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Intrinsic motivations in health and fitness app engagement: A mediation model of entertainment

Thuy Dung Pham Thi and Nam Tien Duong

Abstract

Objective: This study aims to investigate the intrinsic motivations driving continued usage of health and fitness apps, addressing a gap in the literature where user motivation has received limited attention. The study focuses on the role of entertainment as a mediator between intrinsic motivations and continuance intention, using the Uses and Gratifications Theory as a conceptual framework.

Methods: Data were collected through an online survey of 2869 health and fitness app users in Vietnam. Intrinsic motivations were categorized into challenge, curiosity, fantasy, and social interaction. Hypotheses were tested using SEM, and subgroup analyses were conducted to examine variations across demographic groups.

Results: The findings reveal that entertainment mediates the relationship between intrinsic motivations and continuance intention, with challenge and curiosity being the strongest predictors of sustained app usage. Challenge also demonstrated a direct effect on continuance intention, independent of entertainment. Demographic analysis indicated that males are primarily motivated by challenge and curiosity, while females and higher-income users are driven more by curiosity.

Conclusion: This study highlights the importance of intrinsic motivations in shaping user engagement with health and fitness apps. Practical implications include the need for app developers to design features that align with user motivations, such as gamified challenges, personalized content, and interactive elements. Future research should explore extrinsic motivations and validate the framework across other digital platforms to expand its applicability.

Keywords

Health and fitness, apps, continuance intention, intrinsic, entertainment

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Introduction

With the growing popularity of the internet and personal devices, health and fitness apps have become mainstream in the wellness technology space.[1] As of recent reports, a significant percentage of users cite fitness apps as one of their primary methods of maintaining health and wellness.[2] Health and fitness apps now account for a substantial portion of the fitness market, and this share is expected to continue growing in the coming years.[3] However, despite the rapid growth in the value of the health and fitness app industry in recent years, growth rates appear to be slowing down.[4] According to market estimates, the health and fitness app market reached approximately $9.25 billion in 2023, with an annual growth rate projected at 14.08%.[5] Forecasts suggest that the market size will see

Department of Science, Technology, and International Projects, Ho Chi Minh City University of Economics and Finance (UEF), Ho Chi Minh City, Vietnam

Corresponding author:
Nam Tien Duong, Department of Science, Technology, and International Projects, Ho Chi Minh City University of Economics and Finance (UEF), 141-145 Dien Bien Phu, Ward 2, Binh Thanh District, Ho Chi Minh City, Vietnam.
Email: tiendn@uef.edu.vn

only moderate growth, reaching around $10.06 billion by 2029, reflecting the industry's gradual deceleration.[6]

As demand growth slows, competition in the health and fitness app industry has intensified. The primary revenue sources for these apps include subscription fees and the sale of premium features or in-app services.[7] Unlike other industries where piracy or replication of services might be a concern, this model provides fitness app developers with a significant safeguard for profitability. As a result, many developers and companies have entered this competitive market. However, engagement with health and fitness apps requires a significant investment of time and effort, and users are typically limited in the number of apps they can actively use.

Evidence suggests that in many markets, more than 80% of users concentrate their time on less than 20% of the available fitness apps.[8] This indicates that only a small percentage of app developers are likely to be profitable, while the rest may struggle to attract and retain users. As developers continue to release new apps in an attempt to capture a larger market share, slowing demand growth means companies must focus on retaining their existing user base to maximize profitability.

The question is, why do users continue using the same health and fitness app for a long time? How can developers successfully keep users engaged and committed to their app? This is a key challenge for health and fitness app developers. Chiu, and Cho[2] suggested that during the first month of using an app, users are often in a phase of confusion, which is when they are most likely to stop using the app. Once they move past this confusion phase, they enter a longer excitement and engagement phase. To remain profitable, developers must find ways to prevent users from entering the boredom phase too early and instead keep them engaged for the long term by maintaining the excitement and engagement phases.

In recent years, researchers have begun to explore the factors influencing users' continued participation intentions in digital platforms.[9,10] Past research on the continued usage intentions of digital behaviors frequently applies models such as the Theory of Planned Behavior (TPB),[11,12] the Theory of Reasoned Action (TRA),[13,14] the Technology Acceptance Model (TAM),[15,16] the Expectancy Confirmation Theory (ECT), and Flow theory.[17–19] For health and fitness apps, the research often follows similar models. For example, Hyun, Thavisay[20] explored the impact of social influence and flow on users' intentions to continue engaging with online platforms, which can similarly be applied to health and fitness apps.

The current literature on continuance intentions to use health and fitness apps is relatively well-established.[21,22] However, much of the existing research focuses primarily on factors like perceived usefulness, ease of use, or habit formation.[23] Fewer studies have explored how specific entertainment-related factors—such as challenge, curiosity, control, fantasy, and social interaction—contribute to the entertainment value of these apps and, subsequently, their impact on continuance intentions. While previous research has predominantly examined these factors in contexts such as online learning and online repurchase behavior,[24,25] there is a lack of comprehensive analysis of how entertainment-driven elements influence user engagement and sustained app usage in the health and fitness domain. This highlights a gap in understanding the role of entertainment as a mediator in the relationship between app features and continuance intention, presenting an opportunity for further investigation.

Interestingly, while motivation significantly influences user behavior, there is relatively little research that explores the factors influencing the continued use of health and fitness apps from a motivational perspective.[21] Instead, motivation has often been examined in the context of initial acceptance intentions,[26] user satisfaction with the app,[27] and overuse or addiction.[28] Furthermore, existing research lacks consensus on the types of motivations, with each scholar proposing different classification systems, making it difficult to compare, analyze, and accumulate findings across studies.

Moreover, evidence suggests that the motivations driving different types of users to engage with health and fitness apps vary.[26,29] However, there has been limited in-depth exploration of these differences across user groups. Based on this, the current study has three primary objectives: (1) to review the existing literature and propose a preliminary framework for classifying user motivations for engaging with health and fitness apps; (2) to develop a theoretical model for continued usage intentions from a motivational perspective; and (3) to test this theoretical model and explore the moderating effects of different user groups, to contribute to both academic research and practical applications.

Theoretical background

Characteristics and related research on health and fitness apps

An activity can be considered an effective health and fitness experience if it meets several key characteristics. From a design perspective, users of health and fitness apps must follow certain rules or guidelines, which establish challenges, goals, and a sense of achievement.[30] Users derive enjoyment and engagement (playfulness) by overcoming these challenges or reaching their fitness goals. These rules must be set within an appropriate context, interaction model, and perspective to be meaningful.

The context refers to the environment where the fitness activities take place, such as a virtual running track or a simulated workout studio. The interaction model represents how users engage with the app, such as selecting workout

plans, tracking progress, or participating in virtual challenges with friends.[31] The perspective relates to the way users view and experience fitness activities, such as through a first-person view in a virtual race or following a third-person guided workout session.

Health and fitness apps often feature background narratives or virtual simulations that evolve with user progress, creating a sense of realism or immersion.[32] For example, users may participate in globally renowned fitness challenges, where detailed, realistic environments and the excitement of competing with others create an immersive experience that makes users feel as though they are truly part of a live event.

Similarly, health and fitness apps incorporate elements of virtuality and simulation.[33] In other words, these apps create an immersive, seemingly realistic psychological environment that helps users relax and fully engage in challenging and rewarding fitness activities. This immersive experience stimulates users' motivation by allowing them to focus on self-improvement and achievement within a virtual context.[34] Additionally, intrinsic motivation plays a key role in encouraging users to engage with health and fitness apps.[35] Users are unlikely to enjoy or sustain their fitness activities if they feel forced to participate. Third, using these apps provides enjoyable experiences.[36] During their fitness journey, users often engage in high levels of mental activity, leading to various psychological and emotional experiences. Through these experiences, users can achieve optimal life experiences, helping them to build a sense of self-worth and accomplishment.

In addition, health and fitness apps possess a community feature. These apps often involve social interactions, where users can connect with others and form fitness groups or teams.[37] Features like gamification and community-building elements have been shown to enhance user engagement in the apps.[38] Through interactions within these groups, a set of unique rules for thriving in the virtual fitness world gradually emerges, and users internalize these as behavioral guidelines and norms.[39] This community aspect can attract more users to join the same app; conversely, there may also be instances where users leave the app en masse.

Furthermore, health and fitness apps exhibit an exclusivity aspect. Users must remain engaged over an extended period to develop strong fitness habits and fully enjoy the app's benefits.[40] This creates a sense of exclusivity in terms of commitment, time, and financial investment. Once users become deeply familiar with a particular app, they are likely to stick with it.[41]

Most studies reference specific theories, such as the Uses and Gratifications Theory,[42] the Technology Acceptance Model,[43] app design principles,[44] and migration theory.[45] Perhaps due to the immersive nature of health and fitness apps, which transport users into a virtual fitness environment, flow theory has been a popular choice.[21,46]

Finally, some studies believe that the entertainment value of an activity is a key antecedent to users' acceptance or continued usage intentions. For example, Hung and Chang[47] suggested that entertainment effects influence acceptance intentions, while Zhou and Mou[48] argued that once users experience a sense of immersion, including enjoyment or entertainment, they are more likely to continue using the app. The strength of the entertainment effect is closely related to whether users can experience immersion during their engagement with the app. Since motivation is one of the key factors that facilitate and shape immersion experiences,[49] and using health and fitness apps is typically a voluntary activity driven by personal motivation, user motivation has become a popular explanatory variable. However, relatively few studies have explored the influence of user motivation on the intention to continue using health and fitness apps.

Motivation of health and fitness app users

Motivation is one of the factors that initiates and sustains specific behaviors, driving individuals from within to work toward satisfying personal goals or needs.[50] Generally, people engage in behaviors to gain some form of benefit. When individuals feel that a certain need or goal is unmet or unattainable, a sense of tension or stress arises, prompting them to take action to alleviate this discomfort.[51] For instance, when someone experiences stress at work and feels the need for a break or relaxation, they may take action, such as going on a trip, to relieve this tension.

Goals drive and guide people's actions.[52] Hommel[53] described motivation as a psychological process related to the arousal, direction, intensity, and persistence of goal-directed voluntary behavior. Arousal refers to the process of becoming interested in a particular goal (e.g., a student with poor academic performance seeking extracurricular activities to satisfy their need for achievement). Direction involves setting a goal and deciding to pursue it (e.g., the student joins a sports team to become a team member within a short period). Intensity refers to the amount of effort an individual puts into achieving a goal, and persistence is the continued effort to pursue the goal despite encountering difficulties. Thus, motivation is closely related to what we strive for (arousal and direction) and how we pursue these goals (intensity and persistence). It determines why, when, and how much time and energy we allocate to specific activities.[52]

Therefore, behavior typically arises from motivation. For example, some consumers engage in online shopping to stay ahead of trends,[54] while others may download illegal music files to keep up with rapidly changing music trends.[55] Similarly, if developers aim to create a health and fitness app that provides users with an optimal experience and encourages them to continue using it, identifying

and understanding users' motivations for engaging with such apps becomes a critical issue.

Several past studies have attempted to categorize and summarize various behavioral motivations. These frameworks aim to enrich the understanding of different types of motivations, seeking to encompass the wide range of motivations that arise in everyday life.[56,57] However, research focused on specific behaviors often develops its own set of motivations based on the unique requirements of that context. For instance, Imtiyaz, Soni[58] explored how the motivations of individuals influenced their intention to purchase convenience food. To ensure research findings can be compared and accumulated, many fields develop classification frameworks or models of motivation. For example, tourism research commonly categorizes motivations into "push" and "pull" factors,[59] while shopping motivations are often divided into utilitarian and hedonic types.[60]

Online behavior is often seen as an action carried out through the use of information systems. Motivation plays a crucial role in determining whether users will continue using a system.[61] People engage with information systems because they anticipate future internal or external benefits. Morris and Grehl[50] categorized motivation into two types: intrinsic and extrinsic. Intrinsic motivation refers to the satisfaction derived from performing the behavior itself and the internal fulfillment users experience while using the system. Any other factors beyond this do not fall under intrinsic motivation. In contrast, extrinsic motivation refers to the various valuable outcomes an individual expects to gain from performing the behavior, such as rewards, status, or career advancement. Thus, the behavior is seen as having instrumental meaning and value.

Since engaging with health and fitness apps can provide enjoyment and is a voluntary, internally driven behavior,[46] intrinsic motivations such as passion and immersion should naturally be important factors influencing users to engage with these apps.[34] Molina and Myrick[40] also discovered that some individuals use apps as a means to fulfill their inner desires for success and happiness. Therefore, it can be inferred that for the behavior of playing health and fitness apps, intrinsic motivation may be a more important driving factor than extrinsic motivation. Of course, people may engage with apps for extrinsic reasons, such as winning competitions, gaining rewards, or earning recognition. However, since using fitness apps is a voluntary activity driven by intrinsic motivation, it is unlikely that someone with no internal desire to exercise will engage with the app solely for external rewards. In other words, while external incentives may encourage users to be more committed, a person who has no interest in fitness is unlikely to start using a health app just for the sake of rewards. Therefore, intrinsic motivation should be seen as a more critical yet often overlooked factor in driving engagement with health and fitness apps. Based on this, the current study aims to focus on constructing and validating a framework for understanding intrinsic motivations in the context of health and fitness app usage.

A preliminary classification framework of health and fitness app users' motivation

Studies exploring how users develop sustained engagement with health and fitness apps certainly do not overlook motivation as a key variable. However, two key points emerge from the literature review. First, motivation is mostly used to examine the initial acceptance of apps, meaning the users' intent to begin using a health and fitness app,[3] their satisfaction with the app, or their immersion in the activity.[27] Although some studies have explored users' continuance intention or loyalty, most of the explanatory variables are not focused on motivation. For example, many studies used the Technology Acceptance Model, the Theory of Planned Behavior, and Flow Theory to examine the effects of immersion, social norms, and community influence.[3,62] Molina and Sundar[63] investigated this issue from the perspective of app design or features, while Gupta, Dhiman[64] used the Expectation Confirmation Theory in their analysis.

Secondly, existing research on motivation lacks consensus on the types of motivations. This makes it difficult to compare, analyze, synthesize, and accumulate research findings. For instance, studies categorized participation motivations into self-affirmation, anonymous companionship, social learning, and escape to belonging.[29,65] Other studies classified them as self-affirmation, anonymous companionship, escape to belonging, social activities, and leisure entertainment.[66,67] This divergence illustrates that each researcher has their own classification system, leading to considerable differences and little consensus.

Currently, there is very limited research specifically focused on classifying motivations for continuance intention to health and fitness apps. After a review of the literature, this study proposes using the classification framework suggested by Malone and Lepper[68] as the basis for categorizing health and fitness app motivations. This framework divides motivations into personal and interpersonal categories, providing high comprehensiveness and mutual exclusivity, allowing most motivations mentioned in existing research to be incorporated.

For personal motivations, this study follows their original classification, which includes challenge, curiosity, control, and fantasy. For interpersonal motivations, the study adopts social interaction motivation as proposed by Sherry, Greenberg.[69] Below is an explanation of personal motivation categories[68]:

Challenge: This is the motivation to engage in competitions or difficult tasks. In the context of health and fitness apps, challenges such as achieving fitness goals or

competing in virtual races could motivate users to continue using the app.

Curiosity: Curiosity arises from a lack of knowledge. Users are intrigued by the evolving scenarios, new levels, or challenges within the app that they cannot predict in advance, sparking a desire to explore and solve these mysteries.

Control: Users have control over the progression of activities, which satisfies the desire to manage or control outcomes. As the app progresses, users face increasingly difficult fitness challenges. If users feel they lose control over the activities, they may experience frustration or boredom. In a health and fitness app, the ability to customize workouts or control the pace of progress can maintain user engagement.

Fantasy: Fantasy refers to the mental creation of scenarios that do not exist in the real world. In health and fitness apps, the app's background, storylines, characters, and evolving information (such as tracking fitness stats or virtual challenges) allow users to imagine themselves in near-real environments, motivating them to engage with the app.

Some studies suggest that entertainment or passing time are significant motivations for app usage.[70] In the context of health and fitness apps, which are inherently designed to provide a balance between functionality and engagement, entertainment becomes a crucial value.[71] The goal of enjoying the app's features, such as challenges or interactive social elements, serves to motivate users, helping them stay engaged and committed to their fitness goals. Therefore, entertainment motivation and continuance intention are intrinsically linked, and entertainment should not be viewed as an isolated motivational factor but rather as a core driver within the framework, influencing user retention and sustained app usage.

This study does not adopt the interpersonal relationship motivations proposed by Malone and Lepper[68] due to their emphasis on competitive and cooperative dynamics, which are less relevant in the context of health and fitness apps.[2,72] Unlike games where competition and cooperation gradually develop, fitness apps offer more immediate real-life alternatives like team sports.[73] Additionally, Malone and Lepper's focus on competition overlooks the broader social interactions and community support that are key in fitness apps. Lastly, cognitive motivation, which involves achievement and peer recognition, overlaps with personal motivations such as challenge or self-affirmation, making it difficult to classify motivations as entirely distinct. As a result, this study proposes adopting social interaction[69] to represent the concept of interpersonal motivation. This approach better reflects the growing emphasis on the social aspects of health and fitness apps, where users not only compete but also build connections, find belonging, and engage in meaningful social exchanges.[74]

Although the literature identifies various motivations, not all motivations have the same impact on users' intentions to continue using health and fitness apps. Research has shown that the primary motivations driving different types of users to engage with these apps can vary.[75] For example, women are less likely to use apps to fulfill social interaction needs.[76] People who face less pressure and have more leisure time, tend to use fitness apps to achieve personal goals and a sense of accomplishment.[42] Similarly, adults may use fitness apps to relieve work-related stress.[77] Therefore, for different user groups, the impact of various motivations on their intention to continue using health and fitness apps is not always consistent. Different motivations can influence users' intentions based on their demographics, lifestyles, and personal goals.

Hypotheses development and conceptual model

The Uses and Gratifications Theory suggests that individuals use media to satisfy their motivations, and once these motivations are fulfilled, they are more likely to continue using that media. This is because people can self-regulate and respond to their inner needs.[78] The effects that media usage has on an individual are largely determined by the user's purpose for engaging with the media.[69] One of the most important goals of media use is to satisfy urgent, non-monetary intrinsic needs, such as the pursuit of enjoyment.[79] Therefore, the more entertainment or intrinsic satisfaction the media provides, the greater the impact on users, which leads them to continue engaging with it. For example, the entertainment value of TV shows is often proportional to the time spent watching TV, and this effect is amplified when individuals feel the need for relaxation or enjoyment.

The entertainment value of online media is highly correlated with audience attitudes and usage intentions.[80] Similarly, health and fitness apps can be viewed as a leisure tool, providing stress relief and offering entertainment value.[81] One of the most basic goals of users is to find enjoyment and distraction through these apps. Health and fitness apps can fulfill fundamental user needs, such as escaping stress, enjoying their time, and gaining entertainment.[33] When these needs are satisfied, users are likely to continue using the app.[69] Several studies have also shown that the entertainment value of a platform is a key antecedent of users' continued usage intentions.[47]

H1: The more significant the entertainment value perceived by users of health and fitness apps, the stronger their intention to continue using the app in the future.

The Uses and Gratifications Theory posits that the entertainment value of media comes from its ability to satisfy people's needs.[82] Personal motivations are divided into

four categories: challenge, curiosity, control, and fantasy.[68] Below is a discussion of the relationship between these motivations and entertainment value.

First, facing challenges in the pursuit of personal growth is one of the main motivations for engaging in activities.[83] Generally, people have a natural desire to face challenges and solve puzzles.[84] In the context of health and fitness apps, users may complete workout tasks, accumulate fitness progress, and gradually improve their physical abilities—similar to the experience of leveling up a character in a game. An app that is too easy may become boring and unengaging, whereas one that provides adequate challenges can keep users entertained and motivated. The stronger the challenge motivation, the more users will actively try to overcome obstacles and solve fitness challenges, resulting in longer engagement with the app and increased entertainment value.

H2: The more users of health and fitness apps perceive that the app satisfies their challenge motivation, the more significant the entertainment value they will experience.

When someone perceives a gap in their knowledge, it triggers curiosity.[68] Humans are often driven by curiosity to engage in exploratory behavior, such as browsing product catalogs to gain new information. This exploratory behavior satisfies the desire to know more. Similarly, some users of health and fitness apps are inclined to explore new features and workouts to satisfy their curiosity and enjoyment.

In multiplayer scenarios, the progression of challenges and tasks in health and fitness apps might depend on the activities of many users, making future updates or challenges unpredictable.[85] This unpredictability can spark curiosity and motivate users to explore the app further.[86] The stronger the curiosity, the more frequent the exploratory behavior, leading to longer engagement with the app and a greater sense of entertainment. Therefore, the more an app can satisfy this curiosity, the more entertainment users will experience.

H3: The more users of health and fitness apps perceive the app satisfies their curiosity, the more significant the entertainment value they will experience.

From a health and fitness app design perspective, using the app can be viewed as a goal-oriented, problem-solving process. The user, acting as the problem solver, utilizes tools (e.g., workout plans, tracking features) to overcome challenges and achieve fitness goals (e.g., completing a workout or reaching a milestone). The app responds to the user's progress (e.g., providing feedback or unlocking new features as goals are met), creating a dynamic interaction.[87] By allowing users to control various aspects such as workout routines, tracking progress, and adjusting challenges, the app empowers them with a sense of control over their fitness journey. This active participation fosters a feeling of accomplishment and enhances enjoyment, as users manipulate their fitness path, thereby increasing their engagement and entertainment value.[31] If designed effectively, this sense of control can lead to more frequent interaction with the app and greater user satisfaction.

H4: The extent to which users of health and fitness apps perceive the app satisfies their control motivation is positively related to the entertainment value they experience.

One of the key reasons for using media, such as health and fitness apps, is to satisfy the desire for personal achievement and transformation.[32] Just as games allow players to immerse themselves in fantasy worlds, health and fitness apps offer users the opportunity to envision and work toward a better version of themselves. Through features such as progress tracking, personalized workouts, and virtual challenges, users can break free from the limitations of their daily routines and pursue goals they might find difficult to achieve in real life, such as attaining an ideal physique, surpassing fitness milestones, or building endurance.[88] This sense of accomplishing personal transformations can be deeply compelling, enhancing users' immersion and enjoyment. If users feel that the app helps them fulfill these aspirational goals, their engagement and satisfaction with the app will likely increase, leading to continued use and higher enjoyment.

H5: The extent to which users of health and fitness apps perceive the app satisfies their fantasy motivation is positively related to the entertainment value they experience.

Regarding interpersonal motivation, Sherry and Greenberg[69] noted that many users, particularly adolescents, engage in activities like gaming to fulfill their social interaction needs, such as making friends and building relationships. Similarly, social interaction is a fundamental aspect of using health and fitness apps, where users can connect with others, share progress, and participate in group challenges.[89] In the context of health and fitness apps, features like leaderboards, group challenges, and community forums provide spaces for users to interact, exchange fitness tips, and encourage one another. With the rise of the stay-at-home economy and increasing social isolation, the community aspect of these apps has become an essential platform for social interaction.[90] Engaging with the app's community and participating in group activities not only helps users stay focused on their fitness goals but also enhances the entertainment value, as the sense of belonging and shared achievement motivates continued use.

H6: The more users of health and fitness apps perceive the app satisfies their social interaction motivation, the more significant the entertainment value they will experience.

Based on the hypotheses above, the conceptual mode is proposed (Figure 1):

Method

Measures

In this study, data were collected through a questionnaire survey and the hypotheses were tested using SEM. The measurement items used in this study were adapted from previously validated scales in the literature. The adapted items were modified to fit the context of health and fitness apps while maintaining their original theoretical constructs. All scales used in this study fall under fair academic use for research purposes. Where required, permission to use or adapt specific items was obtained from the respective copyright holders. The following constructs were measured:

Challenge (CH): This construct reflects the intrinsic motivation of users to seek out or tackle difficult challenges. The scale was adapted from Novak and Hoffman[91] and consisted of 4 items.

Curiosity (CU) refers to users' desire to explore new or uncommon elements within the app. The three-item scale was based on the work of Agarwal and Karahanna.[92]

Control (CO): This construct captures users' desire for autonomy and the ability to control elements within the app. It was measured using a three-item scale from Agarwal and Karahanna.[92]

Fantasy (FA) reflects users' motivation to immerse themselves in scenarios and experiences unattainable in real life. The four-item scale was derived from Sherry, Greenberg.[69]

Social Interaction (SO) represents users' motivation to interact with others, form friendships, and engage in social exchange within the app. This was measured using a two-item scale from Sherry, Greenberg.[69]

Entertainment (EN) refers to the degree to which users perceive the app as a source of recreational enjoyment. This construct was adapted from Davis, Bagozzi[93] using three items.

Behavioral Intention (BI): This construct measures users' intention to continue using the health and fitness app in the future. The three-item scale was adapted from Hsu and Lu.[94]

These measures were designed to capture the various motivations and behavioral outcomes associated with the sustained use of health and fitness apps.

In addition to the key variables, this study also collected basic demographic information from users of health and fitness apps, including gender, age, occupation, educational level, monthly income, frequency of app usage, app usage time per session, and years of experience using health and

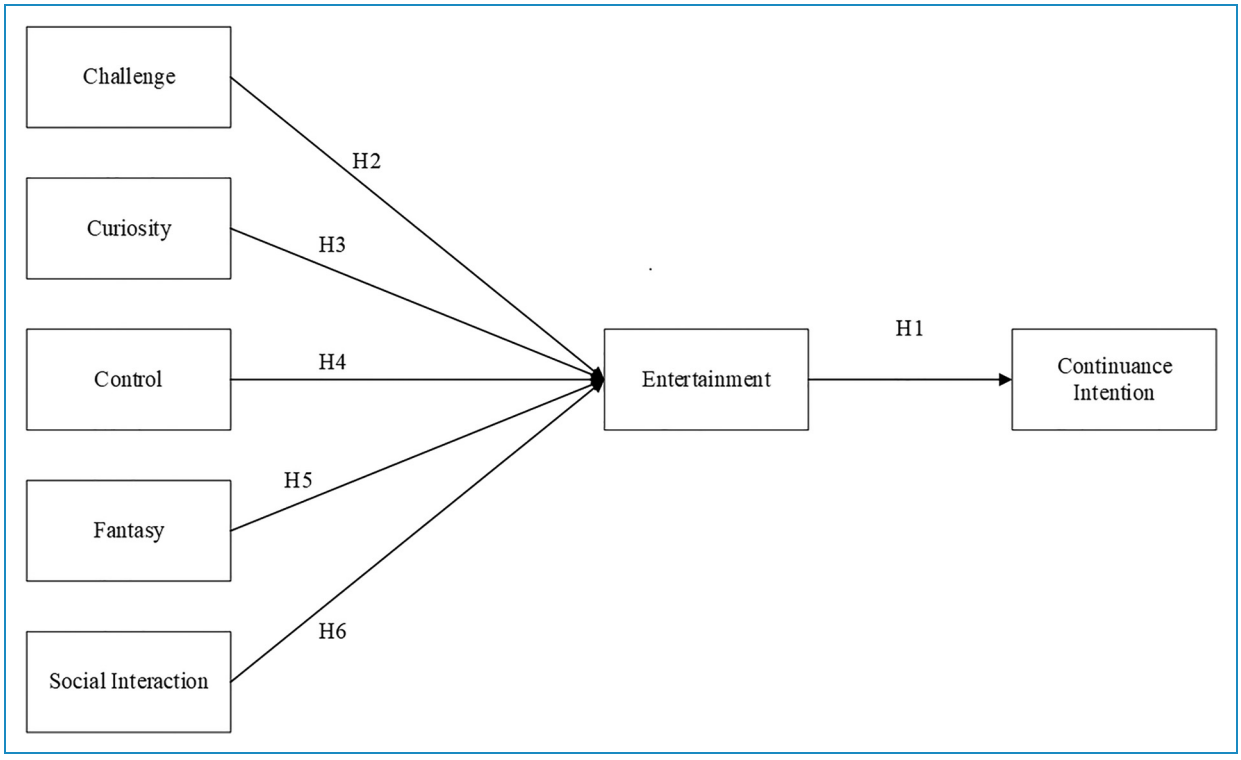

Figure 1. Conceptual model.

fitness apps. Furthermore, the study explored the primary types of fitness activities users engage with through the app, referencing the classification used by prominent fitness platforms. The categories included: *Cardio workouts*: Focus on improving cardiovascular endurance through exercises like running, cycling, and aerobics. *Strength training*: Emphasizes building muscle strength through weightlifting and resistance exercises. *Yoga and flexibility*: Focus on enhancing flexibility, balance, and relaxation through yoga and stretching routines. *Other activities*: Include activities such as HIIT (High-Intensity Interval Training), pilates, and meditation.

To ensure the face validity and content validity of the questionnaire, all items were translated into Vietnamese. The questionnaire was then pre-tested by representative users of health and fitness apps. Based on the feedback regarding the content, clarity of items, and appropriateness of constructs, the questionnaire was revised to improve its overall effectiveness.

Participants and procedures

This study employed a cross-sectional survey design to collect data from users of health and fitness apps in Vietnam. The target population consisted of users with prior experience using health and fitness apps in Vietnam. Due to budget constraints and challenges in identifying the full population, purposive sampling was utilized. This method enabled the recruitment of participants who were most likely to provide relevant insights into the research objectives. While purposive sampling is effective for targeted recruitment, it may introduce potential biases, such as self-selection bias, which are acknowledged in the limitations section.

A structured questionnaire was developed to gather data, including sections on demographic information, app usage behaviors, and intrinsic motivations such as challenge, curiosity, control, fantasy, and social interaction. A 5-point Likert scale was used to measure key constructs, adapting well-established scales to the context of health and fitness apps. To ensure quality and reliability, the survey included three reverse-coded items to identify and filter out inconsistent or invalid responses. The questionnaire was pre-tested with a pilot sample of 30 participants to confirm clarity and relevance. Based on feedback from the pilot study, minor revisions were made to enhance the comprehensibility of the survey items.

Ethical considerations were central to this study. The study received approval from the Ethics Committee of Ho Chi Minh City University of Economics and Finance (UEF). The ethics approval number for this study is 720/QD-UEF. All procedures were conducted in full compliance with the ethical guidelines outlined in the Declaration of Helsinki to uphold the highest ethical standards. Prior to participation, written informed consent was obtained from all participants. For minor participants under the age of 18, written informed consent was obtained from their legally authorized representatives (parents or guardians). Participants were informed about the study's purpose, their right to withdraw at any time, and the confidentiality of their responses.

Data collection was conducted over two weeks (January 15 to January 29, 2024). The questionnaire was distributed through popular fitness forums and websites in Vietnam, where health and fitness app users frequently gather. Links to the survey were shared on these platforms, accompanied by an invitation to participate. To boost response rates, incentives were offered, including 300 coupons valued at $3 each for participants who completed the survey. Despite the voluntary nature of participation, which may introduce self-selection bias, efforts were made to ensure a diverse and representative sample by targeting platforms with a high density of fitness app users.

A total of 3188 questionnaires were collected during the data collection period. After filtering for invalid or inconsistent responses, 2869 valid questionnaires were retained, yielding a valid response rate of 89.99%. The online survey platform's built-in validation features ensured no missing responses, and reverse-coded items helped identify and exclude inconsistent responses.

The data analysis was conducted using Structural Equation Modeling (SEM) to examine the hypothesized relationships between intrinsic motivations, entertainment value, and continuance intentions. LISREL software was employed for SEM analysis, while SPSS was used for preliminary data checks. Confirmatory Factor Analysis (CFA) was performed to assess the reliability and validity of the measurement model. Path analysis was utilized to explore the mediating role of entertainment and the influence of intrinsic motivations on continuance intentions. Additionally, subgroup analyses were conducted to examine variations in these relationships based on demographic factors such as gender, income, engagement levels, and activity types.

Results

Characteristics of the sample

The results indicate that younger users dominate the sample, with age groups distributed as follows: 16–18 years (19.0%), 19–22 years (30.0%), and 23–25 years (18.8%), collectively accounting for 67.8% of the total sample. Among the app users, 71.4% were male and 28.6% were female, with 55.8% of users aged 15–24 years. The main composition of the collected sample is as follows: 69.8% of respondents reported an average monthly income of less than 10 million VND, primarily comprising students (62.1%). Regarding the educational

Table 1. Characteristics of the participants.

Variables	Categories	Number	%
Gender	Male	2048	71.40
	Female	821	28.60
Age	16–18 years	544	19.0
	19–22 years	860	30.0
	23–25 years	538	18.8
	26–30 years	653	22.7
	31–40 years	217	7.5
	41 years and above	57	1.9
Income	Less than 5 million VND	1200	41.8
	5–10 million VND	804	28.0
	10–15 million VND	412	14.4
	15–20 million VND	208	7.2
	20–25 million VND	145	5.0
	25–30 million VND	65	2.3
	30–35 million VND	25	0.9
	Over 35 million VND	10	0.4
Educational level	High school or below	732	25.5
	Bachelor	2023	70.5
	Master or above	114	4.0
Occupation	Employees	970	33.8
	Students	1780	62.10
	Others	119	4.10
App usage experience	<1 year	856	29.9
	1–4 years	1539	53.7
	>4 years	474	16.4
App usage frequency	At least once per day	2102	73.3
	Several times a week	577	20.1
	Once a week	134	4.6
	Once for several weeks	56	1.9
App usage time per session	Less than 1 h	572	19.90
	1–2 h	698	24.30
	2–3 h	694	24.20
	3–4 h	510	17.80
	More than 4 h	395	13.80
Activity types	Strength training	2226	77.6
	Cardio workouts	328	11.4
	Yoga and flexibility	229	8.0
	Other activities	86	3.0

level, most of the respondents hold a Bachelor's degree (70.5%).

The most popular type of health and fitness activity among respondents was strength training (77.6%). Additionally, 73.3% of the total sample reported using the app at least once per day, and 68.5% indicated that they used the app for less than three hours per session. In terms of app usage experience, 53.7% of users had one to four years of experience, while 29.9% had less than a year of experience, and 16.4% had more than four years. These data suggest that the majority of respondents are highly active users, indicating a strong level of engagement. Therefore, the sample appears to be well-suited for data analysis in this study on health and fitness app usage (Table 1).

Validity and reliability

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy for this study's sample was 0.899, and Bartlett's test of sphericity yielded a p-value of 0, indicating that the sample is suitable for factor analysis, as common factors are present in the population. Factor analysis was conducted using Principal Component Analysis (PCA) with Varimax rotation.

As shown in Table 2, all items loaded as expected onto their respective constructs, and all achieved high-reliability

Table 2. Results of exploratory factor analysis.

Component	1	2	3	4	5	6	α
CH1		0.646					0.829
CH2		0.750					
CH3		0.764					
CH4		0.765					
CU1	0.555						0.707
CU2	0.616						
CU3	0.421						
CO1			0.627				0.384
CO2			0.732				
CO3			0.493				
FA1				0.782			0.832
FA2				0.812			
FA3				0.813			
FA4				0.689			
SO1					0.898		0.740
SO2					0.846		
EN1						0.755	0.887
EN2						0.734	
EN3						0.720	
BI1				0.794			0.833
BI2				0.835			
BI3				0.803			

levels. The factor loadings for all items were above 0.5, except for CO3, which had a loading of 0.493. Additionally, the reliability of the control motivation construct was only 0.384, which is below acceptable levels. Therefore, this construct was excluded from further analysis, and H4 could not be tested.

Measurement model

This study employed CFA to assess the convergent and discriminant validity of the measurement model. The results indicated a good fit between the data and the measurement model (RMSEA=0.046; NFI=0.98; NNFI=0.98; CFI=0.99; SRMR=0.035; GFI=0.97; and AGFI=0.95). The summary of the CFA results is shown in Table 3.

The results show that, except for curiosity, which had an Average Variance Extracted (AVE) of 0.46 (slightly below the threshold of 0.5), all other constructs had AVE values greater than 0.5, meeting the criteria for convergent validity.[95] Since the t-values for all items in the curiosity construct were significant,[96] this variable was retained for subsequent analysis.

Table 3. Convergent validity analysis for each construct.

Construct	Measurement Item	t-value	Loading	AVE
Challenge	CH1	44.59*	0.62	0.56
	CH2	49.01*	0.72	
	CH3	40.17*	0.67	
	CH4	40.68*	0.67	
Fantasy	FA1	46.97*	0.84	0.62
	FA2	38.04*	0.75	
	FA3	50.75*	0.87	
	FA4	39.31*	0.66	
Social interaction	SO1	17.94*	0.59	0.76
	SO2	21.61*	1.24	
Curiosity	CU1	41.14*	0.64	0.46
	CU2	38.13*	0.59	
	CU3	30.05*	0.54	
Entertainment value	EN1	58.12*	0.69	0.73
	EN2	58.31*	0.74	
	EN3	49.05*	0.66	
Continuance intention	BI1	51.23*	0.80	0.63
	BI2	46.19*	0.77	
	BI3	43.02*	0.71	

*$p < .05$.

This study followed the method by Igbaria and Iivari[97] to test for discriminant validity. The test involves comparing the squared correlation coefficients between two constructs with the AVE values of each construct. If the squared correlation between two constructs is smaller than the AVE of each construct, it indicates that the constructs have discriminant validity.

As shown in Table 4, all constructs in this study demonstrated good discriminant validity, as the squared correlations were smaller than the corresponding AVE values.

Table 4. Discriminant validity.

Construct	EN	BI	CH	CU	FA	SO
EN	0.73					
BI	0.37	0.63				
CH	0.38	0.25	0.56			
CU	0.41	0.19	0.43	0.46		
FA	0.21	0.11	0.19	0.29	0.62	
SO	0.09	0.04	0.06	0.06	0.03	0.76

Hypothesis testing

This study used the LISREL software and SEM to test the proposed hypotheses, with path parameters estimated using the maximum likelihood method. The overall model fit indices[98] indicated a good fit for the model (χ^2=1067.41, $p = 0.00$; $df = 141$, $\chi^2/df = 7.6$; GFI=0.96; RMSEA=0.048; NFI=0.98; and CFI=0.98). The Chi-square value is known to be highly sensitive to large sample sizes, which, while improving the stability of the observed data, often leads to inflated Chi-square values. This sensitivity may explain why the chi-square to degrees of freedom ratio (7.6) exceeded the recommended threshold of less than 5.[98]

The results of the structural model verification are presented in Figure 2. As expected, entertainment was positively associated with continuance intention to play the game (H1). For intrinsic motivations, challenge (H2), curiosity (H3), fantasy (H5), and social interaction (H6) all showed significant positive relationships with entertainment. However, due to the low reliability of the control motivation construct, H4 could not be tested.

The path analysis of the structural model and the results of hypothesis testing are presented in Table 5.

This study further explores whether entertainment has a mediating effect. Previous research[69] suggested that motivations directly influence behavioral intentions. However, this study proposes that motivations influence continuance intention to engage in health and fitness apps through the mediating effect of entertainment.

To test this hypothesis, two additional theoretical models were developed. Model 2 includes direct paths from the four motivations to continuance intention without considering entertainment as a mediator. Model 3 adds direct paths from the four motivations to continuance intention in addition to the mediating paths from Model 1 that involve entertainment. The test results are presented in Table 6.

Comparing Model 1 and Model 3, it is evident that after adding direct paths from motivations to continuance intention, the effects of the four motivations on entertainment and the impact of entertainment on continuance intention remain largely unchanged. In Model 2, all four motivations significantly influence continuance intention directly.

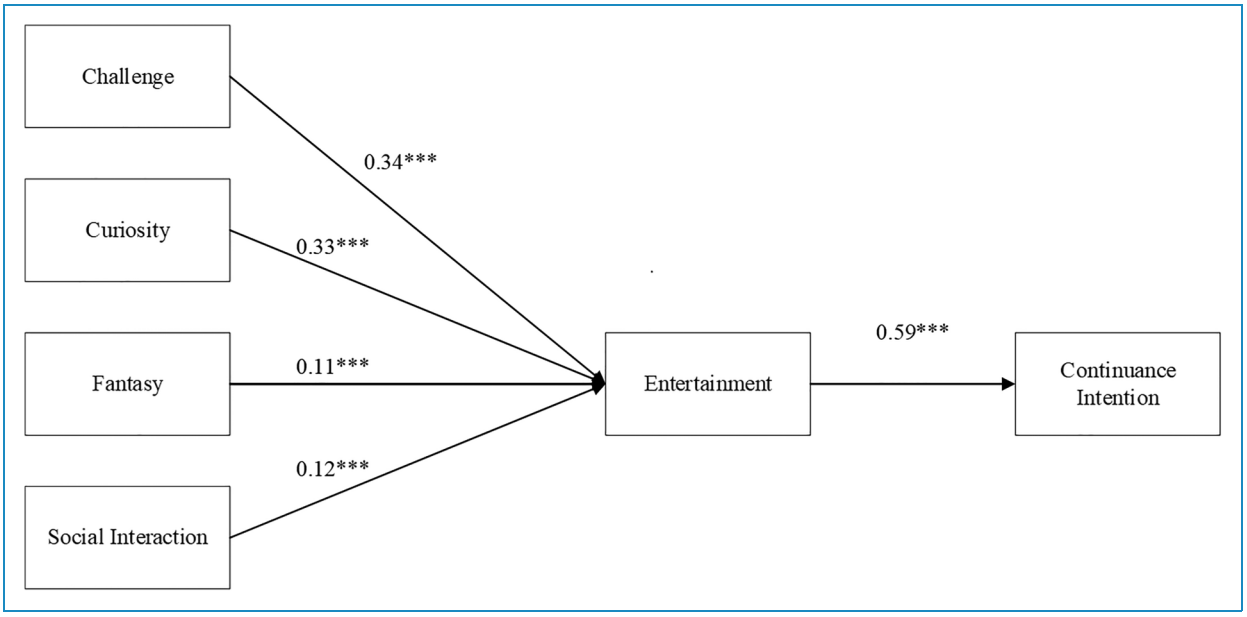

Figure 2. Structural model. ***$p < .001$.

Table 5. Hypotheses testing results.

Hypotheses	Structural Path	β value	t-value	Result
H1	Entertainment → Continuance intention	0.59	29.27***	Accepted
H2	Challenge → Entertainment	0.34	12.93***	Accepted
H3	Curiosity → Entertainment	0.33	10.73***	Accepted
H4	Control → Entertainment			Not tested
H5	Fantasy → Entertainment	0.11	5.19***	Accepted
H6	Social interaction → Entertainment	0.12	8.35***	Accepted

***$p < .001$.

However, when comparing Model 2 and Model 3, it becomes clear that once the mediating paths through entertainment are introduced, the direct effects of the motivations on continuance intention—except for challenge—become insignificant.

This result indicates that entertainment plays a full mediating role between curiosity, fantasy, social interaction, and continuance intention in the context of health and fitness apps. However, challenge still retains a partial direct effect on continuance intention, meaning that entertainment only partially mediates the relationship between challenge and continuance intention. This partial mediation could be attributed to the nature of health and fitness activities, where the inherent challenge of achieving personal fitness goals or overcoming physical obstacles is often enough to drive users to continue engaging with the app, independent of the entertainment value.

Preliminary depiction of how different motivations affect various user groups

Wang and Qi[75] argued that different motivations influence the behavior of various user groups differently. While his research supports this argument, it has not yet been fully confirmed, as many researchers have either overlooked or avoided this topic. Existing studies[75] typically used a limited set of variables to categorize users into a few groups.

This section attempts to take a broader look at how different motivations may impact various potential user groups of health and fitness apps. The goal is to provide a rough depiction of these differences, offering insights into the academic and practical implications of such analysis. This exploration also highlights the potential value and feasibility of conducting further research in this area to better understand how motivation impacts different types of users in the health and fitness context.

In this study, users were first categorized based on eight grouping variables, and then LISREL was used to calculate

Table 6. Mediation effects test results.

Structural Path	Model 1	Model 2	Model 3
Challenge → Entertainment	0.34 (12.93***)		0.32 (12.33***)
Curiosity → Entertainment	0.33 (10.73***)		0.33 (10.72***)
Fantasy → Entertainment	0.11 (5.19***)		0.11 (5.07***)
Social interaction → Entertainment	0.12 (8.35***)		0.12 (8.35***)
Entertainment → Continuance intention	0.59 (29.27***)		0.42 (14.63***)
Challenge → Continuance intention		0.36 (11.45***)	0.22 (7.23***)
Curiosity → Continuance intention		0.14 (3.99***)	0.00 (0.06)
Fantasy → Continuance intention		0.08 (3.30***)	0.04 (1.46)
Social interaction → Continuance intention		0.05 (3.21**)	0.00 (0.03)

**$p < .01$; ***$p < .001$.

the path coefficients for different groups. The results are shown in Table 7. To further verify the moderating effects, the study adopted the Chi-square difference test method.[99] The process is illustrated using gender as an example.

First, the path coefficients for the male sample were calculated using LISREL, yielding a degree of freedom (df) of 137 and a Chi-square value of 817.48. Next, we standardized the path coefficients, including the γ and β values, in the male model to match those of the female model, and recalculated the df and Chi-square values for the male model, which resulted in values of 291 and 1296.47, respectively. We then calculated the Chi-square difference (1296.47–817.48 = 421.64) and the *df* difference (291–137 = 158). Consulting the Chi-square table, we found the critical value for $df = 158$ at the 0.05 significance level to be 188.33.

Since the chi-square difference (421.64) was greater than the critical value (188.33), this indicates a significant difference between the male and female models. The same procedure was followed for the other group classifications, and the results showed that moderating effects were present across all eight classification variables.

From the results in Table 6, it can be observed that, with a few exceptions, all four motivations significantly influence entertainment, with challenge and curiosity having a stronger impact than the other two motivations. Additionally, entertainment significantly affects continuance intention. These findings are consistent with the overall model results shown in Table 4, indicating that the motivation classifications and the proposed model in this study are highly stable. However, different groups exhibit moderating effects, leading to variations in how motivations influence entertainment across different user groups. A deeper explanation follows.

This study first divided the sample by gender, with 2151 males and 718 females. According to the LISREL analysis in Table 7, the entertainment effect was stronger for males than for females. For males, all four motivations enhanced entertainment, with challenge and curiosity being the most influential factors, and challenge having the greatest impact. This could be attributed to males' tendency to seek challenges to demonstrate competence and achieve fitness goals.

For the female group, curiosity was the primary driver of entertainment. This suggests that women with higher curiosity are more likely to explore different aspects of the health and fitness app and derive enjoyment from discovering new features or workouts. While females also enjoy challenges, the effect is not as strong as it is for males. The fantasy motivation did not have a significant impact on entertainment for females. Fantasy-related enjoyment, such as imagining achieving ideal fitness goals or escaping daily stress, may not be as prominent in the context of fitness apps as it is in other leisure activities.

Finally, social interaction had an effect, though not a very strong one. This is in line with findings from previous studies,[76] which noted that women may also prioritize individual goals over social interaction when using the apps.

The study also divided the sample based on disposable income into two groups: those with an income of below 10 million VND (1843 respondents) and those with an income of above 10 million VND (1026 respondents). LISREL was used to analyze the two groups, and the results are presented in Table 7. From the analysis, it was observed that participants with higher incomes were

Table 7. Motivational effects for different user groups.

Hypotheses	Male	Female	High income	Low income	Heavy user	Light user	High engagement	Low engagement
CH→EN	0.34 (11.49***)	0.24 (4.39***)	0.26 (5.08***)	0.36 (10.88***)	0.30 (9.67***)	0.39 (7.60**)	0.30 (9.10***)	0.36 (8.16***)
CU→EN	0.30 (8.51***)	0.45 (6.64***)	0.40 (7.08***)	0.31 (8.15***)	0.36 (9.64***)	0.28 (4.75***)	0.33 (8.39***)	0.34 (6.62***)
FA→EN	0.13 (5.27***)	0.04 (0.88)	0.09 (2.35*)	0.12 (4.50***)	0.11 (4.33***)	0.11 (2.60*)	0.12 (4.50***)	0.08 (2.22*)
SO→EN	0.13 (7.50***)	0.09 (3.56***)	0.14 (5.07***)	0.12 (6.66***)	0.11 (6.50***)	0.14 (5.03***)	0.12 (6.66***)	0.13 (4.97***)
EN→BI	0.45 (13.28***)	0.38 (6.46***)	0.48 (9.41***)	0.40 (11.21***)	0.41 (12.24***)	0.46 (8.12***)	0.44 (12.66***)	0.38 (7.47***)

Hypotheses	Experienced	Novice	Strength training	Non-strength training	Fast-paced activities	Non-fast-paced activities	Adventure	Non-adventure
CH→EN	0.38 (9.70***)	0.27 (7.57***)	0.33 (10.79***)	0.32 (6.21***)	0.32 (3.64***)	0.33 (11.76***)	0.17 (1.77)	0.33 (12.13***)
CU→EN	0.24 (5.59***)	0.43 (9.32***)	0.31 (8.64***)	0.37 (6.06***)	0.43 (3.99***)	0.33 (10.00***)	0.31 (2.50*)	0.33 (10.39***)
FA→EN	0.09 (2.93**)	0.09 (2.93**)	0.12 (4.88*)	0.06 (1.34)	0.01 (0.14)	0.11 (5.05***)	0.10 (1.02)	0.11 (4.93***)
SO→EN	0.14 (6.92***)	0.10 (4.71***)	0.11 (6.75***)	0.17 (5.07***)	0.20 (2.95**)	0.12 (7.91***)	0.35 (3.81***)	0.11 (7.65***)
EN→BI	0.43 (10.52***)	0.41 (10.05***)	0.42 (13.11***)	0.43 (6.73***)	0.42 (13.11***)	0.42 (6.73***)	0.48 3(3.85***)	0.42 (14.14***)

*$p < .05$; **$p < .01$; ***$p < .001$.

slightly more influenced by entertainment in their continuance intention to use the app compared to those with lower incomes, though the difference between the two groups was not substantial. For the higher-income group, curiosity was the main driver of entertainment, suggesting that wealthier individuals might be more engaged with discovering new features or workouts within the health and fitness app. In contrast, for the lower-income group, challenge was the primary source of entertainment. This could be because lower-income individuals may seek a sense of achievement and competence through overcoming fitness challenges in the app, which they may feel is lacking in their real-life circumstances. This finding suggests that the motivations for using health and fitness apps differ slightly based on income levels, with higher-income users seeking novelty and exploration, and lower-income users focusing on overcoming challenges to gain a sense of accomplishment.

The study then divided participants into heavy users (those who use the health and fitness app at least once per day) and light users (those who use the app less than once per day). There were 2102 heavy users and 767 light users. According to the analysis results in Table 7, entertainment had a slightly greater influence on the continuance intention of light users compared to heavy users. This could be because light users, with less frequent engagement, find entertainment to be more impactful. Both challenge and curiosity were the main motivational drivers for both groups. However, light users, who may encounter fewer challenges in the app, place greater emphasis on the enjoyment they derive from overcoming these obstacles. In contrast, heavy users, who have more experience in completing challenges, are more motivated by curiosity for their entertainment.

Additionally, the study divided participants based on time spent per session into low-engagement users (those who use the app for less than three hours per session) and high-engagement users (those who use it for more than three hours per session). There were 905 low-engagement users and 1964 high-engagement users. As seen in Table 7, low-engagement users experienced less entertainment, which explains why the impact of entertainment on their continuance intention was weaker compared to high-engagement users. For both groups, challenge, and curiosity were the primary motivations, with curiosity having a similar effect across both. However, low-engagement users were more influenced by the challenge. Since challenges can directly affect continuance intention without necessarily being mediated by entertainment, this explains why low-engagement users are less affected by the entertainment factor.

The fifth analysis was based on the participants' experience with health and fitness apps. Those with less than two years of experience were classified as novice users (1500 participants), while those with more than two years of experience were classified as experienced users (1369 participants). According to Table 7, the influence of entertainment on continuance intention was generally similar for both groups. Although all four motivations had an impact, the primary drivers remained challenge and curiosity. However, the effect of these two motivations differed between the groups. Novice users were more influenced by curiosity, likely because their shorter usage time meant there were still many new features and activities to discover within the app. In contrast, experienced users were more driven by the challenge motivation. Having used the app for a longer period, they were already familiar with its content and features and therefore placed greater importance on achieving fitness milestones or improving their performance, seeking a sense of accomplishment through overcoming challenges.

In the context of health and fitness apps, the type of activity is often regarded as a significant moderating variable.[88] Therefore, this study also conducted an exploratory analysis of the moderating effects of different fitness activities. Among all participants, those engaging in strength training dominated the sample, totaling 2226 users (77.6%), while other types of activities had fewer users. Since the sample size can affect the stability of path analysis results and the suitability of various indicators,[98] the following results should be interpreted with caution. The findings may change if more data are collected.

First, the study divided users into two groups: those engaged in strength training (2226 participants) and those participating in non-strength training activities (643 participants). According to the analysis in Table 7, the impact of entertainment on continuance intention was generally similar across both groups, with all four motivations showing significant influence. Challenge and curiosity remained the most important factors, but curiosity had a slightly greater influence on users engaged in non-strength training activities. Interestingly, in the strength training group, the impact of the fantasy motivation was more pronounced. Conversely, in the non-strength training group, social interaction had a stronger effect. This may be because, in non-strength training activities, it is more challenging for users to envision themselves as achieving idealized versions of their fitness goals solely through the activity, and thus they may rely more on social interaction for motivation and entertainment. In contrast, strength training may offer users a greater sense of fantasy, as they envision themselves transforming physically and reaching their fitness aspirations, which enhances the entertainment value of the app for this group.

Next, the study divided users into two groups: those engaged in high-intensity, fast-paced activities (203 participants) and those participating in other types of activities (2666 participants). According to the analysis in Table 7, users engaged in fast-paced activities, such as HIIT or cardio-based workouts, were more influenced by curiosity and also tended to use these activities for social interaction

with friends. In contrast, the fantasy motivation did not have a significant impact on the entertainment value for this group ($t = 0.14$). This may be because fast-paced workouts focus heavily on quick reactions, intensity, and rapid progress, leaving little room for users to engage in a fantasy mindset. Users are more focused on keeping up with the pace and reacting to the workout's demands. However, these activities do provide opportunities for social interaction through shared participation with others, offering users the chance to bond over similar fitness goals, discuss workouts, and satisfy their need for social connection.

Finally, the study divided users into two groups: those engaged in adventure-type activities (158 participants) and those involved in non-adventure activities (2711 participants). Each group was analyzed using LISREL, and the results are shown in Table 7. Adventure-type activities typically involve users acting as protagonists in their fitness journey, where the process mimics real life with a series of events such as building relationships, developing skills, and accumulating progress over time. These activities often feature larger variations in challenges and progress, catering more to users' curiosity but may not offer rapidly changing or highly difficult challenges.

When comparing the two groups, it was found that users in the adventure-type group likely seek to experience excitement and thrill that they may not get from real life, which is why their continuance intention is more influenced by entertainment. For adventure-type users, curiosity and social interaction were the primary factors influencing the entertainment value. This could be because users driven by curiosity tend to stay engaged to explore how the fitness journey will unfold. In the process, instead of focusing on competition, these users are more inclined to seek interaction and friendship, relying on the support and help of others to complete their fitness goals.

Discussion and implications

Discussion

According to flow theory,[100] motivation is one of the key factors influencing users' experiences and their willingness to continue engaging with online platforms. Similarly, the act of using health and fitness apps is driven by intrinsic motivation, meaning that motivation plays a crucial role in users' ongoing engagement. Despite this, compared to other research fields such as tourism, where there is a high focus on the role of motivation,[101] studies on health and fitness apps have paid relatively little attention to the role of motivation. The literature review reveals a pressing need for a widely accepted and stable classification of motivations that can offer explanatory power, along with a comprehensive exploration of how different motivations impact various user groups. This study aimed to address that gap by conducting an in-depth investigation, providing a framework for understanding motivation's role in health and fitness apps, and exploring how these motivations affect different types of users. Through this exploration, the study contributes to closing the knowledge gap and opens up new paradigms and opportunities for future research in this area.

Through a review of the literature, this study proposed a preliminary intrinsic motivation classification framework and developed a theoretical model. Nearly 3000 data points were collected to test the explanatory power of the model. As observed from the hypothesis testing results (Table 4), all hypotheses were supported, except for H4, which could not be tested. Additionally, this study found that entertainment acts as a mediating factor between motivation and continuance intention (Table 5). The findings suggest that the stronger a user's challenge, curiosity, fantasy, and social interaction motivations are, the higher their perceived entertainment from the health and fitness app will be, ultimately increasing their intention to continue using the app. Furthermore, the data analysis yielded several interesting and novel insights.

First, the integrated motivation classification framework and the proposed theoretical model proved to be very stable. The data analysis showed that the mediating model, where the four motivations (challenge, curiosity, fantasy, and social interaction) influence continuance intention through entertainment, remained highly consistent across different user groups (Table 6). This indicates that whether a health and fitness app is enjoyable is closely tied to whether users continue to engage with it. The level of entertainment, however, is influenced more by users' motivations than by their characteristics or the type of activity.

Second, while challenge, curiosity, fantasy, and social interaction motivations all significantly influenced entertainment in most cases, challenge and curiosity had a stronger impact than the other two. This pattern remained stable across most types of activities, except for adventure-style activities, where the influence of motivations varied slightly. Thus, in most contexts, challenge and curiosity are the primary factors driving users to continue engaging with the same fitness app.

Third, the challenge motivation had a direct effect on continuance intention, independent of entertainment. This suggests that users are intrinsically motivated to overcome obstacles and participate in challenges to satisfy their need for achievement and self-validation. In some cases, people may not engage with a fitness app solely for entertainment, but rather to gain a sense of accomplishment by meeting their fitness goals, boosting their confidence and self-esteem. The pursuit of achievement through challenges can keep users engaged in the app, similar to findings by Rehman and Abbasi.[34]

Fourth, this study provides a preliminary framework for understanding why different user groups continue to engage

with a health and fitness app, offering insights that can assist businesses in market segmentation and marketing strategy development. Sherry and Greenberg[69] suggested that the design of an app must align with users' motivations to attract and retain them. Wang and Qi[75] further found that the primary motivations driving different user groups to use a product vary. Our study delved deeper into this notion and revealed several interesting findings. The results indicate that males are the most typical users of health and fitness apps, and those driven by challenge and curiosity are more likely to maintain their engagement. Conversely, females are more strongly driven by curiosity, which immerses them in the app's content. Among groups with higher income, heavy usage, high engagement, and novice users, curiosity has a greater influence than challenge. In non-strength training, adventure, and high-intensity activities, users with higher curiosity are more likely to be loyal to the app. Social interaction played a stronger role in activities like adventure and high-intensity training, likely because these activities rely less on direct competition and more on cooperation, coordination, and mutual support among users. These insights can help app developers and marketers tailor their strategies to align with users' motivations and create more engaging experiences for specific user groups.

H4, which proposed that control influences entertainment in health and fitness apps, could not be tested due to the poor reliability of the control variable. Additionally, the AVE value for curiosity was slightly below the 0.5 threshold, indicating there is room for improvement in the measurement quality of these two variables. Further investigation with several user groups revealed that, in high-engagement fitness programs, which had the highest participation, factors such as the user's fitness level, access to equipment, workout progression strategies, and coordination within social or virtual fitness communities, continuously impacted participants' sense of control. The concept of motivation stems from unmet needs, where behavior is motivated by the ability to satisfy those needs. In this context, the perception of whether the need for control is being met fluctuates frequently based on workout dynamics and external factors. In contrast, self-paced fitness activities like yoga or single-session guided workouts may allow users to more easily assess whether their control needs are being satisfied. Another possible reason for the poor measurement quality may stem from the variety of health and fitness apps, each with different levels of difficulty and control mechanisms. For instance, fitness apps that focus on guided programs or interactive challenges may offer users a simplified sense of control, failing to fully satisfy more advanced users' control needs. Moreover, the large number of survey items might have impacted data quality. Armstrong and Overton[102] suggested that responses collected later in the survey process tend to be of lower quality. When reanalyzing the first 400 responses, the reliability of the control variable increased to 0.52, and curiosity improved to 0.74, with the AVE value for curiosity rising to 0.49, which is close to the 0.5 threshold. This suggests that removing lower-quality responses could improve the overall measurement quality in future studies.

Theoretical implications

In recent years, many studies have focused on identifying the factors that influence users' specific behaviors in online environments. Some studies have emphasized the impact of business-related factors, such as exploring the influence of service quality using the SERVQUAL model.[103] Another research approach is based on the Technology Acceptance Model (TAM), which has been adapted to different contexts to develop suitable explanatory theories.[43] However, TAM has often been criticized for placing too much emphasis on extrinsic motivations, which has led some researchers to attempt to integrate intrinsic motivations to modify the model.[104] This study contributes to that line of inquiry by focusing on the role of intrinsic motivations—such as challenge, curiosity, and social interaction—in influencing user engagement and continuance intention in health and fitness apps.

Compared to research on other behaviors, studies that investigate user continuance intention from a motivation perspective are relatively rare. This has limited our understanding, both academically and practically, of the psychological processes that influence users' decisions to continue engaging with a health and fitness app. Additionally, the lack of consensus on how to classify motivations has restricted the ability to compare, accumulate, and synthesize research findings. While some existing studies have contributed to our understanding of user psychology and behavior, the varied results have hindered the advancement of related theories.

This study offers a preliminary classification framework for intrinsic motivations in the context of health and fitness app engagement, which has been shown through empirical research to be highly stable. This framework can serve as a common foundation for future researchers to explore the role of intrinsic motivations. Furthermore, this study's exploratory examination of how different motivations function across diverse user groups provides a more detailed understanding of user behavior patterns. These insights can help fitness app developers segment users more effectively and develop targeted marketing strategies.

Of course, this model is not without its limitations. For example, due to space constraints and certain limitations, the study did not employ the most up-to-date scales or incorporate extrinsic motivations, which could enhance the theoretical foundation. However, these issues are easily addressed, and future researchers can refine this framework by incorporating the latest theories and

measurement scales to systematically examine motivation in more depth.

Additionally, this study opens up many avenues for future research. For example, the same framework could be used to explore other information system-related behaviors, such as motivations for social media participation or mobile commerce usage. Researchers could also integrate this framework with other models, such as TAM, to gain a deeper understanding of users' behavioral intentions. Moreover, employing advanced statistical techniques, such as cluster analysis,[105] could further validate whether the motivations identified in this study are suitable for use as market segmentation variables.

Practical implications

Research from various institutions predicts that the health and fitness app market will continue to grow, with user numbers increasing each year. However, competition among developers is expected to become more intense. This study's in-depth exploration of different user groups can assist companies in effectively identifying target consumers and conducting market segmentation. For example, women with high curiosity are likely to be more loyal users. Developers can tailor marketing strategies to different market segments based on these insights.

To attract more users to health and fitness apps, companies must consider the most important intrinsic motivations within their target market when designing their products. One key finding from this study is that challenge is the most important motivation. Users often seek to achieve a sense of accomplishment that they may not experience in real life, thus boosting their self-confidence and validating their abilities. Drawing from the perspectives of Hoffman and Novak[100] and Kuru[88] on challenges in digital platforms, the difficulty in fitness activities within the app must be appropriately matched to users' skill levels. If the workouts are too easy or too difficult, users will not derive enjoyment or feel a sufficient sense of achievement. Health and fitness apps allow users to choose different levels of difficulty and intensity, so developers need to continuously understand users' abilities to create appropriate challenges and regularly introduce new, more difficult challenges to keep users engaged.

In many cases, curiosity plays a crucial role in user engagement. The design of a fitness app's visuals, sounds, and storylines can stimulate users' curiosity about novel or unique features. To explore these new elements and enjoy the unexpected progressions in the app's content, users are likely to remain engaged. Thus, companies must regularly update the app, introducing new workout routines, activities, and features, whether through changes in the interface, exercise plans, or audio-visual elements, to maintain users' curiosity.

From a social interaction perspective, users are often motivated by a desire to connect with peers and share experiences, which adds to their enjoyment of the app. Therefore, apps should offer more interactive opportunities, such as group challenges, partner workouts, or community engagement, where users can collaborate, assist one another, and work toward common goals. By establishing social communities within the app, developers can facilitate more interactions among users, meeting their social needs and fostering user loyalty.

Limitations and future research

This study highlights several areas for further exploration. First, while a comprehensive motivation classification framework was proposed, other intrinsic motivations, such as escapism, remain unaddressed. Additionally, distinctions between similar motivations, like achievement, self-affirmation, and challenge, need further clarification to develop a more refined model. Secondly, the study's analysis of motivation across different user groups was data-driven and lacked a strong theoretical foundation. Future research could develop hypotheses to test differences in path coefficients between groups more rigorously. Third, further exploration of various app types could enhance understanding of user motivations. Future research should also involve validation studies to improve segmentation criteria. Fifth, using more up-to-date scales could improve the framework. The control motivation scale, in particular, may need refinement to better capture users' dynamic experiences in health and fitness apps. Sixth, future studies could explore extrinsic motivations, such as social pressure or group dynamics, which were not addressed in this research. Lastly, future studies could employ qualitative methods, such as in-depth interviews, focus groups, or user diaries, to explore nuanced user experiences and uncover additional motivations or barriers. Combining qualitative insights with quantitative data could enrich the theoretical framework and provide a more comprehensive understanding of user engagement.

Conclusions

This study advances the understanding of intrinsic motivations in driving user engagement and continuance intention within health and fitness apps. Using flow theory and the Uses and Gratifications Theory, a robust theoretical model that highlights the mediating role of entertainment was developed and validated. With nearly 3000 responses, the findings demonstrate that intrinsic motivations—challenge, curiosity, fantasy, and social interaction—significantly influence entertainment, which in turn impacts users' intention to continue using these apps.

A key strength of this study is its innovative focus on intrinsic motivations, addressing gaps in the literature by

offering a stable classification framework. Challenge and curiosity emerged as the most influential drivers across user groups, underscoring the importance of adaptive challenges and dynamic, curiosity-driven features in app design. Subgroup analyses revealed valuable insights into user-specific behaviors, such as males prioritizing challenges and females emphasizing curiosity, providing actionable guidance for targeted app development.

The findings have practical relevance for developers aiming to enhance engagement through features that align with users' intrinsic motivations. By fostering entertainment and tailoring experiences to user needs, health and fitness apps can drive sustained engagement and loyalty. This study not only contributes to theoretical advancement but also offers practical strategies for success in the competitive digital health market.

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ORCID iD: Nam Tien Duong https://orcid.org/0000-0001-6757-797X

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