



Research article

Investigating the role of social inhibition in enduring involvement in online synchronous exercise classes: A use and gratification perspective

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ABSTRACT

With the advancement of communication technology, online synchronous exercise courses become more common in recent years due to their ability to transcend time and space. Based on uses and gratifications theory (U&G), this study proposes a conceptual model for online synchronized exercise classes and examines the relationships among social inhibition, motivation, satisfaction, and continued involvement. After 322 valid questionnaires were collected and analyzed by partial least squares (PLS), this study confirmed the significant positive effects of hedonic, identified, and integrative motivation on online synchronous exercise satisfaction and the significant negative effect of social inhibition on online synchronous exercise satisfaction. Moreover, online synchronous exercise satisfaction has a positive effect on enduring involvement. This study not only contributes by extending the application of U&G theory to dynamic online synchronized exercise and addressing the interaction and pressure of online users in cyberspace but also provides novel marketing strategies for fitness and sports organizations.

1. Introduction

There has been a substantial increase in online exercise programs in recent years. According to a global fitness trend report, online training, which was ranked 26th in 2020, rapidly became one of the most popular forms of exercise in 2021. With the proliferation of information and communication technologies (ICTs), virtual training was ranked 6th, and mobile exercise apps were ranked 2nd [1]. These results indicate the emergence of online training classes, which are taking a large market share of the exercise market. An online fitness platform operator, Peloton, which is known for offering exercise equipment and live classes, has gained significant popularity among customers. Peloton reported a surge in sales volume of over 500 USD million, up 66 % from the previous year [2]. Such a trend warrants close attention and research by online exercise marketers and ICT service providers as a potential source of revenue in increasingly competitive and turbulent environments. In addition to industrial profits, physiological and psychological well-being are the main factors that drive customers to engage in online exercise.

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The large-scale use of online synchronous classes to replace traditional face-to-face classes is an experiment in a new medium that presents a challenge to both the instructor and the participant. Sepulveda-Escobar and Morrison [3] state that one of the main factors affecting online classes is the lack of direct interaction and sudden disturbance in the surrounding environment. To escape this predicament in the online learning environment, the literature conceptualizes “social presence” as a perceiving the virtual learning environment as “real” [4]. Social presence has been viewed as a key factor in successful learning experiences and collaborative learning in online contexts because it closely connects to the learning and learning community and influences how social interaction unfolds online and affects learning and social outcomes [5]. Recent studies have utilized construal level theory and telepresence theory to elucidate social presence. In addition to the volume of information accrued over time affecting individuals’ subjective constructions of others, social presence is also influenced by individuals’ psychological distance to others, with learning environment and communication media characteristics being two critical factors affecting this distance [6]. This study, focusing on the novel media features of synchronous online courses, discusses whether individuals perceive pressure from others’ gazes in the online space and whether they can immerse themselves in the experience. These pertinent inquiries about social inhibition resonate with the aforementioned perspectives on psychological distance, media characteristics, and the learning environment. Although previous studies have shown that scholars can improve online learning effectiveness, most of the studies involving social presence have focused on static learning environments. Online exercise activities, which are situated in dynamic and interactive environments, are understudied.

Nevertheless, in face-to-face environments, intensive social interactivity could be a barrier to individuals engaging in exercise. For example, Gjestvang and his colleagues’ longitudinal study [7] on motivation and barriers to fitness pointed out that “I am embarrassed for others to see me exercise” was one of the main barriers preventing individuals from participating in exercise. Their results further revealed that even if individuals have purchased health club memberships for one year, they may give up exercising because of others’ judgments. Zimbardo [8] termed this phenomenon “social inhibition” and considered it a condition in which individuals are anxious about social situations and fear criticism from others, which leads them to conform to social norms and limit their behaviors. Fear of talking to others, fear of receiving negative judgment from others, and deliberate avoidance of social interaction are instances of social inhibition [9,10].

Indeed, a high degree of social interactivity may not always be an advantage for sports classes or online synchronized sports courses. Hoyt et al. [11] have successfully replicated the effect of social inhibition in an online-immersive environment. Their results showed that individual performance is impaired by the presence of virtual audiences. From this perspective, an individual’s satisfaction with online synchronous exercise courses may be influenced by their athletic performance.

In light of this, the present study utilizes U&G theory for three main reasons to examine the relationships among motivation, social inhibition, and satisfaction. First, this theory is suitable for “information and communication technologies-based” studies. Furthermore, the “online synchronous” feature of this research can broaden the application scope of the theory. Third, online synchronous courses require participants to use their computers.

Furthermore, U&G theory argues that customers use different media based on their motivations. If individuals’ motivations are satisfied, they will use the media to satisfy their specific motives. It has also been applied in ICT adoption. The research contexts of previous studies were largely static, with few studies considering dynamic courses, such as online synchronization sports, as an example. This study attempts to apply this perspective to hybrid technologies (i.e., web platforms and mobile apps) and dynamic environments (i.e., online synchronization sports). Thus, this study contributes to understanding the relationship between psychological distance in cyberspace and social pressure.

2. Theoretical background

2.1. *Uses and gratifications theory*

U&G theory, which originated in the field of mass communication, explains why people actively seek out specific media to satisfy their specific needs [12]. This perspective indicates that individuals are goal-oriented in media selection and actively integrate media information within their daily lives to achieve the most favorable gratification.

U&G theory is appropriate for this study in three ways. First, December [13] noted that traditional U&G theory can serve as a useful framework for information and communication technology-based studies. For example, a study on over-the-top media services indicated that factors influencing user satisfaction include video content availability, perceived trust, and hedonic motivation [14]. Pang and Zhang [15] indicated that for users of communication software, service quality not only affects user satisfaction but also has significant impacts on benefits, belongingness, and user identification. Online synchronous exercise is an emergent form of exercise in which online users exercise using ICTs and their enduring involvement is determined by their satisfaction. Second, although Ruggiero [16] calls for extending U&G theory to the realms of interactivity, demassification, hypertextuality and asynchronicity, there is a lack of empirical evidence in the existing U&G literature regarding synchronicity and exercise settings. Synchronized online exercise classes are characterized by synchronicity and exercise. Compared with nonsynchronized classes, synchronized courses involve more real-time interactions among instructors and learners [17]. In addition, unlike traditional online learning, which focuses on static and experiential learning activities [18], online exercise classes emphasize the physical presentation of exercises to students by coaches. Third, in U&G theory, motivations are a key factor in explaining how individuals use media to satisfy their needs to gain information or engage in social interaction [19]. Motivation serves as an antecedent of satisfaction. In the context of the present study, turning on a computer device to join an exercise class implies that users’ actions are triggered by their conscious motivations. Thus, U&G theory is applicable in this study.

2.2. Online synchronous exercise and motivations

Online synchronous exercise is a subset of online learning. Previous online synchronous exercise literature indicates that users may earn benefits such as convenience, connection and criticality from ICT interactive platforms. Martinez and Barnhill [20] concluded that a balanced development of social presence, cognitive presence and teaching presence can increase the learning effectiveness and engagement of online synchronous exercise participants, positively impacting their learning experience. Although online learning has boundaryless advantages, online synchronous exercise does not involve face-to-face interaction. This creates a sense of isolation for participants and frustration due to communication barriers and technical difficulties [21]. However, whether all online synchronous exercise participants expect a great deal of interaction remains unknown. In line with this view, Pessin and Husband [22] pointed out that an individual's ability to perform an activity may be adversely affected by the presence of other people, known as social inhibition. For example, interaction on social networking services can impact individuals' mental and physical health. Research findings indicate that fear of missing out is associated with social media intensity, suggesting that social anxiety persists even in the non-face-to-face online world [23]. Therefore, this study intends to address the gaps in previous research on the effects of online social inhibition to discover the characteristics of synchronous learning on the internet.

Self-determination theorists have identified intrinsic, integrated, and identified motivations as three motivations that drive behavior [24]. According to Bandura [25], motivation is a multidimensional phenomenon that involves selection, activation, and sustained direction based on determining factors and intervention mechanisms. Ford [26], on the other hand, stated that motivation is a model comprising three psychological functions, namely, personal goals, emotions, and personal agency beliefs, which are used to direct, motivate, and regulate goal-directed activities.

Recently, motivation theories have also been widely used to explain individuals' exercise and information technology usage behaviors. According to expectancy theory, from a motivational perspective, cognitive trust and perceived value positively impact mobile application users seeking and sharing health information during a pandemic [27]. Du and his colleagues argued that individuals could still safely practice physically active leisure through online exercise classes during the pandemic crisis, providing individuals with health benefits, because these technology-mediated platforms facilitate customer engagement by enhancing the hedonic value of consumption experiences for active leisure [28]. Rooted in self-concept, identified motivation stems from personal values, goal-setting or long-term interests [29]. Applying this concept to an exercise setting, identified individuals regard themselves as exercisers and are motivated to be regularly physically active during their free-time [30]. Thibaut et al. [31] also indicated that, during the lockdown amid the pandemic, individuals with online synchronous exercise experience exhibited more positive attitudes toward sports participation. Online synchronous exercise involves the use of new technological media and the pursuit and achievement of self-goals. Therefore, hedonic, integrated, and identified motives were incorporated into the research model.

2.3. Social inhibition

According to Norman Triplett, social inhibition is the effect of the presence of others on individual performance due to psychological stress [32]. Social inhibition is "the tendency to inhibit the expression of emotions and behaviors in social interactions to avoid disapproval by others" [9]. Hoyt et al. [11] assert that social inhibition is a negative effect driven by the presence of others, either coactors or bystanders. Zajonc [33] proposed a theoretical framework of social facilitation and inhibition effects, which results from the factors of arousal effects or task complexity. His study indicated that the presence of others tends to reduce subordinate responses to complex, unfamiliar tasks and tasks that require more cognitive effort, thinking time and attention. In short, social inhibition reduces the effectiveness of individual performance.

In physical classes, face-to-face interaction is strong and increases learners' competitive performance. However, in online synchronized exercise classes, spatial isolation might result in reduced peer social interaction or others' evaluations. Axmedova and Kenjayeva [34] noted that one of the disadvantages of online learning is that there is less interaction between students and teachers, which tends to create a sense of isolation and a lack of peer companionship. The concept of social inhibition in cyberspace has not yet been empirically investigated. In particular, the high complexity of participating in a sport in a dynamic environment may cause participants to feel greater social pressure.

3. Conceptual model development

3.1. The relationship between motivation and online synchronous exercise satisfaction

Hedonic motivation depends on the pleasure or joy that people obtain from using technology. An interesting information system might attract users to indulge in using it because of its playfulness [35]. Accordingly, hedonic motives lead individuals to use joyful information systems or technologies [36]. Self-determination theory (SDT) proposes that individuals are motivated to act for their own enjoyment or for other reasons [37]. The highest level of self-determination occurs when individuals exercise because they enjoy and love the sport. In an online synchronous exercise context, a previous study confirmed this. For example, Tsai et al. [38] demonstrated the relationship between perceived playfulness and behavioral intentions in exercisers through the Gatherun app. Another study on fitness members indicated that, from the perspective of psychological involvement, pleasure and centrality are crucial for the development of loyalty [39]. Based on these arguments, this study proposes the following hypothesis.

H1. *In online synchronous exercise contexts, hedonic motivation positively influences sports satisfaction.*

Integrated motivation leads to doing an activity because one has integrated the value of the activity with other aspects of his or her life. With integrated motivation, individuals' behaviors and goals are integrated into their identities [40]. Research indicates that compared to athletes with lower levels of specialization, highly specialized athletes tend to have significantly lower levels of diminished sense of achievement and higher levels of integrated motivation and thus less burnout [41]. Moreover, Espada and his colleagues recently reported that even though gender differences exist, integrated regulation positively predicts college students' participation in physical sports activities [42]. Furthermore, Sato et al. [43] examined the relationships among personality traits, running involvement, and life satisfaction and found that the expression of identity and fun expressed through running led to greater life satisfaction. Based on these arguments, this study proposes the following hypothesis.

H2. *In online synchronous exercise contexts, integrated motivation positively influences sports satisfaction.*

Identified motivation involves doing an activity because one has identified the value of doing the activity [40]. Previous studies have confirmed the positive relationship between identified motivation and satisfaction [44,45]. When a person finds an activity personally valuable or important, such as exercising to maintain their health or well-being, they are more likely to engage in that activity. Previous research on adolescents also found a positive association between identified regulation and physical activity [45]. Moreover, a leisure study (i.e., The Dutch Queen's Day event) found identified motivation to influence festival satisfaction [44]. From the point of view of U&G theory, when individuals believe that they are improving through learning and working hard to achieve self-esteem, their satisfaction with sports may increase. Based on these arguments, this study proposes the following hypothesis.

H3. *In online synchronous exercise contexts, identified motivation positively influences sports satisfaction.*

3.2. The relationship between social inhibition and online synchronous exercise satisfaction

Interaction pressure is the result of stress caused by the social interaction that individuals experience due to differences in their expectations, values, and attitudes [46]. Felber and Camiré [47] found that children perceive the excessive involvement of parents in sports as undue control. The stress of the interaction has a negative effect on sport satisfaction. Social inhibition scholars argue that individual performance is reduced by the presence of others, indicating that individuals are aware of being watched by others and experience evaluation, distraction, or other interaction pressures [48,49]. In an environment characterized by interaction pressure, individuals' performance may fall short of expectations, leading to unmet psychological needs for self-evaluation or the activity itself [9]. However, within the spatial constraints of online exercise classes, the psychological distance between participants and their peers might mitigate the pressure caused by social inhibition effects stemming from being scrutinized. Because of the perception of less attention and evaluation, individuals shift their attention toward themselves, making physical activity more enjoyable. Pang et al. [50] also indicated that appropriate social interaction ties have a predictive effect on electronic word-of-mouth. Based on these arguments, this study formulates the following hypothesis.

H4. *In online synchronous exercise contexts, social inhibition negatively influences sport satisfaction.*

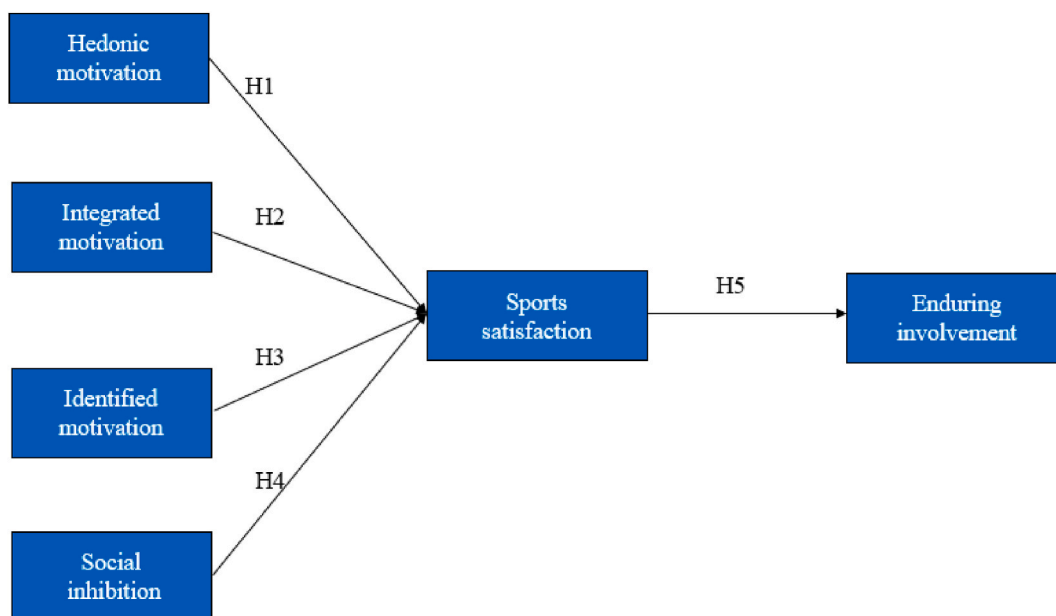


Fig. 1. Conceptual framework.

3.3. 3.2 The relationship between online synchronous exercise satisfaction and enduring involvement

Laurent and Kapferer [51] state that enduring involvement “derives from the perception that the product is related to centrally held values, those defining one’s singularity, and identity, one’s ego.” In short, enduring involvement represents an individual’s ongoing interest in a particular object [52]. Recent research on enduring involvement indicates that, for AI-driven websites, customer stickiness is related to the website atmosphere. Customer stickiness, symbolizing a deep commitment to continued usage and is correlated with positive experiences and attitudes [53]. As enduring involvement has an ongoing nature, individuals can be involved in physical activities and constantly concentrate on exercise. this has also been linked to the level of satisfaction with involvement in distinguished leisure events [54]. In sports marketing contexts, enduring involvement is an effective but incomplete predictor of purchase intention toward sponsored products, mediated by sponsor image and fan loyalty [55].

Enduring involvement is associated with individuals’ persistent attitudes toward things, and these attitudes are relatively stable over time [56]. Their findings also indicate that enduring involvement is manifested by higher levels of satisfaction, participation and involvement when cyclists’ needs are met in the sport. Kang et al. [57] reported that satisfied alternative golf players had higher levels of involvement. This suggests that satisfaction rather than its consequence is a key determinant of involvement. Based on these arguments, this study proposes the following hypothesis, and the conceptual framework is displayed in Fig. 1.

H5. *In synchronized online exercise contexts, sports satisfaction positively influences enduring involvement.*

4. Methodology

Structural equation modeling (SEM) is a statistical analysis method that tests and estimates relationships between concepts and is used to validate theoretical models. It is a multivariate statistical technique that combines causality and path analysis. SEM is also characterized by its ability to analyze the interaction between multiple datasets. In this study, SEM is used to analyze the relationships among potential variables, and empirical data are collected through online surveys. SEM is used to estimate the model parameters. The estimated parameters are then used to test the research hypotheses [58].

4.1. Measures

To assess the proposed model except social inhibition, all scale items were adapted from previous multi-item scales and modified to fit the current research context. The following measures are listed in Appendix A. Three items for hedonic motivation were adopted from Pelletier et al. [59] and Wilson et al. [60]; two items for integrated motivation were adopted from Pelletier et al. [59] and Wilson et al. [60]; three items for identified motivation were adopted from Pelletier et al. [59] and Wilson et al. [60]; ten items for sport satisfaction were adopted from Ng et al. [61]; four items for enduring involvement were adopted from McIntyre and Pigram [62]; and four items for social inhibition were self-developed. Each questionnaire item was measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Because the research context was Taiwan, one of the authors translated the questionnaires



Fig. 2. Case example of online synchronous exercise.

into Chinese; they were then reviewed them by a bilingual expert with a PhD in translation from English to maintain the original meaning and ensure the fluency of the language.

To our knowledge, there are no available items for measuring social inhabitation in online synchronous exercise. This study first drew from the current literature, namely, definitions from Denollet [9] and Hoyt et al. [11], evaluation apprehension theory from Geen [63], distraction conflict theory from Baron [48], and cognitive overload theory from Kahneman [49]. Four items were developed: In online synchronous exercise classes, (1) I feel less concerned about the gaze of others; (2) I enjoy my own exercise; (3) I feel focused on myself; and (4) I don't care much about other people's criticism of me. Next, the research team intentionally reversed the coding for these four items. After the items were developed, seven sports and management scholars were invited to review them for content validity and conceptual clarity. Finally, a pretest was conducted with 61 students to assess the item reliability and validity.

This study used Levene's test to conduct the item analysis. The results were statistically significant ($p < 0.05$), indicating that the scale items have good discriminative power. Levene's test is a powerful and robust method for testing the homogeneity of variances, even when the data are not normally distributed [64]. To assess the discriminative power of each item, the item scores were divided into two groups: the top 27 % and the bottom 27 %. An independent-samples *t*-test was then conducted. A significant *t* value ($p < 0.05$) indicates that the item has good discriminative power. Levene's test was used to test the homogeneity of variances between the two groups. Depending on the results of the test (i.e., homogeneity or nonhomogeneity), the *t* value and the significance level of the mean difference test were further assessed ($p < 0.05$).

4.2. Data collection and participants

An online survey was distributed to social media exercise communities for participants of online synchronized exercise. The synchronized online exercise classes were noted by the participants before they filled out the questionnaire. Synchronized online exercise classes are live online or real-time interactive exercise classes where the instructor and participant engage in the activity online at the same time and can interact (either via microphone or text message). This is in contrast to prerecorded or replayed videos of exercise classes. A sample case is shown in Fig. 2 with the permission of the photographer.

A total of 417 questionnaires were collected, and 95 invalid questionnaires were dropped because of incompleteness or invalidation (a single repeated answer). Therefore, a total of 322 valid questionnaires were collected, for a valid response rate of 77.2 %. Among the respondents, 55.6 % were females, 41.3 % were aged 20–29 years, and 53.4 % had a university education. The sample demographics are shown in Table 1.

5. Results

5.1. Common method variance and nonresponse bias

The data used in this study came from a single source, which might have caused common method variance (CMV) and nonresponse bias (NRB). Before data analysis, this study assessed CMV by using the variance inflation factor (VIF) proposed by Kock [65]. If the VIF is less than or equal to 3.3, the model is not affected by CMV and there is no pathological collinearity. The VIF in the research model ranged from 1.0 to 2.426, which was less than 3.3. This indicates that the data are not affected by common method bias and are free from pathological covariance.

NRB can occur when individuals refuse to participate in a study or drop out before the study is completed. To address this issue, we compared the dependent variable (e.g., enduring involvement) differences between the first and last quartiles of respondents using independent *t* tests [66]. The results showed no significant differences between the two subgroups in terms of the average value of enduring involvement items (*t* value = -0.097 , $p = 0.923 > 0.05$), showing that there was no major concern about nonresponse bias in this study.

Table 1
Sample demographics.

Variables	Characteristics	Frequency	Percent (%)
Gender	Female	179	55.6
	Male	143	44.4
Age	18–20	23	7.1
	20–29	133	41.3
	30–39	66	20.5
	40–49	57	17.7
	50–59	34	10.6
	60–65	9	2.8
Education	Graduate	89	27.6
	Collage	172	53.4
	Junior College	34	10.6
	High School	26	8.1
	Junior High School	1	0.3

N = 322.

5.2. Measurement model

In this study, two indicators, composite reliability and average variance extracted (AVE), were used to examine consistency reliability and convergent validity. The reliability coefficient (composite reliability) ranged from 0.864 to 0.938, which is higher than the threshold value of 0.7 [67]. The standardized item loadings of the structure range from 0.706 to 0.894, which exceeds the critical value of 0.7. All the constructs were shown to have good internal consistency, and the AVE ranged from 0.577 to 0.780, which is higher than the recommended value of 0.5 [67]. As shown in Table 2, all the constructs have good convergent validity.

In addition, Fornell and Larcker [67] proposed a metric to assess whether an instrument has discriminant validity; it requires that the square root of the average variance extracted (AVE) for each construct be greater than the correlation coefficients between the construct and other constructs in the model. Table 2 shows that the diagonal values are higher than the values in the columns, which suggests that the constructs in the model of this study have discriminant validity.

5.3. Structural model

Path coefficients and t values were used to assess the structural model. The path coefficients, t values, and R^2 values were generated by bootstrapping with 5000 resamples. Fig. 3 indicates that H1 has a t value of 3.062 ($p < 0.01$) and a path coefficient of (β) 0.209; therefore, hypothesis 1 is supported. H2 has a t value of 4.046 ($p < 0.001$) and a path coefficient of (β) 0.249; therefore, hypothesis 2 is supported. H3 has a t value of 2.806 ($p < 0.01$) and a path coefficient of (β) 0.151; therefore, hypothesis 3 is supported. H4 has a t value of 7.233 ($p < 0.001$) and a path coefficient of (β) -0.345 ; therefore, hypothesis 4 is supported. H5 has a t value of 26.776 ($p < 0.001$) and a path coefficient of (β) 0.756; therefore, hypothesis 5 is supported. The explanatory variance (R^2) of hedonic motivation, integrative motivation, identified motivation, and social inhibition on sport satisfaction was 0.612, whereas that of sport satisfaction on enduring involvement was 0.570.

6. Discussion and implications

6.1. Theoretical implications

6.1.1. Online synchronous exercise fosters appropriate social distancing

This study has several theoretical implications. First, U&G theory was used to explain users' behaviors on media of information system usage [68–71]. However, most of these studies focus on static or immersive contexts. This study extends the U&G perspective beyond traditional media usage to the dynamic exercise context mediated by ICTs. The findings are consistent with those of previous sports studies [38,72,73]. From the perspective of U&G theory, recent studies on internet usage behavior have indicated that entertainment is a crucial motivation for adoption [74–76]. It is evident that consumers primarily use internet technology for enjoyment, and these pleasurable experiences are mainly because leisure activities do not induce stress. Such entertainment motivations are similar to engaging in online synchronous exercise. Additionally, experiencing fewer peer gazes or judgments leads to greater satisfaction, which aligns with the discussion in this study regarding social inhibition.

6.1.2. The relationships between the three motivations and online synchronous exercise satisfaction

This study empirically confirms that hedonic, integrated and identified motivations are three factors that lead to sport satisfaction. These three factors not only are applicable for traditional athletics domains but also account for the online synchronous exercise field, while integrated motivation has a larger regression coefficient (0.249) and a greater correlation with sport satisfaction than the other variables.

6.1.3. The relationship between social inhibition and online synchronous exercise satisfaction

The data show that social inhibition is essential for understanding online synchronous exercise satisfaction. Specifically, the model indicates that individuals with greater social inhibition experience lower sport satisfaction in online synchronous exercise classes. Social inhibition negative influences sport satisfaction in virtual environments.

Table 2

CR, AVE, Cronbach's alpha and correlations between the constructs.

	α	CR	AVE	SS	EI	IM	HM	DM	SI
SS	0.927	0.938	0.577	0.760					
EI	0.826	0.885	0.658	0.756	0.811				
IM	0.719	0.877	0.780	0.637	0.643	0.883			
HM	0.827	0.896	0.742	0.663	0.625	0.705	0.862		
DM	0.766	0.864	0.681	0.652	0.601	0.669	0.662	0.825	
SI	0.850	0.899	0.689	-0.641	-0.573	-0.407	-0.519	-0.570	0.830

Note: CR: composite reliability; AVE: average variance extracted; α : Cronbach's alpha; SS: Sports satisfaction; EI: Enduring involvement; IM: integrated motivation; HM: hedonic motivation; DM: identified motivation; SI: Social inhibition.

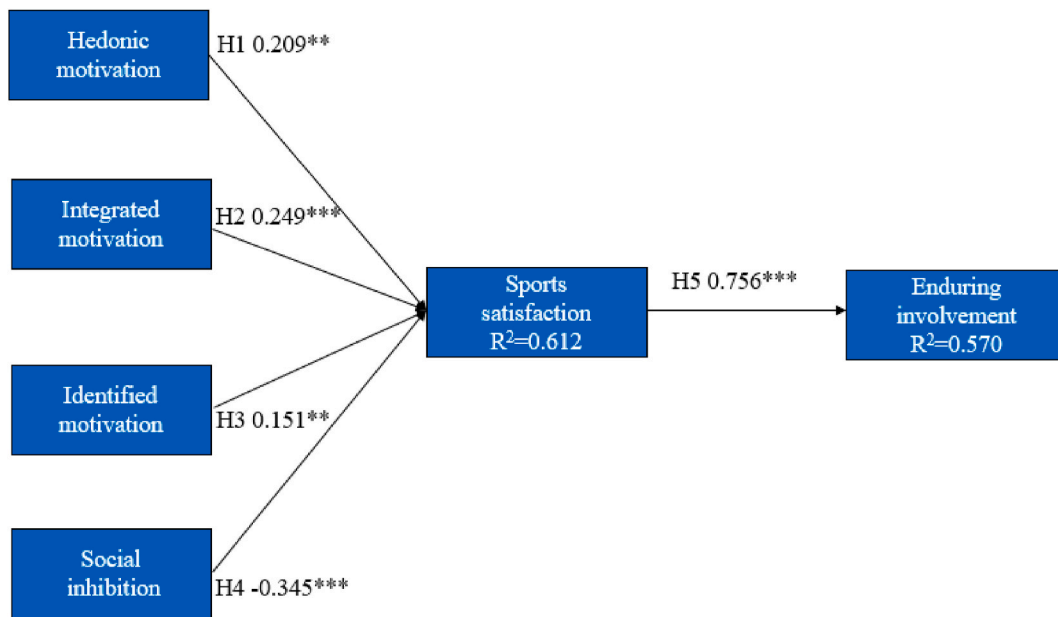


Fig. 3. Results of the conceptual framework.

6.1.4. Online synchronous exercise fosters appropriate social distancing

Moreover, this study contributes to online learning. Compared with face-to-face learning environments, online learning is criticized for a lack of interactivity between the learner and the learning or between the learner and the instructor [3,77]. However, interpersonal interactions in the classroom might have drawbacks. For example, other people's gazes, judgments, and sports skills could cause psychological stress and burden that affect others' persistence [7]. Even in an online setting, Hayes et al.'s [78] study indicated that the gender of the virtual image alone could influence the sense of presence. The finding that social inhibition is negatively related to sport satisfaction implies that social distance in synchronous online classes can alleviate the social inhibition caused by the attention or stress of others, which in turn improves satisfaction. In the online synchronous exercise context, individuals can avoid others' attention and focus more on themselves and enjoy the activity.

Furthermore, the results show that there is a positive relationship between sport satisfaction and enduring involvement. That is, satisfaction is a dependent variable of enduring involvement, while enduring involvement contains cognitive, affective and behavioral dimensions. Despite enduring involvement having been defined and measured in varying ways [79,80], in line with McIntyre and Pigram [62], this study has demonstrated multidimensional conceptions of enduring involvement, namely, attraction, self-expression, and centrality, in the online exercise environment.

6.2. Practical implications

6.2.1. Online synchronous exercise eliminates barriers to exercise

Jong and Drummond [81] pointed out two key aspects of online fitness: it is becoming a popular trend and serves as a source for health and fitness information. This study also has several practical implications. First, exercise promoters usually suffer from some barriers due to transportation distance or social disincentives, such as "I lack transport," "I don't know how to exercise," and "I am embarrassed for others to see me exercise" [7]. However, this study empirically confirms that online exercise can remove these barriers and capture customer satisfaction with the support of ICTs.

6.2.2. Online synchronous exercise can incorporate gamification to attract customers

Next, the results of the study revealed positive correlations among hedonic, integrative, identified motives, sports satisfaction and enduring involvement. The results also indicate that the online exercise context did not affect customers' perceived sport satisfaction or enduring involvement in the course activities. In response to the integrative motivation, the functionalities of avatars, daily life photos, calorie consumption, and health indices (i.e., body mass index, BMI) can be implemented in apps to support individuals in living in line with their lifestyles. These functionalities support individuals in recording and measuring their health improvements and thus maintaining their enduring involvement in sports. Moreover, to enhance identified motivation, sport service providers can cooperate with sport role models, internet celebrities, or professional athletes to endorse the benefits of (online) exercise. Fitz-Walter et al. [82] showed that compared to a nongamified version, customers' enjoyment and motivation increased when using a gamified version of an app. Therefore, practitioners in the sport industry should also consider gamifying online exercise. They can add fun elements at different exercise levels or provide incentives, rewards, or badges to the app to attract customers' interest.

6.2.3. Online synchronous exercise provides a new supplemental solution for the fitness industry

Moreover, the lack of interactivity and isolation of online classes has been noted and discussed in numerous studies [3,83]. However, it is important to consider whether the spatially isolated nature of online classes is always a shortcoming. For example, while physical face-to-face classes can be effective in bringing about interaction, they can also create peer pressure and the psychological burden of being judged by others. Conboy et al. [84] reported that yoga practice had negative effects on male students, mainly because most male students felt peer pressure against practicing yoga. This shows that the presence of multiple people in the field does not always have a positive effect. Zhou et al. [85] noted that one of the functions of social media is to enhance the influence of subjective norms on individual investment to increase user stickiness. These results also indicate that others' evaluations or perceptions of one's behavior are influential.

The empirical results of this study show a negative relationship between social inhibition and sports satisfaction in the context of online synchronization, suggesting that alleviating social inhibition can enhance sports satisfaction. While the distance in cyberspace makes it less likely for participants to interact directly with each other, it creates a safe and reasonable psychological distance. The positive impact of online synchronous exercise classes on respondents' perceptions of online courses is due to the lesser psychological burden of spatial isolation from peers. This positive effect of online distance on social inhibition leads to greater sports satisfaction. These findings suggest that the sports industry may be able to offer online exercise services by mitigating social inhibition in sports and attracting more customers. Online exercise courses offer the feasibility of cross-space participation, a feature that warrants sport service providers developing fee-based courses. Many online participants are reluctant to turn on their cameras, resulting in less interaction in classes and less psychological pressure on participants because they are facing crowds.

6.2.4. A new direction for customer satisfaction in the fitness industry

Customization and gamification: Course designers or information system developers can add functionalities that allow participants to choose customized animated avatars and automatically display cheerleader characters to create a video game-like experience. This can enrich the online screen and balance the lack of interaction with the pressure of the crowd. As Urich [86] mentioned, consumers are more willing to adopt a technological innovation in the form of a fan application when it includes elements of enjoyment, gamification, and social interaction.

Integration of online synchronous courses with physical classes: Michaels et al. [87] showed that inexperienced novices are more likely than experienced veterans to feel pressure to perform in front of others. To address this issue, sports service providers or gyms can use online classes to their advantage by offering a physical membership that provides access to a few free online classes. After members have gained initial experience through online classes, the pressure to enter the physical sports arena might be lower than that of inexperienced members, which could help retain customers and strengthen their loyalty.

7. Conclusion, limitations, and future directions

This study makes four contributions. First, it extends U&G theory from online static courses to online synchronized dynamic exercise courses. Second, it discusses how cyberspace can help alleviate social inhibition and enhance exercise satisfaction. Third, from a marketing perspective, this study can assist health managers in understanding the characteristics of online synchronous exercise courses for marketing purposes. Fourth, it helps information system organizations develop online exercise systems from an information management perspective.

Nevertheless, there are some limitations in this study. This study may be one of the first studies to apply social inhibition to online exercise. Despite this study's rigorous scale development, the scale items were limited by self-development. Future studies might formally develop this construct and examine this scale in different tournament domains. Social inhibition results from the presence of others in the research context. The development of experimental designs to evaluate the number of online users, online and offline contexts, and various exercise types (i.e., aerobic yoga vs. dance) is interesting and promising. Although this study showed that cyberspace might alleviate social inhibition and increase exercise satisfaction, future investigations might further examine the effects on various traits. Understanding the differences in traits enables us to aid exercise managers in formulating effective marketing strategies for target populations. Finally, because the samples were collected in Taiwan, the results may be affected by social, economic, or cultural factors. Future studies should be conducted in different regions or cultures to compare the results and generalize the model.

Ethical statement

According to the ethical regulations in Taiwan, the following situations do not require ethical review: non-invasive interactional research involving investigation, interviews, or general educational testing methods, where researchers have no acquaintance with the research subjects, no collection or recording of any directly or indirectly identifiable personal data is conducted, and no physical or psychological harm is inflicted upon the research subjects, nor does it affect their education, employment, insurance, finances, social relationships, or pose potential discrimination.

This study falls within the scope of exempt from review, and we hereby declare accordingly. The introductory statement of this survey clearly indicates that it is anonymous, does not involve personal information, and respondents are free to leave at any time. Therefore, all participants are considered to have provided informed consent.

Ethics statement

According to the local research ethics regulations (<https://idv.sinica.edu.tw/wentsong/pdf/20170216.pdf>), this study does not collect or record any directly or indirectly identifiable personal data, and does not cause any physical or psychological harm to the research subjects, therefore falls within the scope of exemption from review.

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Data availability statement

Data will be made available upon reasonable request.

CRedit authorship contribution statement

Kuo-Hung Cheng: Writing – original draft, Project administration, Conceptualization. **Chang-Tang Chiang:** Writing – review & editing, Resources, Conceptualization. **Ya-Yun Cheng:** Methodology, Formal analysis, Data curation. **Bruce C.Y. Lee:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e35104>.

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