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Enhancing students' engagement and motivation in physical education: the role of fitness tracker apps

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ABSTRACT

Background: The integration of technology in physical education (PE) has gained increasing attention for its potential to enhance student engagement and motivation. Fitness tracker applications, available on smartphones and wearables, offer innovative solutions for real-time feedback, activity monitoring, and motivational support. **Research Objective:** This study evaluates eleventh-grade students' perceptions of the effectiveness of fitness tracker apps in enhancing engagement and motivation in PE. **Methods:** The study was conducted with 60 students (30 males and 30 females) at Vocational High School 3 Tegal, Central Java, Indonesia. A mixed-methods approach was employed, combining quantitative data from structured questionnaires and fitness trackers with qualitative insights from semi-structured interviews and direct observations. Quantitative data were analysed using descriptive statistics and paired t-tests, while thematic analysis was applied to the qualitative data. **Finding/Results:** The quantitative results indicated significant improvements in student engagement, motivation, and awareness of physical fitness, with increased frequency of app usage and higher motivation to exercise ($p < 0.05$). Qualitative analysis revealed that students appreciated the real-time feedback and motivational features of the apps, which enhanced their overall enjoyment and commitment to physical activities. However, technical challenges such as data synchronisation issues and difficulties with initial setup were consistently reported by participants. **Conclusion:** Fitness tracker applications hold significant potential to enhance student engagement and motivation in PE. The relatively small sample size (60 students) may limit the generalisability of the findings. Future research should address this limitation by incorporating larger samples and exploring solutions to technical challenges.

Keywords: Digital competence; physical education; teaching innovation; technology adoption

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INTRODUCTION

The use of technology in physical education (PE) had become increasingly important in addressing the challenges of modern education. Technological tools had modernized the way physical activity was monitored, enhancing students' engagement and motivation through interactive features. One such technology adopted in PE was fitness tracker applications, which provided real-time feedback to students and monitored their physical activities, such as steps taken, heart rate, and calories burned (Laranjo et al.,

2021). These applications had proven to make PE more interactive, with students actively participating and motivated to achieve their fitness goals (Arufe-Giráldez et al., 2022; Vieira et al., 2022). Additionally, fitness monitoring technology had shown a significant impact on user behavior and motivation, with important implications for PE programmes (Abdelhamid, 2021).

While technology had been crucial for enhancing students' engagement, traditional methods often failed to accurately assess students' physical progress. Fitness tracker applications addressed this issue by providing quantitative data that allowed students to consistently track their physical development (Chaloupsky et al., 2020). These applications also encouraged students to set and pursue personal fitness goals, increasing intrinsic motivation for exercise and fostering healthy competition through gamification (Cao et al., 2022). Several systematic reviews had highlighted the benefits of gamification in PE, including increased motivation and improved physical performance (Arufe-Giráldez et al., 2022). Additionally, gamification had been shown to enhance students' engagement and academic performance when applied in PE settings (Camacho-Sánchez et al., 2023). These applications also optimised the spatial and temporal dimensions of education, creating new opportunities for active and participatory learning (Wang & Du, 2023).

Despite the clear benefits of these technologies, their implementation in developing countries like Indonesia faced significant challenges. Studies had shown that the digital divide greatly affected access to technology in these regions, particularly in the education sector. Many schools lacked adequate infrastructure, devices, and internet connectivity, limiting students' access to technology-based learning, including PE (Jastrow et al., 2022). This divides not only restricted access but also worsened educational inequalities, as students from lower socio-economic backgrounds struggled to access and benefit from digital learning tools (Lozano & Izquierdo, 2019). This gap had been underexplored in previous research, making it crucial to understand how these socio-economic factors influenced students' experiences with fitness technologies in a developing country context.

Additionally, the varying levels of technological familiarity and comfort among students impacted their engagement and the overall effectiveness of these tools in educational settings (Gil-Espinosa et al., 2022). Teachers also faced obstacles in adopting fitness technology due to insufficient training and institutional support. Teachers often struggled to understand the technical aspects of fitness apps and how to use them for real-time monitoring of student progress (Jastrow et al., 2022). Without adequate training and ongoing support, the full potential of fitness technology remained underutilised, particularly in schools with limited technological infrastructure. This study not only explored these challenges but also aimed to provide practical recommendations for overcoming them in the context of Indonesian schools.

This study aimed to evaluate the effectiveness of fitness tracker applications from the students' perspective, assessing how these applications influenced physical activity levels, engagement, and overall motivation in PE classes. While previous studies had demonstrated the potential of fitness tracker applications to improve physical activity engagement, limited research had specifically explored the lived experiences of students in developing countries such as Indonesia, particularly in vocational high schools where the digital divide and socio-economic challenges were more pronounced. Prior research, including that by (Arufe-Giráldez et al., 2022) and (Wang & Du, 2023), had largely focused on more developed countries, where infrastructure and access to technology were not as significant barriers. This study, therefore, sought to fill this gap by understanding the

specific challenges faced by students in Indonesia when using fitness tracker apps in PE.

By exploring these lived experiences, this research uncovered not only the technical challenges faced by students, such as difficulties with device synchronization and app usage, but also the impact on their motivation and engagement. Understanding these challenges provided valuable insights into how technology could be better integrated into PE curricula in developing countries. Additionally, the study aimed to offer policy recommendations for improving the integration of fitness technology in Indonesian schools, addressing issues related to infrastructure and teacher training.

The novelty of this research lay in its focus on the intersection of technology, socio-economic factors, and education in a developing country context. It employed a mixed-methods approach that combined both quantitative and qualitative data to provide a holistic understanding of the students' experiences. By addressing the digital divide and exploring how it impacted the use of fitness technology in vocational schools, this study provided critical insights into how education systems in developing countries could adapt to better utilise technology in promoting healthier lifestyles among students.

METHOD

This study employed a convergent mixed-methods design, which integrates qualitative and quantitative data collection and analysis to provide a comprehensive understanding of the research topic (Younas et al., 2023). This design was suitable for the study as it allowed for statistical analysis of student perceptions, while also offering deeper insights into individual experiences with fitness tracker apps. Quantitative data were collected through structured questionnaires and fitness trackers, while qualitative data were gathered from semi-structured interviews and direct observations.

Participants and Sampling

The study included 60 eleventh-grade students (30 males and 30 females), aged 16-17, from Vocational High School 3 Tegal, Central Java, Indonesia. This age group was selected because adolescents at this stage are forming critical physical activity habits that can influence lifelong health (Monazami et al., 2020). Additionally, their increased maturity compared to younger students allows for more reliable self-reports and active engagement with the fitness tracker technology (Citro et al., 2024).

For the qualitative component, a subset of 10 students was selected for semi-structured interviews. These students were chosen using specific inclusion criteria to ensure diverse representation in terms of gender, age, and varying levels of engagement with the fitness tracker apps. This approach enabled a more comprehensive exploration of individual experiences with the fitness tracker apps. Although the study employed semi-structured interviews, which provide flexibility and depth to capture a range of insights, it was designed to balance breadth with the depth necessary to understand the key themes and issues related to the use of these apps in physical education. This method allowed for a focused investigation into students' perceptions and the challenges they encountered, offering valuable insights that complement the quantitative findings.

Instruments

The first instrument was a structured questionnaire designed specifically for this study, following established methods for evaluating technology use in education (Luo et al., 2022; Monazami et al., 2020). It focused on app usage frequency, perceived importance, motivation for exercise, and confidence in using the apps. The 20-item questionnaire employed a 5-point Likert scale with sample questions such as "The fitness tracker app is beneficial for monitoring my physical activity" and "The app motivates me

to exercise more frequently." The internal consistency of the questionnaire was high, with a Cronbach's alpha of 0.89, indicating strong reliability (Manzotti et al., 2022).

The second instrument was a semi-structured interview approach, widely used in qualitative research to explore participants' personal experiences with educational technologies (Younas et al., 2023; Citro et al., 2024). A purposive sampling method was applied to select a subset of 10 students, considering gender, age, and varying levels of engagement with the fitness tracker apps. This approach ensured a comprehensive exploration of individual experiences and captured diverse perspectives on the use of fitness tracker apps in physical education.

The third instrument involved direct observation, a method commonly used to assess students' engagement and interaction with technology in educational settings (Abdelhamid, 2021). An observation checklist was employed during physical education sessions to track app utilisation, student participation levels, and the overall impact on physical activity performance. This method provided a standardized assessment of engagement, complementing the qualitative insights obtained from the interviews.

Procedure

The study was conducted over a period of four weeks, with several distinct stages. Initially, a briefing session was held to inform students about the study's objectives and procedures, followed by training on how to use the fitness tracker apps. During physical education classes, students used the fitness tracker apps to monitor their activity levels in various exercises, including running, team sports, and aerobic activities. Data from the apps, such as step counts, heart rate, and active minutes, were recorded weekly. This data was used to track students' progress and assess the impact of the apps on their engagement and motivation.

Data collection involved administering the questionnaires before and after the study period to measure changes in students' perceptions. Additionally, interviews were conducted with selected students at the end of the study period, and observations were carried out throughout the study to assess students' engagement and app usage during PE classes.

Data Analysis³⁴

Quantitative Data Analysis

Descriptive statistics were employed to summarise the general trends in students' perceptions of fitness tracker apps before and after the intervention. This method provided a clear overview of changes in engagement, usage, and motivation levels. Paired t-tests were conducted to determine whether the observed changes in students' perceptions from pre- to post-intervention were statistically significant. This statistical approach was appropriate for the study as it provided a robust comparison of related groups, allowing for the identification of meaningful improvements in students' engagement and motivation following the use of fitness tracker apps.

Qualitative Data Analysis¹³

In this study, qualitative data were analysed using thematic analysis, a method that identifies, analyzes, and reports patterns (themes) within the data. The process began with familiarization, where the researcher thoroughly reviewed interview transcriptions and observation notes to gain a deep understanding of the data. Initial codes were then systematically generated across the dataset, capturing significant features relevant to the research questions.

These codes were organised into potential themes, which were reviewed, refined, and named to ensure clarity and coherence. The process involved grouping related codes to form overarching themes that accurately represented the data. This structured approach allowed for an in-depth exploration of students' experiences with fitness tracker applications in physical education.

The final step involved defining and naming each theme, ensuring they were clearly related to the study's objectives. This thorough process ensured that the qualitative insights complemented the quantitative findings, offering a comprehensive understanding of students' experiences with fitness tracker apps in physical education.

Ethical Considerations

The study was conducted in accordance with ethical guidelines to ensure the protection and well-being of all participants. Informed consent was obtained from the students and their parents or guardians. Participants were assured of the confidentiality of their responses and their right to withdraw from the study at any time without consequences. Ethical approval for the study was obtained from the Research Ethics Committee of Universitas Pendidikan Indonesia, ensuring compliance with all relevant ethical guidelines.

RESULTS AND DISCUSSION

Quantitative Result

The results demonstrated significant positive changes in students' perceptions following the study. Key variables such as frequency of app usage, familiarity, perceived importance, motivation to exercise, and confidence in using the app all showed meaningful increases (see Table 1). For instance, average frequency of app use rose from 3.39 to 4.17, indicating increased engagement over the study period. Similarly, motivation to exercise saw an improvement, with mean scores increasing from 3.21 to 4.22.

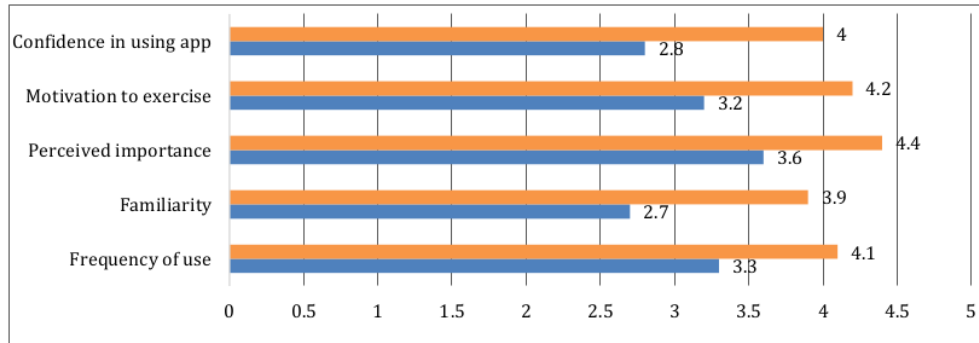
Table 1. Students' Perceptions of Fitness Tracker Applications

Variable	Pre-study Mean	Post-study Mean	Article F-t-value	p-value
Frequency of use	3.4 (0.8)	4.2 (0.7)	Missing 3.72	0.003
Familiarity	2.8 (1.0)	4.0 (0.9)	4.15	0.001
Perceived importance	3.6 (0.7)	4.5 (0.6)	5.02	< 0.001
Motivation to exercise	3.2 (0.9)	4.3 (0.8)	3.9	0.002
Confidence in using app	2.9 (0.9)	4.1 (0.8)	4.22	0.001

Overall, the data illustrate significant positive changes in all measured aspects of students' perceptions. These results highlight the effectiveness of fitness tracker applications in enhancing students' engagement and confidence in physical fitness activities when integrated into their routine. Most students reported feeling more motivated and found it easier to track their fitness progress with the fitness tracker applications. However, some students faced technical difficulties such as synchronisation issues and initial setup confusion.

The findings of this study align well with existing literature that supports the positive impact of fitness tracker apps on student engagement and motivation in physical activities. Students' experiences with fitness tracker apps may have social and psychological implications, influencing their perceptions of physical activity, self-monitoring, and goal achievement within a peer group or community (Patterson et al., 2024). Additionally, fitness tracker apps can support educational initiatives by offering quantified information about training processes and physical activities, enhancing

students' understanding of their fitness routines (Dini Kounoudes et al., 2023). Similarly, (Wang & Du, 2023) highlighted the potential of fitness tracker apps to create dynamic and interactive learning environments, supporting the increased familiarity and confidence seen among the students in this research.



Graph 1. Students' Perceptions of Fitness Tracker Applications

The technical challenges reported by students, such as data synchronisation issues and initial setup difficulties, are consistent with the concerns raised by Guo (2022) who highlighted similar barriers to the effective implementation of fitness technologies. These challenges emphasise the need for adequate technical support and initial training to ensure seamless integration and usage of fitness tracker apps in educational settings.

Qualitative Findings

The thematic analysis of interviews and observations revealed four key themes regarding students' experiences using fitness tracker apps in physical education. Each theme is closely related to the broader research domain of enhancing student engagement, motivation, and self-awareness in physical education through technology.

Theme 1: Increased Motivation and Engagement

This theme explores how fitness tracker apps contribute to heightened students' motivation and engagement in physical education. Students reported that the apps made physical activities more enjoyable and motivating. Features like virtual rewards and automatic reminders were particularly effective in encouraging students to stay active and participate more enthusiastically in physical education classes.

"The app's reminders and rewards system make exercising fun and competitive. I feel more motivated to reach my daily step goals." (P1)

"The app makes tracking my activity easier and I can see my progress, which motivates me to stay active." (P2)

"I like the app because it gives me reminders to move and exercise, which I sometimes forget." (P3).

"Sharing my progress with friends through the app makes it more enjoyable and motivates me to do better." (P4)

These findings align with (Shang et al., 2023) who emphasised the importance of enhancing student motivation to improve learning outcomes in physical education. Schoeppe et al. (2023) also found that goal setting, self-monitoring, and motivational messages in fitness interventions increased engagement and motivation. Similarly, Patterson et al. (2024) implemented a sedentary behavior change app in cardiac rehabilitation, which included a wearable activity tracker, influencing behaviour by creating physical opportunities and enhancing motivation and engagement in physical activity.

Theme 2: Self-Awareness and Fitness Monitoring

This theme examines how fitness tracker apps improve students' self-awareness and monitoring of their physical fitness progress. Students felt more conscious of their fitness levels and were able to track their improvements over time. This awareness was facilitated by the real-time feedback and personalised fitness goals provided by the apps.

"Seeing my fitness progress every day keeps me motivated. I know exactly what I need to improve." (P4)

"Using the app has made me more aware of my fitness levels and what I need to do to improve." (P6)

"The app's features are very helpful in keeping track of my exercise routines and staying motivated." (P7)

The increase in self-awareness and monitoring can be linked to Self-Determination Theory (SDT), which emphasises the development of competence as a critical component of intrinsic motivation (Deci & Ryan, 2000). The fitness tracker apps allow students to self-monitor their physical activity, which helps them develop a sense of competence—one of the three basic psychological needs outlined in SDT. As students track their progress and set personal fitness goals, they experience a greater sense of control over their physical activities, fostering intrinsic motivation. This aligns with findings by Luo et al. (2022), who suggested that structured self-monitoring through digital tools boosts self-confidence and motivation.

Moreover, consistent real-time feedback from the apps further supports students in developing their skills and achieving fitness milestones, reinforcing the cycle of competence development. This process is crucial for promoting self-regulated learning and behavior change, as students become more engaged in actively managing their physical health. According to Chen et al. (2024), self-service technologies, including fitness trackers, enhance users' ability to monitor their activity levels, which contributes to long-term behavior modification.

Theme 3: Technical Challenges and Barriers

This theme identifies the technical challenges and barriers that students faced while using fitness tracker apps. Issues such as data synchronisation problems and initial unfamiliarity with the app's features were common. These challenges hindered the full potential of the apps to enhance student engagement and motivation.

"Sometimes the app doesn't sync with my device, which is frustrating. Also, getting used to all the features took some time." (P8)

"There were some technical issues at first, but once I got used to it, the app really helped me stay on track." (P9)

These technical challenges are consistent with the concerns raised by Guo (2022) about barriers to the effective implementation of fitness technologies. Addressing these issues with adequate technical support and training is crucial for maximising the benefits of fitness tracker apps. Schoeppe et al. (2023) reported similar technical difficulties, highlighting the need for adequate technical support and training. Similarly, Jembai et al. (2022) found that app navigation issues and user discomfort with tracker bands hindered engagement, reinforcing the importance of addressing these technical barriers.

Theme 4: Social Benefits and Constructive Competition

This theme explores the social benefits and the role of constructive competition facilitated by fitness tracker apps. Students reported that they enjoyed friendly competition with their peers, which added a social dimension to physical education and motivated them to engage more actively. The competition was framed positively, encouraging students to improve their physical activity levels while fostering camaraderie rather than rivalry. Such constructive competition has been shown to enhance not only physical outcomes but also social connections among students, making physical education more engaging and supportive.

"We compete to see who can get the highest step count each day. It's fun and pushes us to do more." (P10)

The social benefits and constructive competition observed in this study are supported by Alvarez et al. (2023), who noted that these tools empower students to take control of their physical activity levels and health outcomes. Wons et al. (2022) also highlighted the motivational aspects of social interactions and competition facilitated by these tools. McCormack et al. (2022) emphasised how wearable activity trackers and eHealth apps foster social comparison, competition, and group-based activities, reinforcing the motivational aspects observed in this study.

By addressing these themes, the study provides a comprehensive understanding of how fitness tracker apps can enhance student engagement, motivation, and self-awareness in physical education. These insights are crucial for educators and policymakers aiming to integrate technology effectively into physical education curricula.

These findings are consistent with existing literature on the benefits of fitness tracker applications in educational settings, particularly in physical education (PE). Numerous studies have demonstrated the positive impact of such technology on students' engagement, motivation, and self-awareness in physical activity. For example, Guo (2022) and Wang and Du (2023) noted that fitness trackers provide real-time feedback and set measurable goals, boosting motivation by allowing students to monitor their progress and achieve personal fitness objectives. The immediate feedback offered by these apps plays a key role in enhancing students' intrinsic motivation in PE, as it fosters a sense of competence (Üstün, 2018). When students visualise their progress through the collected data, as shown in this study, they are more likely to participate actively in class and pursue fitness goals outside of school (Guo, 2022; Wang & Du, 2023).

The use of self-monitoring technologies in PE is grounded in the principles of self-regulated learning (SRL), which emphasises the importance of students taking an active role in their learning processes (Gumilang et al., 2022). This study's findings align with

research indicating that fitness trackers enhance student autonomy and self-monitoring capabilities, which are critical for fostering intrinsic motivation. Moreover, wearable fitness trackers have been shown to increase physical activity levels and reduce sedentary behaviours (Barkley et al., 2021). The ability of students to continuously monitor and adjust their activities through the data provided by these apps further empowers them to make informed decisions regarding their health behaviours (Carpenter et al., 2022).

The integration of fitness tracker apps in PE not only promotes engagement but also offers personalized learning experiences, which align with current trends in digital health technologies (Ha et al., 2022). This personalised approach is vital, considering the diverse needs of students in PE settings. Recent trends also highlight the widespread adoption of mobile applications designed to encourage physical activity, with studies showing significant improvements in students' attitudes and behaviors toward fitness when using these technologies (Laranjo et al., 2021). For instance, mobile fitness apps increasingly leverage data analytics and artificial intelligence to provide tailored recommendations, which enhance the effectiveness of fitness interventions by ensuring that students receive guidance relevant to their individual needs (Kalgoitra et al., 2022).

Quantitative analysis revealed substantial increases in students' perceptions regarding the frequency of app use, familiarity, perceived importance, motivation to exercise, and confidence in using the app. These improvements suggest that fitness tracker apps effectively engage students and enhance their educational experience in PE. This aligns with the findings of Khan et al. (2020), who emphasised that increased students' engagement leads to greater satisfaction, enhanced motivation to learn, reduced feelings of isolation, and improved performance. By fostering engagement and motivation, fitness tracker apps can similarly improve student satisfaction and performance in PE programs. In addition, gamification elements—such as rewards, challenges, and social sharing—have been shown to significantly boost user motivation and adherence to fitness programmes (Tong et al., 2022), a finding echoed in this study.

Qualitative insights from interviews and observations further support these quantitative findings. Students reported increased motivation and engagement, attributing their enhanced physical activity levels to features of the fitness tracker apps, such as virtual rewards and automatic reminders. Observations also indicated higher levels of active participation and enthusiasm in PE classes. These observations align with (Shang et al., 2023), who emphasised the importance of enhancing student motivation to improve learning outcomes in PE. Additionally, apps that allow students to track their physical activity and compete with classmates can foster a sense of community and accountability, ultimately leading to increased participation in physical activities (Ben et al., 2022). By leveraging fitness tracker apps to track activity levels and set goals, educators can significantly enhance student motivation and promote active engagement in PE.

Some limitations of this study warrant further discussion. While technical challenges, such as data synchronisation issues, were identified, other factors may have influenced the results, including students' varying levels of familiarity with technology. Previous research has shown that many users, particularly younger ones, may struggle with navigating interfaces and interpreting data (Henriksen et al., 2021; Kononova et al., 2019). Additionally, demographic variables such as age and gender likely played a role in how students interacted with the fitness tracker apps. Younger individuals, especially high school or college students, tend to adopt fitness apps more readily due to higher levels of digital literacy (Baer et al., 2022; Chlebowy et al., 2021). Gender differences may also affect app usage, with men often focusing on features related to performance

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tracking and competition (Rodríguez et al., 2023), while women are more likely to engage in directed activities, such as exercise classes, which are frequently emphasized in health-oriented apps (Tong et al., 2022). These individual characteristics suggest that the effectiveness of fitness tracker apps in educational settings can vary significantly depending on demographic factors.

In terms of practical applications, the findings suggest that fitness tracker apps can serve as valuable tools for teachers, policymakers, and students. Teachers can use the data to tailor PE programmes to individual student needs, increasing engagement and motivation through personalised feedback and goal-setting (Kounoudes et al., 2023). Policymakers might consider integrating these technologies into school curricula to promote active lifestyles and address the global issue of physical inactivity among students (Schoeppe et al., 2023). Future research should explore the long-term effects of fitness tracker use in educational settings, particularly regarding sustained behaviour change and the role of competitive features in fostering healthy competition and peer motivation (Alvarez et al., 2023).

This study adds to the growing body of literature supporting the integration of technology in physical education, providing empirical evidence of the effectiveness of fitness tracker apps. The combination of quantitative and qualitative data offers valuable insights into how these apps can enhance students' engagement, motivation, and self-awareness. Future research should address the identified technical challenges and examine demographic influences to optimise the use of these tools in diverse educational settings.

CONCLUSION

The findings of this study have significant implications for both educational institutions and policymakers. Fitness tracker applications have been shown to improve student engagement, motivation, and self-awareness in physical education. To fully leverage these benefits, policymakers should prioritise integrating fitness tracker apps into educational systems by taking concrete steps. This includes mandating the inclusion of these apps in physical education curricula across schools, ensuring that schools are equipped with the necessary devices and infrastructure through well-planned funding schemes. Additionally, collaborations between app developers and educational institutions should be established to create customised fitness solutions that align with specific educational goals and student needs.

Moreover, enhancing digital literacy is crucial for maximising the effectiveness of fitness tracker technologies. Policymakers should invest in training programs for teachers, enabling them to confidently incorporate these tools into their lessons. At the same time, schools should educate students on how to use and interpret fitness data, empowering them to make informed decisions about their physical health and activity levels. By improving digital literacy, both students and educators will be better positioned to utilise these technologies to their full potential.

The integration of fitness tracker apps into physical education not only fosters engagement but also supports personalised learning experiences, aligning with current trends in digital health technologies. As fitness tracking becomes more prevalent, it is essential to ensure that both students and teachers have the necessary skills and support to fully benefit from these tools.

This study contributes to the growing body of literature supporting the use of technology in physical education by offering empirical evidence of the effectiveness of fitness tracker apps. By combining both quantitative and qualitative data, the research

2 provides valuable insights into how these apps enhance students' engagement, motivation, and self-awareness. Additionally, this study identifies specific technical challenges, such as data synchronisation and app setup difficulties, that should be addressed to optimise the use of fitness trackers in educational settings.

Future research should explore the long-term effects of using fitness tracker applications in physical education, particularly focusing on sustained behaviour change and the role of competition features in fostering peer motivation. Additionally, further studies should consider how these tools can be customised to accommodate diverse demographic groups, such as students from different socio-economic backgrounds or with varying levels of digital literacy. Addressing these issues will ensure that fitness tracker applications are effectively integrated into a wide range of educational settings, thereby enhancing the overall quality of physical education programmes.

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8 CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this research. All procedures and activities associated with this study were conducted in accordance with ethical standards and without any influence from funding agencies or other entities that could affect the objectivity and integrity of the findings.

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