

# A Study on Mobile Fitness Application Usage

Ben C.F. Choi<sup>(✉)</sup> and Nathaniel T. Lee

School of Information Systems, Technology and Management, UNSW Australia  
Business School, UNSW Australia, Kensington, Australia  
chun.choi@unsw.edu.au,  
nathaniel.lee@student.unsw.edu.au

**Abstract.** Although the importance of physical activity in a healthy lifestyle is well known, little attention has been paid thus far to systematically understand users' continued usage of mobile fitness applications. The objective of this paper is to understand the determinants of usage of mobile fitness applications beyond initial adoption. The research model is tested with data collected from fifty users of mobile fitness applications. The results indicate that expectation confirmation is the key predictor of attitudes towards the application, such as perceived usefulness, perceived enjoyment, and satisfaction. Furthermore, users' attitudes are found to determine continued usage intention. Overall, this paper contributes by integrating intrinsic motivation into the expectation-confirmation model for mobile fitness application usage.

**Keywords:** Expectation-confirmation · Satisfaction · Perceived usefulness · Perceived enjoyment · Continued usage · Mobile fitness applications

## 1 Introduction

Increasing evidence suggests that physical activities help form the foundation of healthy living [1]. Despite the health benefits of engaging frequent physical exercises, studies show that the majority of the population is not benefited because people are simply physically inactive in general. More importantly, ample evidence shows that physical inactivity is a major risk factor to health in modern society. The engagement of physical activity typically constitutes a complex interaction between biological, environmental, social, and psychological influences [2]. Past research examining exercise psychology reveals that human motivations are important determinants of exercise behavior [e.g., 3, 4]. More important, emerging evidence suggests that Information Systems (IS) could play an important role in sustaining the impact of motivations on behavior.

Past IS research has drawn on a variety of theoretical perspectives to understand motivations in the context of IS continual usage [e.g., 5, 6]. In particular, the expectation-confirmation model is shown to be particularly useful in understanding individuals' continued usage of technology. Extending the traditional expectation-confirmation model, Bhattacharjee [7] put forth the IS continuance model that continued usage of technology can be determined by perceived usefulness, which represents the consequences of technology usage, and satisfaction, which denotes

individuals' affective attitude toward a technology. The IS continuance model has been widely adopted in IS research [e.g., 8, 9].

Despite the popularity of the IS continuance model, very few studies have tried to apply the model to understand IS continuance beyond utility-based systems. Furthermore, extant studies have primarily focused on investigating the relationships between system quality and satisfaction. This is a crucial omission and an important topic to be investigated since individuals' attitude in sustained mobile fitness applications usage is likely to differ from that in the pre-adoption process. Sustained usage is distinct from pre-adoption because individuals have prior physical experience to draw upon and has formed a level of satisfaction that is likely to influence continued usage. Therefore, additional theoretical insights are needed to understand the sustained usage process, and how factors that predict pre-adoption decisions combine with physical outcomes to influence continued usage decisions.

## 2 Theoretical Background

### 2.1 Expectation-Confirmation Framework

The expectation-confirmation framework has been utilized to examine behavior prior to adoption (i.e., deliberation) and post-adoption (i.e., evaluation). Specifically, as described by Oliver [10], individuals first formed expectations of a technology prior to actual usage. Subsequently, individuals' actual usage resulted in experienced-based perception, which was influenced by these expectations. Substantial differences between deliberation and evaluation would either confirm or refute expectation formed prior to purchase. Overall, the expectation-confirmation framework posits that expectations and level of confirmation affect satisfaction, which ultimately drive individuals' repeated usage intention.

Ample IS research has built upon the expectation-confirmation framework. In particular, Bhattacharjee [7] proposed a modified expectation-confirmation framework, which is extended to explain continued IT usage. To explain continued IT usage, Bhattacharjee [7] emphasized several important differences with past research examining expectation-confirmation. For instance, past expectancy-confirmation research has predominately focused on the importance of pre-usage expectation in influencing confirmation, which in turn affects individuals' satisfaction in using technologies. MacInnis and Price's [8] study, as an example, found that imagery processing influenced consumers' expectation formation, which subsequently interacted with actual experience, to derive satisfaction with their spring vacations. In contrast, Bhattacharjee [7] emphasized the importance of post-adoption expectations. In particular, it is posited that individuals' actual technology usage experience should shape their usage expectation.

Furthermore, past research drawing upon the expectancy-confirmation paradigm have predominately focused on expectation in terms of individual beliefs about the levels of attributes possessed by a technology. For example, in a study examining brand loyalty, Yoon and Kim [9] revealed that consumers derived expectations based on several brand attributes (such as image, economy, and sensory). The authors also

reported that these expectations were typically subjected to a confirmation process, which was the key determinant of overall satisfaction and loyalty. On the contrary, to reflect the unique technological attributes of IS, Bhattacharjee [7] postulates perceived usefulness as the key manifestation of expectation.

In essence, past research suggests that the expectation-confirmation model is a relevant and integral theoretical framework to explain continued IS usage.

## 2.2 Organismic Integration Theory (OIT)

Among the many theoretical perspectives advanced to address motivations of technology usage, the Organismic Integration Theory (OIT) proposed by Ryan and Deci [11] is particularly useful in predicting fitness-related technology usage behavior. OIT focuses on how a user's internal psychological perceptions about autonomy shape his or her intentions and behaviors. In particular, it posits that endogenous motivations are important determinants of user intentions and behaviors.

In contrast to OIT, past IS studies typically view technology usage behavior as being driven by extrinsic motivations, such as perceived usefulness and rewards. For example, Venkatesh and Goyal [12] examined the usage of an internal electronic human resource information system and found that continued usage intention decreased at a faster rate as pre-exposure perceived usefulness increased and post-exposure perceived usefulness decreased. Similarly, Limayem et al. [13] examined university students' usage of the Internet and reported that perceived usefulness was a significant predictor of satisfaction and IS continuance intention. In essence, extant research mostly focused on the essentiality of extrinsic motivations in explaining continued IS usage. As such, OIT provides an important theoretical complement by underscoring the importance of intrinsic motivations.

According to OIT, individuals are volitional and tend to utilize stimuli to satisfy their individual needs. In particular, the theory centers on the unique role of locus of causality, which refers to individuals' ability to enact autonomy by initiating and endorsing behavior as they desire. More importantly, OIT formally posits that locus of causality helps facilitate individuals' intrinsic motivations in performing sustained activities, such as engaging in prolonged physical exercise and participation in strenuous fitness programs. Furthermore, past research has identified a myriad of intrinsic motivations which might drive continued IS usage. In particular, perceived enjoyment has been identified as the key form of intrinsic motivation in using hedonic IS. In the context of mobile fitness application usage, enjoyment is particularly relevant in determining satisfaction. Evidence suggests that enjoyment is a key driver of sustained fitness activities. For instance, Murcia et al. [14] revealed that enjoyment was an important form of self-determined motivation in driving sports engagement. Similarly, Waterman [15] demonstrated that hedonic enjoyment was the major affective state that influenced the extent to which activities were seen as facilitating the realization of an individual's best potential. Overall, past research highlights enjoyment as a key intrinsic motivation which drives sustained fitness-related behavior.

### 3 Research Model and Hypotheses

By integrating the expectation-confirmation model and OIT, the research model is proposed (see Fig. 1). Specifically, this study importantly examines expectation confirmation, which refers to the consistency between a user's expected experience of augmented fitness activities and his or her actual fitness activity experience with the mobile fitness application [16].

Consistent with the expectation-confirmation model and OIT, we consider the impact of expectation confirmation on two forms of motivations, namely extrinsic motivation and intrinsic motivation. Corresponding to the important role of extrinsic motivation, this study considers perceived usefulness, which is defined as the degree to which an individual believes that using the mobile fitness application would enhance his or her fitness activity performance [17]. In this study, in terms of intrinsic motivation, we center on perceived enjoyment, which is defined as the extent to which fun can be derived from using the mobile fitness application [18]. Furthermore, in line with the expectation-confirmation model, this study considers satisfaction with the application, which is defined as the user's emotion-based response about the application, to capture the overall evaluation of the application.

Past IS research typically focused on continued IS usage as the behavioral outcome of expectation-confirmation. This study draws on this view by examining continued mobile fitness application usage, referring to a user's intention to continue using the mobile fitness application [35].

#### 3.1 The Effects of Expectation Confirmation

Ample evidence suggests that expectation confirmation enhances individuals' perceptions of usefulness in using technology [e.g., 19–21]. For instance, prior to actual

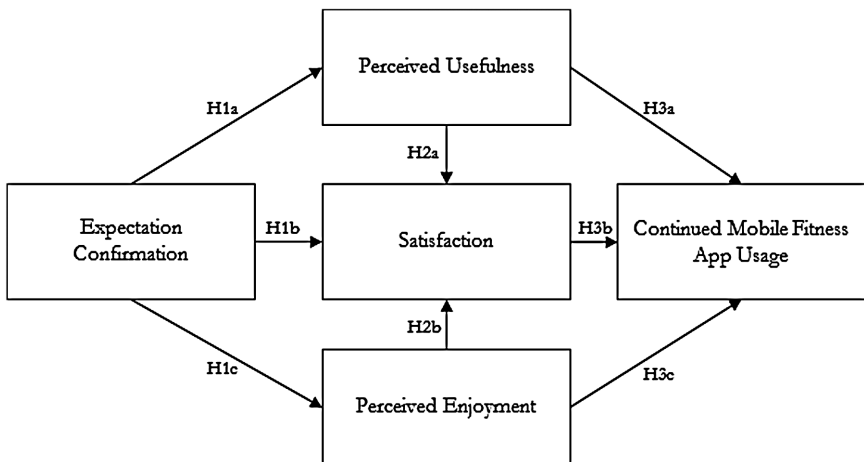


Fig. 1. Research Model

usage, users may be uncertain about what to expect from using the mobile fitness application and hence develop low initial usefulness perceptions. Consequently, given the low initial perceived usefulness, users' expectation can be easily confirmed. Having a strong confirmation of initial expectation, users would be induced to elevate their perceptions of extrinsic utility in using the mobile fitness application. Indeed, theoretical evidence suggests that individuals might experience cognitive dissonance if their elaborative usefulness perceptions are disconfirmed in actual experience [22, 23]. More importantly, individuals typically try to resolve this inconsistency by adjusting their usefulness perceptions to more accurately match their experience. Therefore, we posit

*H1a: stronger expectation confirmation will increase perceived usefulness in using mobile fitness applications.*

Deci and Ryan [24] suggested that sustained behaviors are driven by both extrinsic motivation and intrinsic motivation. In this study, extrinsic motivation is considered in terms of perceived usefulness whereas intrinsic motivation is represented by perceived playfulness. According to the expectation-confirmation model, confirmation is the key determinant of experienced-based motivation.

In the context of mobile fitness application usage, since individuals' perceptions of usefulness and enjoyment are common motivations, it is reasonable to expect that confirmation would impact on perceived enjoyment. Indeed, past research suggests that individuals might experience cognitive dissonance or psychological tension if their pre-usage enjoyment perceptions are not congruent with their usage experience [25, 26]. Hence, we posit

*H1b: Stronger expectation confirmation will increase perceived enjoyment in using mobile fitness applications.*

Individuals form expectations about technologies prior to actual usage. When lower expectation meets with higher performance, users typically develop a stronger sense of confirmation, which in turn drives satisfaction in using the technology. Past studies have demonstrated the relationship between confirmation and satisfaction. For example, Spreng et al. [27] examined the importance of attribute satisfaction and information satisfaction and revealed that expectation congruency, which was informed by the confirmation of prior usage expectation, had significant effects on satisfaction. Liu and Khalifa [28] also found that confirmation is significantly associated with satisfaction with Internet-based services. Therefore, we propose

*H1c: Stronger expectation confirmation will increase satisfaction in using mobile fitness applications.*

### **3.2 The Effects of Perceived Usefulness and Perceived Enjoyment on Satisfaction**

According to expectation-confirmation theory, post-consumption expectation is represented as experienced-based perceived usefulness [7]. Empirical studies reveal that perceived usefulness is particularly important in determining user satisfaction with IS

[17, 29]. For instance, Mawhinney and Lederer [30] reported that users who perceived a technology useful, were more likely to be satisfied with the technology than those who did not.

Additionally, past research suggests that perceived enjoyment is an important precursor of satisfaction in using technology. Specifically, users who report a higher perceived enjoyment in use of a technology tend to be associated with more creative and innovative usage. Consequently, they are more likely to develop insights through exploratory behaviors, hence resulting in an enhanced usage experience. For example, Van Dolen et al. [31] examined online commercial group chat and found that technology attributes which facilitated perceived enjoyment influenced satisfaction directly. In a study examining the role of an IT artifact in online service continuance, Kang and Lee [32] reported that hedonic motivational factors, such as perceived enjoyment, were important antecedents to customer satisfaction.

In summary, we hypothesize the following

*H2a: Higher perceived usefulness will increase satisfaction in using mobile fitness applications.*

*H2b: Higher perceived enjoyment will increase satisfaction in using mobile fitness applications.*

### **3.3 Determinants of Intention to Continue Using Mobile Fitness Applications**

The technology-acceptance model (TAM) underscores the importance of perceived usefulness in driving technology usage. In this model, perceived usefulness is considered the basic extrinsic motivation in driving consumers' repurchase behavior. Recently, researchers noted that TAM, which focused on explaining initial technology adoption, could be extended to predict continued technology usage. Indeed, ample research drawing upon the expectation-confirmation model has demonstrated the positive effect of perceived usefulness on continued usage [e.g., 19, 22, 33].

Past research examining intrinsic motivation reveals that positive subjective experience is an important reason for continuing an activity [34]. To illustrate, when an individual is interested in or enjoys performing an activity, he or she will be intrinsically motivated by the process of the activity, and hence he or she will be more likely to undertake the activity in a prolonged manner. In the context of mobile fitness application usage, users who experience enjoyment are more absorbed and appealed by the augmented exercising experience.

Satisfaction is an individual's feelings of pleasure which is the outcome of evaluating his or her expectation with actual experience. According to the expectation-confirmation model, satisfaction determines intentions to use or not to use a technology in the future. Indeed, in a study examining mobile internet, Hong et al. [33] found that users' satisfaction with mobile internet was the principal determinant of continued usage.

In summary, we hypothesize the following

*H3a: Higher perceived usefulness will increase intention to continue using mobile fitness applications.*

*H3b: Higher perceived enjoyment will increase intention to continue using mobile fitness applications.*

*H3c: Higher satisfaction will increase intention to continue using mobile fitness applications.*

## **4 Research Method**

### **4.1 Operationalization of Constructs**

We adopted existing validated scales with known psychometric properties as far as possible. To assess expectation confirmation in augmented fitness activities, we adapted scales from Bhattacharjee [7] by considering our research context of mobile fitness applications. We also adapted items from previous literature [12, 18, 27] to measure perceived usefulness, satisfaction, and perceived enjoyment. To measure continued mobile fitness application usage, we adapted items from Mathieson [35]. The questionnaire employed a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree).

### **4.2 Sample and Experimental Procedures**

Fifty users of mobile fitness applications participated in the online survey over two weeks. The descriptive statistics of the sample indicate that the majority of respondents were between 18 and 25 years of age.

Nonresponse bias was assessed by comparing early and late respondents (i.e., those who responded in the first two days and those who took part during the last two days). T-tests performed on each group of respondents did not differ significantly in terms of age, Internet experience, or application usage experience. Therefore, nonresponse bias is not a serious concern.

## **5 Data Analysis**

Data analysis was conducted using the partial least squares (PLS) technique.

### **5.1 Instrument Validation**

Convergent validity and discriminant validity were assessed. Convergent validity can be established by examining composite reliability (CR), Cronbach's  $\alpha$ , and the average variance extracted (AVE) of constructs. The CR and Cronbach's  $\alpha$  for all constructs

**Table 1.** Descriptive Statistics and Correlations

	Mean	S.D.	CON	PU	PE	SAT	C-USE
CON	4.78	1.45	<b>0.91</b>				
PU	4.89	1.32	0.46	<b>0.88</b>			
PE	4.22	1.56	0.43	0.33	<b>0.82</b>		
SAT	4.97	1.89	0.45	0.42	0.41	<b>0.81</b>	
C-USE	4.54	1.09	0.28	0.35	0.39	0.47	<b>0.79</b>

Notes: S.D. = Standard Deviations; CON = Confirmation; PU = Perceived Usefulness; SAT = Satisfaction; PE = Perceived Enjoyment; C-USE = Continued Mobile Fitness Application Usage

exceeded 0.7. The AVE for each construct was greater than 0.5. Since the results met all threshold criteria, the convergent validity for the constructs was supported.

Discriminant validity of a measurement model can be established when the square root of AVE for each construct is greater than the correlations between that construct and other constructs. As shown Error! Reference source not found., this requirement was met. We also tested for common method bias based on the guidelines suggested by Liang et al. [36]. Results showed a small magnitude of method variance and insignificant method factor loadings, and hence method bias was unlikely a concern in this study (Table 1).

## 5.2 Hypotheses Testing

Path coefficients and significance values are reported in Fig. 2. As hypothesized, expectation confirmation has significant effects on perceived usefulness ( $\beta = 0.41$ ,  $\rho < 0.01$ ), perceived enjoyment ( $\beta = 0.38$ ,  $\rho < 0.01$ ), and satisfaction ( $\beta = 0.35$ ,  $\rho < 0.01$ ). Thus, H1a, H1b, and H1c are supported.

Furthermore, as expected, perceived usefulness is found to have a significant and positive effect on satisfaction ( $\beta = 0.32$ ,  $\rho < 0.05$ ). Likewise, perceived enjoyment also positively affects satisfaction ( $\beta = 0.28$ ,  $\rho < 0.05$ ). Hence, H2a and H2b are supported (Fig. 2).

Finally, perceived usefulness ( $\beta = 0.34$ ,  $\rho < 0.05$ ), perceived enjoyment ( $\beta = 0.29$ ,  $\rho < 0.05$ ), and satisfaction ( $\beta = 0.26$ ,  $\rho < 0.05$ ) are found to have significant and positive effects on continued mobile fitness application usage. Therefore, H3a, H3b, and H3c are supported.

## 6 Discussion and Concluding Remarks

### 6.1 Discussion of Results

The results supported all our hypotheses. There are several important findings obtained from our study. Firstly, this study reveals that both satisfaction and perceived usefulness act as key motivators for continued application usage. This finding is consistent with past research examining expectation-confirmation, which claimed that satisfaction



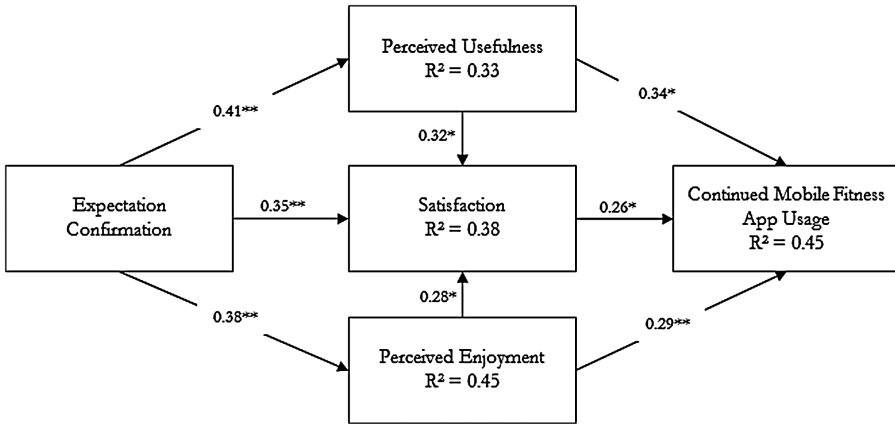


Fig. 2. Results of Hypotheses Tests

and perceived usefulness are two major determinants of sustained behavior. Further, perceived enjoyment is found to have substantial influence on continued usage. As hypothesized, an individual with high level of perceived enjoyment has a greater desire to maintain the intrinsic benefit, confirming the effect of self-determination on sustained behavior. Also, the significant effects of perceived usefulness and perceived enjoyment on satisfaction are consistent with and extend previous research on experience-based motivations that explains the effects of intrinsic and extrinsic benefits on satisfaction associated with fitness activities.

Additionally, consistent with the expectation-confirmation paradigm, expectation confirmation is found to be the key predictor of perceived usefulness, perceived enjoyment, and satisfaction in the context of mobile fitness application usage.

## 6.2 Contributions

This study makes several important contributions. First, we establish that extrinsic benefit evaluation (i.e., perceived usefulness) is not the only consideration in individuals' expectation-confirmation in using mobile fitness applications. Past IS research examining expectation-confirmation in technology usage has predominately focused on the importance of extrinsic benefits (i.e., perceived usefulness and perceived ease of use) in driving continued usage behavior. The interesting role of intrinsic benefit evaluation has been largely neglected. In this study, we enrich this stream of research by positing and empirically demonstrating that perceived enjoyment is a major experienced-based intrinsic benefit that individuals evaluate.

Secondly, this study adds to the literature by extending expectation-confirmation theory. This concept has previously been used to explain continued IS usage [e.g., 9, 37, 38]. In this study, the theory is used to model and understand the motivations behind the continued usage of mobile fitness applications. Further, a salient contribution is made by showing how various perspectives, such as technology acceptance

framework and flow theory, can be integrated to explain sustain usage of technology. While the expectation-confirmation framework serves as the overarching perspective for our explanation of continued usage of mobile fitness applications, technology acceptance framework and flow theory elucidate the specific effects of extrinsic and intrinsic motivations on satisfaction and continued usage.

This study additionally contributes to the broader line of research on technology acceptance that has mainly been conducted in workplace settings [e.g., 12, 38]. Previous research [e.g., 13] has also explained how voluntary continued internet usage could be predicted by confirmation and satisfaction. Our study adds to this literature by examining confirmation as the key determinant of satisfaction in using mobile fitness applications.

### 6.3 Limitations and Future Research

The interpretation of our findings is subject to certain limitations. First, our results are largely consistent with past IS research examining expectation-confirmation. Yet to test the robustness of our findings, it would be useful to replicate this study across a variety of mobile applications. Second, it may be possible to identify additional antecedents of satisfaction in using mobile fitness applications. For example, individuals who have been physical active may derive greater satisfaction in using the application than those who are less active. Thus, future studies could explore various personal characteristics that may influence expectation-formation in the context of mobile fitness application usage.

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