Individual Fitness App Use: The Role of Goal Orientations and Motivational Affordances

Completed Research

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Abstract

Lacking physical activity is an ongoing problem in our society and fitness apps are positioned to address this issue. They aim to induce motivation towards physical activity by providing different motivational features that build upon self-quantification, gamification, and social network capabilities. Little is known, however, whether, how, and why users with differing motivation-relevant goals employ these motivational features differently. Drawing upon Motivational Affordances, the 'Choice of Situation' model, and Achievement Goal Theory, this paper investigates how users' goal orientations (i.e., mastery and performance goals) account for different ways of using fitness apps. Empirical validation with 417 fitness app users reveals distinct patterns between individual goals and the use of fitness apps for self-monitoring, exercise guidance, rewards, and social comparison. This paper contributes to the literature on individualized fitness app use, theoretically extends the concept of motivational affordances with individual differences and aids practice in tailoring fitness app features.

Keywords

Fitness apps, motivational affordances, individual differences, choice of situation, achievement goal theory.

Introduction

The lack of regular physical activity is a pertaining problem for most western societies (WHO 2010). Although of high importance for health and well-being, most people are not regularly physically active as recommended (Penedo and Dahn 2005). Promoting physical activity is a great challenge for health promotion since decades (WHO 2010), and fitness apps are gaining increasing attention to counteract this problem. The WHO (2018), for instance, is now partnering with Google in fitness app development to address societies' decreasing physical activity. The global revenue for this market is amounted to 15 billion USD in 2017 and expected to increase to 20 billion USD in the next years (Statista 2018).

To motivate people towards physical activity, fitness apps –such as Strava or Nike+ Running– offer a variety of motivational features to the users which build upon self-quantification, gamification, and social network capabilities (Hamari et al. 2018; Stragier et al. 2018). However, little has been put forth so far to examine how users make use of these features and particularly why. While it is well-known that people pursue different motives and goals for physical activity (e.g., Roberts et al. 2007), their role in determining the use of the motivational features in fitness app has not been examined exhaustively. Given the competitive fitness app market space, fitness app developers are in need to possess a thorough understanding about their user base and how to design and deploy the various features to best meet users' different motivations and goals for physical activity. To advance knowledge about the role of individual motivational differences in fitness app use and to support developing fitness apps that motivate individually, this research asks:

RQ. *How do user's motivational differences determine the use motivational features in fitness apps?*

In answering this question, this paper draws upon the concept of Motivational Affordances (Zhang 2008) and Achievement Goal Theory (Ames 1992; Maehr and Zusho 2009) and theorizes how motivational affordances of fitness apps serve as 'goal structures' with differing emphasis on mastery and performance goals. Fitness app users pursuing such mastery or performance goals hence are more likely to draw upon such affordances that share the same focus on mastery and performance goals. Empirical evaluation with

417 fitness app users lends support for these theoretical considerations and reveals distinct patterns of fitness app uses. Thereby, this paper contributes to 1) the nascent stream of individualized fitness app use to 2) theory of motivational affordance by incorporating the role of individual differences.

The rest of this paper unfolds as follows. Next, the background on fitness apps and motivational affordances is presented alongside the key theoretical tenets of the 'Choice of Situation' model and Achievement Goal Theory. Based on this, the theoretical considerations and hypotheses are developed subsequently. Then, the methodological approach and empirical results are presented before the findings, implications, and limitations are discussed.

Theoretical Background

Motivational Affordances in the Fitness App Context

Fitness apps –such as Strava or Nike+ Running– aim to motivate people towards physical activity. App vendors incorporate a multitude of software features to promote motivation and engagement that build upon self-quantification, gamification, and social network capabilities (Hamari et al. 2018; Stragier et al. 2018). Through these features, fitness apps provide a set of 'motivational affordances' to the user (Stragier et al. 2018; Zhang 2008). The concept of 'affordances' generally refers to the potential ways of using information technology in support of one's goals (Markus and Silver 2008). Extending this, 'motivational affordances' denote "*the properties of an object that determine whether and how it can support one's motivational needs*" (Zhang 2008, p. 145). Typical affordances of fitness apps include self-monitoring, exercise guidance, rewards, and social comparison (cf. Table 1) (Rockmann and Gewald 2018).

Affordance	*Definition: The possibility to …*	*Feature example*
Self-monitoring	… systematically document and observe one's sport behavior.	Logs of activity metrics (e.g., time, distance, pulse)
Exercise guidance	… get instructed for physical activity.	Informational contents, exercise reminders, training schedules, live feedback
Rewards	… obtain rewards for physical activity.	Points, badges, trophies
Social comparison	… compare one's performance against others.	Leaderboards, competitions, activity reports, profiles

Table 1. Popular Motivational Affordances in Fitness Apps

Thus, when using fitness apps, exercisers can record and document their physical activity by metrics such as distance, speed, or heart rates (i.e., *self-monitoring*). They can retrieve informational contents such as exercise tips and can also set up exercise schedules and reminders (i.e., *exercise guidance*). They can gain points and trophies for activity achievements like running 5km (i.e., *rewards*) and by drawing upon social network capabilities, they can also connect with others and compare their exercise behavior with virtual friends (i.e., *social comparison*) (Hamari et al. 2018; Rockmann and Gewald 2018; Stragier et al. 2018). Nonetheless, because such apps are still relatively novel, research is just at the beginning to understand how and why people make use of these motivational affordances (James et al. 2019a).

Motivation research informs that individuals, and hence fitness app users, hold different motivations and goals for physical activity and that the personal environment needs to be aligned with such individual motivations and goals for optimal motivational effects (Murayama and Elliot 2009). Albeit awareness exists that there might be no 'one-size-fits-all' approach in employing the motivational affordances (Hamari et al. 2014; Johnson et al. 2016; Orji and Moffatt 2016), such motivational differences of the users have been barely examined so far with few notable exceptions. Stragier et al. (2018) focused on runners and how their different motivations to run (e.g., physical, social, achievement, and psychological) determine feature uses. The study of Hamari et al. (2018) was interested in the importance users assign to the incorporated motivational features based on individual, goal-related factors such as goal focus, goal attributes, or goal orientations. Most recently, research also focused on distinctions between exercise motivations ranging from intrinsic to extrinsic and use of fitness app features (James et al. 2019a; James et al. 2019b).

This research at hand was developed and carried out in parallel to the recent progressions just outlined. As such, the current paper seeks to complement the few available studies theoretically and empirically to

further enhance the knowledge about motivational-related, individual differences and fitness app uses. Next, this paper develops a theoretical understanding about a 'motivational fit' between users and fitness app affordances which serves as a parsimonious explanation as to how and mainly why motivation-relevant, individual differences guide users in engaging with particular affordances in fitness apps.

Choice of Situations and Achievement Goal Theory

Instrumental for human motivation are both the person and the environment – yet optimal motivational outcomes emerge when the person and environment 'fit' with each other (Murayama and Elliot 2009). When using fitness apps, exercisers can draw upon various software features to create their own 'motivational' environment – which, however, requires exercisers to purposively select and use those features that best fit their motivational goals and needs (James et al. 2019a; James et al. 2019b).

Behavioral research informs about the processes through which individuals select and enter specific situations while avoiding others (Diener et al. 1984; Emmons et al. 1986). The so-called 'Choice of Situation' model posits that –if given free choice– people actively choose situations that best 'fit' their personality and allow them to behave in harmony with who they are (Ickes et al. 1997). A somewhat obvious example is that introverted persons are less likely to attend crowded events or loud bars (Diener et al. 1984). Inherent to this line of thinking is that individuals can identify certain characteristics and behavioral opportunities of a situation that match their personality characteristics when choosing to enter or avoid this specific situation (Ickes et al. 1997). Whilst this theoretical notion appears to be well to understand how fitness app users (i.e., the 'person') choose to make use of specific affordances (i.e., the 'situation') in general, it requires a careful identification of the specific characteristics shared by both the person and the situation in order to make according predictions (Ickes et al. 1997).

Hereto, particularly goal-based motivational theories are well positioned to identify the shared characteristics and mechanisms underlying situational choice (Ickes et al. 1997). The underlying premise is that situations consist of well-defined 'goal structures' –distinct possibilities potentially facilitating individual's goal accomplishment– and people pursuing specific goals seek out those situations from which they believe they will help them in accomplishing their goal (Emmons et al. 1986; Ickes et al. 1997).

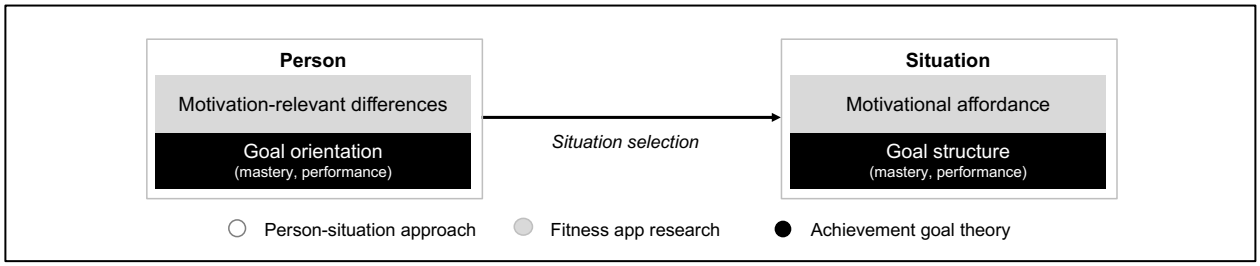

Figure 1. Theoretical Approach

Achievement Goal Theory (AGT; Ames 1992; Nicholls 1989) is a motivation-theoretical framework concerned with the goals pursued by the individual and the goals emphasized within the situation with strong empirical support in the physical activity context (Roberts et al. 2007). AGT posits that in achievement contexts, such as sports, individuals' decisions and subsequent behaviors are guided by their achievement goals (Roberts et al. 2007). AGT distinguishes two major achievement goals: mastery goals focusing on competence development and performance goals focusing on competence demonstration (Roberts et al. 2007). These goals can be focused by the individual –referred to as 'goal orientations'– and can also be emphasized within the environment, known as 'goal structures' (Murayama and Elliot 2009).

Goal orientations are dispositional tendencies of the individual (Nicholls 1989). Individuals with a mastery goal orientation thrive for competence development believing that competence and mastery is the result of hard work and effort (Maehr and Zusho 2009). Mastery-oriented persons value the process of learning rather than the outcome and are interested in the progress they make in self-referenced manner (Ames 1992; Elliot and McGregor 2001). Fitness app users with a mastery goal orientation may be eager to improve their physical abilities, like running a longer distance, and may be particularly interested in features that afford observing their performance progress. In contrast, individuals with a performance goal orientation

consider reflect upon their achievements in normative ways. By outperforming others, they seek to demonstrate superior competence but also aim to gain others' positive judgments (Maehr and Zusho 2009). The social network capabilities of fitness apps may be of relevance for performance-oriented users in order to compare their performance against others, to enter competitions, or to earn trophies for being the 'best.'

Goal structures are the goal-relevant emphases within an individual's social environment (Ames 1992). Equally, goal structures are distinguished by their emphasis on mastery and performance goals which can be induced by environmental practices such as specific messages sent by teachers, sports coaches, or peers (Ames 1992; Murayama and Elliot 2009). A mastery goal structure emphasizes improvement where individuals perceive that effort and learning are valued, whereas a performance goal structure stresses relative ability, social comparison, and interpersonal competition (Murayama and Elliot 2009).

As depicted in Figure 1 above, AGT enables to identify the characteristics (i.e., mastery and performance goals) shared by the person (i.e., goal orientations) and the situation (i.e., goal structures). The motivational affordances (cf. Table 1) can be thought of providing such distinct goal structures. For example, the social comparison affordance enables interpersonal comparison of physical competencies and to engage in competitions – similar to what is known as a performance goal structure. As fitness app users may perceive such goal structures within the motivational affordances, it can be assumed that their goal orientations guide their selection and use of corresponding motivational affordances as elaborated upon next.

Hypotheses Development

This paper aims to develop a deeper understanding of how people interact with fitness apps in general and how they choose to use particular motivational affordances incorporated. Based on the theoretical considerations just developed (cf. Figure 1), the following hypotheses detail how users' achievement goal orientations (mastery and performance goals) guide their use of motivational affordance.

The **self-monitoring affordance** essentially provides a mastery goal structure and should be therefore especially attractive for users high in a mastery goal orientation. This is assumed because the self-monitoring affordance allows documentation of physical activity behavior and to monitor progress and performance (Lupton 2016; Rockmann and Gewald 2018) – an emphasis on making improvements similar to what is described as a mastery goal structure (Ames 1992; Murayama and Elliot 2009). Fitness app users holding a mastery goal orientation should be particularly inclined towards the self-monitoring affordance as it provides a goal structure supporting them to improve their physical abilities and to observe their progress in a self-referenced manner (Ames 1992; Conroy et al. 2003). Initial evidence supports this contention. For example, fitness app users pursuing improvement motives use more often features allowing them to evaluate their activity and progress (Stragier et al. 2018). Users who are intrinsically motivated to exercise or seek to improve their skills, fitness, and appearance draw more upon data collection and analysis features (James et al. 2019a). Lastly, users holding a mastery orientation assign higher importance on self-quantification features including logs (Hamari et al. 2018). Performance-oriented users, in contrast, seek to evaluate themselves on normative bases and to gain favorable judgments from others (Maehr and Zusho 2009) and the self-monitoring affordance does not provide a goal structure which facilitates their goal attainments so that fitness app users holding a performance goal orientation rather avoid using the self-monitoring affordance.

> ***H1.*** *Usage of the self-monitoring affordance is* ***a)*** *positively determined by a mastery goal orientation and* ***b)*** *negatively predicted by a performance goal orientation.*

The **exercise guidance affordance** provides a mastery goal structure for fitness app users alike. Exercise guidance aims to support fitness app users in developing and improving their physical abilities by providing users with guidance, such as alerts, reminders, exercise programs and schedules or other means of instructions while exercising (Rockmann and Gewald 2018; Zhang and Lowry 2016) which facilitate learning and improvement as emphasized by a mastery goal structure. Fitness app users who are mastery oriented should be thus more inclined towards such exercise guidance features as it facilitates their striving to improve. For performance-oriented users, in contrast, the exercise guidance affordance appears to hold little that could satisfy their striving to demonstrate their competencies to others.

> ***H2.*** *Usage of the exercise guidance affordance is* ***a)*** *positively determined by a mastery goal orientation and* ***b)*** *negatively predicted by a performance goal orientation.*

The **rewards affordance** serves as both mastery and/or performance goal structure and should be mainly used by fitness app users high in a mastery and/or performance goal orientation. This is because rewards, such as virtual points or trophies, can be granted on normative bases where users outperform or compete against other users (i.e., a performance goal structure) but also for self-set goals and achievements, such as exceeding one's previous performance records or by entering challenges such as 'running 5km' (i.e., a mastery goal structure). Thus, as the reward affordance values physical improvements, particularly users holding a mastery goal orientation can be assumed to make use of this affordance. Recent literature has shown that outcome-focused users who compare their current against future or past performance, place higher importance on such reward features (Hamari et al. 2018). At the same time, though, the rewards affordance is also attractive for performance-oriented users because rewards, such as trophies, are also granted for outperforming other users and hence serve to signal physical competencies to other users (Stragier et al. 2018). Available evidence tends to support this consideration alike as performance-oriented users have been shown to assign higher importance to reward-related features (Hamari et al. 2018). Likewise, recent literature indicates that users with a socially motivated exercise goal are more likely to use reward features in fitness tracking technologies (James et al. 2019a).

> ***H3.*** *Usage of the rewards affordance is* ***a)*** *positively determined by a mastery goal orientation and* ***b)*** *positively predicted by a performance goal orientation.*

The **social comparison affordance** provides a performance goal structure for fitness app users. Social network features, such as newsfeeds to follow other users' activities and leaderboards, endorse public evaluation and competitions – characteristics identical to a performance goal structure (Ames 1992; Morris and Kavussanu 2008). The social comparison affordance should be thus particularly used by fitness app users high in a performance goal orientation as it complements their striving to become better than other users (Maehr and Zusho 2009). Recent literature has shown that socially motivated users draw upon such social interaction possibilities including competition and comparison features (James et al. 2019a). Moreover, users who like to prove their abilities against others, place higher importance on social network features including activity reports of other users (Hamari et al. 2018). Likewise, another study found that users with competitive achievement motives more often use social network features to observe other users' activities (Stragier et al. 2018). Although one would expect that mastery-oriented individuals are less interested in social comparison behavior because mastery-oriented people do not rely on normative standards, research has shown and explained that the contrarian is often the case (Butler 1992; Park and Park 2017; Régner et al. 2007). Mastery-oriented people enact social comparisons to gain a reference for self-improvement (Régner et al. 2007) so that fitness app users pursuing a mastery goal are also likely to draw upon the social comparison affordance.

> ***H4.*** *Usage of the social comparison affordance is* ***a)*** *positively determined by a mastery goal orientation and* ***b)*** *positively predicted by a performance goal orientation.*

Research Method

For hypotheses testing, a quantitative study was conducted within the context of the fitness app 'Strava' (www.strava.com). Strava is a popular social-network based fitness app that offers the focal affordances (cf. Table 1) and predominantly targets physical activities such as running or cycling. Respondents were recruited using an online panel provided by Amazon Mechanical Turk. Following recent guidelines (e.g., Jia et al. 2017), participation was restricted to the United States and several means to ensure response quality were incorporated (e.g., screening questions, attention tests, recording of IP addresses). Data was collected in the Q1/2018.

Measurement items for goal orientation items are based on established research (Conroy et al. 2003; Elliot and McGregor 2001) and were assessed with three items each and by instructing respondents to think about their sports and exercises. Instruments for the motivational affordances were taken from prior fitness app literature (Rockmann and Gewald 2018), adapted to the Strava context and assessed with four items each. All items were assessed with Likert-7 scales (strongly disagree/agree). Example items for each construct are presented in Table 2.

After data collection and preparation[1] (Jia et al. 2017), the final data consists of 417 responses characterized as follows: 62.4% are male, and the average age is 32.2 years (SD 8.5 years). Participants use Strava at mean of 10 months (SD 12.7 months) and 56.4% use Strava 'often' or 'always' when doing sports. 73.8% of the respondents conduct sports between 'several times a week' or 'almost every day.' Although official reports of Strava's users are not available, the sample's characteristics are in line with recent studies assessing Strava or comparable fitness apps (Hamari et al. 2018; Stragier et al. 2018).

Construct	*Example item*	*Reference*
Affordances	*When I use Strava, I use features that allow me …*	(Rockmann and Gewald 2018)
Self-monitoring	… to keep track of my exercise activities.	
Exercise guidance	… get guidance how to better perform physical exercises.	
Rewards	… to make my physical activity rewarded.	
Social comparison	… to compare my performance with the performance of others.	
Mastery goal	It is important to me to perform as well as I possibly can.	(Conroy et al. 2003; Elliot and McGregor 2001)
Performance goal	It is important for me to perform better than others.	

Table 2. Measurement Instrument Examples

The data was subsequently analyzed by structural equation modeling using partial least squares (Chin 1998) with the software SmartPLS 3 (Ringle et al. 2015). Data analysis first involved an assessment of the measurement instrument followed by evaluation of the structural model and hypotheses.

Results of the measurement instrument evaluation are depicted in Table 3 and provide adequate psychometric properties (Chin 1998). As all constructs were modelled with reflective items, evaluation results supports *item reliability* (all item loadings > 0.707; p<0.001), *construct reliability* (Cronbach's alpha (CA) > 0.7; composite reliability (CR) > 0.7; average variance extracted (AVE) > 0.5), as well as *discriminant validity* (each item loads highest on its intended constructs; inter-variable correlations are smaller than the root of the corresponding AVE as shown in the diagonal lines; highest value for heterotrait-monotrait ratio of 0.752 is below 0.85). *Common method bias* (CMB) can be of concern when using self-reported data obtained through a single method (Podsakoff et al. 2003). Two tests were conducted to evaluate the presence of CMB in the data whose results did not raise great concerns. First, results of Harman's single factor test show that only 37.6 % of the variance is explained by one factor which is not the majority. Second, results of the test proposed by Liang et al. (2007) indicate a CMB ratio of 1:392 which is much smaller compared to prior research employing this test (e.g., Liang et al. 2007).

Construct	*CA*	*CR*	*AVE*	*Discriminant validity*					
				1	2	3	4	5	6
1 Self-monitoring	0.855	0.902	0.697	**0.835**					
2 Exercise guidance	0.844	0.895	0.681	0.191	**0.825**				
3 Rewards	0.878	0.916	0.732	0.221	0.506	**0.856**			
4 Social comparison	0.860	0.905	0.706	0.210	0.493	0.652	**0.840**		
5 Mastery goal	0.763	0.864	0.678	0.586	0.406	0.361	0.435	**0.824**	
6 Performance goal	0.868	0.919	0.792	0.085	0.381	0.562	0.654	0.408	**0.890**

Table 3. Psychometric Properties of the Measurement Instrument

The structural model was subsequently analyzed by assessing the explained variance (R^2), the significance of the path coefficients as well as effect sizes (f^2) using a bootstrapping procedure with 5,000 iterations (Chin 1998). Additionally, a path comparison test was performed (Rodríguez-Entrena et al. 2018) to assess whether the influences of mastery and performance goals significantly differ for each affordance.

[1] In total, 624 persons opened the survey. 110 of them indicated that they are not using Strava and hence did not pass the screening criteria leaving 514 persons who participated in the study. To rule out participants who have potentially taken the survey multiple times, 89 responses with non-unique IP addresses or non-unique MTurk Worker IDs were dropped (N=425). Finally, only responses who passed at least one attention test were retained (James et al. 2019a) leading to a final dataset of N=417.

Results

The empirical results lend support for the hypotheses (Table 4). The use of the affordances is explained with R^2 values of 22.0% to 46.2% by the two focal goal orientations, a result comparable to related studies (e.g., Hamari et al. 2018; James et al. 2019b). The results support seven out of the eight hypotheses.

	Self-monitoring	*Exercise guidance*	*Rewards*	*Social comparison*
R^2	37.2%	22.0%	33.7%	46.2%
Mastery goal	0.662*** (f^2=0.581; L)	0.301*** (f^2=0.097; S)	0.159** (f^2=0.032; S)	0.202*** (f^2=0.063; S)
Performance goal	-0.185*** (f^2=0.045; S)	0.258*** (f^2=0.071; S)	0.497*** (f^2=0.311; M)	0.572*** (f^2=0.506; L)
Path difference	0.477***	0.043^{ns}	0.338***	0.370***
*** p<0.001; ** p<0.01; * p<0.05; ^{ns} p≥0.05 f^2 ≥0.02 (S; small), ≥0.15 (M; medium), ≥0.35 (L; large) (Cohen 1988)				

Table 4. Results

Results support that use of the *self-monitoring affordance* is positively predicted by a mastery goal (H1a supported) and negatively predicted by a performance goal (H1b supported). Moreover, the influence of both goal orientations do not only differ in direction but also significantly in magnitude (i.e., a significant path difference of 0.477) and the mastery goal orientation exhibits a higher effect size. As such, the self-monitoring affordance can indeed be interpreted as providing a mastery goal structure. Use of the *exercise guidance affordance* is, as hypothesized, positively determined by mastery goal orientation (H2a supported) but, contrary to expectations, also positively determined by performance goal orientations (H2b not supported). Moreover, both goal orientations do not significantly differ in path magnitude and both exhibit a comparable effect size so that the exercise guidance affordance provides both a mastery and performance goal structure. As hypothesized, using the *rewards affordance* is positively determined by both goal orientations (H3a and H3b supported). As the influence performance goal orientation is significantly stronger and higher in effect size, the rewards affordance provides a mastery rather than performance goal structure. Lastly, the social comparison affordance is positively determined by both goal orientations as hypothesized (H4a and H4b supported) yet can be interpreted as providing a performance goal structure as the performance goal orientation has a significantly stronger influence and also exhibits a higher effect size. The results are discussed in light of the study's implications next.

Discussion

This research was motivated by the lack of regular physical activity prevailing in most societies (WHO 2010) and the need to better understand whether, how, and why individual, individual motivation-relevant differences determine users' interactions with fitness apps. A theory-guided approach was developed and empirically validated with 417 fitness app users explaining how and why individuals' exercise goal orientations (mastery and performance) predict distinct patterns of using fitness apps for self-monitoring, exercise guidance, rewards, and social comparison.

As this study supports, fitness app users construct their individualized motivational environment by selectively engaging with those motivational affordances that best fit their motivational goals (James et al. 2019a; James et al. 2019b). Precisely, fitness app users seeking to improve their physical abilities and hence hold a *mastery goal orientation*, usually engage with fitness apps for self-monitoring and to receive exercise guidance. Both affordances provide those users with a mastery goal structure which provides the means to facilitate their improvement goals. Although to a lesser extent, mastery-oriented users also engage with means to receive rewards and to compare themselves with other users because these affordances value their improvement efforts with virtual trophies or provide normative references for self-improvement respectively (Régner et al. 2007). Both rewards and social comparison are much more attractive for users holding a *performance goal orientation* because both affordances provide performance goal structures. In the latter case, this is not surprising, as the social comparison affordance provides means to complement their striving for interpersonal performance comparisons and competitions (Ames 1992) such as by

following the sports activities and performances of other users. The observation that the rewards affordance is used by performance-oriented rather than by mastery-oriented users is likely to be caused by the research context Strava. Strava is positioned as a social network so that the rewards affordance in this particular app is built mainly upon the social network capabilities providing virtual trophies for those who score highest relative to other users. Contrary to that, performance-oriented users are less likely to draw upon the self-monitoring affordance. This affordance promotes self-referenced attainments and hence cannot fulfill their striving for normative comparisons. Contrary to expectations, performance-oriented users also tend to draw upon the exercise guidance affordance. However, it has been recently shown that extrinsically or socially motivated users –which shares characteristics with performance goal orientations– are more likely to use fitness app features that facilitate them to control their exercise regimen, including reminder and goal management functionalities (James et al. 2019a; James et al. 2019b).

Based on these empirical findings, this paper makes the following contributions to literature and theory.

Individual uses of fitness apps. First, this paper contributes to the emerging stream on motivation-relevant individual differences in fitness app use (Hamari et al. 2018; James et al. 2019a; James et al. 2019b; Stragier et al. 2018). Fitness apps incorporate a variety of software features to motivate people to be physically active (Hamari et al. 2018; Lister et al. 2014). Yet it is well-known that individuals, and hence fitness app users, can differ in their underlying motives and goals to exercise (Murayama and Elliot 2009) and scholars raise awareness that a 'one-size-fits-all' approach in deploying such features might not be effective (Hamari et al. 2014; Johnson et al. 2016; Orji and Moffatt 2016). So far, few studies analyzed how such motivation-relevant differences account for individualized uses of fitness apps (Hamari et al. 2018; James et al. 2019a; James et al. 2019b; Stragier et al. 2018). This research complements this nascent area of research supporting the notion that motivational differences yield distinct yet predictable, goal-relevant patterns of fitness app uses (James et al. 2019a; James et al. 2019b). Such individual patterns can yield further insights into fitness app use. For instance, initial evidence indicates that the motivational benefits gained from the affordances in use can also vary due to the individual motivations and goals of the users (James et al. 2019b; Rockmann and Maier 2019). As an implication, research needs to consider such motivational differences when studying fitness app phenomena such as adoption and (dis-)continuance decisions or the motivational consequences of fitness app use.

Individual differences in motivational affordances. Second, this paper also theoretically extends the concept of motivational affordances (Zhang 2008). So far, the literature on motivational affordances is silent concerning the theoretical role of individual differences, especially how and why people make use of specific motivational affordances. First, this paper provides a theoretical linkage for the role of individual differences in the enactment of affordances by using the key tenets of 'Choice of Situation' model in arguing that people's personality characteristics will select those affordances that best fit their personality (Ickes et al. 1997). Second, this paper provides an approach in developing a contextual instantiation of the 'Choice of Situation' model by identifying the shared characteristics of both the user and the affordances. In particular, this paper utilized Achievement Goal Theory (Ames 1992; Nicholls 1989) to identify and to theorize the potential, goal-relevant fit between users and affordances. For research interested in the 'fit' between users and motivational affordances, this paper implies that scholars need to identify the characteristics shared by users and the affordances. At the same time, this paper extends the 'Choice of Situation' model and Achievement Goal Theory into digital environments. In particular, this paper theorized and provided empirical evidence that the notion of 'goal structures' is not only bound to real-world social environments as created by social actors like parents or teachers but can also be constituted in information technologies created by their designers and developers.

Practical implications. For practice, this paper guides the development of fitness apps in general and the incorporation of the motivational affordances in particular. Individuals are differently motivated and hence require individualized 'motivational environment' that fit their exercise-relevant goals. Albeit features that afford self-monitoring, exercise guidance, rewards, and social comparison are available in most fitness apps (Lister et al. 2014), fitness app vendors should tailor these features to the goals the users pursue to provide an optimal motivational environment. This research provides the patterns between the users' goals and corresponding affordances in use (cf. Table 4). Users who strive to improve their physical abilities are particularly drawn to features that allow self-monitoring of their physical activities and to features that provide exercise guidance. When striving to demonstrate their physical competence and to outperform others, users utilize features enabling social comparisons and rewards.

Limitations and further research. Some limitations must be acknowledged. First, this study focused on one single app offering the focal motivational affordances. Albeit the concrete instantiation might slightly differ between fitness apps (as discussed concerning the rewards affordance), the general empirical findings share commonalities with recent studies on the role of individual differences in the context of other fitness apps which enhances the generalizability potentials of the study at hand (Hamari et al. 2018; James et al. 2019a; James et al. 2019b; Stragier et al. 2018). Nonetheless, future research should validate the results across other fitness apps. Second, this study investigated actual users, their goal orientations and resulting fitness app uses. Non-users and their goal orientations and their perceptions about the affordances can provide further meaningful insights, which could be of particular relevance on how to attract new users. Third, this paper focused on motivational differences as predictors of affordance use. As discussed, recent research has shown that such individual differences can also serve as moderating factors for the relationship between affordances and motivational outcomes (James et al. 2019b). Thus, further research needs to extend the role of achievement goals alike to enhance knowledge about individual differences in shaping the outcomes of using fitness apps.

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