Exploration on How Integration Degree into Sport APPs Affect Users' Attitude and Behavioural Habit towards Physical Exercise

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Abstract

Sport applications (Apps) exert significant influence on users' attitudes and behavioural patterns by virtue of their convenience, accessibility, social engagement, and goal-setting features. This study aims to explore the impact of sports Apps on users' attitudes and behaviours towards sports. Questionnaires were administered, and statistical analyses were conducted, gathering 273 responses. K-test and T-test methodologies were employed. Participants, users of sports Apps, were surveyed to examine how their integration into the virtual communities within these Apps affects their attitudes and behavioural habits towards sports. Findings indicate that the extent of integration into sports Apps significantly correlates with users' attitudes towards physical exercise and their behavioural habits. Deeper integration corresponds with increased activity levels and the establishment of more robust exercise routines across various dimensions. The study suggests that developers should enhance the content of sports and fitness Apps continuously, improving their scientific accuracy. Furthermore, active individuals engaging in physical exercise are encouraged to utilize sports and fitness Apps fully, leveraging their functionalities to enrich their fitness pursuits and cultivate a positive attitude towards sports.

Keywords: Sport APPs, Virtual Community, Attitude of Physical Exercise, Integration Degree, User's Attitude, Behavioural Habit.

Introduction

The advent of information technology, characterized by the rapid transmission of electronic information resources and the widespread use of smartphones, coupled with the exponential expansion of information data, has led to the ubiquitous adoption of "sports APPs" among fitness enthusiasts for monitoring their physical activity behaviours (Ben et al., 2022). A "sports APP" denotes sports and fitness software applications installed on smartphones, encompassing functionalities such as step counting, distance tracking, speed measurement, calorie consumption estimation, and route mapping (Qi & Cheng, 2022). Beyond mere recording capabilities, these apps also facilitate social interactions, participation in activities, sports organization, and reward systems akin to real-world community engagements, thereby fostering online virtual communities (Tu, Hsieh, & Feng, 2019).

Several investigations indicate the potential efficacy of sports applications in facilitating individuals' engagement in physical activities. These apps commonly integrate features such as goal-setting, challenges, and reward systems, which have demonstrated the capability to enhance users' motivation and adherence levels. Through the establishment of objectives and the continuous monitoring of progress, users can derive a sense of accomplishment and sustain their enthusiasm, thereby upholding their exercise regimens. Additionally, certain sports apps incorporate social functionalities, enabling users to share their fitness accomplishments, provide mutual encouragement, and engage in communication. Such social interactions cultivate a feeling of participation and belonging, fostering a supportive virtual community wherein users can receive reinforcement and assistance. Furthermore, many apps offer real-time feedback and monitoring capabilities, aiding users in comprehending their exercise status and developmental trajectory. This enables them to make informed adjustments to their training regimes, effectively managing and enhancing their physical well-being. This article endeavours to delve into the psychological dimensions underlying the influence of sports apps and their intrinsic attributes on individuals' exercise habits and attitudes. The framework of "use and satisfaction" posits individuals with specific needs as constituents of the audience, conceptualizing their media exposure activities as the process of utilizing media to gratify those needs. Central to this inquiry is an examination of how sports apps cater to users' internal requisites and consequently modulate their attitudes and behaviours towards physical fitness.

In this study, the survey data from users of sports applications are subjected to analysis and manipulation using SPSS 23.0. The primary objective of this research is to investigate the influence of diverse activities within the application on users' attitudes and behavioural patterns concerning physical exercise. Additionally, the study aims

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to ascertain whether the level of integration into sports applications correlates with users' attitudes and behavioural tendencies towards physical activity. Ultimately, this paper endeavours to offer novel insights into enhancing the general public's attitudes and behavioural practices related to physical exercise.

Literature Review

Fitness Applications (Apps) on Physical Activity Behaviour

Recent scholarly attention has been drawn to the influence of fitness applications (apps) on physical activity behaviour. As smartphones and wearable devices have become increasingly ubiquitous, individuals are relying more on these digital tools to monitor and enhance their fitness levels. Research in this domain has examined various facets, including the effectiveness of fitness apps in promoting physical activity, their impact on motivation and adherence to exercise regimens, as well as the potential challenges and constraints associated with their utilization. Studies suggest that well-crafted fitness apps can exert a positive influence on physical activity behaviour by furnishing personalized workout plans, tracking progress, providing immediate feedback, and cultivating social support through virtual communities. However, concerns have emerged regarding the sustainability of behaviour change facilitated by these apps in the long run, sustained user engagement, and the necessity for continual updates and enhancements to uphold their efficacy. A nuanced understanding of the effects of fitness apps on physical activity behaviour is pivotal for guiding future interventions and fostering healthier lifestyles in the digital era. Inmaculada's research reveals that mobile devices serve as potent resources for enhancing and augmenting physical activity while engendering novel elements of motivational mechanisms in sports and their impact on physical education. The findings indicate that the utilization of mobile applications yields a positive influence on the context of physical activity, extending beyond mere exercise to encompass benefits such as heightened motivation and potential skill development (Aznar Díaz et al., 2019). Alessandra Sarcona's study suggests that the usage of health apps may positively impact eating behaviour (Sarcona et al., 2017). The exploration of fitness applications (Apps) primarily centres on their educational functions, with much of the literature employing experimental methodologies to investigate the impact of mobile Apps on physical aspects. Mollee observed that despite the well-established health advantages of physical activity, a significant portion of the populace fails to meet recommended guidelines. Consequently, there is a pressing need for effective and readily accessible interventions to bolster physical activity levels (Mollee et al., 2017; Gao & Suvimolstien, 2024).

Various contents are available within sports Apps. However, extant research lacks comprehensive examinations of the effects of exercise Apps on exercise habits and attitudes, particularly concerning their specific content. Moreover, delving into the specific mechanisms influencing exercise habits and attitudes warrants further investigation.

Definition of Integration Degree in the Context of Sport Apps

The notion of integration degree within the domain of sport applications (apps) has garnered increasing significance amidst the ongoing digital transformation shaping individuals' engagement with physical exercise. Integration degree denotes the level of assimilation, interaction, and functionality offered by sport apps in facilitating users' exercise routines and fitness objectives. This multifaceted construct encompasses diverse facets, including the seamless integration with wearable devices, provision of personalized workout regimens, real-time feedback mechanisms, and facilitation of social interaction and support among users (Angosto et al., 2020).

Scholarly investigations into the definition of integration degree underscore its pivotal role in shaping users' attitudes towards sport apps and influencing their behavioral tendencies pertaining to physical exercise. Research suggests that higher levels of integration, characterized by comprehensive features and smooth user experiences, correlate with heightened user satisfaction, motivation, and engagement with exercise programs (Ijaz et al., 2020; Raharja, 2021). Notably, apps offering customization of workout plans based on users' fitness levels, preferences, and objectives tend to receive positive evaluations, augmenting users' sense of control and autonomy in managing their fitness routines.

Moreover, the extent of integration within sport apps significantly influences users' perceptions of app efficacy and usefulness in promoting physical activity (Tu et al., 2019). Apps furnishing informative feedback on workout performance, facilitating progress tracking, and incorporating interactive elements such as challenges, incentives, and social sharing functionalities are more likely to evoke favourable responses from users and foster sustained engagement in exercise endeavours.

Nevertheless, it is imperative to acknowledge that the conceptualization and implementation of integration degree can vary across different sport apps and user cohorts. Factors encompassing app design, functionality, usability, and user preferences exert considerable influence on shaping users' experiences and perceptions of integration. Furthermore,

ongoing advancements in technology and user interface design continue to influence the conceptualization and operationalization of integration degree within sport apps.

Behavioural Habit Formation

Behavioural habit formation constitutes a fundamental aspect of individuals' involvement in physical exercise, and the extent of integration within sport apps emerges as a pivotal determinant in shaping these habits. Behavioural habit formation denotes the process wherein repetitive actions and routines become entrenched and automatic, resulting in sustained adherence to desired behaviours such as regular physical activity.

Research examining the influence of integration degree within sport apps on behavioural habit formation has uncovered several salient insights. Firstly, apps offering heightened integration levels, such as personalized workout plans, progress monitoring, and real-time feedback mechanisms, prove more efficacious in fostering habit formation among users (Hagger, 2019; Yang, 2024). These functionalities equip users with essential resources and assistance to establish consistent exercise regimens, monitor their advancement, and receive timely reinforcement for their endeavours.

Secondly, the design and user-friendliness of sport apps wield significant influence in promoting habitual usage and engagement with physical exercise (D'Addario et al., 2020). Apps characterized by intuitive navigation, visually appealing interfaces, and user-centric design are better positioned to facilitate habit formation by mitigating accessibility barriers and enhancing overall user experience. Incorporating gamification elements such as challenges, incentives, and social interactions further stimulates users' motivation and dedication to regular exercise, thereby fostering the cultivation of favourable behavioural habits over time (Darejeh & Salim, 2016).

Moreover, the integration of social features within sport apps, including virtual communities, peer support networks, and social sharing functionalities, contributes to the cultivation of social norms and identities associated with physical activity. Users who feel a sense of belonging to a community of like-minded individuals through the app are more inclined to embrace and sustain healthy exercise habits as an integral part of their lifestyle. Nonetheless, challenges pertaining to habit formation within sport apps persist, encompassing issues such as user engagement, retention, and long-term adherence to exercise routines. Despite the initial enthusiasm and motivation engendered by highly integrated apps, sustaining behavioural habits necessitates continuous support, reinforcement, and tailored interventions tailored to users' evolving requirements and inclinations (Naslund et al., 2017).

In summary, the extent of integration within sport apps significantly shapes users' behavioural habit formation regarding physical exercise. A comprehensive understanding of how app features, usability, gamification strategies, and social interactions influence habit formation is imperative for devising effective interventions and fostering sustained engagement in healthy behaviours among app users. Future research endeavours should persist in exploring innovative strategies and technologies harnessing integration degree to engender enduring behavioural changes and bolster overall well-being.

Users' Attitude Towards the Integration Degree of Sport Apps

Comprehending users' perspectives regarding the integration level of sport apps is imperative for evaluating their holistic perception and response to these digital platforms within the realm of physical exercise. Extant scholarly works have explored diverse facets of user attitudes, encompassing satisfaction levels, preferences, motivations, and the influence of app attributes and functionalities on users' involvement in exercise regimens. Empirical investigations consistently demonstrate the intrinsic link between users' satisfaction with sport apps and the integration degree, alongside the extent to which these apps fulfil their expectations and requirements (Alnawas & Aburub, 2016). Sport apps offering extensive integration, such as tailored workout plans, progress monitoring, and real-time feedback mechanisms, tend to elicit positive appraisals from users who perceive these features as valuable assets in their fitness endeavours. Conversely, apps characterized by limited integration or cumbersome user interfaces may evoke frustration and discontent among users, thus impacting their overall app and exercise experience.

Furthermore, user preferences regarding app attributes and functionalities exert considerable influence on shaping their attitude toward physical exercise (Jo & Park, 2023). For instance, certain users may gravitate toward apps incorporating gamification elements, challenges, rewards, and social interactions, as these features amplify motivation and engagement with exercise pursuits. Conversely, individuals prioritizing simplicity, ease of navigation, and clear goal-setting functionalities may favour apps with minimalist designs and straightforward interfaces.

Moreover, the motivations underpinning users' engagement with sport apps and physical exercise exert a significant impact on their attitude toward integration degree (Nuss & Li, 2021). Intrinsic motivators such as health objectives, self-enhancement, enjoyment of physical activity, and social interaction emerge as pivotal drivers of

favourable attitudes toward app integration (Zhang & Solmon, 2013). Additionally, extrinsic factors including social support, peer influence, and professional guidance contribute to users' motivation and attitude toward leveraging sport apps for exercise purposes.

It is imperative to acknowledge the potential evolution of users' attitudes toward integration degree over time, influenced by their exposure to various apps, encounter with novel features and functionalities, and adaptation to evolving fitness goals and preferences. Continuous feedback mechanisms, user surveys, and usability assessments serve as invaluable tools for app developers and researchers to glean insights into users' evolving attitudes and preferences, facilitating iterative enhancements and tailored interventions that resonate with users' exigencies and anticipations (Nayebi, Adams, & Ruhe, 2016).

In conclusion, extant literature on users' attitudes toward the integration degree of sport apps underscores the significance of aligning app attributes, functionalities, and user experiences with users' preferences, motivations, and contentment levels. By comprehending and addressing users' attitudes, app developers and researchers can optimize the efficacy, usability, and overall impact of sport apps in fostering positive attitudes toward physical exercise and fostering enduring engagement in health-promoting behaviours.

User Experience and Engagement

User experience and engagement represent pivotal determinants of the efficacy and success of sport apps in fostering sustained involvement in physical exercise. The integration degree of these apps assumes a central role in shaping users' interactions, experiences, and overall satisfaction levels, thereby facilitating heightened engagement and adherence to exercise regimens. Existing scholarly discourse has scrutinized various facets of user experience and engagement, encompassing usability, interactivity, gamification elements, social functionalities, and the overarching effectiveness of apps in nurturing enduring commitment to physical activity.

Gamification elements, including challenges, rewards, badges, leader boards, and virtual achievements, wield considerable influence in augmenting user engagement with sport apps (Bitrián, Buil, & Catalán, 2020). Leveraging psychological principles of motivation, competition, and accomplishment, these gamified features incentivize users to establish goals, monitor progress, and sustain dedication to their fitness pursuits. Empirical evidence underscores that integrating gamification strategies into sport apps can bolster user motivation, enjoyment, and protracted involvement in physical exercise endeavours.

Furthermore, social features embedded within sport apps, such as social sharing functionalities, community forums, group challenges, and peer support networks, contribute significantly to enhancing user experience and engagement (Liu et al., 2020). Users cherish opportunities to connect with kindred spirits, exchange experiences, solicit advice, and receive encouragement from their social circles within the app ecosystem. Such social interactions cultivate sentiments of belongingness, motivation, and accountability, thereby fostering sustained engagement and adherence to exercise routines among users.

Social cognitive theory underscores the reciprocal interplay between individuals and their social milieu, alongside the processing and interpretation of information within the social context by individuals (Wood & Bandura, 1989). Within the purview of the study, variances in participants' perceptions, attitudes, and behavioural intentions vis-à-vis the virtual community of the exercise app can be explored, along with the consequential impact of these disparities on their attitudes toward physical activity and behavioural habits.

Subject and Method

Subject

From October to December 2022, a cohort of 305 users of the virtual sports application were anonymously selected as respondents through random sampling procedures. The survey instrument utilized a Likert scale format. The questionnaire encompassed eight dimensions: behavioural attitude, target attitude, behavioural perception, emotional experience, behavioural control efficacy, subjective norms, behavioural intentions, and behavioural habits. Data collection was conducted online, yielding 273 completed questionnaires, indicating a response rate of 89.5%. The effective response rate, denoting fully completed and valid submissions, was calculated at 95.2%.

Statistical Methods

In this investigation, SPSS 26.0 served as the analytical tool. Initially, the questionnaire data underwent pre-processing to derive scores for each dimension within the physical activity scale. Subsequently, the Kolmogorov-Smirnov test (K-S test) was employed to assess the normality of score distributions within respective groups. Finally, the T-test was executed to evaluate the two-sample hypothesis concerning the equivalence of dimensional scores across the dataset.

Experimental Method and Data Classification

In this investigation, the assessment of attitudes and behavioural patterns related to physical exercise relied on the "Exercise Attitude Scale" devised by Wang (2010).

Additionally, the utilization frequency of various functionalities within the sports application was subjected to comparison and analysis through the utilization of the Delphi method. To augment the evaluation, three supplementary metrics were incorporated, namely, the "number of medals" (Won, Chiu, & Byun, 2023), "number of online sports activities" (Valcarce-Torrente et al., 2021), and "frequency of giving likes" (Lin et al., 2019). These supplementary indicators were integrated into the questionnaire alongside the "Physical Exercise Attitude Scale" to enrich the breadth of assessment.

Number of Medals

The concept of medals within the sports application platform serves as a form of reward bestowed upon users upon achieving specific goals, such as exercise intensity, frequency, continuity, or participation during holidays. These medals play a pivotal role in incentivizing and motivating users to engage in physical activity to attain more rewards. Consequently, the count of medals accrued by users represents a significant metric for gauging the depth of users' integration within the sports application community.

Among the survey participants, 134 respondents indicated possessing "less than 10" medals, signifying their status as primary users of sports applications. Hence, questionnaires reporting "more than 10 medals" were amalgamated into the "more medals group." Consequently, the study categorizes respondents into two distinct groups: the "more medals group" (comprising individuals with more than 10 medals) and the "less medals group" (comprising individuals with less than 10 medals).

Participation Times of Online Sports Activities

Online sports activities constitute a significant component of the sports application platform, simulating offline competitions. These activities encompass various types: regular and quantitative, non-regular and quantitative, as well as regular and non-quantitative. Participants engage in these activities with the opportunity to attain rankings or medals, fostering a sense of satisfaction or victory. Consequently, the level of involvement in online sports activities serves as a crucial metric for assessing integration within the sports application ecosystem.

From the initial questionnaire analysis, approximately 52% of respondents reported "never participated" in online sports activities. Consequently, participants were categorized into two distinct groups based on their participation frequency: the "participated group" and the "no participation group.".

Frequency of Giving Likes

Liking in a sports app is a way to acknowledge and praise friends' activities, fostering online interaction and satisfaction. Frequent liking fosters mutual appreciation and enhances the app's virtual community. It's also seen as a gauge of integration into the community. From the stats, 35% never like, 62% occasionally do, and few like often. This divides participants into "liking" and "not liking" groups.

Results and Analysis

Comparison of Each Indicator in Exercise Attitude Scale: More Medals Group vs. Less Medals Group

Scores, except for "subjective criteria," were higher in the group with more medals compared to the group with fewer medals (Table 1). K-S test showed normal distribution for "behavioural cognition," "emotional experience," "subjective criterion," "behavioural intention," and "behavioural habits." These indicators were tested using double sample hypothesis testing, with results in Table 2.

Table 1

Scores and K-S Test of Physical Exercise Attitude-Behaviour in the More Medals Group and Less Medals Group

Group	Indicator	Behavioural Attitude	Target Attitude	Behavioural Perception	Emotional Experience	Behavioural Control Sense	Subjective Criteria	Behavioural Intentions	Behavioural Habits
More Medals Group	X±S	30.45±4.23	51.68±5.89	31.38±4.23	40.56±4.38	29.16±4.56	17.30±5.46	29.60±3.35	40.24±5.33
	P (K-S test)	0.03	0.04	0.05	0.34	0.35	0.49	0.49	0.57
Less Medals Group	X±S	26.34±5.04	43.23±4.38	28.56±2.45	36.89±5.33	22.35±4.37	19.82±4.35	25.36±3.80	33.69±4.74
	P (K-S test)	0.35	0.44	0.48	0.49	0.03	0.17	0.15	0.45

Table 2

Hypothesis Testing Results of Physical Exercise Attitude-Behaviour in the More Medals Group and Less Medals Group

Hypothesis Test	Behavioural Perception Emotional Experience	Subjective Criteria	Behavioural Intentions	Behavioural Habits
P（t-test）	0.001	0.001	0.004	0.002	0.000

The t-test results in Table 2 indicate highly significant differences (P < 0.001) in the five dimensions: "behavioural cognition," "emotional experience," "subjective standard," "behavioural intention," and "behavioural habit." More medals signify greater autonomy in exercise attitude, reduced external influence, richer physical and mental exercise experiences, intensified willingness to participate, and stronger habitual exercise behaviour in the group with more medals.

Online Sports Activity Participation Group and Non-Participation Group

Table 3 demonstrates that scores across all dimensions, except for "subjective criteria," were elevated in the participant group compared to the non-participant group. Both groups exhibited normal distribution in the six dimensions: "behavioural attitude," "target attitude," "behavioural cognition," "emotional experience," "subjective criteria," and "behavioural habit." This allows for hypothesis testing, with the ensuing results outlined below.

Table 3

Scores and K-S Test of Physical Exercise Attitude-Behaviour in the Online Sports Activity Participation Group and Non-Participation Group

Group	Indicator	Behavioural Attitude	Target Attitude	Behavioural Perception	Emotional Experience	Behavioural Control Sense	Subjective Criteria	Behavioural Intentions	Behavioural Habits
Participation Group	X±S	31.54±4.65	50.82±6.02	31.38±4.23	40.83±4.65	29.65±4.95	18.31±5.23	28.65±3.68	38.95±5.36
	P (K-S test)	0.25	0.07	0.42	0.47	0.28	0.49	0.09	0.21
Non-Participation Group	X±S	28.43±5.33	47.36±6.12	27.38±2.93	36.87±5.24	22.07±4.17	19.78±4.42	25.26±3.44	33.35±5.74
	P (K-S test)	0.50	0.50	0.11	0.03	0.12	0.17	0.04	0.51

Table 4

Hypothesis Testing Results of Physical Exercise Attitude-Behaviour in the Online Sports Activity Participation Group and Non-Participation Group

Hypothesis Test	Behavioural Attitude	Target Attitude	Emotional Experience	Subjective Criteria	Behavioural Habits
P（t-test）	0.001	0.001	0.000	0.008	0.000

As indicated in Table 4, significant disparities were observed in the five dimensions: "behavioural attitude," "target attitude," "emotional experience," "subjective criteria," and "behavioural habits" between the two groups (P < 0.001), along with "subjective standard" (P < 0.001). Moreover, the distinction in "subjective criteria" was highly significant (P < 0.001).

It sounds like the online physical activity group has a more informed and focused approach to exercise compared to those not participating online. They seem to have a better understanding of the benefits of physical activity and clearer goals, and they are less swayed by external factors. Additionally, their consistent participation suggests a higher level of habituation and willingness to engage in exercise regularly. This could be attributed to the support, accountability, and knowledge-sharing within the online group, which fosters a more conducive environment for maintaining exercise habits.

Giving Like Group and No Giving Like Group

In Table 5, all dimensions except "subjective criteria" had higher scores in the giving-like group compared to the no-giving-like group. The K-S test indicated higher scores in "behavioural attitude," "goal attitude," "behavioural cognition," and "physical activity" in both groups. The scores for six dimensions— "behavioural attitude," "goal attitude," "behavioural cognition," "emotional experience," "sense of control," and "behavioural habits"—followed a normal distribution, allowing hypothesis testing.

Table 5

Scores and K-S Test of Physical Exercise Attitude-Behaviour in the Giving Like Group and No Giving Like Group

Group	Indicator	Behavioural Attitude	Target Attitude	Behavioural Perception	Emotional Experience	Behavioural Control Sense	Subjective Criteria	Behavioural Intentions	Behavioural Habits
Giving Like Group	X±S	31.48±4.23	50.23±5.92	29.43±4.12	39.21±4.23	26.35±4.56	18.31±5.23	28.35±4.24	38.95±5.36
	P (K-S test)	0.15	0.29	0.49	0.32	0.07	0.49	0.12	0.11
No Giving Like Group	X±S	28.43±5.33	46.36±6.12	28.38±2.93	36.87±5.24	21.07±4.17	19.78±4.42	24.26±3.44	33.35±5.03
	P (K-S test)	0.50	0.50	0.40	0.49	0.18	0.50	0.04	0.51

The t-test results in Table 6 indicate a highly significant difference ($P < 0.001$) between the two groups in six dimensions: "behavioural attitude," "target attitude," "behavioural perception," "emotional experience," "behavioural control," and "behavioural habits.".

Table 6

Hypothesis Testing Results of Physical Exercise Attitude-Behaviour in the Giving Like Group and No Giving Like Group

Hypothesis Test	Behavioural Attitude	Target Attitude	Emotional Experience	Subjective Criteria	Behavioural Habits
P（t-test）	0.001	0.001	0.000	0.008	0.000

In the realm of attitudes towards physical exercise, the giving-like group demonstrated more precise perceptions regarding the impacts and outcomes of physical activity, clearer objectives concerning exercise, enhanced autonomy in controlling exercise behaviour, enriched emotional engagement with exercise activities, and a more favourable outlook on physical exercise. Regarding behavioural performance, the giving-like group exhibited a heightened level of habitual exercise behaviour.

In conclusion, it becomes evident that varying degrees of involvement within the APP virtual community significantly influence users' attitudes and behaviours towards physical exercise. Users deeply engaged in each aspect exhibit greater accuracy in perceiving the functions and outcomes of physical exercise, a stronger determination towards exercising, and a heightened level of exercise habituation.

Comparison of Deep Integrating Users and Shallow Integrating Users

The classification of "deep integrating users" was based on meeting the criteria of having "more than 10 medals," actively engaging in "online sports activities," and consistently demonstrating "giving likes." Conversely, individuals categorized as "shallow integrating users" were identified by their lack of involvement in "online sports activities" and their infrequent or non-existent "giving likes.".

Comparison of Scores and Normal Distribution Test

Table 7 indicates that, except for the "subjective criterion," all dimensions' scores were higher in the deep integrating users group compared to the shallow integrating users group. The K-S test indicated that the scores of six dimensions—"behavioural attitude," "target attitude,"

"emotional experience," "behavioural control," "behavioural intention," and "behavioural habits"—in both groups followed a normal distribution, allowing for hypothesis testing.

Table 7

Scores and K-S Test of Physical Exercise Attitude-Behaviour in the Deep Integrating Users and Shallow Integrating Users

Group	Indicator	Behavioural Attitude	Target Attitude	Behavioural Perception	Emotional Experience	Behavioural Control Sense	Subjective Criteria	Behavioural Intentions	Behavioural Habits
Deep Integrating Users	X±S	33.36±4.13	51.23±6.04	30.43±3.22	41.21±4.17	28.23±5.56	17.31±5.57	29.26±3.24	39.95±5.23
	P (K-S test)	0.05	0.07	0.04	0.32	0.48	0.49	0.27	0.24
Shallow Integrating Users	X±S	28.43±5.23	46.63±6.78	28.38±2.87	35.83±5.24	21.76±4.04	19.56±3.92	24.56±2.87	33.65±5.28
	P (K-S test)	0.50	0.50	0.16	0.49	0.37	0.02	0.48	0.51

Table 8

Hypothesis Testing Results of Physical Exercise Attitude-Behaviour in the Deep Integrating Users and Shallow Integrating Users

Hypothesis Test	Behavioural Attitude	Target Attitude	Emotional Experience	Behavioural Control Sense	Behavioural Intentions	Behavioural Habits
P（t-test）	0.001	0.001	0.000	0.000	0.001	0.000

The findings from the t-test presented in Table 8 reveal a notable distinction in various facets, including "behavioural attitude," "target attitude," "emotional experience," "sense of behavioural control," "behavioural intentions," and "behavioural habits" ($P < 0.001$). This suggests that, regarding attitudes towards physical exercise, the deep integrating users group demonstrates a clearer sense of purpose and attitude. Specifically, within their approach to physical exercise, this group exhibits clearer objectives and a higher level of autonomy in managing exercise behaviours. Furthermore, as their engagement with physical exercise deepens, their emotional connection to exercise becomes more profound and nuanced. Their evaluation of behaviour becomes more favourable, alongside a heightened willingness to engage in exercise. Additionally, the deeply integrated group displays a greater degree of habitual exercise behaviour.

Overall, it becomes apparent that as participants engage more extensively with the sports APP platform, gradually incorporating its functionalities, they progressively assimilate into the physical exercise activities facilitated by the platform. This transformation is reflected in their altered attitudes and behaviours towards physical exercise, fostering the development of favourable sports beliefs and steadfast exercise habits. Pertaining to the association between sports APP usage and physical activity behaviour, extant literature suggests that the platform serves as an effective catalyst for influencing physical activity behaviour (Fanning, Mullen, & McAuley, 2012; King et al., 2016).

Conclusion

The integration of sports APP users into virtual communities correlates with differences in attitudes and exercise habits. Deeper integration fosters richer emotional experiences and more effective exercise behaviours. Users develop clearer exercise goals and more accurate perceptions of exercise benefits, leading to increased willingness to exercise and more frequent engagement. This study highlights the potential for cultivating positive attitudes and stable exercise habits through sports APP usage, offering a novel approach to enhancing public fitness behaviours. Future research should explore how sports APPs impact physical activity habits across different age groups, tailoring improvements accordingly.

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