

Does gamification affect the engagement of exercise and well-being?

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ABSTRACT

Exergames can be considered a useful technology and tool for regular exercise when faced with the COVID-19 outbreak and social distancing period. This study examined the influence of gamification features (immersion, achievement, and social interaction) on the exergames' engagement and well-being. PLS-SEM examines the constructs' effect on the exergames play intention. Results indicated that immersion, achievement, and social interaction-related features were positively associated with users' emotional, cognitive, and social engagement. Moreover, these engagements are likely to increase well-being further. The results implied that gamification could be positively associated with engagement and well-being and could be the reference for health-related and exercise industries.

Keywords: COVID-19, Exergame, immersion, achievement, social interaction

1. INTRODUCTION

As the highly contagious COVID-19 virus spreads worldwide, quarantining at home is an important preventative measure for everyday life [1-3]. It might cause social isolation, health anxiety, and other side effects [4]. The uncertainty and unpredictability of the epidemic not only threaten people's mental health but also affect their physical health [5]. When sport-clubs, gyms, and parks are all closed, people have little opportunity to promote their health. Consequently, they may choose to maintain their physical and mental health by engaging in indoor activities, such as exergames as the advisable options [6, 7].

Exergames are a new generation of digital games that incorporate ample body motion with attractive games [8, 9]. It works on the concept that exercise is integrated with digital games, such as Nintendo Ring Fit Adventure, Just Dance 2021, and Fitness Boxing 2: Rhythm & Exercise. Playing exergames may resemble doing conventional exercise, a potential means of improving health and fitness [10]. In 2020-2021, the demand for indoor fitness was growing rapidly due to the global COVID-19 epidemic. For example, the Nintendo Ring Fit Adventure game has shipped 8.68 million units and has become more popular, which provides a gaming experience and changes their physical activities. Exergame focus on the physical, emotional, and psychological states of exercise [6, 7], which is more critical than traditional games. This is a significant consideration for people choosing to use the exergames in an uncertain and unpredictable COVID-19 environment. Many researchers have examined the motivations of users' exergames playing intentions. However, rare of them discussed the engagement in the exergames phenomenon. Accordingly, this study adopted the gamification perspective to examine its effectiveness in people's exergaming behavior.

Based on previous studies, gamification could increase consumer engagement, awareness, and loyalty to the brands [11, 12], but some details are still unknown. Regarding this gap, this study examines the relationship between gamification features, engagement, and well-being. In particular, exergames are not only games but also help to establish a health-related activity, which allows users to gain a sense of responsibility and develop healthy habits [13]. Therefore, understanding the effect of gamification features on motivating and sustaining exergame engagement is essential. Based on previous studies, this study suggested that immersion, achievement, and social interaction-related gamification features may influence users' emotional, cognition, and social engagement, respectively. In addition, these engagements may further increase their well-being.

This study employed a survey to collect data and PLS-SEM to test the hypotheses. Such features are likely to increase users' engagement for regular exercise and fun when they continue to play the exergame or have more well-being. Moreover, research findings contribute to a multidisciplinary understanding of designing effective strategies to motivate players and sustain engagement.

2. LITERATURE REVIEW

2.1 Gamification and the features on exergames

Gamification is defined as a design approach that attempts to provide positive game experiences in non-game settings [14]. According to previous studies, gamification would positively affects users' attitudes, brand awareness, and brand engagement [15-17]. That is, gamification alters users' cognitive processes and changes and maintains their behavior. Many game mechanics and game-design-related gaming motivations have been discussed previously [18, 19]. However, the immersion, achievement, and social-related dimensions are more suitable for examining the behavior of exergame

players. So, this study tried to identify the gamification features and modeled the immersion, achievement, and social interaction factors as antecedents of exergame engagement.

Immersion-related features primarily aim to immerse the player in their self-directed inquiring activity, including gameplay mechanics such as avatars, virtual identity, storytelling, narrative structures, customization/personalization features, and roleplay mechanics [20]. When users are in playful or immersive states, they are more intrinsically interested since they are engaged in the activity for pleasure and enjoyment [21, 22]. Therefore, Immersion-related features may be more motivating to play the game.

Achievement-related features primarily aim to increase the players' feelings of accomplishment, which include badges, trophies, challenges, missions, goals, leaderboards, progression metrics, virtual currencies, etc. [14]. Prior studies have revealed that achievement-related features comprise goal structures, effort investments, and optimizing consumer behavior [15]. As perceived challenge can influence players' intention [23, 24], achievement-related features may encourage them to concentrate more on playing, thus increasing their desire to play games [20, 24].

Social interaction-related features primarily enable users to connect with others immediately [17], such as a team, group, or social competition in the game. According to previous studies, the ambiance between teammates could enhance their desire to do well [25], and the competition between players would improve a feeling of belonging. Moreover, participants were more socially connected when interacting in the game [26]. Playing at home with family and friends can also promote social interaction, and their gamified behaviors would be helpful for social belonging and improve engagement.

2.2 The relationship between gamification features and engagement

Engagement refers to the psychological process of the user participating in particular activities [27]. Xi and Hamari [16] indicated that engagement is a further reflection result of the consumer/brand interaction. Previous studies have identified that engagement plays a critical role in designing games that assist in healthy behavior maintenance [13, 24]. Previous studies have proposed that user engagement is multidimensional, including emotional, cognitive, and social levels [28, 29]. Therefore, this study examined the influence of gamification features on emotional, cognitive, and social engagements.

Emotional engagement is the user's perception of positive emotional feedback from physical activities [30]. Users might need belonging affection so that they would be required to increase their emotional engagement [28, 29]. Some studies suggested that immersion-related features to the experience of expressive freedom [31], flow, and optimal experience [20, 22] may elicit more emotional and affective reactions (e.g., enjoyment, joy, pride, and surprise). That is, when users perceive immersion-related features as necessary to the exergames, these features may be strongly linked to the flow experience and may motivate their emotional engagement. On the contrary, users

who do not think immersion-related features are important may have less motivation for emotional engagement. Therefore, this study assumed that immersion-related features are positively associated with emotional engagement and suggested that:

H1: Immersion-related gamification features are positively related to emotional engagement by exergame players.

Cognitive engagement refers to the amount of cognition, attention, and opinion they possess regarding their attitude toward the object [31]. Cognitive engagement involves many mental functions, including imagination, perception, reasoning, identification, and judgment [30]. According to a previous study, the two primary triggers for engagement behaviors are the users' needs and desires [32]. Therefore, users require exercise for their well-being, and exergames can replicate the benefits of exercising.

Achievement-related features are cognitive styles and are associated with goal-driven engagement and behavior. When users feel playing exergame is exercise instead of games, they would like to do the training like working out, which can improve players' physical function and fitness [33]. That is because exergames require users to move their body movements to manipulate gaming avatars to deal with gaming contexts [34]. They may perceive these activities as real-world exercises due to the intensive use of their body. Therefore, achievement-related features are more likely to be strongly associated with cognitive engagement. This study predicted that:

H2: Achievement-related gamification features are positively related to cognitive engagement by exergame players.

Social engagement in social interaction involves enhancing the interaction with others with a focus on engagement [31, 35] and is more relevant to the aspect of play-game activities with others [29]. For instance, online communities can foster norms of reciprocity and trust, thus creating opportunities for social engagement by encouraging users to feel connected to the topic [36].

Social interaction-related features, such as 'likes', comments, collaborations, and teams, are believed to have naturally positive impacts on social engagement [37]. Players can quickly connect and interact with others through these features, then share and discuss related information about the exergame experience. Accordingly, the social-oriented gamification features are more likely to increase social engagement. Therefore, this study hypothesized that:

H3: Social interaction-related features are positively related to social engagement by exergame players.

2.3 The relationship between engagement and well-being

Exergames requires users to move their muscle and bodies [38], which meet the need for exercise, justifying that the need for training is an essential determinant of continued intention [32]. That is, playing exergames provides the same psychological and physical benefits as doing conventional exercise [33].

According to a previous study, these engagements allow users to experience competence, as they continuously inform and provide them with affective feedback [39]. In addition, the feedback from the exergames during an exercise session can encourage physical activity [40]. That is, when users receive more performance feedback towards the exergames, they may also help to improve their well-being [41]. This study also suggested that gamification features may promote users' engagement (either emotional, cognitive, or social engagement) and then gain more well-being, and concluded that:

H4: Emotional engagement is positively related to well-being by exergame players.

H5: Cognitive engagement is positively related to well-being by exergame players.

H6: Social engagement is positively related to well-being by exergame players.

3. METHODS

3.1 Procedure

This study aimed to develop a conceptual framework to support the theoretical understanding of the engagement of exergames and well-being in Taiwan. Participants were recruited to take part in a four-week exergame-tracking experiment. Based on prior research to examine the gamification frameworks, this study identified three general features that may impact three types of engagement behavior, which may further influence well-being during this pandemic period.

Participants completed the questionnaire to indicate whether the seven constructs influenced them while they played exergame. All the measures were reflective, and the items were adapted from previous studies and modified to fit the study context. After ensuring that the scale was valid with several proxies, this study used a structured questionnaire and descriptive statistical methods to examine H1 to H6. Figure 1 illustrates the research framework.

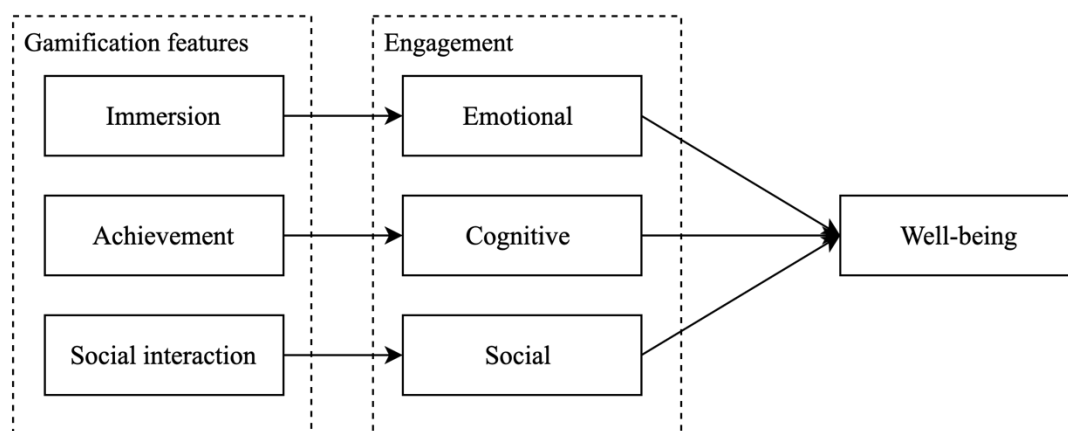


Figure 1. The research model

The procedure of the study is as follows. At the beginning of the study, participants were asked to track their usage behavior of the exergame for four weeks. They had to

exercise for 30 minutes thrice a week (in adventure mode). Then, they need to complete a questionnaire regarding their impressions of the gamification features, engagement, and well-being at the end of the four-week training.

3.2 Measures

For study purposes, this study adopted 13 items to measure three gamification-related features (immersion, achievement, and social interaction), which had been classified in previous studies [16, 25]. First, this study took avatars/virtual identities/profiles, customization/personalization features, and narrative/story elements as immersion-related features of the exergame. Second, game elements like badges/medals/trophies, virtual currency/coins, points/scores/experience points, status bars/advanced level, leaderboards/rankings/high score lists, and difficult tasks are listed as achievement-related features. Third, social features include teamwork, social competition, and social network cues. Specifically, participants should rate their level of "how critical they think when playing the Nintendo exergame" using a 7-point scale ranging from 1 (not important at all) to 7 (extremely important). This study used exploratory factor analysis to identify the measurement items' latent structure and clarify their relationships. In addition, there was no cross-loading in the dataset. (Cronbach's α immersion-related = .756; Cronbach's α achievement-related = .852; Cronbach's α social interaction-related = .882)

Based on So, et al. [28] and Vivek, et al. [29] studies, a five-item emotional engagement (Cronbach's α = .926), a four-item cognitive engagement (Cronbach's α = .922), and a six-item social engagement questionnaire (Cronbach's α = .926) were used in this study. The well-being (Cronbach's α = .791) was derived from Chen and Kee [42]. All items were scored on a seven-point Likert scale (strongly disagree-strongly agree), so a higher score means a higher level of agreement. This study ran a test-retest reliability analysis before the formal experiment as showed in table 1.

3.3 Participants

A total of 56 participants joined in this four-week exergame-tracking study. The study took place on October 2021. The participants used their devices at home. However, the user who had not played exergame for 30 minutes thrice a week would be omitted from the data. All participants should fill up the questionnaire after the 4-week training, and the data from 50 samples comprised 18 men (36%) and 32 women (64%), and the average age was 20.85 years ($SD = 4.22$), ranging from 18 to 32, were collected.

4. RESULTS

4.1 Validity and reliability of the measurement

This study ensured expert validity by including game, fitness, and health experts in the item generation. The questionnaire items had clarified through several feedback loops. Two exergame users and two marketing academics not involved in the study

samples were the consultants to ensure criterion validity. These procedures could ensure that all respondents understood each item and that each item accurately measured the respective constructs. (see Table 1)

Table 1. Factor loading based on a principal components' analysis

Construct		item	Loading	Cronbach's α
Gamification features	Immersion-related	IM1	0.841	.756
		IM2	0.763	
		IM3	0.751	
	Achievement-related	AC1	0.792	.852
		AC2	0.744	
		AC3	0.863	
		AC4	0.698	
		AC5	0.802	
		AC6	0.704	
		AC7	0.697	
Social interaction-related	SI1	0.955	.882	
	SI2	0.824		
	SI3	0.850		
Engagement	Emotional	EM1	0.862	.926
		EM2	0.893	
		EM3	0.926	
		EM4	0.908	
		EM5	0.896	
	Cognitive	CO1	0.877	.922
		CO2	0.898	
		CO3	0.935	
		CO4	0.894	
	Social	SOC1	0.953	.926
		SOC2	0.964	
		SOC3	0.892	
		SOC4	0.888	
		SOC5	0.761	
		SOC6	0.833	
	Well-being	WB1	0.935	.791
		WB2	0.919	
		WB3	0.716	
WB4		0.812		
WB5		0.769		

This study used PLS-SEM to test the path of the measurement model. This study also used confirmatory factor analysis to test convergent validity, discriminant validity, and reliability. The *t*-values of all items were significant, and the average variance extracted was greater than 0.5 for all constructs. In terms of discriminant validity, no inter-correlation of constructs exceeded the square root of the AVE of either of the compared constructs [43]. Thus, convergent validity was confirmed. Regarding construct reliability (CR), all values were higher than 0.7. (see Table 2)

Table 2. Discriminant validity and reliability

	AVE	CR	IM	AC	SI	EE	CE	SE	CU
Immersion features	0.618	0.829	0.786						
Achievement features	0.577	0.901	0.640	0.759					
Social interaction features	0.771	0.910	0.410	0.561	0.878				
Emotional engagement	0.805	0.954	0.447	0.611	0.363	0.897			
Cognitive engagement	0.812	0.945	0.440	0.571	0.420	0.676	0.901		
Social engagement	0.782	0.955	0.370	0.495	0.437	0.628	0.683	0.884	
Well-being	0.744	0.896	0.408	0.469	0.194	0.686	0.601	0.645	0.862

The diagonal is the square root of the average variance extracted, and the matrix is the correlations between factors

4.2 Hypothesis Tests

Immersion-related features were positively related to emotional engagement, and H1 was supported ($\beta = 0.553$, $p < 0.001$). Achievement-related features were positively associated with cognitive engagement ($\beta = 0.832$, $p < 0.001$), and social interaction-related gamification features had a relationship with social engagement ($\beta = 0.593$, $p < 0.001$). H2 and H3 were also significantly supported by the results. Overall, the findings implied that all dimensions of gamification features were positively associated with engagement behavior. (see Table 3)

Table 3. Full results in this study.

Path coefficients	β	z	p
Immersion features \rightarrow Emotional engagement	0.553	7.466	0.001 *
Emotional engagement \rightarrow Well-being	0.540	5.702	0.001 *
Immersion features \rightarrow Well-being	0.004	0.019	0.985
Achievement features \rightarrow Cognitive engagement	0.832	7.742	0.001 *
Cognitive engagement \rightarrow Well-being	0.002	0.030	0.976
Achievement features \rightarrow Well-being	0.270	1.030	0.303
Social interaction features \rightarrow Social engagement	0.593	7.445	0.001 *
Social engagement \rightarrow Well-being	0.328	6.783	0.001 *
Social interaction features \rightarrow Well-being	-0.294	-4.012	0.001 *

β = standard regression coefficient; * $p < 0.05$

Moreover, emotional ($\beta = 0.540$, $p < 0.001$) and social ($\beta = 0.328$, $p < 0.001$) engagement were positively related to well-being by exergame players, supporting H4 and H6. On the other hand, cognitive engagement was not significant to well-being ($\beta = 0.002$, $p = 0.976$). Players may initially feel a certain cognitive interest in the exergame, but this will gradually become dull and boring. At this time, the cognitive aspect of the exergame's participation behavior does not directly affect the player's well-being. Therefore, the results rejected H5.

4.3 Mediating effects

In the research model, this study also examined the mediating role of engagement

behavior on the relationship between gamification features: (a) immersion-related, (b) achievement-related, (c) social interaction-related- and well-being. Mediators provide additional information about how or why two variables are associated. This study tested engagement behavior's mediation effect by following three-step mediation analysis [44].

Based on study results, immersion-related features have a significant relationship with emotional engagement, and emotional engagement also has a positive effect on well-being. The next step is to analyze the impact of immersion-related features (independent variable) on well-being (dependent variable). Table 4 indicated no direct effect between immersion-related features and well-being ($\beta = 0.004$, $p < 0.985$). Therefore, a full-mediation relationship between the immersion-related features and well-being was supported.

In addition, as table 4 showed, the relationships between social interaction-related features (independent variable) and well-being (dependent variable) had both significant direct ($\beta = -0.294$, $p < 0.001$) and indirect effects ($\beta = 0.328$, $p < 0.001$). This means that social interaction-related features might have a direct impact on well-being and might also have an indirect effect on well-being through social engagement.

5. CONCLUSIONS

5.1 Discussion

COVID-19's uncertainty and low predictability affect users' mental health, as well as their physical health [5-7]. Exergames have become a popular way to maintain physical and psychological health. Engaging people to exercise energetically becomes a critical challenge [34]. For study purposes, this study investigated a model to evaluate the relationship among gamification features, engagements, and well-being upon exergames in the COVID-19 pandemic.

This study contributes knowledge to the body of literature on gamification and marketing by providing empirical evidence on the relationships between different features and engagement. First, the researchers were interested in whether the gradual release of game features can improve engagement over time [13, 38]. According to the study's empirical results, gamification features were positively associated with engagement behavior. More specifically, immersion-related gamification features were positively related to emotional engagement, achievement-related gamification features were positively associated with cognitive engagement, and social interaction-related features had a relationship with social engagement by exergame players (H1-H3 were accepted). In other words, players may be more willing to explore the exergame through immersion-related features, which gradually causes them to become more familiar with the games. The findings are consistent with previous work [19, 20].

Surprisingly, the results indicated that achievement-related gamification features were not significantly associated with continued use. The explanation for this result may be that achievement-related features such as a high score list/leaderboard,

collecting badges, accumulating points, earning virtual currency, and fulfilling tasks serve a more achievement function as they display personal information to others, which can facilitate user participation in exergames. Nevertheless, the essence of a game is played, and the benefits of exercise are physical and mental health [34]. If an exergame merely incorporated achievement-related gamification features, this would not be sufficient to evoke genuine experiences that will lead to continuous play and well-being. Furthermore, this implied that the achievement-related features and cognitive engagement embedded in the core gameplay were perceived to be more motivating than the straightforward aspects of achievement in games.

5.2 Theoretical implications

The results of this study have several theoretical implications. First, although several studies have investigated whether and how gamification might improve marketing performance [11, 12, 14], there was seldom empirical evidence for the continuous playing of exergames and well-being. This study extended the gamification-related studies [14, 26] on exergames and found that individuals may be motivated by gamification features to engage in exercise, especially immersion, achievement, and social interaction-related gamification features. Second, in contrast to previous studies [25, 45], this study may be able to shed light on the mechanisms of how gamification impacts engagement and what types of features are more appropriate for interaction. This study was unique in identifying the novel mediators (emotional and social engagement) that can facilitate the impacts of gamification features on well-being toward exergames due to the global COVID-19 epidemic.

5.3 Practical implications

The findings provide practical suggestions for exergame providers and designers. First, it is essential for exergames providers to remind their users to be more concerned about their physical health and to realize that they need regular exercise during this pandemic. Moreover, exergame providers should simulate realistic exercise movements in their games and make sure that the specific simulation is sufficiently vivid to evoke users' immersive experience and motivation to perform conventional exercises at home, which may further satisfy their regular exercise needs. Second, there is an exciting finding that achievement-related features and cognitive engagement were not significantly related to well-being. This helps dispel anecdotal explanations of the exergame's popularity, as well as why its popularity has plummeted after its initial novelty has worn off. Therefore, it is essential that exergame designers recognize fitness-related improvements during engaging behavior and design integrated applications and interfaces that show quick feedback about the relationship between engaging behavior and improved health indicators. The feedback about the facts could be displayed between levels of exergame play and then often draw attention to the exercise achievement and benefits.

5.4 Limitation and future research

This study had some limitations. First, there is a possibility that gamification features might vary across different exergames. Future studies could choose different types of exergames or examine cross-cultural differences in their well-being in order to increase the generalizability of the findings. Second, this study discussed the factors that contribute to users continuing to play the exergame during the COVID-19 outbreak. Especially when individuals cannot access gyms and are left with fewer health-promoting alternatives. Further research is needed due to the change in the environment that gives users another way to exercise. Third, this study examined users' engagement and well-being by a survey-based method. Scholars should consider other forms of collecting related data to get a more precise and complete understanding of motivational factors for participants in exergames. For example, future studies could adopt a longitudinal research design that compares motivating factors for exergame players.

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