AIS Transactions on Human-Computer Interaction

Volume 15 | Issue 2 Article 3

6-30-2023

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Recommended Citation
Sampat, B., Behl, A., & Raj, S. (2023). Understanding Fitness App Users' Loyalty and Word of Mouth through Gameful Experience and Flow Theory. *AIS Transactions on Human-Computer Interaction, 15*(2), 193-223. https://doi.org/10.17705/1thci.00088
DOI: 10.17705/1thci.00088

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Sampat, B., Behl, A. & Raj, S. (2023). Understanding fitness app users' loyalty and word-of-mouth through gameful experience and flow theory. *AIS Transactions on Human-Computer Interaction*, *15*(2), pp. 193-223.

DOI: 10.17705/1thci.00188

Available at http://aisel.aisnet.org/thci/vol15/iss2/3

Transactions on Human-Computer Interaction

Research Paper DOI: 10.17705/1thci.00188 ISSN: 1944-3900

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Abstract:

In this study, we examine the effect that a gameful experience and personalization have on the flow experience of fitness app users. We also test the association between flow experience and satisfaction in using fitness apps and whether satisfied users remain loyal and spread word of mouth regarding fitness apps. We use the belief-attitude-behavior framework as a theoretical lens and flow theory to explore the proposed relationships. Four hundred thirty-one fitness app users from India participated in the study. The results indicate that gameful experience and personalization lead to flow experience. We found a positive association between flow and satisfaction wherein satisfied fitness app users spread word of mouth and remained loyal to using fitness apps. Our findings will help fitness app developers identify factors to retain fitness app users and attract new ones.

Keywords: Fitness Apps, Gameful Experience, Personalization, Flow Theory, Satisfaction, Word of Mouth, Loyalty

Andreas Janson, Manuel Schmidt-Kraepelin, and Ali Sunyaev were the accepting senior editors for this paper.

1 Introduction

Healthcare practitioners focus on harnessing the advances in information technology (IT) to drive preventive healthcare. Mobile fitness applications (fitness apps) have gained extreme popularity in the last few years as they provide personalized fitness-related information and facilitate preventive healthcare (Beldad & Hegner, 2018; Jin et al., 2022). These apps allow users to self-track, quantify, and analyze massive amounts of data to make informed health decisions (Molina & Myrick, 2021) and to share this information with others on social media platforms (Maturo & Setiffi, 2016). In January 2022, fitness apps recorded approximately 17 million downloads worldwide (Ceci, 2022).

However, despite the extensive adoption and benefits that these fitness apps offer, researchers have found that underuse and lapsed usage jeopardize the likelihood that users will obtain benefits from them (Esmaeilzadeh, 2021; Schmidt-Kraepelin et al., 2020). Users cease using or abandon most smartphone apps after using them for a single time due to dissatisfaction (Tarute et al., 2017). To ensure users continue to use fitness apps, they require effective engagement mechanisms that compel users to feel satisfied while using them. Thus, we need to understand user satisfaction given the positive health outcomes that using fitness apps can generate. In fitness apps, developers now incorporate gamified elements (Schmidt-Kraepelin et al., 2018; Koivisto & Hamari, 2019) to shape user behavior and enable users to develop sustained user habits over time (Ögel Aydın & Argan, 2021; (Schmidt-Kraepelin et al., 2020). Gamification uses game elements in a non-game context (Behl et al., 2021; Schöbel et al., 2021). Fitness apps (e.g., Nike+, RunKeeper, and MyFitnessPal) have gamified elements that offer users rewards and badges and facilitate better engagement for optimizing healthy practices (Windasari et al., 2021). Apps such as Fitbit, Endomondo, and so on attract more users (Edwards et al., 2016) by tracking their digital trace data for better performance (Whelan & Clohessy, 2021) and user engagement.

Scholars have underscored gameful experience as an effective strategy for encouraging people to engage in more physical activity (Cai et al., 2022). The healthcare industry has rapidly adopted gamification for self-monitoring and health management (Soni et al., 2021; Stepanovic & Mettler, 2018). However, the extant literature lacks studies that explain how effectively underlying gamified components in fitness apps result in user satisfaction (Sardi et al., 2017).

Personalization refers to the capacity to dynamically modify services based on user tastes and personal preference information (Chellappa & Sin, 2005). Many organizations use artificial intelligence (AI) techniques in fitness apps to enable personalization and make them more intelligent (Ostrom et al., 2019). A tailored approach to health promotion can outperform a one-size-fits-all strategy (Lustria et al., 2013). Fitness apps enhance the user experience by encouraging users to change their behavior (Kankanhalli et al., 2021). Personalization ensures that an application provides the appropriate information to the appropriate individual at the right time and in the correct manner (Sun et al., 2013). Personalized fitness apps provide feedback to users and help them set and review goals. However, personalization does not always have a favorable impact. Responses to personalized content differ as some users view it as credible, while others treat it with skepticism and exhibit higher avoidance levels (Tran, 2017). However, to fully avail the potential benefits that can be gained from various features of customized health services, users must disclose their personal information to apps (e.g., height, weight, health status, food preferences, living style, BMI, age, shipping address, name, location, app access duration and pages viewed). Personalization in fitness apps requires continuous monitoring, which can raise several privacy-related concerns. Research has examined how social media personalization facilitates relationship building (Guinaliu-Blasco et al., 2019) and user engagement (Maslowska et al., 2016) due to how much data social media collects. Researchers have studied personalization in healthcare on websites to understand adherence to a healthy diet (Orji et al., 2014), privacy concerns (Guo et al., 2016), and non-compliance with diet plans (Vo et al., 2019). Thus, we need to understand whether including personalization in fitness apps leads to a flow experience (i.e., better engagement, absorption in the activity, and complete user control) despite the potential privacy challenges.

App quality aspects enhance users' experience and can cause flow, a state in which users fully concentrate and engage with an activity. With the different features and data-collection strategies that fitness apps offer (e.g., satellite monitoring and heart monitoring), exercise has become an experience. Research suggests that users often experience flow when using technology (e.g., fitness apps), which can lead to satisfaction and long-term engagement (Gao et al., 2014). Extant literature has reported that the flow state plays a more crucial role in activities that require constant effort, such as exercise (e.g., Csikszentmihalyi, 1990). A

gameful experience leads to a flow state, which results in better user engagement (e.g., Hamari & Koivisto, 2014, 2015).

Prior studies on fitness apps have examined the effect that using fitness apps has on users' behavior, such as meeting their health goals (Herrmann & Kim, 2017), monitoring food intake, and adhering to diets for weight loss (Chen et al., 2018). Although many users recognize that fitness apps can have a positive effect on their health, they often discontinue, abandon, and/or switch apps as they fail to see such an effect (Yang et al., 2020). Studies suggest that users sharply reduce how often they use fitness apps in the six months after initially using them (Pellegrini et al., 2018). Likewise, only 2.58 percent of users adhere to the diet that self-monitoring apps suggest (Helander et al., 2014). Extant literature has pointed out that one of the most critical parameters for deciding the users' continuance usage of apps is users' satisfaction (Gao & Bai, 2014, Cyr, 2008; Kim et al., 2008, Biduski et al., 2020).

In this context, the extant literature has also identified user loyalty and WOM as essential outcomes of user satisfaction (Biduski et al., 2020; Cyr, 2008; Gao & Bai, 2014). However, in the context of fitness apps, it is still uncertain whether user satisfaction with a fitness app translates into positive WOM about and loyalty to it. Thus, to overcome this limitation, we examine the extent to which gameful experience in fitness apps contributes to providing a flow experience to users, which can enhance their satisfaction, result in their spreading positive word of mouth (WoM) about an app, and increase their loyalty to the app.

Thus, we address the following research questions (RQ):

RQ1: How do gameful experience and personalization affect the flow experience?

RQ2: Does the flow experience in fitness apps lead to user satisfaction?

RQ3: Do satisfied fitness app users remain loyal and spread positive WOM about fitness apps to others?

In this study, we draw on the belief, attitude, and behavior framework and flow theory (Csikszentmihalyi, 1975) to conceptualize the variables of interest and capture the various contours of users' satisfaction, loyalty, and WoM. Researchers and practitioners in social psychology have underscored the important role of beliefs, attitudes, and behaviors in understanding human behavior related to user satisfaction and continued usage intentions. For example, Ajzen (1980) argued that beliefs predict people's attitudes. Thus, a person's attitude directly affects their behavioral intentions. Gao et al. (2015) grounded their research on belief-attitude-behavior framework to examine users' continued intentions regarding loyalty and WoM. Furthermore, past studies have reported that, in the technology applications context, flow experience plays a pivotal role in users' satisfaction (Cheng, 2021). Thus, based on these observations, the beliefs, attitudes, and behavior framework and flow theory suit efforts to understand users' loyalty and WoM as behavioral intentions based on their beliefs (gamified experience and personalization) and attitudes (flow and satisfaction).

This paper proceeds as follows: in Section 2, we present the study's theoretical background. In Section 3, we discuss the propositions and the conceptual research model. In Section 4, we describe the research methodology we followed. In Section 5, we discuss the results. In Section 6, we discuss the study's theoretical and practical implications. Finally, in Section 7, we conclude the paper.

2 Theoretical Background

2.1 Gameful Experience

Organizations apply gamification to enhance customer experience and build long-term customer relationships (Fankhauser, 2013). Past scholars have suggested that gamified elements such as rewards, points, and challenges paired with the desired behavior enhance users' participation and retention (Behl et al., 2021). Past studies have reported that gameful experiences can play a critical role in user satisfaction, especially in human-computer interactions (Schöbel & Janson, 2018; Schöbel et al., 2020a; Sola et al., 2015). Gamification effectively encourages people to indulge in fitness activities (Chen & Pu, 2014) through challenges, medals, rankings, and avatars. These gamified elements can motivate users to follow fitness activities with fun and enjoyment (Bitrián et al., 2020), which can eventually result in behavioral change (Feng et al., 2018). The extant literature has suggested that a gamification environment positively influences users' intrinsic motivation and significantly changes their behavior (Mekler et al., 2017; Xi & Hamari, 2020). Gamification in fitness apps can effectively motivate users to perform fitness activities with enjoyment (Sardi

et al., 2017). When used in a non-game context, gameful experiences can increase a service's value and, thus, increase satisfaction and loyalty (Ašeriškis & Damaševičius, 2014).

2.2 Flow Theory

Flow theory (Csikszentmihalyi, 1975) suggests that users experience flow when entirely engrossed with and engaged in an activity such that they focus their attention on it and filter out irrelevant perceptions to experience immersion. Flow constitutes a critical intrinsic motivator that impacts users' participation in an activity (Huang, 2012). Researchers have extensively applied flow theory in various applications, especially in human-computer interaction, regarding user continuance intentions (Hu et al., 2017; Hsu & Lin, 2021). Flow theory is a nebulous concept that encompasses various components such as perceived enjoyment, perceived control, and attention focus (Koufaris, 2002). Past studies have suggested these three factors as the most crucial flow dimensions (Finneran & Zhang, 2005; Koufaris, 2002; Schaffer & Fang, 2022). In the fitness app context, perceived enjoyment refers to the fun, pleasure, and interest that users experience when using a fitness app. Perceived control refers to the sense that users have complete control while using a fitness app. According to flow theory, a challenging task motivates users to perform it (Csikszentmihalyi, 1990). Apps with fitness challenges can provide a unique user experience and, thus, enhance user satisfaction (Soni et al., 2021; Yan et al., 2021). Intrigued by this fact, past scholars have examined the relationship between flow experience and user satisfaction in varied settings (Cheng, 2021; Hsu & Lin, 2021; Lee & Kim, 2017; Zhou, 2013). While in flow when using fitness apps, a person may experience intense engagement, a distorted sense of time, high motivation, and a loss of self-consciousness. To experience flow while using fitness apps, users require clear goals, immediate feedback, and challenges.

2.3 Personalization in Fitness Apps

AI-enabled personalization in fitness apps refers to gathering user data when users interact with the apps, which provides custom-based information judiciously. Based on the collected data, the app dynamically self-configures user behavior by creating services suitable for their needs (Grua et al., 2022). Simple personalization measures can include sending personalized communication messages to users (Kankanhalli et al., 2021). Personalization in fitness apps leads to increased user performance (Liu & Tao, 2022; Passalacqua et al., 2021). Apps with personalized interfaces provide preference matching that influences users' needs (Guo et al., 2016). Personalized fitness apps let users create routines that they can integrate into their personal lives without symptoms or biometric data triggering them (Vardhan et al., 2022).

2.4 Word of Mouth and Loyalty

Word of mouth (WoM) provides a vital way for users to both obtain and disseminate information about a product/service (Özdemir et al., 2016). It allows users to effectively convey their experiences, views, and information about products/services to others as compared to media or newsprint (Al-Adwan et al., 2022). For instance, users often participate on social media platforms and share their reviews, forums, ratings, communities, and recommendations, which can affect other users' behavior (Chan & Ngai, 2011). Users often rely on recommendations from friends, family, and peers before using a fitness app (Cheng et al., 2022). Jarrad et al. (2021) opined that favorable WoM generates positive sentiment towards a product/service. Breazeale (2009) pointed out that discontented users feel more inclined to vent their anger against the organization by spreading negative WoM. Thus, organizations should focus on improving the customer experience to avoid negative WoM (Buttle, 2009). WOM has emerged as a critical factor (Šegota et al., 2021) as users now rely on other users more than businesses' traditional marketing and advertisement campaigns.

Loyalty refers to consumers' commitment to continue using a product or service despite the availability of several switching options (Oliver, 1999). Chang (2015) suggested that loyalty represents a consumer's willingness to recommend products or services to others apart from personally using them. Deng et al. (2010) identified user loyalty as a critical factor that plays a significant role in users' post-adaptive satisfaction, which, in turn, positively influences their repeat behavior (Flavián et al., 2006; Keating et al., 2003). Satisfied users continue associating with specific organizations by displaying loyalty towards their product(s) or service(s) (Hirschman, 1970). User loyalty helps avert high customer churn rates (Eshghi et al., 2007), a common phenomenon when users have access to myriad fitness apps. Mattke and Maier (2021) suggested that fitness app developers need to understand factors determining user loyalty to retain users as it provides various benefits throughout all stages of the IT lifecycle.

2.5 Belief-Attitude-Behavior Framework

Ajzen (1980) posited that an individual's beliefs form the foundation for their attitude, which further governs their behavioral intentions and, thus, affects their behavior. Following this notion, Ajzen (1985) underscored the impact that belief has on the individual's attitudes, behavioral perspectives, and actions. Researchers have studied the belief-attitude-behavior to examine the effect that the flow experience has on users' purchase intentions (Huang et al., 2017; Lu et al., 2022) and whether users' satisfaction leads to continuance intentions to use an app (Alessa et al., 2018; Huang et al., 2020; Xu & Du, 2018; Yarimoglu & Gunay, 2020) and found evidence to support the theory's robustness. In line with previous studies (e.g., Gao et al., 2015), we followed the belief-attitude-behavior framework as our underlying conceptual framework (see Figure 1).

3 Hypothesis Formulation

3.1 Gameful Experience and Flow

Gamification refers to representing non-game elements in a game-like fashion (Morford et al., 2014; Schöbel et al., 2020b; Eppmann et al., 2018) to create a game-like consumer experience, which can motivate users, increase their enjoyment, and, thus, affect their behavior (Huotari & Hamari, 2017). It refers to designing systems and tasks that induce motivating and engaging experiences similar to those that games induce (Deterding et al., 2011; Hassan et al., 2019; Huotari & Hamari, 2017; Liu et al., 2013). Researchers have studied gamification in healthcare (Kari et al., 2016; Schmidt-Kraepelin et al., 2018) to improve health outcomes. Gamified elements in fitness apps offer rewards for 1) engagement (e.g., badges: iconic features that indicate consumer achievement (Koivisto & Hamari, 2014), progression, milestones that demonstrate progress (Brauner et al., 2013), and points: performance measured using numerical elements (Walsh & Golbeck, 2014)) and 2) improved social interaction (e.g., likes (Hamari & Koivisto, 2015), leaderboards (Allam et al., 2015), teams (Xu et al., 2017)) to encourage fitness app users to form behavioral changes (Nicholson, 2015). Several scholars have examined gamification in healthcare to promote exercise (Jang et al., 2018), health (Sardi et al., 2017), and healthy habits (Gowthamani et al., 2022). Users experience flow when they experience absorption and enjoyment (Whittaker et al., 2021), challenges (Poncin et al., 2017), suspense (Anselme, 2010), and excitement to complete a task (Leclercq et al., 2018). Game elements emulate the play's rewarding characteristics. Studies have posited that gameful experiences that result from gamification can induce flow (Berger et al., 2018). Thus, we hypothesize:

H1: Gameful experience is positively associated with the flow.

3.2 Personalization and Flow

Personalization—also called customization (Fan et al., 2013; Rose et al., 2012) and embodiment (Kim et al., 2013)—refers to creating a tailored structure and content based on what users need, look and feel, presentation, aesthetics, and geographical location to suit their implicit and explicit needs (Zanker et al., 2019). Personalization in fitness apps allows app developers to alter rules or content for specific user contexts to promote efficient usage and engagement with an app (Helf & Hlavacs, 2016). A personalized fitness app can include features such as displaying app users' names when they log in and providing exercise customization using algorithms that model users' needs and behaviors (Bilgihan et al., 2016). In this way, such an app caters information to users while they use the service, which can enhance their sense of control, experience, and enjoyment and lead to flow (Liu et al., 2021; Zhang et al., 2007). With personalization, fitness apps can provide a more tailored experience that suits users' fitness objectives, preferences, and levels. Users can graduate to more strenuous workout sessions due to fitness app personalization, which gives them more control over their workout.

Personalized challenges tailored to users' abilities provide higher engagement. Individuals experience flow when they need to engage in challenges that stretch their capabilities to achieve their goals (Csikszentmihalyi, 1990). Personalization can provide constant challenges catered to users' skills, which supports engagement. The important triggers for flow include clear objectives, personalized feedback, and a balance between a user's talent and challenges. As users participate in a physical activity, they will lose track of time, stick to their fitness regimen to achieve their goals, and, thus, experience flow. Personalized features in fitness apps benefit users by enhancing their motivation, enjoyment, adherence to workout regimes, and results, as well as by providing accurate tracking and customized support, which can result in enjoyable and effective health outcomes (Dominique, 2021). Thus, we hypothesize:

H2: Personalization is positively related to flow.

3.3 Flow and Satisfaction

Users experience flow (FW) when 1) they feel a state of total involvement (Csikszentmihalyi & Csikszentmihalyi, 1992), concentration, and absorption when conducting an activity (Csikszentmihalyi, 1990); 2) activities that they perform challenge their skills (Csikszentmihalyi et al., 2005); and 3) they set defined goals and work towards achieving them. The flow construct measures perceived enjoyment, control, and attention focus (concentration) (Finneran & Zhang, 2005). Providing feedback on the actions that users take and sending them notifications to achieve these fitness goals helps users set challenging yet achievable goals (Yan et al., 2021). An app that provides a compelling experience leads to satisfaction (Gao et al., 2015); thus, users exhibit a positive attitude toward using it (Lee et al., 2018). Fitness apps allow users to set goals and accomplish them, which may initially seem challenging but are not impossible to accomplish. Such goals enable users to feel satisfied and experience flow when achieving and meeting goals. This act lets users experience a flow state as they become completely absorbed in fitness activities, feel a sense of control over their environment, experience enjoyment, lose self-consciousness, and focus on tasks (Csikszentmihalyi & LeFevre, 1989). Thus, being in a flow state enhances users' perceptions of an experience and leads to satisfaction (Gao et al., 2015). Studies have shown a positive association between flow and satisfaction in in-game purchase intention (Goli & Vemuri, 2021), mobile learning applications (Wang & Lin, 2021), mobile apps (Chou, Chiu, Ho, & Lee, 2013), and mobile location-based advertising augmented reality (AR) games (Thongmak, 2019). Thus, we hypothesize:

H3: Flow is positively associated with satisfaction with using fitness apps.

3.4 Satisfaction and Word of Mouth

With an increase in how many fitness apps continue to appear in app stores, organizations face more and more competition to hold on to users and obtain positive word of mouth (WOM) about their products/services. Satisfied users expend more time and revisit their preferred apps (Kim et al., 2016). WoM reflects users' intention to recommend or reject mobile (mhealth) apps to their friends and family (Birkmeyer et al., 2021). WoM influences user behavior tremendously in that users' choices depend on feedback they receive about products/services (Preko et al., 2021). Studies have established the relationship between satisfaction and WoM (Lai, 2020; Leung, 2020; Preko et al., 2021). Satisfaction plays a critical role in whether users spread WoM (Lai, 2020) and talk informally about fitness apps, which can occur online or offline. Due to cohort size limitations, introducing innovation in healthcare WoM in fitness apps is often expensive (Birkmeyer et al., 2021). WoM refers to interpersonal communication among users regarding their personal experience about a product after using it (Kalinić et al., 2020; Richins, 1983; Tandon et al., 2018). Positive WoM also involves advocacy that creates a positive impression and increases user awareness. Users spread negative WoM (e.g., to not use a product or service) when a product or service does not meet their expectations (Thakur, 2019). Racherla et al. (2012) suggest that users can easily find WoM about mobile apps before using them. Positive WoM is one of the most influential factors that affects whether users will use an app (Lee & Chung, 2009). Thus, we hypothesize:

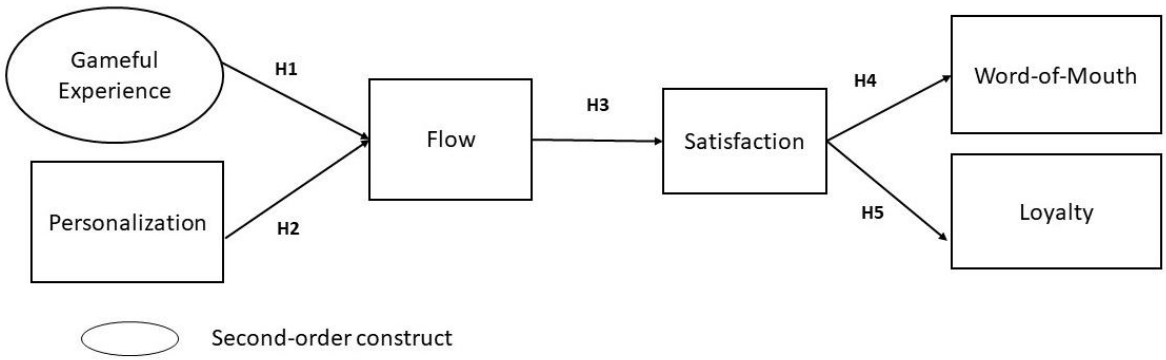
H4: Satisfaction is positively associated with positive word of mouth.

3.5 Satisfaction and Loyalty

Consumer loyalty refers to an individual's commitment to re-patronize or re-buy a preferred product or service (Oliver, 1999). Consumers experience strong positive emotions using gamified fitness apps (Tu et al., 2019), which increases their satisfaction and retention levels (Ferreira Barbosa et al., 2022). Among other things, satisfaction results in loyalty (Anderson & Srinivasan, 2003; Choi & Kim, 2004), which encourages users to continue to use fitness apps. In the fitness app context, loyalty refers to the predisposition to use the same fitness app and repeatedly purchase the services (such as workout and meal plans) it provides (Edvardsson et al., 2000; Homburg & Giering, 2001), and it derives from the conviction that the app offers better benefits than others (Hallowell, 1996). The service user experience influences a user's repurchase intentions or continued usage (Thakur, 2019). Loyalty helps fitness app developer organizations achieve success with sustained use (Casaló et al., 2008). Loyalty is a behavior that users express over time and depends on their psychological processes. Gamification encourages increased consumption and loyalty (Hofacker et al., 2016). Users who adopt fitness apps with several game elements demonstrate higher loyalty than users who adopt fitness apps with limited game elements (Feng et al.,

2020). Gamification in loyalty programs (i.e., gamified loyalty programs) impacts user loyalty towards them and their behavioral intentions (Hwang & Choi, 2020). Gamified loyalty programs increase customer loyalty, which enhances their intention to use fitness apps against conventional loyalty programs (Al-Zyoud, 2021). We can use reinforcement theory to explain the loyalty that results from users' satisfaction with using fitness apps. Indeed, several studies across different contexts, such as mobile commerce (Lin & Wang, 2006), mobile phone usability (Lee et al., 2015), and banking (Mohsin Butt & Aftab, 2013) have identified satisfaction as the most crucial factor that predicts user loyalty. Thus, we hypothesize

H5: Satisfaction is positively associated with loyalty.



Note: gamified experience comprises the following first-order constructs: enjoyment, absorption, creative thinking, activation, absence of negative effect, and dominance.

Figure 1. Proposed Conceptual Model

4 Research Methodology

4.1 Survey Instrument Development and Administration

We designed our survey instrument by borrowing items from prior literature and making minor changes to suit the study's context. We present the detailed items used for each construct and the studies from which we borrowed them in Appendix A. The questionnaire's first section comprised two screening questions to ensure accurate participant selection:

1) Have you used a fitness app in the recent past?
2) Are you aware of gamification features used in fitness apps?

The second section comprised items that measured the study constructs, and the concluding section included questions about respondent demographics.

We borrowed the scale items to measure gameful experience from Eppmann et al. (2018). We treated flow as the first-order construct and borrowed its items from Saadé and Bahli (2005) and Esteban-Millat et al. (2014). We measured satisfaction using items that we borrowed from Casaló et al. (2008) and Kim (2021). We borrowed six items to measure loyalty and five items to measure WoM from Casaló et al. (2008). We borrowed the five-item personalization scale from Chellappa and Sin (2005). We measured the items using a five-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (5). We established the scale's content validity by contacting gamification and health informatics experts. We tweaked how we framed a few items based on their suggestions.

We pilot-tested the survey instrument with 40 participants using fitness apps to ensure that the wording used in the survey lacked ambiguity and errors. We noted how long it took the participants to complete the questionnaire. We incorporated the feedback from the pilot test into the final study, where we reworded some items to reduce ambiguity. We used convenience and snowball sampling to collect data by reaching out to fitness app users, a method that several other fitness app studies have also used (Kim, 2022; Klenk et al., 2017). Fitness app users are conversant with technology; thus, we distributed an online questionnaire link to 600 fitness app users. We asked the respondents questions to understand the fitness apps they

currently used and how long they had used them for. We received 446 responses in all (71.5% response rate). After we cleaned the data, 431 usable responses remained. Since we collected the data over four months from July to November, 2022, the sample may have differed in responses between the early and late respondents. Thus, we tested the responses from early and late respondents using an independent sample t-test and found no significant mean difference. Likewise, we also performed an independent sample t-test to check the difference between males and females and found no significant difference in their responses. Table 1 presents the participants' demographic characteristics.

4.2 Data Analysis

Before proceeding with the analysis, we checked for missing values and multicollinearity. We eliminated respondent entries with missing values. The variance inflation factor (VIF) values were below 5, which indicates that the data did not suffer from multicollinearity. We tested the conceptual model using partial least squares (PLS), a variance-based structural equation modeling (SEM) technique, which has strong roots in regression and path analysis with good prediction capability (Sarstedt et al., 2021). Since we focus on prediction in this study (McIntosh et al., 2014) and to explain the driver constructs, PLS-SEM represents a better choice than covariance-based SEM (CB-SEM). CB-SEM represents a more appropriate choice for testing which competing model best fits the data (Anderson & Gerbing, 1988). PLS-SEM can deal with higher-order constructs (e.g., gameful experience in our study) (Sarstedt et al., 2019) in a single model (Hair et al., 2011). PLS-SEM substantially reduces measurement error effects (Henseler et al., 2014) and increases parameter-estimation efficiency (Hair et al., 2021). PLS modeling relies on an algorithm that estimates the path coefficients in the structural model after estimating the best weights for each block of the measurement model (Chin & Newsted, 1999). Thus, based on these observations, we applied Warp PLS 7.0, which uses partial least squares structural equation modeling. We adhered to Kock's (2019) guidelines to avoid the bias that leads to inaccuracies in the path coefficients by ignoring the measurement errors that traditional PLS-SEM poses.

5 Results

5.1 Measurement Model

We tested the measurement model's reliability and validity by examining the constructs' individual-item reliability and convergent and divergent validity. We checked the instrument's reliability by using a random data distribution. We followed the two-stage data-analysis approach that Anderson and Gerbing (1988) propose. In the first stage, we checked the model's validity and examined the reflective constructs by performing confirmatory factor analysis (CFA) (Fornell & Larcker, 1981). In the second stage, we tested the structural model after deeming the measurement model appropriate. We summarize the measurement model in Table A1 in Appendix A. The scale composite reliability (SCR) ranged from 0.82 to 0.93 and the average variance extracted (AVE) ranged from 0.60 to 0.69. Furthermore, the factor loadings were more significant than 0.5. Thus, following Fornell and Larcker's (1981) criteria, we confirmed that our model exhibited convergent validity. We examined the scale's discriminant validity by comparing the square root of AVE with the corresponding correlation coefficient for each construct. Table 2 indicates the square root of AVE exceeded the corresponding correlation coefficients, which confirms the measurement scale's discriminant validity. The correlation coefficients did not exceed 0.9, which indicates the absence of multicollinearity among the constructs. We tested for heterotrait-monotrait (HTMT) ratio of correlations and found all the values lower than the threshold value of 0.85, which suggests discriminant validity did not pose an issue in the study (Henseler et al., 2015). We tested the model's fit using the fit guidelines that Sarstedt et al. (2014) provide. The results showed model fit was good and acceptable for this study as the average path coefficient (APC) was 0.452 ($p < 0.001$), average R square (ARS) was 0.769 ($p < 0.001$), average full collinearity VIF (AFVIF) was 4.24 (ideally < 5), and the Tenenhaus GoF was 0.445 (large > 0.36; medium > 0.25; small < 0.1) (see Table 3). The non-linear bivariate causality direction ratio (NLBCDR) estimates causality; that is, it measures the extent to which bivariate non-linear coefficients of association provide support for the hypothesized directions of the causal links in the conceptual model. We report the causality assessment indices in Table 4.

Table 1. Users' Demographic Profile

Demographic factor	Option	Frequency	Percentage
Exercised in the last 3 months	Yes	401	93.04
	No	30	6.96
Hours expended per week	Less than one hour	30	6.96
	Between one and two hours	95	22.04
	More than two hours	306	71
Gender	Male	223	51.74
	Female	206	47.8
	Transgender	0	0
	Prefer not to say	2	0.46
Age (years)	≤ 20	69	16.01
	21-30	95	22.04
	31-40	172	39.91
	41-50	60	13.92
	≥ 50	35	8.12
Education	High school	73	16.94
	Two-year higher education	52	12.06
	Bachelor degree	250	58
	Masters or doctoral	56	12.99
Occupation	Self-employed	73	16.94
	Employed	293	67.98
	Student	65	15.08
Length of using fitness apps	Less than one year	61	14.15
	One to two years	56	12.99
	Two to three years	181	42
	Three to four years	129	29.93
	Four years	4	0.93
Select the fitness app most frequently used	Healthify Me	61	14.15
	MyFitnessPal	108	25.06
	Curefit	51	11.83
	Fittr	69	16.01
	Seven-7 minute workout	17	3.94
	Strava	52	12.06
	Nike Training Club	39	9.05
	Others	34	7.89

5.2 Common Method Bias

We examined common method bias (CMB) using Harman's single-factor test (Podsakoff & Organ, 1986). The results indicated that the overall model explained 69.24 percent variance, whereas a single factor explained only 25.31 percent. As a single factor did define most of the variance, we can conclude the sample did not suffer from CMB. Researchers need to test for causation before testing hypotheses (Kock, 2015). One way to do so involves examining the non-linear bivariate causality direction ratio (NLBCDR). We did so and determined it to be 0.803 (acceptable value > 0.7), which confirms that causality did not pose a problem in our research (see Table 4).

Table 2. Measures for Discriminant Validity

	PE	AB	CT	ACT	ANA	DOM	FE	SAT	WOM	LOY	PER
PE	***0.67***										
AB	0.43	***0.52***									
CT	0.26	0.34	***0.74***								
ACT	0.28	0.42	0.36	***0.62***							
ANA	0.36	0.27	0.31	0.34	***0.52***						
DOM	0.42	0.24	0.52	0.31	0.26	***0.63***					
FE	0.14	0.21	0.27	0.27	0.25	0.43	***0.64***				
SAT	0.25	0.15	0.32	0.26	0.31	0.25	0.42	***0.55***			
WOM	0.32	0.34	0.12	0.25	0.13	0.21	0.22	0.38	***0.57***		
LOY	0.14	0.16	0.15	0.31	0.17	0.17	0.27	0.2	0.36	***0.72***	
PER	0.28	0.22	0.36	0.15	0.26	0.16	0.26	0.16	0.38	0.26	***0.6***

Note: PE: perceived enjoyment, AB: absorption, CT: critical thinking, ACT: activation, ANA: absence of negative effect, DOM: dominance, FE: flow, SAT: satisfaction, WOM: word of mouth, LOY: loyalty, PER: personalization.

Table 3. Model Fit and Quality Indices Parameters

Model fit and quality indices	Values (threshold values if any)
Average path coefficient (APC)	0.452 ($p < 0.001$)
Average R^2	0.769 ($p < 0.001$)
Average block VIF	4.24 (acceptable if value ≤ 5)
Tenenhaus GoF	0.445 (large if value ≥ 0.36)

Table 4. Causality Assessment Indices

Causality Assessment Indices	Values (threshold values if any)
Sympson's paradox ratio (SPR)	0.821 (acceptable if ≥ 0.7)
R^2 contribution ratio	0.929 (acceptable if ≥ 0.9)
Statistical suppression ratio (SSR)	0.749 (acceptable if ≥ 0.7)
Non-linear bivariate causality direction ratio (NLBCDR)	0.803 (acceptable if ≥ 0.7)

5.3 Hypothesis Testing

Figure 2 shows the results from the PLS-SEM analysis using Warp PLS. We chose not to perform parametric data-based tests as PLS-based SEM does not necessarily have a prerequisite condition. We used a bootstrap procedure to estimate parametric estimates' standard error and significance (Behl et al., 2023). We treated gameful experiences as a second-order construct. We found support for all first-order constructs in the study. Absorption ($\beta = 0.43$, $p < 0.001$) had the highest effect on gameful experience followed by activation ($\beta = 0.37$, $p < 0.001$), enjoyment ($\beta = 0.32$, $p < 0.001$), creative thinking ($\beta = 0.35$, $p < 0.001$), dominance ($\beta = 0.12$, $p < 0.001$). We found the absence of negative effects to be insignificant. We found support for all the hypotheses. Table 5 reports all results from testing the hypotheses (H1-H5). We found a positive association between gameful experience and flow ($\beta = 0.48$, $p < 0.001$) and between personalization and flow ($\beta = 0.54$, $p < 0.001$), which supports H1 and H2, respectively. We found the relationship between flow and satisfaction ($\beta = 0.65$ $p < 0.001$) to be significant, which supports H3. Finally, we found the relationship between satisfaction and word of mouth ($\beta = 0.62$, $p < 0.001$) and between satisfaction and loyalty ($\beta = 0.35$, $p < 0.001$) to be significant, which supports H4 and H5, respectively.

Table 5. Structural Estimates

Hypothesis	Effect that	Has on	β	P-value	Results
H1	Gameful experience	Flow	0.48	***	Supported
H2	Personalization	Flow	0.54	***	Supported
H3	Flow	Satisfaction	0.65	***	Supported
H4	Satisfaction	Word of mouth	0.62	***	Supported
H5	Satisfaction	Loyalty	0.35	***	Supported
Note: *** Significance level 0.001					

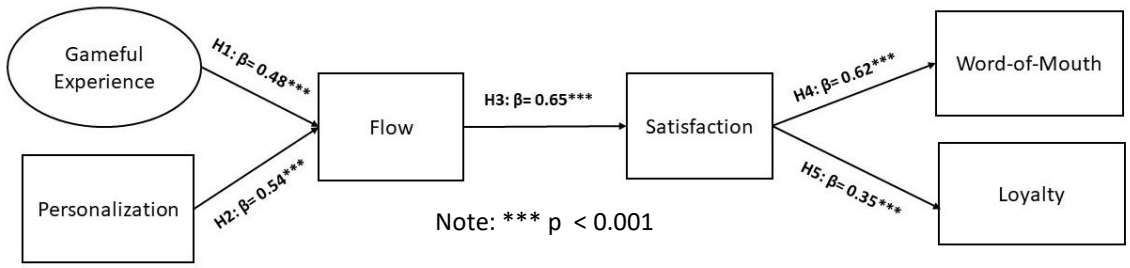


Figure 2. Structured Model with Standardized Paths

6 Discussion and Theoretical and Practical Implications

6.1 Discussion

In line with Berger et al. (2018), our results support the assertion that a gameful experience leads to flow for fitness app users. A gameful experience creates an autotelic experience (Rachels & Rockinson-Szapkiw, 2018), which motivates users to continue using fitness apps as they enjoy them. The gaming experience in the app may create emotional benefits similar to a sense of immersion, mastery, and flow in the activity (Kim et al., 2023). The gameful experience of fitness apps allows users to enjoy and lose track of time while exercising. Gamified features in fitness apps encourage users to meet their goals, which helps them efficiently complete tasks and maintain their complete attention, which leads to flow (Kim et al., 2022). The fact that fitness apps use simple challenges that users can set themselves improves the flow experience. Despite being virtual, gamified elements such as rewards, badges, and trophies in fitness apps positively influence the flow experience (Yuniasri et al., 2021). We found a positive association between personalization and flow experience, which implies that providing personalized services based on users' health needs can improve their flow experience and reduce how much time and effort they need to expend to identify the right food and exercise regimen suitable for them. Personalization ensures a fitness app delivers the fitness message to the right audience at the right place and at optimal times. When fitness app users receive a personalized message, they feel like it reflects their needs. Thus, they find the message enjoyable and may be completely engrossed in and concentrating on it, which can lead a flow state (McQuail, 1987). The recommendation systems that fitness apps use for personalization result in positive user emotions (Tyrväinen et al., 2020). Personalization affects flow as a fitness app user may pay more attention to a personalized message than a general message targeted at a broader audience (Robins, 2003). Users refrain from overlooking the content in these messages and investigating their details as they have an interest in content that pertains to them (Kim & Han, 2014). Furthermore, we found a positive association between flow and users' satisfaction, which concurs with Pavlou et al. (2007). As for why, a challenging but achievable goal-based health activity, supported by a fitness app, may induce a flow experience (Yan et al., 2021). As a result, users may become engrossed in the app, which provides them with satisfaction while using it. We also found a significant association between satisfaction and fitness app loyalty. This result concurs with past studies (Anderson & Sullivan, 1993; Casaló et al., 2008). We can attribute this significant association to fitness app designers providing additional features in apps such as

personalized digital self-avatars, engaging videos, nutritional tips, live workout sessions, and freebies that may increase user satisfaction.

The study showed that, when consumers find fitness apps to deliver satisfying services, they will eventually recommend them to others. We attribute this finding to the fact that, according to the rational emotive behavior theory, users' behavior results from their attitude (Turner & Davis, 2019). As past scholars have noted, satisfaction signals a positive attitude (Zhang et al., 2019). Thus, satisfied fitness app users show their positive attitude by recommending apps to others.

6.2 Theoretical Implications

This study makes several significant contributions to research by providing new insights regarding fitness app users. The study results suggest our research model exhibited acceptable fit. First, we considered gameful experience as a multidimensional construct with features such as enjoyment, absorption, creative thinking, activation, absence of negative affect, and dominance (Eppmann et al., 2018). In doing so, we contribute significantly to the gamification literature, which has referred to gameful experience dimensions as skill development, social connectedness, expressive freedom, and social comparison (Wolf et al., 2018). In this study, we pioneered integrating and empirically testing gameful experience and personalization of flow experience in using fitness apps. Second, researchers have not previously studied in the fitness app context to understand how satisfaction, loyalty, and WoM affect whether users uptake fitness apps. Existing studies have used several adoption theories (e.g., the technology acceptance model (TAM) (Sampat et al., 2018) and the unified theory of acceptance and use of technology (UTAUT) (Liu et al., 2019) to understand the behavioral intention to use fitness apps. We applied gameful experience and flow theory to understand its impact on fitness app users' satisfaction and address the scant attention that previous literature has paid to the topic. Our results indicate flow experience leads to satisfaction.

Third, by investigating a less explored but pertinent variable (i.e., AI-enabled personalization), the study adds an intriguing perspective to the literature on fitness apps. The positive and significant influence of personalization further opens new research avenues regarding the role that personalization plays in enhancing users' flow experience while using fitness apps. Lastly, the study contributes substantially to the expanding body of research on fitness apps. Extant studies have focused on users' initial adoption, continued usage, and discontinuance of fitness apps but have seldom examined the effect that satisfaction, loyalty, and WoM together have on whether users continue to use fitness apps. The study's findings can initiate more research into fitness apps to better understand users' behavior regarding fitness app usage.

6.3 Practical Implications

Our findings have practical implications for fitness app designers. Users' satisfaction level primarily determines their loyalty and ability to recommend an app to others. Thus, app designers must develop an environment conducive to exercise by introducing new game elements and unique customized services to enhance loyalty. Our results emphasize that a gameful experience and personalization impact the flow experience, which leads to user satisfaction; hence, app designers must make deliberate efforts to provide a gameful experience. They can include enjoyable and absorbing gamified activity-tracking features (e.g., pedometer, squat counter, push-up counter) that enhance creative thinking and feelings of dominance (e.g., earning rewards to level-up, leader boards, points, quests, progress notifications), activate users to exercise (e.g., goal setting, community finding, performance graphs, social feedback, user levels), which would overcome the adverse effects that inhibit users' long-term app usage. App designers can consider users' health conditions (e.g., high blood pressure, arthritis) and consult dieticians and health practitioners while designing and personalizing content for users. The positive influence that flow experience had on user satisfaction suggests that app designers should provide features that maintain a delicate balance between workout challenges and users' physical strength to perform the workouts (Yan et al., 2021), which would enhance users' flow experience. The app designers should design challenging yet attainable physical workout plans to enhance users' flow experience. App designers must incorporate suitable game elements aligned with user requirements to achieve higher satisfaction.

Personalization's significant influence on flow suggests that app designers should not design apps based on the belief that one size fits all. Personalization in diets (e.g., ketogenic, paleo, and vegan) and workout plans can further help users meet their fitness goals and, thus, enhance their satisfaction with an app (Baabdullah et al., 2018). Digital self-avatars can play several roles: 1) a coach that provides personalized recommendations and advice on changing health behavior, 2) a health practitioner who provides health

assessment (Klassen et al., 2013), 3) a friend (Bickmore et al., 2005) who supports and motivates the user to achieve goals. These outcomes can influence user motivation or satisfaction while using fitness apps (Schöbel et al., 2020b). Similarly, personalization in the form of cultural adaptations of avatars while using gamification (e.g., Indian looks and augmentation to an Indian population) can increase satisfaction levels. By providing personalized stress-relieving exercises, fitness apps can help combat users' mental stress (e.g., the stress that many faced during the COVID-19 pandemic) (Sampat et al., 2022).

6.4 Limitations of the Study and Directions for Future Research

Despite this study's theoretical and practical implications, it suffers from certain limitations that open avenues for future researchers to consider while designing their studies. First, we grounded our conceptual framework on the belief-attitude-behavior framework. Future studies can posit their work on uses and gratification theory, self-determination theory, theory of normative social behavior, and goal-setting theory to examine fitness app users' behavior. Employing other frameworks may uncover new dimensions in the present study context. Furthermore, future studies can extend this work by including service dimensions into the framework as it is an entwined part of the fitness app user experience. Understanding the effects of emerging technologies such as wearable devices and virtual reality could also augment customer satisfaction.

Similarly, understanding the effects of performance and ease of use may drive users' intentions to use fitness apps. Researchers could further develop our model by adding health-related factors (e.g., health consciousness, health goals, and health self-efficacy) or psychological factors (grit and perseverance) as moderating variables. We also recommend examining the role of free apps (freemium) versus fee-chargeable (premium) apps as a moderator, as it may influence loyalty and WoM. We did not incorporate gender or age as moderators, but future studies could investigate this factor as it may yield interesting insights.

Second, the data for this study came from a single country (i.e., India); thus, the results may lack generalizability. Future studies can validate our findings across various geographical and cultural contexts or conduct cross-cultural studies to improve their external validity. Third, we adopted a cross-sectional study design, which may suffer from inherent methodological and sampling biases and, thus, explain user behavior over time to a limited extent. Alternated methods such as longitudinal research design or collecting data over multiple timestamps may help overcome these challenges and produce robust findings. Future studies could employ mixed methods by conducting personal or focus-group discussions to gain a deeper insight into the antecedents of satisfaction. Third, we examined the effect that personalization had on the flow experience. Although we took a novel approach, the study captured limited personalization dimensions. Future researchers could broaden the personalization scope by focusing their research on various personalization facets such as content, interface, channel, and functionality personalization (Kankanhalli et al., 2021).

Lastly, we did not classify fitness apps (e.g., meditation, yoga, diet, and sleep) in this study. The features that different app categories offer may vary greatly; thus, the reasons for satisfaction could be diverse. Future studies could examine the motivations for using apps belonging to various categories to understand user satisfaction.

7 Conclusion

In this study, we explain how personalization and gameful experience lead fitness app users to experience flow. Personalization in fitness apps provides health services with personal relevance for users suffering from various ailments using mobile devices. The apps tailor their content to fit users' needs, and users can alter the language or browse a range of fitness videos (i.e., beginner, intermediate, and advanced) relevant to their needs or health conditions. Personalization in content (i.e., app design, social networking component) leads to flow. Gamification in fitness apps provides a sense of motivation and psychological and physiological changes in users lead to experiencing a flow state. Further, we examined the effect that flow experience had on users' satisfaction when using fitness apps. Satisfied fitness app users tend to spread positive word of mouth about their experience in using such an app while remaining loyal to using it.

Acknowledgements

We thank our reviewers for their valuable feedback. Special thanks to the guest editors for their comments, recommendations, and assistance.

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Appendix A

Table A1. Summary of the Measurement Model

Construct	Items	Factor Loading	Variance	Error	AVE	SCR
Perceived Enjoyment	PE1	0.79	0.62	0.38	0.68	0.93
	PE2	0.88	0.77	0.23		
	PE3	0.85	0.72	0.28		
	PE4	0.81	0.66	0.34		
	PE5	0.78	0.61	0.39		
	PE6	0.85	0.72	0.28		
Absorption	AB1	0.84	0.71	0.29	0.67	0.92
	AB2	0.81	0.66	0.34		
	AB3	0.80	0.64	0.36		
	AB4	0.82	0.67	0.33		
	AB5	0.80	0.64	0.36		
	AB6	0.85	0.72	0.28		
Creative Thinking	CT1	0.84	0.71	0.29	0.63	0.87
	CT2	0.76	0.58	0.42		
	CT3	0.81	0.66	0.34		
	CT4	0.77	0.59	0.41		
Activation	ACT1	0.79	0.62	0.38	0.69	0.90
	ACT2	0.83	0.69	0.31		
	ACT3	0.89	0.79	0.21		
	ACT4	0.80	0.64	0.36		
Absence of Negative Effect	ANA1	0.74	0.55	0.45	0.60	0.82
	ANA2	0.74	0.55	0.45		
	ANA3	0.84	0.71	0.29		
Dominance	DOM1	0.89	0.79	0.21	0.68	0.89
	DOM2	0.73	0.53	0.47		
	DOM3	0.80	0.64	0.36		
	DOM4	0.86	0.74	0.26		
Flow	FE1	0.83	0.69	0.31	0.64	0.90
	FE2	0.81	0.66	0.34		
	FE3	0.75	0.56	0.44		
	FE4	0.85	0.72	0.28		
	FE5	0.75	0.56	0.44		
Satisfaction	SAT1	0.80	0.64	0.36	0.64	0.90
	SAT2	0.83	0.69	0.31		
	SAT3	0.82	0.67	0.33		
	SAT4	0.75	0.56	0.44		
	SAT5	0.79	0.62	0.38		
Loyalty	LOY1	0.88	0.77	0.23	0.68	0.91
	LOY2	0.76	0.58	0.42		
	LOY3	0.87	0.76	0.24		

Table A1. Summary of the Measurement Model

	LOY4	0.74	0.55	0.45		
	LOY5	0.85	0.72	0.28		
Word of mouth	WOM 1	0.83	0.68	0.33	0.67	0.91
	WOM 2	0.87	0.76	0.23		
	WOM 3	0.76	0.61	0.39		
	WOM 4	0.78	0.58	0.44		
	WOM 5	0.84	0.72	0.28		
Personalization	PER1	0.78	0.61	0.39	0.58	0.87
	PER2	0.73	0.53	0.47		
	PER3	0.79	0.62	0.38		
	PER4	0.76	0.58	0.42		
	PER5	0.74	0.55	0.45		

Note: PE: perceived enjoyment, AB: absorption, CT: critical thinking, ACT: activation, ANA: absence of negative effect, DOM: dominance, FE: flow, SAT: satisfaction, WOM: word of mouth, LOY: loyalty, PER: personalization.

Appendix B

Table B1. Measurement Items Used in the Study

Second-order construct	First-order construct	Measurement items
Gameful experience	Enjoyment	I feel that using this fitness app is PE1. Fun PE2. Pleasurable PE3. Enjoyable PE4. Interesting PE5. Entertaining PE6. I would use the fitness app for its own sake, not only when being asked to
	Absorption	AB1. While using fitness apps, I forget where I am. AB2. I forget about my immediate surroundings while I use fitness apps. AB3. After using fitness apps, I felt like coming back to the "real world" after a journey. AB4. Using fitness apps "got me away from it all". AB5. While using the fitness apps, I was completely oblivious to everything around me. AB6. While using the fitness apps, I lost track of time.
	Creative thinking	CT1. Playing the game sparked my imagination. CT2. While playing the game I felt creative. CT3. While playing the game I felt that I could explore things. CT4. While playing the game I felt adventurous.
	Activation	ACT1. While using the fitness app I felt activated. ACT2. While using the fitness app I felt jittery. ACT3. While using the fitness apps, I felt frenzied. ACT4. While using the fitness app I felt excited.
	Absence of negative effects	ANA1. While using the fitness app, I felt upset. ANA2. While using the fitness app, I felt hostile. ANA3. While using the fitness app, I felt frustrated.
	Dominance	Dom1. While using the fitness app, I felt like being in charge. Dom2. While using the fitness app, I felt influential. Dom3. While using the fitness app, I felt autonomous. Dom4. While using the fitness app, I felt confident.
	Flow	FE1. I am absorbed in what I am doing while using the fitness app. FE2. I feel I have perceived control when I am using the fitness app. FE3. I am often unable to keep track of the passage of time while using mobile fitness apps. FE4. When using this fitness app, my attention is focused on the workout activity. FE5. When using this fitness app, I am deeply engrossed in the workout activity.
	Satisfaction	SAT1. I am satisfied with my decision to use this fitness app. SAT2. I am satisfied with my previous experiences with this fitness app. SAT3. I'm satisfied with this fitness app service. SAT4. This fitness app meets my needs and expectations. SAT5. My choice to use this fitness app was a wise one.
	Word of mouth	WOM1. I will recommend this fitness app to other customers. WOM2. I will point out the positive aspects of this fitness app if anybody criticizes it. WOM3. If someone asks me for information on fitness apps, I provide them with information about this fitness app. WOM4. I would like to share my usage experience about this fitness app with others. WOM5. I would like to register as a member of the fitness app and share my opinions on its advantages.
	Loyalty	LOY1. I have the intention to continue using this fitness app. LOY2. I will recommend this fitness app to other users. LOY3. When using fitness apps, I consider this app to be my first choice. LOY4. I am a loyal customer of this fitness app. LOY5. I would still use the services of this fitness app even if another app offers me better rewards. LOY6. Even if the price increases, I still would like to use this fitness app.

Table B1. Measurement Items Used in the Study

	Personalization	PER1. I value fitness app that are personalized for my device (e.g., computer, mobile phone etc.) and operating system (e.g., iOS, Android) that I use. PER2. I value fitness app that are personalized for my usage experience preferences. PER3. I value fitness app that acquire my personal preferences and personalize the services and products themselves. PER4. I value fitness app services that are personalized based on information that is collected automatically (such as IP address, pages viewed, access time) but cannot identify me as an individual. PER5. I value fitness apps that are personalized on information that I have voluntarily given out (such as age, name, shipping address, BMI) but cannot identify me as an individual.

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Transactions on Human - Computer Interaction