"Who cares about fireworks?" – A Study on Digital Coaching, Gamification and Exercise Motivation

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Abstract

Digital coaching systems offer users support in their physical training through insights and advice based on the individual's activity data. Often these systems utilize gamification mechanisms to motivate users. In this study we conduct interviews with digital coaching users to understand how digital coaching systems are used to motivate physical activity, what kind of a role gamification plays, and how digital coaching systems should be developed further to better motivate users. We find that data itself is more motivating than gamification mechanisms, that players use data to play their own, internal games; and that data is also used for social purposes. We find that the benefits from digital coaches today are limited and mainly related to accurate exercise tracking and visualization of user data. Gamified elements are used on a low level and not perceived as value-adding by the users; deeper understanding of motivation theory and promoting intrinsic motivation is needed.

Keywords: Coaching, Gamification, Digital coaching, Physical training, Wellness intervention, Self-determination theory

1. Introduction and background

They ran together as a part of their physical training program. Both of them used their sport watches to collect data about the training. After running for a while, her watch vibrated, and the digital coach sent a firework display on the watch screen. So boring! she thought. The same thing every time, why is such garbage built in? Almost at the same time his watch vibrated, and the digital coach gave him thumbs up. Great, a confirmation that I am on the right track. It gives me strength to continue my training. Thanks coach! This story shows that two people react differently to the digital coach's reward. In this study we explore how users are motivated – or not motivated – in their exercise habits by digital coaching systems and their gamification mechanisms.

Coaching has typically been the domain of personal trainers, but digital coaches are expanding the picture. With digital coaching we refer to software solutions that supply the user with insight and advice based on the user's individual data, in line with [1], distinguishing it from solutions offering only tracking or visualization of activities. Digital coaches differ from human coaches in their ability to tirelessly and accurately record and display exercise. Digital coaching can also supplement face-to-face coaching in a meaningful way: the digital coach can support with reminders, goal adherence and goal setting between face-to-face sessions with a human coach. Typically, the goal of any type of coaching is behavior change [43]. Kari and Rinne [31] suggest that digital coaching might enable users to be more goal-oriented than when using tracking software, and thus better able to achieve desired outcomes. Many current solutions for digital coaching also include elements of gamification, with the purpose to further engage and motivate the user [33].

Gamification is defined as using game thinking and its fundamental mechanics in non-game contexts [e.g. 16, 60]. Its central features lie in its ability to motivate and engage people in conducting desired behaviors. More specifically, organizations, firms or/and institutions that wish to change peoples' cognition, emotion and behaviors, have to engage and motivate a change [51]. It is common to employ measures that facilitate extrinsic motivation, such as money or other resources, but it has been shown that intrinsic rewards are better than extrinsic in motivating and engaging people [12, 39]. Examples of extrinsic rewards are badges, awards and money. Intrinsic rewards are rewards that are non-physical and emotionally connected, such as choice, progress or self-development, which facilitate intrinsic motivation. Intrinsic rewards can be perceived as a situation, opportunity or facilitator for enabling the intrinsic motivation as portrayed in Self-Determination-Theory (SDT).

In literature, gamification consists of several elements that constitute the action of gamifying something to the individual actually displaying a particular behavior. For instance, mechanics, psychological mediators and outcomes are commonly portrayed in literature as a causal chain that links a mechanic to an outcome [23, 25]

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Existing research illustrates that gamifying a service occurs often in three sequences [23]. One being the mechanics, which are rules and aesthetics when altering non-game contexts [44]. The other one is the psychological processes that mediate the relationship between the mechanic and the desired outcome [17, 23]. The final one is the disciplinary-specific outcome, such as purchasing, performance, or increased workout [e.g. 9]. Consequently, the outcomes of gamifying a process are highly domain specific.

To illustrate, whilst the ultimate goal for a teacher can be to increase the student's learning outcomes, likewise do mechanics need to evoke positive thoughts and feelings in students to sequentially motivate learning [41, 55]. Consequently, the outcomes of gamification are exceedingly circumstantial; such as marketers want to increase sales [see 25, 34], or software developers want to increase code output [7], and thus these mechanics should be domain-congruent.

Gamification has gained large traction in research, and has matured a lot in recent years [38]. According to [40], gamification has grown from a niche topic to encompassing an array of interdisciplinary domains, such as crowdsourcing, sustainability, health and wellness, computer science, software development, marketing and tourism [e.g. 37, 63].

In the context of health and wellness, there is a considerable amount of literature emphasizing the effects of gamification on cognitions, emotions and behaviors [3, 21, 29]. Zichermann and Linder [65] state that gamification can impact people by the increase of dopamine release: "*…dopamine is released when people challenge themselves to something and then achieve that objective. This causes pleasure and a desire to do the loop again*".

In the following section, we describe our research area in the intersection of digital coaching, gamification and exercise motivation; and pose a research question.

1.2 Research Area and Research Question

Cugelman [10] states, "*The persuasive architecture of gamification shares elements in common with coaching, which relies on a coach's ability to foster team member motivation, employ strategies to help their team overcome opposition, provide support in building member's techniques, and help members build their character*". The author contends that due to these similarities, digital health interventions can be gamified using coaching theory.

Not only are governments, healthcare institutions and providers looking for effective ways to aid people on the path to better health [2], but also the private sector strives to encompass and seek opportunities to bridge the gap between technology and exercise. Digital coaches do not compete between each other, in marketing at least, in terms of how many more kilos their customers have lost in average [46], or customers being generally 'healthier'. Specifications, fashion and easy-to-use interface tend to be promoted; typical marketing points are the number of sensors, notifications, sleep tracking and whether it is compatible with an OS (iOS, Android, Mac, Windows). So, why is it that motivation and engagement, or the outcome is not promoted as a selling feature? Does the consumer need to be pre-engaged to work out when using a fitness tracker or can a digital coach actually instigate and engage new healthy behaviors by i.e. nudging? Motivation and engagement have been debated for a long time, both in psychology, social sciences and business research [28, 32, 49]. Recent contributions in technology and digitalization have provided individuals practical and theoretical tools, one of them being gamification [32].

In line with the statement of [40], "*Understanding contextual factors is critical for successful gamification, but this has been overlooked so far in the research on gamified health interventions*", there still persists a gap for which mechanics are actually congruent to health-related contexts.

Self-determination theory (SDT) is a central theory of human motivation. SDT has been used in varied contexts to understand what motivates people, e.g. within education, parenting and sports [8]. In this study, we want to investigate whether SDT can aid us in understanding whether and how digital coaching systems and gamified elements included in them motivate users in their physical activities.

Based on this, we see a need to investigate what users of gamified training watches with a digital coach experience and feel about their equipment. We see both a practical and a theoretical need to elucidate the use. A practical one when it comes to users' experience and a theoretical one when it comes to understanding the use. This should provide an opportunity to see both practical and theoretical implications.

The research question is: *In light of self-determination theory, how do digital coaches and their gamified elements support exercise motivation?*

2. Self-determination Theory and Gamification

Ryan and Deci's [45] well-cited work illustrates motivation as "*to be motivated means to be moved to*

do something". The emphasis illustrates that there are causes and effects of being (un)motivated. Just as motivation can be portrayed as energy, it can simultaneously be viewed in terms of why, or to explain the cause, intention, reason for an occurrence of an human behavior [48]. As [45] further elaborate, while the concept of motivation may at first seem unitary, it goes beyond showing only a level of it, but is also an orientation of it. The orientation refers to the motivational type, extrinsic or intrinsic. Originating and centered in the fulfilment of needs, the realization of human potential and self-actualization, the theory is overarching and employed to explain various behaviors such as economic, social, health-related and other [56]. The theory depicts extrinsic motivation being categorized according to the influences on behavior, such as originating in external events or actors, in terms of money or sanctions. It refers to doing tasks for instrumental reasons, such as obtaining external approval, money, and other influences that separate the incitement from the task per se [14]. It is also usually dependent on the level of autonomy, the perception of choice and how much perceived control over the task/situation the person has [45].

In contrast, intrinsic motivation, being central to many gamification theories, foretells how inner enjoyment can facilitate behavior [28, 30, 49]. Intrinsic motivation is portrayed as doing something because of inner enjoyment and need-satisfaction [45]. What contrasts intrinsic and extrinsic motivation most, is the potential effects these have in different contexts. Intrinsic motivation can merely be evoked by doing the task itself. Thus, there seem to be contexts and instances in which intrinsic situations fit better. For instance, in situations where the person is non-monitored and has a great self-perceived autonomy [e.g. 36], or working without the "need to" [19], exercising more, or doing a course in your own pace [5]. Following the logic of intrinsic motivation as a continuum, the theory is in line with gamification and exercise literature that aim to evoke behaviors in people by making the task fun, relevant and enjoyable [30, 49]. While research shows that culture can [not always, see 15] moderate whether people are more or less prone to be influenced by extrinsic/intrinsic rewards, there is no doubt that long term behaviors are sustained by supporting need-satisfaction, partly or mostly intrinsically evoked [15, 19]. SDT argues that there is a psychological need for autonomy, competence and relatedness. These three basic psychological needs [12, 45, 67], are essential for psychological health and act as a facilitator for internal motivation.

Autonomy refers to the feeling of control the person has over a given situation, sense of choice, and the ability to govern it [57]. In studies, autonomy has shown to be suppressed by external rewards, where the specific autonomy for the task is instead motivated by other factors than free will [11]. Furthermore, factors such as deadlines, or other time-related restricting factors, also suppress the aspect of autonomy.

Competence is the most fundamental psychological need for giving an individual power to activate herself. It bears similarity to the concept of self-efficacy by Bandura [in 61]. It is the feeling of having an effective and competent way to meet and handle/interact with the surrounding context or environment. Feelings of competence can be achieved through challenges that are appropriate for the individual, positive and constructive feedback, informative feedback and structure. It can be as a desire i) to do something well, ii) to be successful in interacting or iii) to apply effort to be effective [13].

Relatedness refers to the feeling of being connected to others. It is a psychological need fulfilled by belonging to a group, being cared for and feeling attachment to others [13]. In the gamification context, this is often discussed in relation to social game elements, such as groups, social networks, and chat functions [4]. Groh [20] draws attention to the possibilities of creating meaningful stories and shared goals for the user to relate to, as well as ensuring there is a meaningful community available that the user can connect to. Sailer et al. [47] clarify that relatedness can be evoked through a meaningful role in a common story, and through a sense that the individual's actions are important to the group's performance. In a systematic review on self-determination theory research within exercise and physical activity [56] it is noted, that the association of satisfaction of relatedness to exercise behavior is largely absent. The authors consider that the need for relatedness might simply not be present in contexts where solitary exercise is the norm.

SDT has grown considerably in popularity in recent years and has intensified the integration between gamification, exercise and SDT-literature [56]. Despite this, there are not many studies specifically targeting exercise motivation and gamification through the lens of self-determination theory. Relevant research from other contexts can be found. Shi and Cristea [53] propose motivational gamification strategies based on self-determination theory for an e-learning context. In testing the strategies, they found most success with supporting students' competence, least for supporting relatedness. Examples of strategies to support autonomy were e.g. setting learning goals with clear descriptions and more than one way to reach the goal, and positive, immediate feedback for learning activities.

Competence was supported e.g. by dividing goals into small chunks of increasing difficulty and opportunities for frequent decision-making. Relatedness was targeted e.g. by learning communities and visualizations of social status and reputation. The strategies proposed by Shi and Cristea could be transferred to an exercise context. In a similar vein, Van Roy and Zaman [58] present SDT-based heuristics for employing gamification in an educational context and also give guidance for adapting them. Nicholson [39] draws on Organismic Integration Theory, a sub-theory of self-determination theory, and outlines a need to design gamification in a user-centred, rather than organization-centred way, and to avoid mechanism-centered design. Aparicio et al. [4] map game mechanisms to the three SDT components, e.g. linking avatars and profiles to autonomy, progressive information and leaderboards to competence and groups and chats to relatedness; mechanisms and their link to SDT components are not tested empirically. Hamari and Koivisto [22] focus on social aspects in their study on gamification in the exercise context and find support for the emergence of relatedness through social features. Spillers and Asimakopoulos [54] found that social and gamification elements in a running app can affect motivation negatively if good user experience and good technical functionality is not achieved. Zuckerman and Gal-Oz [66] compared the efficacy of two versions of a walking app; a gamified one and a version focused on quantification of the user's data. Their results indicated that the two implementations were equally effective in increasing walking.

In conclusion; researchers have developed and tested gamification mechanisms inspired by SDT in different contexts. In the exercise and wearable computing context, however, there is a lack of research. In a systematic review of literature on gamification in the health and wellness context, Johnson et al [29] describe a lack of studies focusing on the effect of game design elements on intrinsic motivation. In the same review, the authors find some support for rewards driving health behaviors such as physical activity, but also some mixed results and a needfor more rigorous studies. Avatars were mostly associated with positive health outcomes.

3. Methodology of research

Semi-structured interviews with eight respondents were conducted in fall-winter 2018. Interviews are commonly used in exploratory research. The convenience sample was chosen according to simple pre-determined criteria: the participants had to be users of a system fulfilling our definition of a digital coach. The interview guide was designed to broach interviewees' usage of digital coaches through the lens of SDT; the questions were grouped thematically according to the three essential psychological needs in SDT. Interview duration was from 30 to 60 minutes. Interviews were recorded and transcribed. Interview transcripts were manually analyzed using conventional qualitative content analysis, making note of emerging patterns and themes [26, 64]. Data analysis was conducted in parallel with data collection, enabling the researchers to identify a point of saturation where no new themes were emerging [66]. As the research is qualitative, it will not be possible to generalize the results, they only show what the eight participants believe and experience.

4. Findings and discussion

Respondents, heritage, age, sex, occupation and physical activity are listed in Table 1 below.

Table 1. Interview participants.

ID	Coun*	Age*	Sex*	Occupation	Phy*
F1	Fin	44	M	Manager	Med
F2	Fin	39	F	Researcher	High
F3	Fin	68	F	Retiree	Med
F4	Fin	42	F	Entrepreneur	Med
S1	Swe	36	F	PhD	Med
S2	Swe	24	M	Student	Med
S3	Swe	40	M	Fire engineer	High
S4	Swe	30	F	Factory	Med

*Note: The abbreviation and descriptions are; Coun=Country [Sweden=(Swe), Finland=(Fin)], Phy=Physical Active[High=4-5 sessions /week, Med=2-3/week, Low=1-2/w, None=0/w]

The participants utilized a wide range of gadgets to support their physical training, e.g the Apple Watch, Fitbit Charge 3 and Polar Vantage-M. An individual engaged in physical training collects data through their gadget which then compiles statistics (Figure 1).
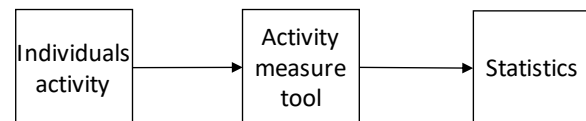

Figure 1. Activity statistics

The following sections (4.1-4.3) are arranged according to the three major themes that emerged from the interviews: the role of data and statistics, gamification and rewards, and social dimensions and social use of statistics. We discuss our findings in relation to self-determination theory and contrasting with previous gamification literature. In 5 we summarize our most central findings.

4.1. The role of data and statistics

The measurement and refinement of data is at the heart of a digital coach (Figure 2). Most of the users expressed extreme frustration if the measurement did not accurately reflect their performance and activities. Accurate measurement of exercise data is likely to support the user's feeling of competence. The recorded data made an exercise session more tangible; documented proof of what they had done. It also enables the user to take action towards improvement or behavior change and it makes exercising more interesting or fun. One of the interviewees (F1) expressed "*when I started using the [sports] watch I could measure my speed... it keeps it interesting and adds something extra. If I only swim without something telling me how I am doing, some updated information, it becomes boring... I want more of this, more information of what I am really doing*." Data is frequently described in terms showing a great appreciation, almost addiction towards the gathering of self-data. Another participant emphasized: "*I use the information to know my body, my abilities and what I can achieve*" (S3). In almost all cases, data or the statistics were of value to the users <u>themselves</u>, functioning as a motivational component [52]. Users want to go back to the core of the data to contextualize the relevance of the numbers with their lives. The appreciation portrays itself as self-gratitude of doing an activity while being reflected and stored in the data [52]. The data motivates the participants intrinsically, especially in their perception of their skill development and competence, which is crucial for the intrinsic motivation [13].

Human coaches are not as skilled at accurate data capture as digital coaching systems but excel at feedback and advice. The digital coaches are still far away from human coaches in this respect. The insights and feedback that the digital coaches refine from the data are modest in utility. Also, the interviewed users perceive the feedback from the system as insignificant as well as emotionally neutral; neither positive nor mildly negative feedback affects the users very strongly, whereas interaction with a human coach might lead to stronger feelings of pride or disappointment. The users overall felt that they were in charge of goal-setting and that the digital coach *supported* that, whereas a human coach would likely have a more active role in choosing and updating goals. A comment by interviewee F1 describes this well: "*My goal is to do 1km faster. I've set that goal. It's not the watch telling me to do that. But it tells me if I reach it or not.*" Goal-setting with a digital coach seems thus to support the desire for autonomy as described in SDT [13]; it aids the individual to feel in control of their actions and choices. Bandura [5] claims that both autonomy and competence needs should be satisfied, in order for a user to maintain intrinsic motivation.

One interesting observation arising from the interviews is, that several participants use their data to play their own games with their own rules: a kind of self-made, internal gamification, even though they might not use the words 'playing' or 'games' in describing their activities. An example of this might be when a person makes up rules for each exercise session; rules e.g. regarding intensity and length of training session. The rules are derived from or related to the data from the user's previous exercise sessions. These internal processes serve purposes for goal-setting and goal achievement, but also simply to make training more fun and exciting.

To conclude, our findings indicate that gathering data might at present be the main reason participants use digital coaches and the main source of motivation offered by the coaches.
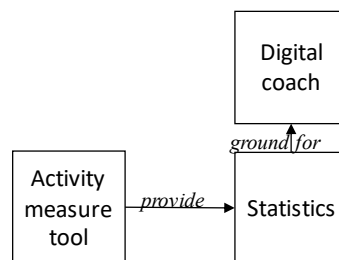

Figure 2. A digital coach refines statistics to actionable insights.

4.2. Gamification and rewards

Most digital coaches can provide rewards to the user. Gamified reward mechanisms were however not perceived to be especially rewarding, in contrast to some research evidence [29]. The gamified reward (Figure 3) mechanics in the users' digital coaches could best be described as amusing visual components that did not impact on motivation, nor on the everyday activities. Examples of such rewards are on-screen fireworks, achievements (e.g. badges, praise such as "you were active five days in a row, good job!") or progress-bars. The participants described their reactions to such rewards to be uniformly mild and that they did not influence their actions and behavior. Thus, gamified elements failed to influence intrinsic motivation, but operate as a type of an external reward. Participant F2 describes: "*It sometimes tells me I'm an over-achiever, that I have passed my goals. It will buzz and do fireworks when I reach a goal. And then I think,*

OK, that's nice." The internal games described in the previous section are likely to be more motivating than the current, superficial gamification implementations.

At the current state, the different gamified mechanics do not have the ability to adjust themselves to the variety of needs to provide sufficient value to users. They do not influence exercise motivation significantly. However, they do not seem to cause any annoyance or interference with their planned behavior.
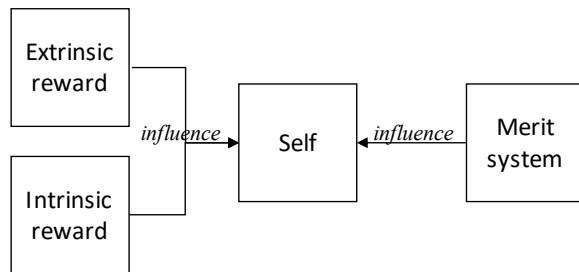

Figure 3. Rewards

4.3. Social dimensions and social use of statistics

The collected training statistics can be used for social purposes in e.g. social meetings and training planning. A meeting occurs in a social context (e.g. family, training group at gym or one training partner) where results of training and statistics can be used as a subject of conversation and as a comparison. According to the findings, social elements play a fundamental role for exercise for many of the participants. The motivating social elements lies in providing statistics which can be transformed into comparative elements, either to support each other in the group, or for competition which subsequently facilitates positive behavior; *Comparing statistics with family* (S2) or *comparing statistics with my own chosen group* (S1). Such a relatedness refers to the feeling of belonging to a group, being cared for and feeling of attachment [13], i.e. relatedness in SDT. The majority of the respondents describe that the social comparison is only of value when being compared to closer relationships, such as friends, family or acquaintances. Comparison to unknown persons is not interesting. This could also be linked to autonomy and the sense of control of one's data and how it should be utilized [45]. Interviewee F2 describes her attitude to the social functionalities of her sports watch:"*It would be a bit weird. None of my closest friends have [sports watches]. So I would be sharing info with acquaintances or unknown people."*

Further, not all of the participants showed any interest in sharing their exercise data. One of the participants (F1) explains: "*I don't use social*

functions. The function where you put something on social media about what I have done today, I think it is laughable...when I see others doing it I think it is ridiculous. If I put something like that out there and no one reacts – I would be so disappointed! They're supposed to give 'thumbs up' and if they don't, it will ruin my day! I don't need acceptance from anyone else. And it is no one else's business." There seems to be a perceived risk involved in the social use of statistics; the 'wrong' response from the peer group might decrease motivation.

Training statistics can be used as a tool that affects social ranking. The rank system depends on training and/or a social contexts merit system. There is an interaction between individuals in the social meeting and the social rank which in turn is affected by the merit system (Figure 3) affecting the meeting. For example, the classic races in Sweden, "*consists of a collection of some of the longest, largest and oldest races in the world of cycling, swimming, running and skiing.*" [18]. To do one of the classics gives status. To do the four races during one calendar year gives a higher status, to do it multiple times over several years gives an even higher rank. Another example can be how many steps the individual walks in one day, how many meters he/she swims per week or how many cross fit workouts he/she has done in a month.

In the previous sections, we identified that the gamified rewards in the participants' systems do not seem to add significant value, whereas accumulating data and statistics seems to be value-adding and rewarding. The merit system acts partly as a rewarding function, by measuring user's competence or skills and to rank them appropriately. However, the ranking system ought to be used only if the participant has the type of personality that is motivated by this, which is similar to the *type of players* in gamification [Bartle in 50]. To overcome these obstacles, merit systems may be designed with gamification mechanics that stimulate single-player modes and ranking systems logics.

Typical digital coaching has several mechanics that support relatedness and that impacts the interaction between people [35, 47]. Not all people have the desire or are in the position to compete with people. Social interaction may also be perceived as a supporting function to the original desire of gathering data on one's own behavior. This is somewhat related to the term of quantified self (QS) that [52] state about the gathering of statistics.

Starting from statistics gives a result in a merit system which in turn influences the social rank and influences a social meeting. At the same time, the statistics can be used by the individual in a social

meeting and to plan further training. Figure 4 illustrates the social use of statistics.
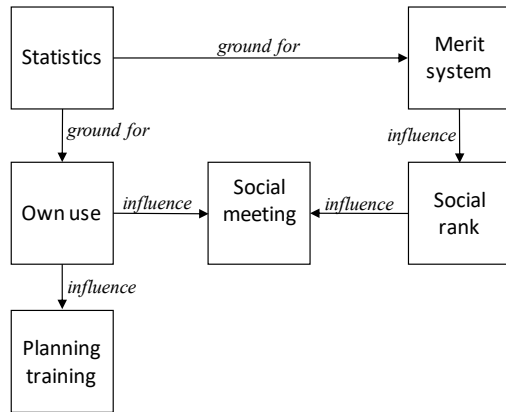

Figure 4. Social use of statistics

5. Conclusions

The sections above (4.1-4.3) paint a picture of physical training supported by digital coaching systems. In Figure 5 we illustrate the complete picture of using digital coaching systems that emerges from our interviews.

The digital coaches are to some extent gamified; this is mainly done by utilizing extrinsic gamification mechanisms such as badges and fireworks which means that they have very little impact on the users' motivation. We suggest that developers of digital coaching systems further investigate which gamification mechanisms have real potential to influence users' feelings of competence and autonomy, rather than just offering a superficial reward. Drawing from previous research, we suggest more intrinsically motivating mechanisms, such as the use of avatars that develop as the user develops or using leaderboards and awards in a cooperative rather than competitive way [29]. This would likely also have an impact on sustained interest in using the technology.

Moreover, there is a great difference between a simulated illustration of a human, versus an actual human and the underlying psychology during interaction. For instance, although the digital coaches aim to motivate, set up and follow up goals, just as a human coach, it is not likely that a user would feel as she is disappointing a digital coach if she does not follow through with her training. Similarly, for relatedness: it is not fulfilled by the actual DC, but rather by the opportunities it offers to connect to others. Therefore, it is important to understand the occurring psychology and its limitations to adjust the DC for the better.
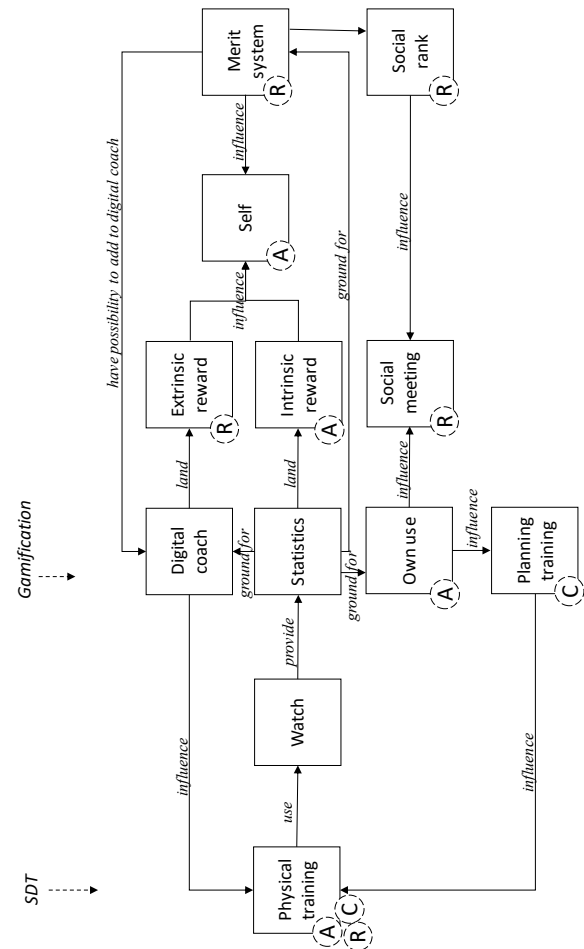

Figure 5. Model for individual's physical training and motivation with digital coaching system (A = Autonomy, C = Competence, R = Relatedness)

Self-determination theory helps us understand how digital coaches motivate users in their exercise. In our study we find, that fulfilment of each of the basic needs – autonomy (A in Figure 5), competence (C) and relatedness (R) – is supported by digital coaches. As the digital coaching systems are described by the users to support their goal setting, this supports self-efficacy and *autonomy*. Having access to their data enables users to feel *competence*, as they can use their data to set suitable challenges and update them as they progress. *Relatedness* is achieved through the social sharing of data to known people and through the enactment of different merit systems. What is striking is that the gamification mechanisms in the digital coaches are *not* related to the fulfilment of basic needs and thus do not support motivation. This is likely related to the simple, extrinsic gamification mechanisms utilized. In contrast, the collected data and statistics on it seem to be related to fulfilment of basic needs and through that motivation. In other

words: digital coaches affect exercise motivation in our participants, but mostly through the basic functions of accurate data collection and visualization and the individuals' own use of the data; not through gamification mechanisms.

5.1. Theoretical and practical contributions

This study contributes to research with an understanding of how digital coaches motivate physical activity. While past research has emphasized the importance of various mechanics for reaching an outcome [17, 23], this study emphasizes the complexity and limitations of DCs in physical activity. By exploring the various motivations with the STD framework, this study identifies relationships in the context of DCs (see figure 5) and the type of intrinsic motivations in each case. As mentioned in literature [10], gamification has been a tool for engaging and motivating users in various contexts, however, this study sheds light on gamification in wearables and reveals them, at most, as a supporting function to activities that are already bound by rules, games and rewards. Play, games and fun exist beyond the actual DC, but within the everyday task of different individuals. By understanding the user's lifestyle, appropriate mechanics can be employed.

For practitioners who provide various sensors and gamified DCs, there are several aspects to consider. Firstly, practitioners are urged to move beyond the extrinsically motivating game elements, as they are of little use for exercise motivation. Furthermore, as data and statistics are of high importance to users, more effort should be put into developing useful visualizations and functionalities on a users' data. Our findings also show that many users perceive different values from the DCs and to accommodate all individual requirements would be very difficult. However it seems that the aspect of the gadget itself is not the main selling point, but rather what it can offer, which is similar to the aspect of service-dominant-logic [59]. More specifically, users seek to achieve different outcomes, one may seek to maintain training, while someone else may want to start being physically active, thus the method for engaging and motivating users to use their DC is immensely intricate. As it is very difficult to communicate the benefits of the DC to the various different needs, users have created meaning by interpreting the gathered data by themselves. It is by emphasizing the potential outcomes and the importance of data that individuals may see value and continue physical activity. With regard to communicating these values, regardless of health or revenue interests, close collaboration between health and marketing practitioners are

recommended. The optimal solution is if makers of the DCs create highly personalized experiences suiting the diverse needs of individuals, either through extensive profiling or AI. Lastly, the findings suggest that social comparison or cooperation occurs most preferably in inner circles and enhancing this function may be more effective than sharing results, for instance, in social media.

Finally, system providers of gadgets for physical training have much to gain by thinking of the individual user's needs, i.e. individual customization of gadget and its digital coach. One part to take into account is how a gadget could understand what a user wants or needs. Furthermore, the provider ought to think about rewards (part of gamification), SDT, and that a digital coach cannot be of a general nature in its functionality.

5.2. Limitations and future research

While this qualitative exploratory study has provided novel insights, it is not without limitations. Firstly, while the sample of eight respondents was small, it still reached saturation. It would be interesting to confirm and test the findings on a larger scale, in even more countries with quantitative methods. Secondly, an additional query could be to state the relationship between training statistics and intrinsic rewards or behaviors, where SDT, gamification and Quantified Self act as moderators of the relationship. Lastly, it would be of interest to categorize the complexities, or the obstacles discovered for successful impact on behavior, to overcome these and to implement these for further testing.

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