huotari and Hamari [12, p. 19] mentioned that gamification refers “to a process of enhancing a service with affordances for gameful experiences.” Further, they explain that gamification aims to improve motivation and the engagement. Seaborn and Fels [13, p. 14] describe gamification as a possibility to “motivate and engage end-users through the use of game elements and mechanics.” Further, gamification is not only used to motivate users to engage in desired behavior, but also to help to change a behavior or even increase the loyalty to a brand [14, 15].

Furthermore, Huotari and Hamari [12, p. 19] explain that there does not exist one “clearly defined set of game elements.” But, the use of game design elements is beneficial as it motivates users [11]. Game elements are here, as the name suggests, elements that are commonly used in games (e.g., achievements, points, leaderboards, and so on). Hunnicke et al. [16] explain with their MDA framework (mechanics, dynamics and aesthetics) that mechanics can trigger different dynamics. Mechanics like challenges trigger dynamics like competitions where users want to beat others, compare themselves and want to win. Blohm and Leimeister [17] confirm as well that game mechanics trigger game dynamics and show their correlations, for example, rankings create a game dynamic of competition.

Activity tracking technologies are usually equipped with some of those game elements. Ilhan and Fietkiewicz [2] found out considering the 12 investigated activity tracking applications that, documentation, avatars, time pressure, clear goals, badges, and community features were integrated at less to 50% [2]. Their investigations include, besides those game elements (mechanics) that achievements (here, badges) can be shared with other users and that challenges could be included to compete against others or oneself. Challenges come with a leaderboard, showing the users how many steps they took but also how many steps other users took. Challenges could be characterized as a five-day step challenge (Fitbit) or as a monthly challenge (Samsung Health) to rank users according to their counted steps. It depends on the activity tracking application. Time constraints are also integrated in activity tracking technology. The user can set their own daily step goal which has to be completed during a day. Some fitness trackers also include levels and points that can be gained by fulfilling various tasks such as reaching your daily step goal for 3 days [2].

All those gamification elements (here, mechanics) are made to motivate the user to engage with the activity tracking technologies and not only to support the engagement with using a service but as well to support the reach of a desired behavior, here to be physically more active. Those gamification mechanics can be motivating. But apart from concretely integrated game mechanics, here challenges and achievements, there are reaction-device based motivation aspects, which belongs here to the gamification elements, as well. These include the daily step goal and the feedback to be more active. Considering the aim of using gamification elements, to motivate users of services, here to be more physically active, the following research questions arises:

RQ1a: Do the reaction-based device functionalities motivate users to be physically active?

RQ1b: Do the gamification elements (challenges and achievements) motivate users to be physically active?

But apart from concretely integrated game elements, people might be intrinsically or extrinsically motivated while doing something in their everyday life (including, school, work, leisure time, and so on).

## 2.2 Self-Determination Theory (SDT)

The SDT, developed by Richard M. Ryan and Edward L. Deci and starting in the 1970s, is based on human motivation. It evolved from studies that researched effects of extrinsic rewards on intrinsic motivation [18].

Intrinsic motivation occurs regardless of extrinsic rewards or external reasons (e.g., friends, family members, work environment). Doing something for fun is defined as being intrinsically motivated [19]. The intrinsic motivation is the person's own motivation, the task-orientated motivation. There are different reasons to be intrinsically motivated: the fun of the task itself, to try something new, curiosity, and to accomplish something [20].

The extrinsic motivation is divided into four categories from the least autonomous to very autonomous [20]. The four extrinsic sub-forms of regulations are "external regulation," "introjection," "identification," and "integration." Considering the external regulation, people would use the fitness tracker in order to get rewards. Introjected regulation means here the use of a fitness tracker to show others how much physically active they were during the day. Apart from that, identified regulation means users who identify the importance of the task. For example, a user identifies with the importance of being fit and, therefore, uses the fitness tracker to achieve this goal. Lastly, integrated regulation is reflected in cases where a user has completely accepted the fitness tracker and its value [20].

Apart from intrinsic and extrinsic motivation, there is amotivation [20]. Amotivation is defined as being not motivated at all to act and do something [20]. It happens, when there is no value in the activity or task [21], the feeling of not being competent enough to fulfil the activity or task [22] as well as the expectation that doing the task will not yield the desired outcome [23].

Therefore, with using the SDT, it is possible not only to understand why specific decision or behaviors are triggered, but also to explain their background. This led to the second research question:

RQ2: Are users intrinsically or extrinsically motivated to use a fitness tracker?

Apart from researching the motivational nature and the impact of gamification, users might have other reasons as to why they are using their activity tracking technologies as well.

## 2.3 Uses and Gratifications Theory (U&GT)

The U&GT is an approach to understand why people use a specific medium, what gratifications attract them, if they obtained them, and what kind of content satisfies their social and psychological needs [24]. It is distinguished not only between gratification sought and gratification obtained, but also their correlation. The sought gratification might be completely different from the obtained gratification [25]. If a user joins a

Facebook group for gathering information as a gratification, the user might obtain social interaction as a gratification as well [26]. Ilhan [27] found out that users of activity tracker or fitness-related Facebook groups seek mainly information and obtain information while using them, but they also tend to have fun while using those Facebook groups. Considering the U&GT, there are four basic gratifications noticeable: information, socialization, self-presentation (self-status seeking) and entertainment [26, 28–31].

The four basic gratifications are used to analyze the motivation as to why users use activity tracking technologies. For example, an activity tracker offers a lot of information: How many steps a user took, how many active minutes the user had during a day, how many calories were burned, and so on. To learn this information can cause the use of activity trackers. Using a fitness tracker to socialize, can work either through the integrated functionalities (e.g., groups, challenges) or through doing sports together supported through the use of fitness trackers. Through the fitness application of the activity trackers, people can share their achievements, experience, and even join challenges against each other. Using a fitness tracker might evoke fun and might therefore be used for entertainment. Eventually, the use of fitness tracker for self-status seeking (self-presentation) is caused by the motivation to share and show others how many steps a user has been taking during a day or to use an expensive fitness tracker as a status symbol. Therefore, the paper will answer the last research question:

RQ3: Which gratifications do the users seek and obtain while using a fitness tracker?

### **3 Methods**

#### **3.1 Interviews**

First, six semi-structured interviews [32] with friends as well as members of the Department of Information Science at the Heinrich Heine University of Düsseldorf, Germany were conducted which took place in October and November 2017. An interview took about 30 minutes. All six interviewees were using fitness trackers. This preliminary study not only enabled gaining more insight into the use and motivation of fitness trackers but helped with setting up the survey as well. The participants were asked questions about their fitness tracker, their behavior, as well as the impact (motivation) to be more physically active. The interviews were not recorded, instead notes were taken.

#### **3.2 Survey**

The survey was first pretested by colleagues at the Department of Information Science at the Heinrich Heine University of Düsseldorf, Germany. The survey was spread to and through colleagues/friends and through social media platforms like fitness forums, Facebook, Twitter, Reddit, and Xing. The sampling of the survey was non-probabilistic and the survey was available in English. The survey was anonymous and no contest or

prize money were offered to the participants. The survey is characterized through two main parts.

The survey starts with questions about the sociodemographic data. The participant answers questions about gender, age (nonobligatory), country and which fitness tracker is used.

After the first part, the first four statements asked for the gratifications sought, followed by further four statements for gratifications obtained. The next part of the survey contained statements about the SDT. The first three statements asked about the intrinsic motivation, followed by four questions about the sub-forms of the extrinsic motivation. The reaction-based device motivation has eight statements in total. Those statements are based on the outcomes of the conducted interviews. The gamification elements challenges and achievements had each their own statements. The gamification element challenge contains nine statements, and achievements by four. Before participants had the possibility to evaluate those statements, conditional questions, here “Do you recognize achievements?” and “Do you take part in challenges?” precede. Especially for the case that participants do not take part in challenges, three statements based on the amotivation of SDT were included as well. Based on the interviews, it was obvious that users either recognize achievements or do not notice at all that they exist. All these statements, except the “yes/no” questions, are equipped with a seven-point Likert scale from 1 “Strongly Disagree” to 7 “Strongly Agree.” Participants have the possibility to choose the option ‘prefer not to answer’ as well.

### **3.3 Data Preparation and Analysis**

The data included 942 filled out (non-completed and completed) surveys. After cleaning the data, 253 surveys were removed. Those cases were participants who did not fill out the survey to the end ( $N = 229$ ). Further, as this study concentrates on activity tracking technology users, participants who mentioned not to use fitness trackers were removed as well ( $N = 8$ ). Another participant was removed due to the low age of 7 and 16 participants, who do not specify their age ( $N = 15$ ). All in all, there were 689 adequate responses. The data is not normally distributed. The statements equipped with a Likert scale were not interval scaled. Therefore the data will be considered as ordinal. Instead of the mean, the median had to be used while analyzing the data. From the 689 participants, 73.9% were female, 25.4% were male and 0.7% preferred not to say. Most participants of the survey came from the USA (40.5%) and Germany (30.5%). The three most-used fitness trackers were Fitbit (39%), Garmin (27.3%) and Apple Watch (10.9%). The age ranges from 9 to 72 years.

## **4 Results**

### **4.1 Do the Reaction-Based Device Functionalities Motivate Users to Be Physically Active? (RQ1a)**

Figure 1 shows the results of the reaction-based device motivation. With the first statement, if users are motivated when the fitness tracker tells them to be active, the users somewhat agreed (median: 5).

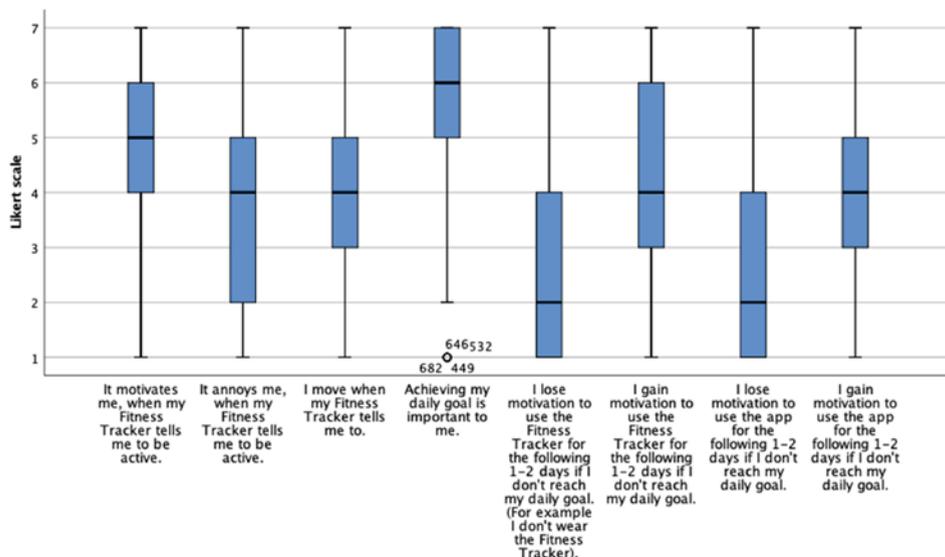


Fig. 1. Reaction-based device motivation (N = 673; excluded cases listwise).

The participants of the survey neither agree nor disagree with the statement that it annoys them when the fitness tracker tells them to be active (median: 4). Although users are motivated when the fitness tracker tells them to be more physically active, they neither agree nor disagree to moving (median: 4). It is important to reach the daily goal (median: 6), but if the goal is not reached, users do not lose motivation to use the fitness tracker (median: 2) or the app (median: 2). Users are not getting more or less motivated to use the fitness tracker when they did not reach their daily goal (median: 4) and the app (median: 4).

#### 4.2 Do the Gamification Elements (Challenges and Achievements) Motivate Users to Be Physically Active? (RQ1b)

61% of all participants do take part in challenges while 39% of them do not. Figure 2 shows the impact of challenges while using activity tracking technologies. Users agree to being more physically active (median: 6) when taking part in a challenge and to enjoying it (median: 6). Participants are neutral (neither agree nor disagree) about feeling pressured when taking part in a challenge (median: 4) but they somewhat agree to directing their behavior towards winning a challenge (median: 5). Participants do not lose motivation to use the fitness tracker (median: 1) or to take part in the next challenge (median: 1) after losing a challenge. The users strongly agreed to not losing interest in taking part in the next challenge after they won the last one (median: 1). Interestingly, after winning a challenge, users are much more certain to take part in the next challenge for sure (median: 6) than after losing (median: 5).

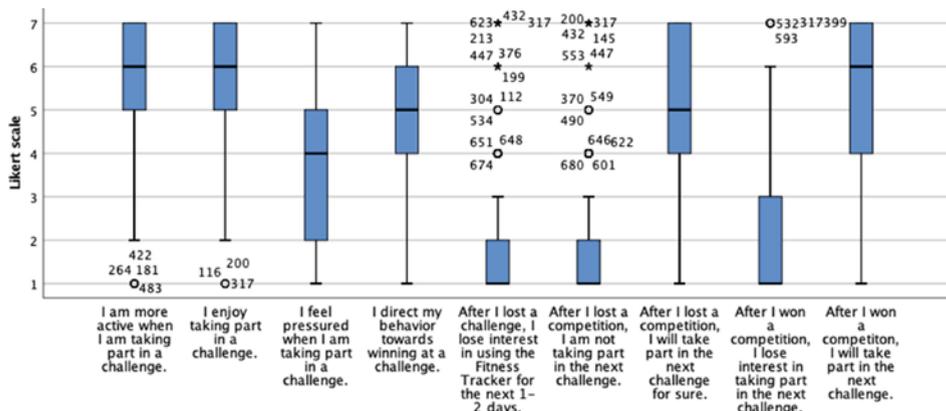


Fig. 2. Impact of challenges/competitions (N = 413; excluded cases listwise).

89% of the participants did recognize achievements and answered the statements about achievements. Figure 3 shows that users feel rewarded when they get achievements (median: 6) and enjoy it (median: 6). The participants of the survey also agreed to changing their behavior towards obtaining achievements (median: 5). Lastly, users do not compare each other based on achievements (median: 3).

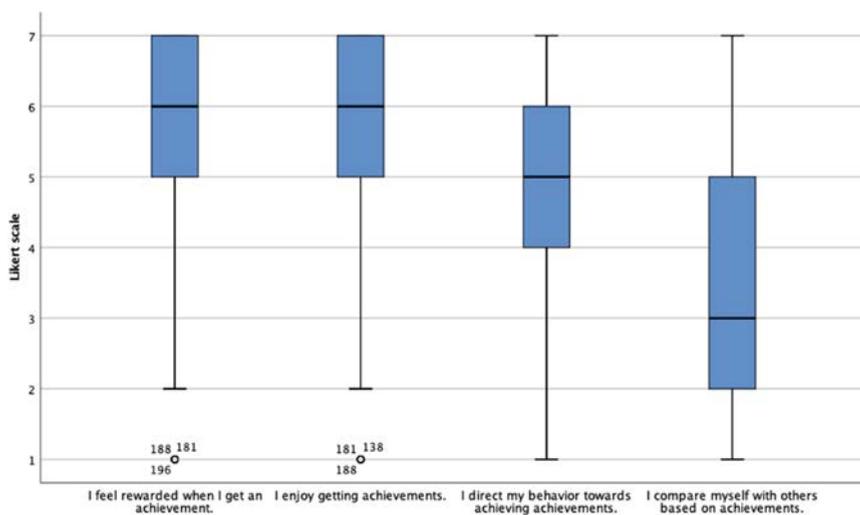


Fig. 3. Impact of achievements (N = 602; excluded cases listwise).

### 4.3 Are Users Intrinsically or Extrinsically Motivated to Use a Fitness Tracker? (RQ2)

The motivation to use fitness trackers can be extrinsic or intrinsic (Fig. 4). Users are intrinsically motivated to use fitness trackers, because they use them for fun (median: 6), to accomplish something (median: 6) and to learn something new (median: 5). The

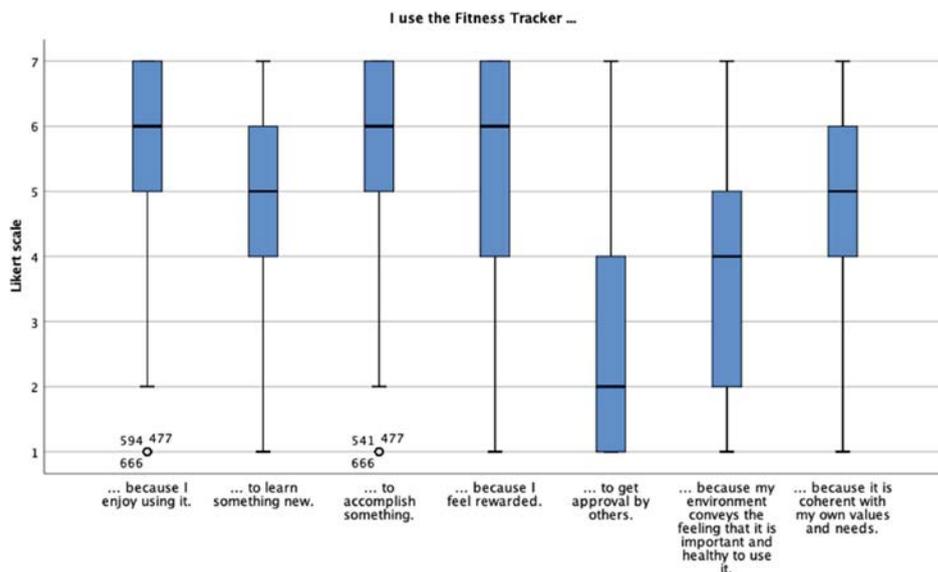


Fig. 4. Self-determination (N = 675; excluded cases listwise).

next four statements represent the extrinsic motivation. Many users agreed with the statement “I use the fitness tracker because it is coherent with my own values and needs” (integrated regulation, median: 5). The median for identification, “I use the fitness tracker because my environment conveys the feeling that it is important and healthy to use it”, is neutral (median: 4). Many users disagreed to using the fitness tracker to get approval by others (introjected regulation, median: 2). Interestingly, although users are highly intrinsically motivated, they are also highly extrinsically motivated. The participants of the survey agreed with external regulation, “I use the fitness tracker because I feel rewarded” (median: 6).

#### 4.4 Which Gratifications Do the Users Seek and Obtain While Using a Fitness Tracker? (RQ3)

The results represented in Fig. 5 show that users are seeking information (median: 7). Most users were not looking for social contacts (socialization) and entertainment, because they disagreed with those statements (median: 2). They somewhat disagree that they use the fitness tracker because they want to present themselves (median: 3). Users are not only seeking but also obtaining information (median: 7). Social contacts are both not sought and not obtained (median: 2). Entertainment and self-presentation are, as mentioned above, not sought much but still, users obtain some of it on a low level (median: 3).

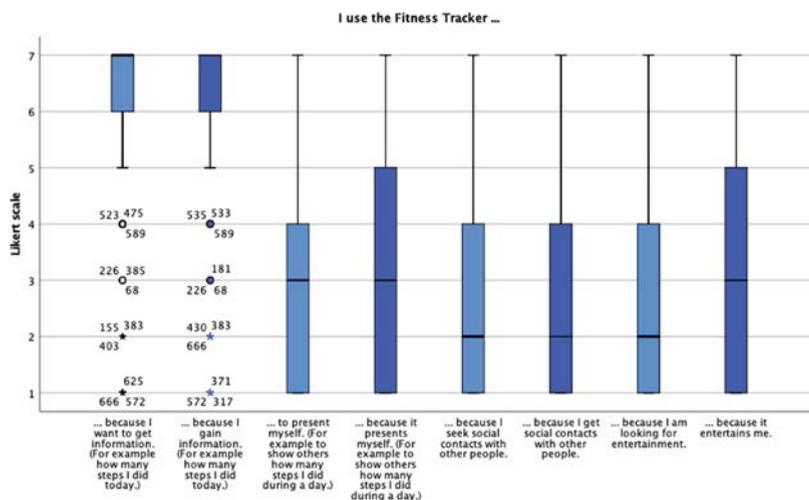


Fig. 5. Gratifications sought and obtained (N = 674; excluded cases listwise).

## 5. Discussion

The purpose of this investigation was to understand whether or not gamification elements on fitness trackers foster use, if users are intrinsically or extrinsically motivated, and what gratifications the users of fitness trackers are looking for and which they are obtaining.

The investigation confirms that it is important to reach the daily goal. Especially, users feel motivated when the fitness tracker reminds them to be active, but this does not mean that they move when the fitness tracker tells them to. From the interviews that were made before the survey, the participants told that when the fitness tracker tells them to be active, they only move when it is appropriate. For example, they do not get up and start moving around when they are in a meeting, but they mostly do so when this happens during their break. The participants agreed that, although achieving the daily goal is important, they did not lose motivation to try it again the next day when they did not manage it. From the interview, when the daily goal is close to being reached, the user needs less than 500 steps to reach the goal, most users still get up in the evening and do the last steps to finish the goal. In the case where, for example, still 2,000 and more steps are needed to reach the daily goal the user usually just relaxes in the evening.

This study concentrated on two gamification elements. The gamification mechanics achievements and challenges were looked at separated from the reaction-based device motivation. Users notice challenges, make use of them, and enjoy them. This can help with being and staying motivated to be more physically active. Therefore, competitions do foster motivation and the use of activity trackers. The users agree that they will take part in the next challenge no matter whether they won or lost the last one, although they are a little more motivated to join the next challenge if they won. Users who are joining a challenge could be as a result more physically active because they might feel motivated to walk more to beat other users who are on the first ranks. The motivation to join a challenge is the same as to reach the daily goal. Users do more sports and are

more physically active when they are challenging others. Users notice that other users might have more steps and they might try to compete with that person and catch up. In the interviews, some participants mentioned they do the same and nearly all participants in the interviews who do challenges agreed that being the last is the worst. It can be assumed that many people are more physically active because nobody wants to be the last on the leaderboard. This can also lead to feeling pressured.

The SDT was used to find out what motivates users to use the fitness tracker and if the behavior is caused by extrinsic or intrinsic motivation. As shown in the results, users of fitness trackers are both intrinsically and extrinsically motivated. For users, it is important to accomplish something and to have fun, which are both intrinsic motivations. Apart from that, users like to receive rewards, which is a highly extrinsic motivation. Rewards are, for example, reaching a daily goal or getting an achievement. When users get an achievement, they feel motivated and rewarded.

This research focuses on which gratifications (socialization, entertainment, self-presentation, and information) users are looking for and which they are obtaining. The results show that users of fitness trackers are looking mainly for information. This can explain why people bought a fitness tracker. They are looking for information which supports the goal to be more physically active. Information is not only sought but also obtained by the users. Fitness trackers show amongst other things how many steps a user takes during a day. This helps to walk more or to develop an awareness of one's physical activity level.

Lastly, achievements motivate users as well. Users enjoy getting achievements and directing their behavior towards getting them. Users like to receive rewards and enjoy the feeling of getting the rewards based on achievements but they do not compare themselves to others based on achievements. This means users see achievements as something personal that is for themselves, as a personal reward.

The study showed that the motivation of users to use fitness trackers is both extrinsic and intrinsic. Users are seeking and obtaining information as a gratification. They want to know how many steps they take and how physically active they are. Competitions, achievements and the reaction-based device functionalities do foster use of activity trackers and their applications. The users stated that they enjoyed these elements and they helped them to be more active.

Our study did a successful step in the research of the motivation for the use of fitness trackers. The study has of course the limitation that the results only show a selection from all users of fitness trackers.

Future work should investigate if the motivation of users from fitness trackers starts to decrease over time. Do different fitness trackers motivate differently? Further, are there differences in the use of the fitness trackers and the gamification elements considering different generations and genders? Last but not least, it can also be researched if there are differences between users from different countries.

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