Digital motivation: fitness apps and student physical activity

Motivación digital: aplicaciones de fitness y actividad física estudiantil

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Abstract

Objective: The study aims to investigate the influence of fitness apps on physical activity and intrinsic motivation for exercise among students. Amid growing digitalization and a decline in physical activity among young people, finding effective ways to use digital technologies to increase motivation for physical activity is of particular relevance.
Methodology: The study involved 100 university students (aged 18-25) randomly assigned into control and experimental groups of 50 each. For 12 weeks, the experimental group used the Adidas Running fitness app selected deliberately according to MARS criteria, while the control group led a normal lifestyle. The effectiveness of the intervention was assessed using quantitative (analysis of physical activity data) and qualitative (surveys) methods. The study used validated instruments, including the Basic Psychological Needs in Exercise Scale (BPNES), the Intrinsic Motivation Inventory (IMI), and the Self-Organization of Activity Scale (SOA).
Results: The results show a significant increase in physical activity in the experimental group (by 36.7%) compared to the control group (5.4%, $p<0.001$). The experimental group also showed a statistically significant improvement in intrinsic motivation and the satisfaction of basic psychological needs ($p<0.001$). Qualitative analysis shows a positive impact of social functions and gamification on students' motivation.
Conclusions: The study provides evidence of the effectiveness of using digital technologies to increase students' physical activity and intrinsic motivation. The findings have important practical implications for developing strategies to increase physical activity among young people and can be applied to develop physical education programs in higher education institutions.

Keywords

Self-organization; self-determination theory; physical education; mobile apps; Gamification.

Resumen

Objetivo: El estudio busca investigar la influencia de las aplicaciones de fitness en la actividad física y la motivación intrínseca para el ejercicio entre estudiantes. En un contexto de creciente digitalización y disminución de la actividad física en jóvenes, resulta especialmente relevante encontrar formas efectivas de utilizar tecnologías digitales para incrementar la motivación hacia la actividad física.
Metodología: Participaron 100 estudiantes universitarios (18-25 años), asignados aleatoriamente en grupos control y experimental (50 cada uno). Durante 12 semanas, el grupo experimental utilizó la app Adidas Running, seleccionada mediante criterios MARS, mientras el grupo control mantuvo su estilo de vida habitual. La efectividad de la intervención se evaluó mediante métodos cuantitativos (análisis de datos de actividad física) y cualitativos (encuestas). Se emplearon instrumentos validados: la Escala de Necesidades Psicológicas Básicas en el Ejercicio (BPNES), el Inventario de Motivación Intrínseca (IMI) y la Escala de Autoorganización de la Actividad (SOA).
Resultados: El grupo experimental mostró un incremento significativo en actividad física (36.7%) frente al grupo control (5.4%, $p<0.001$), junto con mejoras estadísticamente significativas en motivación intrínseca y satisfacción de necesidades psicológicas básicas ($p<0.001$). El análisis cualitativo reveló un impacto positivo de las funciones sociales y la gamificación en la motivación estudiantil.
Conclusiones: La investigación evidencia la efectividad de las tecnologías digitales para aumentar la actividad física y motivación intrínseca en estudiantes. Los hallazgos tienen implicaciones prácticas relevantes para diseñar estrategias de promoción de actividad física en jóvenes y podrían aplicarse en programas de educación física universitaria.

Palabras clave

Autoorganización; Teoría de la autodeterminación; Educación física; Aplicaciones móviles; Gamificación.

Introduction

In the age of rapid digitalization, the influence of technology on various aspects of our lives is growing ever more significant and controversial (Filipova, 2023). This impact is especially evident in the physical activity of young people (Akhmetshin et al., 2019), particularly students (Dias et al., 2024). For today's students, smartphones and applications have become integral parts of everyday life (Anikeeva et al., 2024). There is an alarming downward trend in physical activity among young people (Guthold et al., 2020), which creates a complex and ambiguous situation.

Our study focused on understanding the opportunities to increase students' interest in physical culture and sports using common gadgets and applications available to almost every modern student. Digital technology offers innovative methods of motivating (Sari et al., 2024) and tracking physical activity and health (Berdysheva et al., 2024). Research shows that the use of mobile applications can lead to an improvement in physical activity (Romeo et al., 2019). Gamified mobile apps prove to have a positive impact on students' motivation to exercise (Kim et al., 2018). Social media and mobile apps have the potential to promote physical exercise among university students (Tong et al., 2019).

In the context of the growing use of digital technologies to improve students' physical activity, their impact on self-organization and intrinsic motivation is relevant. This issue falls at the intersection of motivation psychology, Self-Determination Theory (SDT), and modern technological trends (Fomicheva et al., 2021; Shurygin et al., 2024).

SDT (Ryan & Deci, 2000) postulates that the satisfaction of three basic psychological needs, autonomy, competence, and relatedness (Togaibayeva et al., 2022), is vital for developing sustained intrinsic motivation. In the context of physical activity, digital technologies have the potential to both facilitate and hinder the fulfillment of these needs (Estrada-Araoz et al., 2024).

In the study by Kerner and Goodyear (2017), which examined the influence of wearable fitness devices on adolescent motivation, a dual effect of such technologies was identified. On one hand, these gadgets genuinely help users become more aware of their activity levels and receive immediate feedback on their performance. However, the authors also uncovered a concerning trend: over time, many participants developed a form of dependency on external rewards, which could ultimately undermine their intrinsic motivation for physical activity.

In a later study, Kerner et al. (2019) further explored this issue and reached a significant conclusion: we need specialized approaches to designing digital tools that foster users' autonomous motivation. According to the researchers, a mere system of external incentives is insufficient—truly effective applications should cultivate users' sense of autonomy and mastery. Only such a balance can ensure the development of genuinely sustainable intrinsic motivation for physical activity. Teixeira et al. (2020) examined the problem through the lens of self-determination theory and conducted a comprehensive analysis of scientific literature on the impact of digital technologies on motivation for physical activity. After synthesizing numerous studies, they formulated a key practical insight: the most successful digital solutions are those that address fundamental psychological needs—autonomy, competence, and relatedness. It is precisely such programs and applications that are most likely to help individuals develop strong intrinsic motivation for regular exercise.

Of course, the use of digital technologies to promote self-regulation and intrinsic motivation is not without its challenges. Particularly illustrative in this regard is the study by Stawarz et al. (2015). They found that most modern habit-forming applications, including those targeting physical activity, take the simplest approach—constantly reminding users of required actions and distributing virtual rewards for compliance. Paradoxically, this method may even hinder the development of genuine self-regulation and autonomous motivation, making individuals reliant on external stimuli.

Of particular interest is the recent study by Rasheed et al. (2021), conducted during the peak of the COVID-19 pandemic. They sought to determine whether electronic simulation games could help students maintain physical fitness and psychological well-being under restrictive conditions. The results were highly encouraging—students who engaged in physical exercise through Xbox 360 demonstrated significantly better psychological health outcomes compared to the control group. This study clearly demonstrates that, in unconventional circumstances, digital technologies can serve as an effective tool for sustaining not only physical activity but also students' psychological balance.

The accumulated scientific evidence clearly indicates the need to reconsider existing approaches to using digital technologies to promote physical activity among students. An innovative solution was proposed by Shin et al. (2022). They developed a flexible model that accounts for individual user characteristics and aims to achieve a delicate balance—applying external incentives in a way that gradually gives way to intrinsic motivation and the development of self-regulation skills. Such a personalized approach appears highly promising.

As we can see, despite notable progress in understanding how digital technologies influence students' self-regulation and intrinsic motivation for physical activity, this field still contains numerous gaps and unresolved questions. This is precisely why we chose to focus our research on developing individualized approaches that account for each student's unique characteristics and help them cultivate lasting intrinsic motivation and effective self-regulation skills. We were particularly interested in determining how to appropriately match digital tools to different personality types.

Method

For the study, a classic experimental design was selected, comprising pretesting, intervention, and posttesting. This choice was not arbitrary and was justified by several considerations. First, random assignment of students to experimental and control groups was implemented, which significantly reduced the influence of extraneous variables and ensured comparability between participants on key characteristics. This methodological approach enhanced the study's internal validity, allowing for greater confidence in concluding that observed changes resulted specifically from the intervention (use of fitness applications) rather than external factors. Preliminary and concluding testing ensured that changes in key variables before and after the intervention were accurately measured. This design enabled us to compare between-group and within-group effects. This design is the most appropriate for testing causal relationships between fitness app use and changes in students' physical activity, self-organization, and intrinsic motivation, consistent with our aims.

Participants

Participants for the study were recruited through a pre-selection process from among students of a specific university (University X). To recruit participants, questionnaires were distributed through all available channels - from official university email to student social media groups and popular messaging platforms. The questionnaire included key screening questions: age, faculty/department, smartphone ownership, frequency of physical exercise, absence of contraindications for physical activity, and willingness to commit to the 12-week study period. This approach facilitated the recruitment of an adequate number of eligible participants. Sampling criteria included being an 18-25 full-time student, owning an iOS or Android smartphone, having no contraindications to moderate physical activity, and being willing to participate in the full research program. Exclusion criteria were active use of fitness apps in the past three months, participation in other physical activity-related studies, and having injuries or diseases limiting physical activity.

After preliminary online screening, 237 students met the inclusion criteria. From this number, 100 participants were selected as follows:

1. All 237 eligible candidates were stratified by gender and department to ensure a representative sample.

2. Following group assignment, each candidate was assigned a unique identification number to facilitate randomized selection at the subsequent stage. Using Excel's RANDOMBETWEEN function, participants were then systematically sampled from each group while maintaining proportional representation according to actual gender and faculty distributions within the student population. This methodology ensured the creation of a representative sample. The sampling procedure continued until 100 participants were selected, with gender and academic discipline ratios preserved throughout the process. Selected respondents received formal invitations to attend a research briefing session organized by the investigative team. During this session, detailed explanations were provided regarding the study's methodological framework and procedural requirements. In case of refusal or non-attendance, they were replaced by the next randomly selected number from the respective stratum.

3. The briefing session was attended by 103 students (including substitutes), of whom 100 signed informed consent and were included in the study.

The 100 participants were then randomly assigned into the CG (n=50) and EG (n=50) using the RAND function in Microsoft Excel.

Procedure

The hypotheses posed in the study were as follows:

H1: The use of fitness apps will lead to a significant increase in physical activity in the EG compared to the CG.

H2: Intrinsic motivation for physical activity will increase significantly in the EG compared to the CG.

1. The Mobile App Rating Scale (MARS) method, a validated tool for assessing the quality of mobile health apps, was used to objectively evaluate and select a mobile app (Rodrigues et al., 2019; Stoyanov et al., 2015).

Three independent experts with experience in physical culture and information technology conducted the assessment.

Initially, we selected the five most popular fitness apps with a Russian-language interface and no geographical restrictions. Each app was then rated on the 23 MARS scale items grouped into five categories: engagement, functionality, aesthetics, information quality, and subjective quality. Each item was rated on a five-point scale (from one – "inadequate" to five – "excellent").

In addition to standardized parameters of the MARS scale, supplementary evaluation criteria relevant to the study's specific objectives were applied:

1) Availability of a fully functional Russian-language version;

2) Accessibility of core features without financial restrictions (absence of paywalls for basic functionality);

3) Capability to export quantitative data in formats suitable for subsequent statistical analysis.

The application evaluation protocol consisted of the following sequential stages:

1) Seven-day functional testing of applications with documentation of identified technical characteristics.

2) Independent expert evaluations by three specialists across all MARS scale parameters (n=23).

3) Collaborative discussion and consensus-building regarding final assessment scores with justification of discrepancies.

4) Calculation of arithmetic means for each evaluation category to generate composite quality indicators.

According to the comprehensive expert assessment results, the Adidas Running application demonstrated the highest composite quality score (M=4.68), with particularly elevated ratings in functionality (M=4.8) and aesthetic design (M=4.7), indicating its optimal compliance with research requirements (Table 1).

Table 1. Assessment of fitness apps using the MARS scale

Application	Engagement	Functionality	Aesthetics	Information quality	Subjective quality	Mean score
Adidas Running	4.6	4.8	4.7	4.6	4.7	4.68
Nike Run Club	4.5	4.7	4.8	4.5	4.6	4.62
RunKeeper	4.3	4.6	4.4	4.5	4.4	4.44
Samsung Health	4.4	4.5	4.3	4.6	4.3	4.42
Mi Fit	4.2	4.4	4.2	4.3	4.2	4.26

Procedure

1. High functionality and stability of the app.

2. The presence of all functions necessary for the study:

- Accurate physical activity tracking;
- Social elements;
- Gamification;
- Detailed analytics.

3. Availability on all popular platforms.

4. Availability of Russian-language interface.

5. Free basic functionality sufficient for conducting the study.

The choice of the app was driven solely by its technical specifications and functionality required for the study, and not by any commercial reasons.

Adidas Running best met the established criteria and requirements, as evidenced by the objective MARS score and the availability of the necessary functionality to conduct the planned assessments and interventions.

2. Fitness trackers: participants used their smartphones to track physical activity via Adidas Running.

a) Adapted version of the Basic Psychological Needs in Exercise Scale (BPNES) to assess the satisfaction of three basic psychological needs (autonomy, competence, and relatedness) in the context of physical activity (Höchsmann et al., 2019).

b) Intrinsic Motivation for Physical Activity Questionnaire (adapted version of the Intrinsic Motivation Inventory, IMI) to assess participants' intrinsic motivation for physical activity. This survey targets different aspects of intrinsic motivation, including interest/enjoyment, perceived competence, and efforts/importance.

c) Self-Organization of Activity Scale (SOA) to assess participants' ability to plan and organize their exercise. This scale can capture changes in self-organization that may result from using the app (Filipova, 2023; Mitina & Rasskazova, 2019).

We developed a brief weekly online survey to collect qualitative data on users' experience with Adidas Running and their subjective assessments of changes in physical activity levels. The survey consisted of 10 questions including closed-ended questions using a five-point Likert scale and open-ended questions to gather more detailed information. The validation results proved that the questionnaire had satisfactory psychometric properties and could be used for weekly assessments of participants' experience using the app and subjective changes in physical activity. The internal consistency of the questionnaire was confirmed by Cronbach's alpha ($\alpha = 0.82$).

The study was conducted over 12 weeks:

1. Preliminary testing (one week): All participants completed baseline assessments of physical activity, self-organization, and intrinsic motivation.

2. Intervention (10 weeks):

- The EG used Adidas Running to plan, track, and analyze their physical activity.
- The CG led their lives as usual without using special apps to track physical activity.
- Every week, all participants completed the weekly survey about their experience and level of physical activity.

3. Concluding follow-up testing (one week): all parameters were assessed a second time.

Data analysis

The empirical data underwent a two-pronged analytical approach combining quantitative and qualitative methodologies. The quantitative analysis employed an independent samples t-test, preceded by normality testing using the Shapiro-Wilk test. For qualitative analysis, we conducted systematic thematic analysis of weekly survey responses, implementing coding and categorization procedures following Braun and Clarke's (2006) methodological framework.

Survey data were analyzed using non-parametric statistical methods due to the distribution characteristics and measurement scale properties. Within-group comparisons of pre- and post-intervention measures utilized the Wilcoxon signed-rank test for paired samples, as this approach was required to identify statistically significant changes given the non-normal data distribution ($p < 0.05$). The Mann-Whitney U test was used to compare changes between the CG and EG. Correlation analysis was performed using Spearman's rank correlation coefficient.

The study was conducted according to ethical standards. All participants provided informed consent. The data were anonymized to ensure confidentiality.

Results

Data analysis showed a significant increase in physical activity in the EG compared to the CG (Table 2).

Table 2. Comparison of the average weekly number of steps between the CG and EG

Group	Beginning of the study	End of the study	Change
EG	5,234 ± 1,245	7,156 ± 1,478	+36.7%
CG	5,156 ± 1,312	5,432 ± 1,423	+5.4%

The average weekly step count in the EG increased by 36.7%, whereas the CG showed only a slight increase of 5.4%. Statistical analysis using a t-test for independent samples proved that the differences between the groups were statistically significant ($t = 6.82$, $p < 0.001$).

Analyzing BPNES scores, we found a statistically significant increase in the satisfaction of all three basic psychological needs in the EG (Table 3).

Table 3. Median levels of satisfaction of basic psychological needs before and after the experiment

Need	Group	Pre-experiment	Post-experiment	p-value
Autonomy	EG	4.0 (3.5-4.5)	5.0 (4.5-5.5)	<0.001
	CG	4.0 (3.5-4.5)	4.0 (3.5-4.5)	0.62
Competence	EG	3.5 (3.0-4.0)	5.0 (4.5-5.5)	<0.001
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.84
Relatedness	EG	3.5 (3.0-4.0)	4.5 (4.0-5.0)	<0.001
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.91

Note: The data are presented as median (interquartile range)

The Wilcoxon test confirmed that the increase in the satisfaction of all three basic psychological needs in the EG was statistically significant ($p<0.001$ for all three needs). In contrast, the CG showed no significant changes.

The Mann-Whitney U test confirmed significant differences in changes between the groups across all three needs ($p<0.001$).

Spearman's rank correlation coefficient indicated that increased satisfaction of basic psychological needs correlated positively with increased physical activity ($\rho = 0.65$, $p < 0.001$ for autonomy; $\rho = 0.69$, $p < 0.001$ for competence; $\rho = 0.57$, $p < 0.001$ for relatedness).

The analysis of intrinsic motivation showed a statistically significant increase in intrinsic motivation for physical activity in the EG ($p<0.001$) (Table 4).

Table 4. Average intrinsic motivation scores before and after the experiment

Group	Pre-experiment	Post-experiment	p-value
EG	3.5 (3.0-4.0)	5.0 (4.5-5.5)	<0.001
CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.73

Note: The data are presented as median (interquartile range)

The increase in intrinsic motivation for exercise in the EG was confirmed to be statistically significant by the Wilcoxon test ($p<0.001$). In the CG, no statistical changes were observed.

The Mann-Whitney U test confirmed the significance of differences in the changes between the groups ($p<0.001$).

Next, the EG demonstrated an evident improvement across all self-organization subscales, while the CG showed minimal statistically insignificant changes (Table 5).

Table 5. Median self-organization scores

Subscale	Group	Pre-experiment	Post-experiment	p-value
Regularity	EG	3.5 (3.0-4.0)	4.5 (4.0-5.0)	<0.001
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.78
Purposefulness	EG	3.5 (3.0-4.0)	4.5 (4.0-5.0)	<0.001
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.82
Perseverance	EG	3.0 (2.5-3.5)	4.0 (3.5-4.5)	<0.001
	CG	3.0 (2.5-3.5)	3.0 (2.5-3.5)	0.91
Fixation	EG	3.5 (3.0-4.0)	4.0 (3.5-4.5)	<0.01
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.85
Self-organization	EG	3.0 (2.5-3.5)	4.0 (3.5-4.5)	<0.001
	CG	3.0 (2.5-3.5)	3.0 (2.5-3.5)	0.88
Orientation to the present	EG	3.5 (3.0-4.0)	4.0 (3.5-4.5)	<0.05
	CG	3.5 (3.0-4.0)	3.5 (3.0-4.0)	0.93

Note: The data are presented as median (interquartile range)

The greatest increase in the EG can be seen in the subscales of "regularity" and "purposefulness" (median increase of 1.0 point, $p<0.001$). The "perseverance" and "self-organization" subscales also displayed significant improvements (median increase by 1.0 point, $p<0.001$)., $p<0.001$).

Less pronounced yet statistically significant changes were observed for the subscales "tracking" ($p < 0.01$) and "present-moment orientation" ($p < 0.05$). These values indicate positive dynamics, though with lower statistical significance compared to other parameters.

Between-group comparisons using the Mann-Whitney U test revealed statistically significant differences across all subscales ($p < 0.001$), demonstrating a robust experimental intervention effect.

Qualitative analysis of weekly survey data identified the following key thematic categories:

1. Increased awareness of physical activity: A significant majority of experimental group participants (85%) reported enhanced metacognitive skills for monitoring their physical activity levels.

2. Increased motivation due to social interaction functions: 72% pointed out that the opportunity to compare results with friends and participate in virtual competitions enhanced their motivation.

3. Improved exercise planning skills: 78% suggested they had become better at planning their workouts.

4. Difficulties in starting to use the app: 40% reported difficulties in the first two weeks of using Adidas Running, although most (35%) added that these difficulties had diminished over time.

5. Progress satisfaction: By the study's conclusion, an overwhelming majority of experimental group participants (82%) demonstrated high satisfaction with their achieved physical activity outcomes.

The empirical findings support the following conclusions regarding the study hypotheses:

H1: The use of Adidas Running application significantly increases physical activity levels in the experimental group compared to the control group. This hypothesis received statistical confirmation. The experimental group showed a statistically significant increase in physical activity (36.7%, $p < 0.001$) compared to the control group (5.4%).

H2: Intrinsic motivation for physical activity significantly increases in the experimental group compared to the control group. This hypothesis also found empirical support. Scores on the Intrinsic Motivation Inventory (IMI) indicate a statistically significant increase in intrinsic motivation in the experimental group ($p < 0.001$), while no significant changes were observed in the control group.

The results provide comprehensive evidence of Adidas Running's effects on students' physical activity, intrinsic motivation, basic psychological need satisfaction, and self-regulation skills, demonstrating the multifaceted impact of digital technologies on respondents' physical and psychological functioning.

Discussion

The findings demonstrate the significant positive influence of Adidas Running on physical activity, intrinsic motivation, and self-organization among students.

We observed a considerable increase in physical activity in the EG (by 36.7%) compared to the CG (5.4%). This is consistent with previous studies, such as the meta-analysis by Romeo et al. (2019), which suggests that smartphone apps can significantly boost physical activity. However, our study demonstrates a more pronounced effect, which may be due to the duration of the intervention and the specific characteristics of Adidas Running.

The significant increase in BPNES scores in the EG supports the provisions of SDT (Ryan & Deci, 2000) in the context of physical exercise. Improvement is observed across all three dimensions: autonomy, competence, and relatedness. This finding agrees with the conclusions of Teixeira et al. (2020) that digital interventions that support these needs contribute to the establishment of stable intrinsic motivation.

The results obtained with the IMI questionnaire show a significant increase in intrinsic motivation in the experimental group. This contradicts the concerns raised by Kerner and Goodyear (2017) that digital devices can create dependency on external stimuli. Our results give evidence that, when used appropriately, digital technologies can foster intrinsic motivation.

The improvement in self-regulation indicators, particularly in systematic planning and goal-directed behavior, demonstrates Adidas Running's potential as a tool for developing essential metacognitive competencies. This finding expands the scientific understanding of digital technologies' impact on self-regulation presented in the works of Stawarz et al. (2015) and Romi (2024), providing empirical evidence of a positive correlation between using purposefully selected digital tools and the development of self-regulation skills.

The qualitative analysis of weekly surveys yields valuable methodological insights into the application's mechanisms of influence on students' motivational constructs and behavioral patterns. Systematic categorization of qualitative data enabled identification of key influencing factors and establishment of cause-effect relationships between specific application features and observed psychological effects.

Our results contribute to the development of theoretical insights into the impact of digital technologies on students' physical activity and motivation.

The advances in SDT in the digital context were further validated by demonstrating how properly designed digital tools can support all three basic psychological needs: autonomy (through the provision of choice and control over physical exercise), competence (through progress tracking and feedback), and relatedness (through the social functions of the app). This expands the understanding of the applicability of SDT in a digital context (Akhmetov et al., 2024).

The mechanisms through which digital technologies influence intrinsic motivation are more complex than previously believed. Our study shows that when implemented correctly, extrinsic incentives (achievements, rewards) can promote intrinsic motivation instead of undermining it, as suggested in some previous studies (Kerner & Goodyear, 2017).

The key efficacy factor of this mechanism involves achieving an optimal balance between external stimulation and user autonomy support, which aligns with fundamental tenets of self-determination theory.

The role of social components in developing sustainable motivation demonstrates substantial significance. Interactive features enabling user connectivity, comparative performance analysis, and virtual competitions generate additional engagement (Kuang & Li, 2022), fostering long-term physical activity motivation. These findings corroborate and extend previous research conclusions regarding social support's importance in establishing health-preserving behavioral patterns.

The interconnection between self-regulation and digital tools manifests through the application's influence on planning and goal-setting skill development. Notably, improved self-regulation indicators emerged not only within physical activity contexts but also in broader life domains, suggesting skill generalization.

The process characteristics of forming exercise habits through digital technologies indicate that successful development of sustainable behavioral patterns requires gradual transition from extrinsic to intrinsic motivation, where digital tools serve as supportive mechanisms rather than primary motivators. This model facilitates motivational construct internalization and promotes long-term physical activity persistence.

Based on our findings, we can provide several practical recommendations.

Our recommendations for the adoption of digital technologies in physical education include the following measures:

- Introducing digital tools gradually, considering students' current digital literacy,
- Providing technical support and instruction on how to use the applications,
- Integrating digital tools into existing physical education programs,
- Creating a system to monitor the effectiveness of digital technologies implemented.

Possible strategies to increase the effectiveness of using fitness applications include:

- Personalization of workout goals and programs,
- Regular updates of content and challenges,
- Encouraging social interaction between users,
- Using gamification to support interest,
- Provision of constructive feedback.

The methods for overcoming barriers to the adoption of digital technology include:

- Providing preliminary training on how to use the app,
- Creating a user support system,
- Considering personal preferences and technical possibilities,
- Gradually increasing the difficulty of tasks and goals,
- Regularly collecting feedback to identify and address problems.

Possible opportunities to personalize approaches to student motivation include:

- Considering individual goals and preferences,
- Adjusting the complexity of tasks to the level of training,
- Providing a selection of activity types,
- Individualizing the rewards and achievements system,
- Accounting for the personal pace of progress.

Prospects for the integration of digital tools into educational programs lie in:

- Developing complex programs combining traditional and digital learning methods,
- Creating a system for evaluating the effectiveness of digital tools,
- Developing inter-university cooperation in the field of digital physical education,
- Developing methodological recommendations on the use of digital technologies,
- Creating a platform for the exchange of experience between teachers and students.

Particular attention should be paid to the long-term effectiveness of digital interventions and to the development of methods to support motivation after the active phase of using the apps. This may include creating a system of gradual transition from actively using the app to a more independent exercise organization.

The conclusions and recommendations can serve as a foundation for further development of physical education programs in higher education institutions and effective strategies to boost students' physical activity using digital technologies.

Notwithstanding, our study has limitations. First, the duration of the study (12 weeks) did not enable us to evaluate the long-term effects of using the app. Second, the study was conducted on a limited sample of students from a single university, which prevents us from generalizing its results.

Conclusions

The study results provide compelling evidence for the efficacy of digital technologies, particularly the Adidas Running application, in promoting physical activity among students while fostering intrinsic motivation and self-regulation skills. The empirical findings may serve as a foundation for developing evidence-based strategies to enhance physical activity in youth populations.

A fundamental conclusion of this research confirms the superior effectiveness of digital interventions that account for individuals' basic psychological needs and incorporate social interaction elements. This underscores the necessity for a comprehensive methodological approach when designing and implementing digital technologies within physical education and health promotion contexts.

Promising directions for future research include longitudinal analysis of application effects and the development of personalized approaches tailored to user characteristics. An additional area of scientific interest involves examining integration mechanisms for incorporating digital tools into standardized physical education programs.

This study makes a substantial contribution to understanding digital technologies' role in enhancing students' physical activity and psychological well-being, while opening new perspectives for innovative methodological approaches in physical education and health promotion grounded in empirically verified data.

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