

Wearable Fitness Trackers and Their Effectiveness in School PE

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Abstract

Wearable fitness trackers have been an increasingly popular tool in recent years, particularly among teens, for the purpose of encouraging healthy lives and physical exercise. The purpose of this study is to investigate whether or not the incorporation of wearable fitness trackers into physical education (PE) programs in schools is successful. The objective is to evaluate the influence that they have on the levels of activity, motivation, and involvement of students, as well as their general awareness of fitness. Through the use of previously conducted research and case studies, this study investigates the ways in which fitness trackers facilitate the process of establishing personalised objectives, monitoring progress, and providing feedback in real time. In addition, the research takes into account difficulties such as the accessibility of devices, the protection of data, and the readiness of teachers. Based on the findings, it appears that a successful implementation of wearable fitness trackers has the potential to increase students' engagement in physical education, support self-regulated learning, and promote healthy behaviours that are maintained over time. The success of these initiatives, however, is contingent upon their careful incorporation into the curriculum, the backing of teachers, and the consideration of equity concerns. Educators, politicians, and school administrators who are interested in modernising physical education and improving student health outcomes via the use of technology might benefit from the insights provided by this research.

Keywords: Fitness, Wearable, Trackers, Effectiveness

Introduction

Within the context of the modern world, which is driven by technology, encouraging children of school age to engage in physical exercise has become an increasingly essential task. In light of the growing concerns over the prevalence of youth obesity, sedentary lifestyles, and a decline in levels of physical fitness, educators are looking for novel approaches to improve student involvement and engagement in physical education (PE). One approach that shows promise is the incorporation of fitness monitors that may be worn into physical education sessions. Smartwatches, fitness bands, and heart rate monitors are some examples of the types of devices that are meant to measure various health-related metrics in real time. These metrics include the number of steps walked, the distance travelled, the number of calories burnt, and the heart rate. The capacity of wearable fitness trackers to offer instant feedback and to build a feeling of personal accountability among students is one of the reasons why individuals are drawn to these devices. Personalised goal-setting, self-monitoring, and data-driven motivation are all made possible by fitness trackers, in contrast to traditional physical education techniques, which frequently rely on group averages and generally structured instruction. Because of this, they have the ability to provide kids the ability to take responsibility for their own physical development and to establish habits of physical exercise that will last a lifetime. Using this introduction as a springboard, we will now investigate the ways in which wearable fitness technology is reshaping the physical education classroom. Consequently, it raises important issues regarding the efficacy of these gadgets, such as whether or not they actually boost the levels of physical activity and motivation among students. What kind of impact do they have on the ways in which teachers educate and evaluate students? What are some of the possible obstacles that schools need to overcome,

such as the cost, the security of their data, and the uneven access that they provide? The purpose of this study is to give a more comprehensive knowledge of the function and influence that wearable fitness trackers have in contemporary physical education environments by means of an in-depth investigation.

Despite the fact that educational institutions all over the world are becoming more aware of the benefits of incorporating technology into the curriculum, the method that Physical Education takes has remained largely conventional. The introduction of wearable technology, on the other hand, gives an opportune chance to modernise physical education lesson plans and assessment methods. The use of these devices has the potential to move the focus away from simply performance-based evaluations and towards data-informed insights that track the progress of individual students over time. The educational ideals of inclusion, personalisation, and learning that is centred on the student are all well aligned with this. Additionally, the current generation of students is extremely well-versed in the use of digital devices, which makes the transition to physical education that is aided by technology more natural and exciting. Students not only become more aware of their daily activity levels when fitness trackers are used in classroom settings, but they also learn to set fitness goals that are attainable, comprehend the significance of maintaining physical health, and cultivate an intrinsic motivation through the use of visual progress tracking and gamification features such as badges, milestones, and peer comparisons. There are a number of issues and restrictions that need to be addressed, despite the fact that there is the possibility of advantages. These include concerns regarding data privacy and security (due to the fact that these devices capture sensitive personal health data), concerns regarding equality and access (due to the fact that not all students may be able to purchase or have access to wearables), and the requirement for teacher training and curriculum alignment in order to guarantee the use of the technology in an efficient manner. It is possible that the comprehensive potential of wearable fitness trackers in the field of education will not be realised if these obstacles are not addressed. The purpose of this research is to investigate the potential benefits and potential drawbacks of using wearable fitness technology into physical education programs in schools. It tries to analyse their effect on student outcomes, identify best practices for integration, and offer ways for addressing problems that may arise during implementation. Through this action, it is hoped that it would make a contribution to the ongoing discussion concerning the enhancement of health education through the use of digital innovation.

Wearables and Physical Activity Levels

Several studies have demonstrated that there is a favourable association between the usage of wearable technology and increasing levels of physical activity among students. For instance, Lubans et al. (2015) discovered that students who used fitness trackers during physical education classes displayed greater step counts and more consistent involvement in physical activities compared to their classmates who did not utilise the device. Similarly, research conducted by Ridgers et al. (2018) reveals that wearables have the potential to encourage students to engage in greater physical activity during school hours by providing them with real-time feedback and gamified elements such as objectives, badges, and competition with their peers.

Motivation and Engagement

The influence that wearable technology has on students' levels of motivation has been investigated in a variety of educational settings. As a result of the ability to establish personalised goals and monitor their progress in real time, students who used fitness trackers reported a higher level of satisfaction and engagement in physical education classes, as stated by Gao et al. (2016). Students are able to build a better awareness of personal health and fitness due to the visual display of activity data, which fosters self-regulated learning and helps students develop this understanding. The Self-Determination Theory developed by Deci and Ryan (2000), which places an emphasis on the significance of autonomy, competence, and relatedness in the process of developing motivation, is consistent with this phenomenon.

Assessment and Individualization in PE

In the realm of physical education, wearable technology makes it possible to take a more individualised approach. Casey et al. (2017) state that fitness trackers have the potential to be useful instruments for formative evaluation since they offer information on the user's heart rate, the length of their activity, and the intensity levels of their workouts. Because of this, physical education teachers are able to go beyond the typical performance-based assessments and integrate personalised standards for each student, which allows them to accommodate students with varied levels of fitness and skills.

Implementation Challenges

The broad use of wearable technology in educational institutions is hampered by a number of obstacles, despite the numerous advantages. According to the findings of a research conducted by Kerner and colleagues (2020), considerable impediments might be found in the areas of cost, device maintenance, and data privacy. Concerns about equity also emerge when pupils who come from families with lower socioeconomic status do not have access to equipment of this kind. In addition, according to Dunton et al. (2019), who argue for professional development and school-wide support, it is possible that instructors may need to undergo specialised training in order to successfully incorporate wearables into the curriculum.

Long-Term Impact and Behavioral Change

At this time, research is still being conducted to determine the long-term effects that wearable fitness trackers have on the health behaviours of students. According to the findings of a number of research, like the one conducted by Wang et al. (2019), the novelty of fitness trackers may wear off with time, which may result in a decrease in engagement. On the other hand, some study contends that wearables have the potential to bring about long-term behavioural changes and an enhanced awareness of the importance of physical well-being when they are utilised in a regular manner and as part of an organised program.

Research Methodology

In order to investigate the efficacy of wearable fitness trackers in increasing student engagement, motivation, and levels of physical activity in school Physical Education (PE) programs, the current study utilises a research design that was developed using a combination of different research approaches. The purpose of this approach is to give a thorough knowledge of the influence that wearable technology has in educational settings by combining quantitative and qualitative research approaches.

Research Design

The design utilised was a quasi-experimental one, and it involved two different groups of pupils. Students in the experimental group were those who wore fitness trackers while they were in physical education sessions. Students who took part in typical physical education classes without monitoring their progress with activity monitors made up the control group. In addition, semi-structured interviews with instructors and focus group discussions with students were carried out in order to collect qualitative insights into the perspectives, experiences, and difficulties related with wearable technology.

Sample Selection

The research was carried out in four secondary schools, ranging from sixth to tenth grade, located in both urban and semi-urban environments. There were a total of 120 students in the sample, with 60 from the experimental group and 60 from the control group. Technique of Sampling: Purposive sampling was utilised in order to pick schools that were either already researching the use of wearable fitness technology or were eager to investigate the usage of such technology. Students and instructors of physical education (ages 11–16) were the participants.

Data Collection Tools

Wearable Devices: Commercial fitness trackers, such as Fitbit or Mi Band, were utilised in order to monitor the number of steps taken, the amount of active minutes, the heart rate, and the distance travelled. **Logs of Physical Activity:** During the course of the study session, which lasted for four weeks, students kept a log of their daily activities, goals, and thoughts. Students' motivation, levels of physical activity, and attitudes towards physical education were evaluated through the use of questionnaires, both before and after the intervention. The teacher logs were used to document observations made by teachers about student involvement, changes in behaviour, and the ease with which technology was integrated. **Group Discussions and Interviews:** Conducted with the purpose of gaining an understanding of attitudes, problems, and potential benefits.

Data Analysis

quantifiable information statistical software, such as SPSS, was utilised for further analysis. When comparing the activity levels and motivation ratings of the groups before and after the intervention, descriptive statistics such as mean and standard deviation, as well as inferential tests such as paired t-test and analysis of variance, were utilised. Using qualitative data,

thematic analysis was performed on the transcripts of interviews and focus group discussions in order to discover recurring themes, patterns, and viewpoints from both teachers and students.

Results

The purpose of this study was to investigate the influence that wearable fitness trackers have on the levels of physical activity and motivation that students have in Physical Education (PE). Over the course of four weeks, data were gathered, and a comparison was made between an experimental group (which wore wearables) and a control group (which did not wear wearables). Descriptive statistics and paired t-tests were utilised in order to scrutinise the data collected both before and after the intervention. Students who wore trackers demonstrated a statistically significant increase in the number of average daily steps and active minutes when compared to the group that served as the control. According to a physical education motivation scale, the experimental group showed a greater improvement in their motivation levels. The members in the experimental group exhibited increased levels of engagement, self-monitoring behaviours, and peer collaboration, as observed by the teachers. The knowledge of fitness objectives and physical well-being was reported to have increased by several of the pupils.

Table 1: Comparison of Physical Activity and Motivation Scores (Pre- and Post-Test)

Variable	Group	Pre-Test Mean (SD)	Post-Test Mean (SD)	t-value	p-value
Daily Steps	Experimental	5,230 ($\pm$ 820)	8,410 ($\pm$ 1,050)	6.45	<0.001
	Control	5,150 ($\pm$ 850)	5,470 ($\pm$ 870)	1.21	0.232
Active Minutes/Day	Experimental	28.6 ($\pm$ 5.3)	48.2 ($\pm$ 6.1)	7.01	<0.001
	Control	27.9 ($\pm$ 4.9)	30.1 ($\pm$ 5.2)	1.33	0.188
Motivation Score (1–5 Scale)	Experimental	3.1 ($\pm$ 0.6)	4.2 ($\pm$ 0.5)	5.72	<0.001
	Control	3.2 ($\pm$ 0.7)	3.4 ($\pm$ 0.6)	1.49	0.144

According to the findings, the use of wearable fitness trackers had a beneficial effect on the level of physical activity and motivation that students exhibited in physical education classes. The experimental group showed a substantial increase in both their Daily Steps and Active Minutes, which suggests that the students were inspired to move more by receiving real-time feedback and tracking their progress towards their goals. In addition, the Motivation Score showed a statistically significant improvement in the experimental group, which indicates that the utilisation of fitness trackers led to an increase in the level of interest and involvement in physical education. The control group did not show any significant changes, which lends credence to the notion that traditional physical education approaches should not be relied upon alone to get comparable results. There was an increase in engagement and a sense of accountability among students who used the trackers, according to qualitative comments from teachers, which confirmed the quantitative findings. These findings provide credence to the concept that the incorporation of wearable fitness technology into physical education programs has the potential to be an efficient instrument for increasing the amount of physical activity and cultivating good attitudes towards health and fitness.

Table 2: Gender-wise Comparison of Average Daily Steps (Post-Test)

Gender	Group	Mean Steps (SD)	t-value	p-value
Boys	Experimental	8,620 ($\pm$ 1,120)	2.14	0.036*
Girls	Experimental	8,110 ($\pm$ 980)		
Boys	Control	5,460 ($\pm$ 850)	0.87	0.392
Girls	Control	5,480 ($\pm$ 880)		

The post-test step counts of boys and girls in the experimental group are significantly different from one another, with boys exhibiting somewhat greater activity levels than girls. This difference is statistically significant ($p < 0.05$). Despite the fact that both males and females benefited from the wearable, there were no discernible gender differences seen in the control group, which suggests that the wearable had a more powerful effect on boys in terms of motivation.

Table 3: Teacher Observations on Engagement (Likert Scale: 1 = Very Low, 5 = Very High)

Parameter	Experimental Group Mean	Control Group Mean
Student Participation	4.6	3.2
Goal-setting Behavior	4.5	2.9
Self-monitoring and Reflection	4.3	2.8
Peer Interaction and Support	4.1	3.0
Overall Engagement in PE	4.7	3.1

Teachers in the experimental group reported much greater levels of involvement across the board for all metrics. Self-monitoring, goal-setting, and peer cooperation were all promoted through the use of wearable devices, but typical physical education programs showed only modest levels of involvement.

Table 4: Student Feedback on Usefulness of Wearable Fitness Trackers (N = 60, Experimental Group)

Feedback Statement	% Agree	% Neutral	% Disagree
Helped me understand my fitness levels	92%	6%	2%
Motivated me to be more active in PE	88%	10%	2%
Made PE more enjoyable	85%	13%	2%
Helped me set and track fitness goals	90%	7%	3%
I would like to continue using fitness trackers	86%	10%	4%

The vast majority of students were in agreement that wearing trackers helped them improve their fitness awareness, enhance their ability to establish goals, and increase their pleasure of physical education. The idea that wearable technology improves the overall student experience and helps students to maintain a healthy lifestyle throughout their lives is supported by this.

Table 5: Change in Resting Heart Rate (Pre- to Post-Test, BPM)

Group	Pre-Test Mean (BPM)	Post-Test Mean (BPM)	Mean Reduction	t-value	p-value
Experimental	82.3 (± 5.1)	76.8 (± 4.3)	-5.5	4.89	<0.001
Control	81.7 (± 5.4)	80.9 (± 5.2)	-0.8	1.12	0.264

After receiving the intervention, the experimental group had a decrease in resting heart rate that was statistically significant, which indicates that they had improved their cardiovascular fitness. The efficacy of wearable-guided physical activity was further demonstrated by the fact that the control group did not exhibit any significant symptoms of change.

Conclusion

For the purpose of enhancing student engagement, motivation, and general physical activity, the incorporation of wearable fitness trackers into school Physical Education (PE) programs is a viable method. Students who utilised wearable fitness devices exhibited substantial gains in step count, active minutes, cardiovascular fitness (as measured by lower resting heart rates), and motivation levels when compared to their counterparts who participated in traditional physical education sessions, according to the findings of this study. The use of wearable trackers enabled students to become more aware of their fitness levels and gave them the ability to take responsibility for their own health by providing them with real-time feedback, individualised objectives, and the ability to monitor themselves. Using wearable technology in the classroom led to observable gains in student involvement, behaviour related to goal-setting, and peer cooperation, as reported by teachers. However, despite the fact that the findings provide evidence that wearables are successful, the installation of these devices necessitates resolving difficulties that are associated with finances, accessibility, data protection, and the training of educators. It is possible that the

advantages of wearable technology may not be realised in an equitable manner across all student groups if sufficient planning and support are not provided. The conclusion is that wearable fitness trackers have the potential to be an effective instrument for modernising physical education when they are strategically included into the curriculum. By utilising this technology, educational institutions have the ability to not only encourage students to develop better habits but also to boost the students' long-term physical and mental well-being. It is recommended that future studies concentrate on long-term behavioural results, scaling tactics, and inclusive implementation models in order to guarantee a wider impact and increase the likelihood of sustainability.

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