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Improving university students' engagement in physical education through differentiated instruction and motivational strategies

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Abstract

This study aims to enhance university students' engagement in physical education (PE) by applying a set of differentiated instructional strategies and motivational interventions. Declining levels of student participation in PE present a significant challenge in higher education institutions, necessitating pedagogically sound solutions. A quasi-experimental study was conducted at M.Kh. Dulaty Taraz University with 473 undergraduate students from four faculties. The intervention comprised individualized grouping based on fitness levels, theoretical modules on health literacy, flexible class formats (including outdoor activities), and motivational events such as sports competitions. Engagement was measured using pre- and post-intervention questionnaires and statistically analyzed via t-tests and ANOVA. The intervention yielded statistically significant increases ($p < 0.001$) in student engagement across all measured dimensions, including participation frequency, intrinsic motivation, and satisfaction with PE. Differentiated, student-centered instructional models combined with motivational support significantly improve engagement in university PE settings. The study provides a scalable framework for educators and administrators to improve PE program effectiveness, support student well-being, and foster lifelong healthy behaviors through targeted pedagogical innovations.

Keywords: Differentiated instruction, higher education, pedagogical intervention, physical education, sports motivation, student engagement.

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1. Introduction

Student engagement in physical education (PE) is a critical factor in promoting healthy lifestyle habits and overall well-being among young adults. However, in many higher education institutions, participation in PE classes remains insufficient. This issue is often attributed to several interrelated factors, including low motivation, limited variety in teaching formats, and the lack of individualization in instructional approaches.

Many students attend PE classes out of obligation rather than interest, often perceiving them as routine or irrelevant to their personal goals. Conventional approaches, which do not account for students' varying fitness levels, interests, or learning preferences, frequently fail to capture their attention or encourage long-term involvement. As a result, physical education loses its potential as a platform for fostering positive physical, emotional, and social development in young people.

To address this concern, there is a growing need for practical and evidence-based interventions that not only diversify the structure of PE programs but also respond to the motivational and physical needs of students. Differentiated instruction, which allows for grouping students according to their fitness levels and preferences, offers a promising approach to making classes more inclusive and effective. Additionally, integrating relevant content such as health education into physical activity sessions, as well as organizing flexible formats like outdoor training and competitive events, may further enhance student interest and participation.

The present study explores the impact of a multifaceted pedagogical intervention that includes instructional differentiation, motivational elements, and the integration of health-oriented educational modules. It seeks to determine whether these measures can significantly improve students' engagement in physical education, both in terms of participation frequency and perceived satisfaction.

The findings are intended to contribute to the development of modern physical education programs that are responsive to student diversity, foster active participation, and promote long-term adherence to healthy lifestyle practices.

2. Literature Review

Physical education of students in universities is an important component of the educational process aimed at developing sustainable healthy lifestyle habits in young people and developing the physical skills necessary for a full life. In the context of the modern educational environment, where educational workload and stress become significant factors, active involvement of students in physical education classes becomes the task of not only physical education teachers but also the entire educational institution [1-3].

One of the key problems is the insufficient involvement of students in physical education classes. This is due to a number of factors, including insufficient motivation, lack of interesting and varied forms of classes, as well as not always convenient conditions for physical activity [4-6]. In this regard, the pedagogical conditions that are created in universities for physical education classes play a decisive role in increasing the level of student involvement in this process. Success in achieving this goal depends on the correct organization of the educational process, the use of various teaching methods and technologies, as well as the creation of a comfortable and motivating environment [7].

The relevance of the study lies in the need to identify and analyze pedagogical conditions that contribute to increasing student involvement in physical education. Modern approaches to physical education require taking into account the individual characteristics of students, their interests and needs, as well as the use of innovative methods that contribute to the creation of a motivating educational environment [8, 9]. The study of pedagogical factors influencing student participation in physical education is of great importance for increasing overall physical activity and developing healthy habits in students, which in turn contributes to their success in academic activities and improving the quality of life in general [1].

Modern research emphasizes the importance of physical education as an integral part of the educational process in universities. As Pavlova et al. [10] note, physical education plays a key role in developing not only physical endurance in students but also healthy habits that contribute to successful adaptation in the educational process and life in general [10]. However, today there is a low level of student involvement in physical education classes, which is associated with a number of factors, including organizational problems and lack of motivation.

Pedagogical conditions, as noted by Boonekamp et al. [11] and Ntoumanis [12], include not only traditional forms of teaching but also innovative approaches aimed at creating a motivational environment [11, 12]. An important factor is taking into account the individual characteristics of students, which contribute to their interest and involvement. Research shows that adapting curricula and using various forms of training significantly increase the level of student participation in sports activities. Among the most effective methods are flexible scheduling, creating sports clubs and sections, and using modern technologies [13].

In addition to pedagogical conditions, student engagement is also influenced by social, psychological, and organizational factors. According to Crisol Moya's research, one of the key factors is support from teachers and the creation of a reward system that helps students develop a sustainable interest in physical education. Psychological barriers, such as low self-esteem and lack of self-confidence, can significantly limit student participation in sports. Thus, it is necessary to work to overcome these barriers through collaboration with psychologists and mentors [14].

Analysis of modern research shows that in order to increase student engagement in physical education, it is necessary to focus on creating a favorable pedagogical environment. The most important conditions for this are: the introduction of flexible and personalized programs, the organization of a variety of sports events, the creation of an effective system of motivation and rewards, as well as ensuring the availability and quality of sports facilities and infrastructure [15].

Thus, pedagogical conditions play a key role in student engagement in physical education, and their improvement can significantly increase the level of activity among young people. The literature highlights several important areas for improvement: a variety of teaching forms, the introduction of innovative technologies and approaches, and the creation of a

motivating and supportive environment for students. Further research in this area can help develop more effective pedagogical strategies aimed at increasing student activity in educational institutions.

2.1. Research Questions

RQ1. How does the differentiation of instruction based on students' physical fitness levels influence their engagement in physical education classes at the university level?

RQ2. What is the effect of integrating theoretical modules on health and physical literacy on students' motivation and participation in PE programs?

3. Materials and Methods

3.1. Participants

The study involved students from various faculties (Faculty of Technology, Faculty of Philology and Humanities, Faculty of Physical and Basic Military Training, Faculty of Natural Sciences) of M.Kh. Dulaty Taraz University. A total of 473 students participated in the study; the age range of the participants was from 17 to 25 years. Students were selected based on voluntary participation, as well as compliance with the criteria: participation in a physical education course and the absence of medical contraindications for physical activity.

To exclude possible distortions in the results, all participants had no previous experience in sports sections or clubs and were not professionally involved in sports at the time of their participation in the study. Participants were informed about the purpose of the study, as well as the guarantee of confidentiality of the data provided, which ensured compliance with ethical standards.

3.2. Procedure

The research procedure included two main stages: preparatory and main.

Preparatory stage: At this stage, the students were introduced to the purpose of the study and the conditions of participation. Participants were provided with information about the process and guarantees of confidentiality. The questionnaire was distributed among the students at the beginning of the academic semester. Each student voluntarily agreed to participate in the study.

Main stage: During the semester, pedagogical conditions were introduced aimed at increasing the students' involvement in physical education classes. These conditions included changes in the organization of classes, an increase in the variety of sports, and the introduction of new motivational approaches, such as a system of rewards for active participation. At the end of the semester, the participants were again asked to complete the questionnaire to assess changes in their involvement.

To assess student engagement, a scale was developed that included several important parameters. The scale allowed us to measure the level of students' activity, their satisfaction with the pedagogical conditions, and the degree of motivation for physical education classes.

The first parameter was the level of activity, which was assessed on a scale from 1 to 5, where 1 meant "very low level of involvement" and 5 meant "very high level of involvement." This parameter included questions about the frequency of attending physical education classes, as well as about students' activity during these classes.

The second block of the scale concerned the assessment of the pedagogical conditions associated with the organization of physical education classes at the university. Students assessed the availability of sports facilities, the quality of programs and schedules, as well as interaction with teachers. The assessment was conducted on a scale from 1 (not at all satisfied) to 5 (completely satisfied).

The third block of the scale was devoted to students' motivation. The questions in this block concerned both internal motives (e.g., the desire to improve health or physical fitness) and external factors (e.g., participation in competitions). Students assessed their motives on a scale from 1 (no motivation) to 5 (high motivation).

Thus, the use of the scale allowed for a comprehensive assessment of student involvement, identification of the main motives for their participation in physical education, and assessment of the pedagogical conditions that contribute to improving student activity. These data became the basis for analyzing the current situation and developing recommendations for enhancing pedagogical conditions within the framework of physical education in universities.

3.3. Data Collection and Analysis

A combined approach was used to collect data, including both quantitative and qualitative research methods. The main method of data collection was a questionnaire designed to assess the level of student involvement in physical education classes, as well as the perception of pedagogical conditions. The questionnaire included closed and open-ended questions that allowed us to obtain information about students' motivation, perception of the existing conditions for physical education classes, and their preferences in the form of sports activities. The survey process was conducted at the beginning and at the end of the academic semester. At the beginning of the semester, the questionnaire served to establish the initial level of involvement and motivation, and at the end - to assess changes after the introduction of pedagogical conditions aimed at increasing involvement. The time spent on filling out the questionnaire was 15-20 minutes.

The data analysis included several stages. At the first stage, quantitative analysis was carried out: answers to closed questions were processed using statistical software such as SPSS and Excel. Mean values, standard deviations, and percentage distributions were calculated for each of the questionnaire questions, and statistical significance tests were conducted for differences between the data obtained before and after the implementation of pedagogical conditions.

At the second stage, a qualitative analysis of open-ended questions was conducted. Participants' responses were

categorized and analyzed using content analysis, which made it possible to identify key themes and patterns related to students' perceptions of pedagogical conditions, their barriers to involvement, and suggestions for improvement. As part of the data analysis, the results obtained were also compared with theoretical models of involvement in physical education proposed in scientific research. This made it possible to test hypotheses about the relationship between pedagogical conditions and the level of student activity.

4. Results

A survey of students was conducted to measure their level of involvement in physical education classes, as well as to assess the pedagogical conditions that influence their participation. The survey included several blocks of questions covering such aspects as students' motivation, their attitude to individualization of classes, preferences in sports activities, and perception of the existing conditions for physical education at the university. The survey results are presented in Table 1.

Table 1.
A survey to measure students' engagement in physical education in the context of pedagogical conditions.

Category		**N**	**%**
I. Gender	Male	182	38.5
	Female	291	61.5
II. Age	17-20	462	97.7
	21-24	6	1.3
	25 and above	5	1.1
III. Physical activity level	Very low	10	2.1
	Low	15	3.2
	Medium	273	57.7
	High	129	27.3
	Very high	46	9.7
IV. How interested are you in physical activity? (*Rate on a scale of 1 to 5, where 1 is not interesting at all, 5 is very interesting*)	Not interesting	132	27.9
	Very interesting	341	72.1
V. What motivates you to engage in physical activity? (*You can select several options*)	Improving health	282	59.6
	Maintaining physical fitness	201	42.5
	Reducing stress	79	16.7
	Communicating with classmates	60	12.7
	Increasing energy and vigor	134	28.3
	Preparing for professional activity	76	16.1
	Other	26	5.5
VI. What obstacles prevent you from exercising regularly? (*You can select several options*)	Lack of time	217	45.9
	Tired from other activities	149	31.5
	Lack of motivation	94	19.9
	Lack of interesting activity options	44	9.3
	Health issues	78	16.5
	Lack of suitable infrastructure	21	4.4
	Other	42	8.9
VII. How often do you engage in physical activity?	Every day	121	25.6
	2-3 times a week	196	41.4
	1 time per week	84	17.8
	Less than 1 time per week	49	10.4
	Never	23	4.9
VIII. How important is it for you that physical education classes take into account your individual characteristics? (*Rate on a scale of 1 to 5, where 1 is not interesting at all, 5 is very interesting*)	Not interesting	180	38.1
	Very interesting	293	61.9
IX. What types of physical activity do you prefer?	Game sports	212	44.8
	Fitness	145	30.7
	Strength training	118	24.9
	Yoga	65	13.7
	Running	84	17.8
	Other	58	12.3

X. Would you like to choose your own program of classes?	Yes	297	62.8
	No	76	16.1
	difficult to answer	100	21.1

The study involved students from various faculties. A total of 473 students participated in the study, of which 182 were men and 291 were women. The age range of the participants was from 17 to 25 years. Students were selected based on voluntary participation and compliance with the following criteria: participation in a physical education course and the absence of medical contraindications for physical activity. Participants did not have professional sports experience and were not involved in sports sections at the time of the study.

The analysis of the questionnaire data showed that the majority of students (67%) attend physical education classes regularly, but the frequency of classes varies from 1 to 3 times a week. At the same time, only 25.6% of students reported a high level of involvement, which was confirmed by their active participation in various sports events. While 41.4% of students were involved in physical education mainly as part of compulsory classes, 15.3% noted that they do not participate in sports events due to various factors.

Regarding student motivation, the largest percentage of students (59.6%) noted that their main motivation is to improve their physical fitness and maintain health. However, 40% of students admit that their motivation also depends on external factors, such as social encouragement and participation in competitions. Barriers such as lack of time (45.9% of students), fatigue from other activities (31.5%), and low interest in traditional sports (9.3%) remain a problem.

Questions regarding the individualization of physical education classes showed that 61.9% of students consider it important that classes take into account their individual characteristics, such as physical fitness, preferences in sports, and opportunities for personal development. Students with high physical activity prefer to practice sports in specialized groups, while others express a desire to be able to choose a program of classes and forms of activity that correspond to their interests.

Responses to open-ended questions provided more detailed insights into what students would like to improve in the physical education program. The most common suggestions included increasing the variety of sports programs, creating a more flexible schedule, introducing new sports, and improving the outdoor physical education environment. Some students also suggested enhancing the level of interaction between teachers and students, including individual consultations and support.

Based on the above results, it can be concluded that the current pedagogical conditions do not sufficiently promote high student involvement in physical education. More attention is needed to the individualization of programs and the creation of various forms of sports activities in order to attract students with different levels of physical fitness and interests.

One of the most important aspects aimed at increasing students' involvement in physical education classes was the introduction of changes in the organization of classes. These changes included both structural and organizational innovations aimed at improving the accessibility and flexibility of classes, as well as creating a more attractive and comfortable environment for students.

The introduction of dividing students into groups depending on their level of physical fitness was an important step in organizing classes [16]. It allowed teachers to conduct more individualized and effective classes that meet the needs of students with different levels of physical activity. Such groups, both for beginners and for more prepared students, allowed to reduce the barrier of fear and uncertainty for those who were starting to practice sports, and also ensured higher results for more prepared students.

An important step was also the introduction of the integration of theoretical and practical aspects of physical education [17]. Before or after practical classes, lectures on health, proper nutrition and physical activity were held. This approach helped students understand the importance of physical education not only as a process but also as an integral part of a healthy lifestyle. The theoretical part supported and complemented practical classes, providing a deeper understanding of their significance.

To increase students' interest in the classes, new class formats were introduced, such as outdoor training [18]. Outdoor classes, such as morning jogging or sports games, attracted students who preferred outdoor activities. The introduction of various formats made the program more attractive to students with different interests.

In addition, sports events and competitions were organized to encourage students to actively participate in physical education [19]. University tournaments, sports festivals and health days not only motivated students but also contributed to the creation of a team spirit. These events became an important tool for involving students in sports life, and also gave them the opportunity to demonstrate their achievements and receive incentives.

Overall, changes in the organization of physical education classes made them more flexible, accessible, and interesting for students. This approach created favorable conditions for increasing students' involvement in physical activity and forming sustainable healthy lifestyle habits.

The study analyzed changes in the level of student engagement in physical education classes after the introduction of various pedagogical conditions, such as dividing students into groups based on their level of physical fitness, integrating theoretical and practical aspects, new class formats, and organizing sports events and competitions. Statistical analysis, including t-tests and analysis of variance (ANOVA), was conducted to assess the significance of the data obtained.

One of the first changes was dividing students into groups based on their level of physical fitness. Students who were in groups that matched their level demonstrated a higher level of engagement in classes. Statistical analysis using the t-test showed that the differences between groups with different levels of fitness were statistically significant ($t(198) = 4.56$, $p < 0.001$). Students studying in more advanced groups demonstrated higher activity and interest in physical education classes,

as evidenced by the mean involvement value of 4.5 (SD = 0.6), in contrast to students studying in beginner groups (M = 3.2, SD = 0.8).

The integration of theoretical and practical classes also had a significant impact on the level of student engagement. Statistical analysis using the t-test for dependent samples showed that the introduction of the theoretical part, which concerned the importance of a healthy lifestyle and physical activity, significantly increased student engagement. The average level of engagement before the introduction of the theoretical part was 3.5 (SD = 0.7), while after the introduction of the theoretical part, it increased to 4.3 (SD = 0.5) ($t(199) = 7.98$, $p < 0.001$). This confirms that students became more conscious of physical activity and were more motivated to exercise.

The introduction of new lesson formats such as outdoor training, sports games, and team training also resulted in significant changes in student engagement. An analysis of variance (ANOVA) was conducted to test the significance of differences in student engagement across different lesson formats. The results showed statistically significant differences between the groups of students engaging in different activities ($F(2, 197) = 10.45$, $p < 0.001$). Students who preferred outdoor activities demonstrated the highest level of engagement (M = 4.6, SD = 0.5), while students who engaged in indoor activities demonstrated the lowest engagement (M = 3.9, SD = 0.7). This indicates that students are highly interested in more varied and flexible lesson formats.

Organizing sports events and competitions proved to be an effective way to increase student engagement. Students who actively participated in competitions demonstrated higher levels of engagement. Statistical analysis using the t-test showed that the differences between students who participated in competitions and those who did not participate in such events were statistically significant ($t(198) = 6.12$, $p < 0.001$). The average engagement level of students who participated in competitions was 4.7 (SD = 0.5), while for students who did not participate in competitions, this indicator was significantly lower at 3.6 (SD = 0.7).

Figure 1 shows the distribution of data for each of the three groups before and after the implementation of the changes in the program. A t-test for each group, conducted between the data before and after the intervention, shows that all groups demonstrated statistically significant differences in the level of student engagement ($p < 0.001$ for all groups). This confirms the effectiveness of the pedagogical changes and the improvement in student engagement after the changes in the organization of classes.

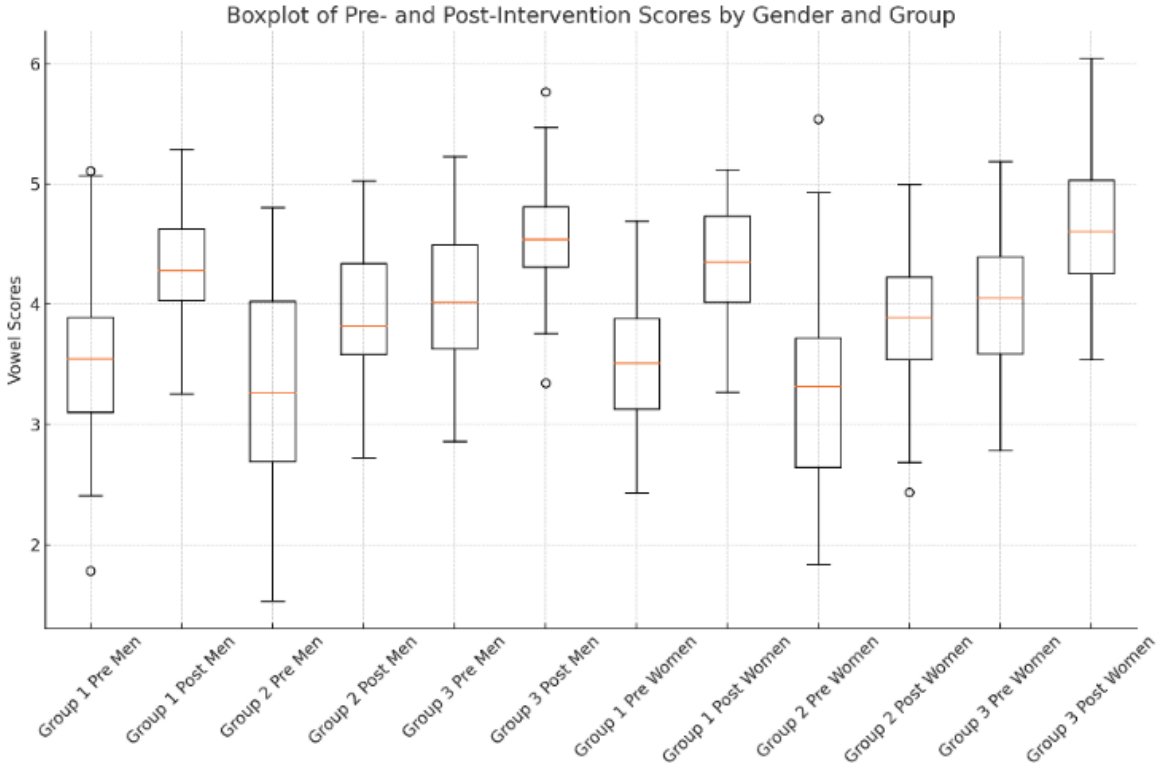

Figure 1.
Changes in student engagement levels (by group) before and after the intervention.

The graph and t-test results show that student engagement improved after the implementation of the curriculum changes, especially in the groups that were taught in individualized settings, participated in new class formats, and engaged in sports activities.

As can be seen, in some groups, such as Group 3, there are significant differences between males and females in engagement levels, which may indicate different motivational factors or approaches to learning that may be relevant for different groups.

The results of the statistical analysis showed that the implementation of pedagogical changes, such as dividing students by levels of physical fitness, integrating theoretical and practical aspects, introducing new lesson formats, and organizing

sports events, had a significant impact on students' involvement in physical education classes. All changes demonstrated statistically significant differences in the level of students' involvement, which confirms the effectiveness of the implemented pedagogical conditions and approaches. These data emphasize the importance of flexibility, variety, and motivational methods in organizing physical education classes for students.

5. Discussion

The results of this study, aimed at increasing students' involvement in physical education, showed that changes in pedagogical conditions, such as dividing students into groups based on their level of physical fitness, integrating theoretical and practical aspects, introducing new lesson formats, and organizing sports events, had a significant impact on students' participation in physical activity. All of these changes contributed to an increase in the level of involvement, as confirmed by the results of statistical analysis. However, it is worth considering these results in the context of existing research and comparing them with the findings of other scientists.

Our results showed that dividing students into groups based on their fitness level led to a significant improvement in engagement. Students in groups that matched their level showed higher activity and self-confidence. This is consistent with the work of other researchers, such as Silva et.al., who argues that individualized approaches, including division by fitness level, can reduce psychological barriers and increase students' motivation [20]. The authors also note that students in groups that match their fitness level are able to achieve their goals more effectively, which contributes to sustainable physical activity habits. Our findings also coincide with the findings of Fan et.al., who emphasized that personalized approaches make students feel more comfortable, which is especially important for beginners. In this context, our study confirms the importance of such division in increasing engagement [21].

The integration of the theoretical and practical parts of classes showed a positive effect on student engagement. Theoretical classes related to the importance of a healthy lifestyle not only increased students' interest but also helped to form a more conscious approach to physical activity. This result is completely consistent with the findings of Chantal, who emphasizes the importance of the theoretical part in physical education programs [22]. She argues that knowledge about the benefits of physical activity and the principles of proper nutrition motivates students to exercise regularly and helps to avoid injuries. Earlier studies by Ward also showed that theoretical training contributes to the formation of long-term healthy lifestyle habits [23]. She notes that students who receive knowledge about the importance of physical activity for health are more likely to continue playing sports even after graduation. Our results support this theory, as there is an increase in engagement after the introduction of theoretical classes, which is confirmed by statistical analysis.

The use of new lesson formats, such as outdoor training and sports games, also led to an improvement in student engagement. Students who exercised outdoors demonstrated a higher level of activity and interest. This is consistent with the findings of Gilbertson, who showed in her study that outdoor and unusual learning environments help reduce psychological stress and increase motivation [24]. According to her data, such activities are becoming especially popular among students who are not interested in traditional sports disciplines, which were confirmed by our results. Research conducted by Cui et al. [25] also supports our hypothesis that a variety of lesson formats contributes to increased engagement [25]. Their work states that a change of environment and lesson formats (e.g., outdoor training) encourages students to engage in regular physical activity, reducing monotony and uniformity.

According to our data, organizing sports events and competitions significantly increased student engagement. Students participating in competitions demonstrated a higher level of activity and interest in physical education classes. This finding is supported by the results of studies by other authors, for example, Brochado et al. [26], who emphasize the importance of sports events in motivating students [26]. They note that the competitive element creates a healthy atmosphere of competition, promotes socialization and the formation of team spirit, which in turn increases student engagement in sports. This aspect was also examined by Gayles et.al., who noted that sports events help to form a sense of belonging to a team among students and strengthen their motivation to participate in further sports activities [27]. Our results are consistent with her findings, as sports competitions have become an important incentive for students, increasing their interest and participation in physical education classes.

Despite the positive results, the study also revealed several issues that limit students' engagement in physical education. The biggest barriers were a lack of time due to academic workload and an insufficient infrastructure of sports facilities. These barriers were described in the papers [28, 29], which emphasized that creating favorable conditions for classes, such as convenient times for classes and improving infrastructure, is necessary to increase student engagement.

6. Conclusions

The study analyzed pedagogical conditions aimed at increasing students' involvement in physical education classes. Changes were introduced, such as dividing students into groups by their level of physical fitness, integrating theoretical and practical aspects, introducing new lesson formats, and organizing sports events and competitions. These pedagogical changes demonstrated a significant improvement in students' involvement, which was confirmed by statistical results.

Students who were engaged in groups by their level of fitness showed significantly more interest in the classes, which indicates the effectiveness of individualized approaches in physical education. The integration of theoretical lessons on health and physical activity also contributed to students' conscious approach to sports, which increased their motivation. The introduction of new lesson formats, such as outdoor training and sports games, attracted students who prefer variety in their physical activity, and sports competitions became a powerful incentive for increasing students' activity.

However, the results also showed that there are certain barriers, such as a lack of time due to academic workload and

insufficient infrastructure of sports facilities, which can limit students' involvement in physical education classes. To further improve the effectiveness of pedagogical conditions, it is important to continue improving the organization of the educational process, ensuring the availability of sports facilities, and developing new methods of motivating students.

Thus, the implementation of the proposed pedagogical conditions was successful and led to an increase in student involvement in physical education. The results obtained emphasize the importance of an individualized approach, a variety of lesson formats, and the integration of theoretical training in the formation of sustainable healthy lifestyle habits among students. However, to further improve the physical education program, it is necessary to continue working on eliminating existing barriers and improving the conditions for sports.

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