ORIGINAL ARTICLE

# The effect of an adapted inclusive physical education program on motor skills and academic engagement of children aged 9–10 years

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**Abstract**

*Background and Study Aim*: Inclusive physical education is associated with supporting the motor, social, and emotional development of children with diverse educational needs. In mainstream school settings, students with delayed psychological and intellectual development often experience difficulties in performing motor tasks and maintaining activity during lessons, which necessitates targeted pedagogical adaptation. Despite the use of various inclusive and adapted approaches, their relative effectiveness in improving functional motor skills and academic engagement among schoolchildren with special needs remains of practical interest. The aim of this study was to evaluate the effect of an adapted inclusive physical education program on motor skills and academic engagement of children aged 9–10 years.

*Material and Methods*: The study was conducted during the second semester of the 2023–2024 academic year and involved 32 fourth-grade students, three of whom had delayed psychological and intellectual development. Data were collected under natural educational conditions during physical education classes organized in an inclusive format. The assessment of essential motor skills was carried out using standardized tests evaluating coordination, balance, movement accuracy, speed, and manipulative skills. In addition, a remote questionnaire was administered to assess students' interest and activity levels during the lessons. Statistical analysis included the calculation of mean values and the use of Student's *t*-test to examine differences and changes in the measured indicators.

*Results*: Students with delayed psychological and intellectual development demonstrated improvements in essential motor skills following the application of the adapted methodology. Specifically, balance maintenance time increased on average from 18.1 ± 3.01 s to 21.9 ± 1.01 s, walking accuracy along a line improved from 16.53 ± 2.21 cm to 18.2 ± 2.04 cm, and the number of step-up repetitions decreased from 62.4 ± 4.25 to 56.8 ± 2.25, reflecting enhanced movement control. The speed of object transfer also improved (from 1.3 ± 1.69 s to 1.9 ± 1.04 s). Statistically significant changes were observed for several indicators ($p < 0.05$). In addition, an increase in academic engagement was noted, as reflected by a higher proportion of positive evaluations of distance-based lessons and a greater interest in physical education compared with baseline.

*Conclusions*: The results of the study indicate that an adapted inclusive approach to physical education lessons promotes the development of essential motor skills in students with delayed psychological and intellectual development and enhances their academic engagement. The observed positive changes in motor performance and the increased interest in physical education confirm the effectiveness of structured exercises, step-by-step instructions, and individualized pedagogical support. The organization of inclusive lessons with the involvement of a teaching assistant creates favorable conditions for the successful inclusion of children with special educational needs in the educational process and contributes to the formation of more stable motivation for physical activity.

**Keywords**: inclusive physical education, adapted physical activity, intellectual disabilities, motor skills, pedagogical support, academic engagement

## Introduction

Physical education classes play a central role in the development of motor, cognitive, and social competencies of schoolchildren, forming a foundation for their physical well-being and participation in active life. Within the context of contemporary education, ensuring equal access to physical education for students with special educational needs has become increasingly important, as their participation in physical activity is often limited by a combination of pedagogical, organizational, and interpersonal factors. The challenge of adapting lesson content, teaching methods, and environmental conditions represents a multifaceted task that requires careful consideration of children's individual capabilities, the complexity of inclusive interaction, and the influence of the educational context on the success of their physical and social development.

The theoretical foundations of inclusive physical education are shaped by integrative research that synthesizes evidence on pedagogical,


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organizational, and social mechanisms determining the participation of students with disabilities. A key contribution is the review by Fröberg [1], which systematizes conceptual approaches to understanding the integration of students in physical education lessons and emphasizes the importance of coherence in lesson structure, environmental accessibility, and the quality of interpersonal interactions. These positions are consistent with the findings of two systematic reviews [2, 3], which demonstrate that teachers' attitudes, pedagogical flexibility, and organizational conditions constitute the fundamental basis for successful inclusion. This theoretical framework is further complemented by the meta-analysis by Pocock et al. [4], which illustrates the influence of structural and social factors on the forms and dynamics of participation of students with disabilities. The early integrative review by Qi and Ha [5] remains relevant for the conceptualization of inclusive practices, as the authors emphasize the need to view physical education as a system in which pedagogical, organizational, and interpersonal components jointly determine the accessibility and quality of the educational process. Taken together, these foundational works form a conceptual basis defining the mechanisms of inclusion in physical education.

Other studies in the field of inclusive physical education focus on students' subjective experiences and the specifics of their interaction with the educational environment. Research by Haegele and Sutherland [6] and Haegele et al. [7] shows that the engagement of students with various impairments is largely determined by spatial accessibility, clarity of instructions, and the nature of interpersonal support. The authors emphasize that these factors together create a sense of safety and predictability during lessons. An important contribution to understanding the conditions for successful inclusion is provided by studies examining teachers' professional competence [8, 9]. These studies indicate that teachers' readiness to adapt lesson content influences the quality of the educational experience of students with disabilities. Mastery of flexible and varied instructional methods is also associated with key characteristics of the educational process. In addition, the use of professional communities, including digital platforms, complements pedagogical practice and affects the organization of teaching. Further insight is offered by the study of Liu et al. [10], which systematizes evidence on barriers to and facilitators of student participation, focusing on social acceptability, organizational flexibility, and the structural accessibility of physical education lessons. These studies demonstrate that, in recent years, scholarly attention has increasingly focused on a detailed analysis of the factors that determine students' actual experiences of participation and the effectiveness of pedagogical practices within inclusive educational environments.

Applied research demonstrates a wide range of practical solutions aimed at enhancing the engagement and development of students with disabilities within physical education settings. Intervention programs [11, 12] show that structured adapted physical activity contributes to increased motivation, improved psychological well-being, and the development of motor skills. The results of these studies confirm the effectiveness of targeted pedagogical interventions. Practice-oriented approaches further complement these findings [13, 14] by proposing strategies for adapting motor tasks, organizing socially supportive environments, and translating international recommendations into school practice. Another line of research emphasizes the importance of teacher preparation [15], indicating that participation in adapted programs enhances teachers' self-efficacy and readiness to implement inclusive teaching methods. Together, these applied sources demonstrate that the integration of evidence-based interventions, methodological strategies, and professional development for teachers creates a foundation for improving the quality of participation of students with disabilities in physical education.

The analysis of research findings indicates that the quality of inclusive physical education is determined by a combination of pedagogical attitudes, organizational conditions, and students' subjective experiences. This is supported by both foundational reviews and applied studies. Authors emphasize that the effectiveness of inclusive practices is shaped through the flexible adaptation of content, the creation of a supportive environment, and the use of appropriate pedagogical strategies, which together allow for consideration of the diverse needs of children with disabilities. It is also highlighted that the practical implementation of these principles remains a multifaceted task, influenced by variability in educational contexts, the level of teacher preparation, and the structural characteristics of the school environment. At the same time, there remains a need for a more integrated understanding of how pedagogical approaches, organizational decisions, and individual student characteristics jointly shape the success of inclusion in physical education. This provides a rationale for formulating the research objective aimed at analyzing key factors of inclusion and their interrelationships within contemporary educational practice.

The aim of this study was to evaluate the effect of an adapted inclusive physical education program on motor skills and academic engagement of children aged 9–10 years.

## Materials and Methods

*Participants*

The study involved 32 fourth-grade students aged 9–10 years. Among the participants, 29 were typically developing schoolchildren and 3 students had special educational needs associated with delayed psychological and intellectual development. All children were enrolled in the same mainstream school and attended physical education classes organized in an inclusive learning format. Students with special educational needs completed the tasks with the support of a teaching assistant, who provided the necessary pedagogical assistance.

*Ethical Considerations*

The study was conducted in accordance with generally accepted ethical standards of pedagogical research. Participation of the students was based on informed consent obtained from parents or legal guardians. The school administration was informed about the purpose of the study and granted permission for its implementation. No personal data were recorded, ensuring the confidentiality of all participants. Students with special educational needs performed the tasks within safe workload limits under the supervision of a teaching assistant, who took into account the individual characteristics of each child. The study protocol was approved by the University Research Ethics Committee of H. S. Skovoroda Kharkiv National Pedagogical University, confirming compliance with requirements for risk minimization and the protection of participants' rights.

*Study Design*

The study was conducted with primary school students under real educational conditions and included an observational (baseline) stage and an intervention (formative) stage. The baseline stage was carried out during the second semester of the 2023–2024 academic year, from January to May 2024, at the Berestovenky Branch of Krasnohrad Lyceum No. 4 of the Krasnohrad City Council, Kharkiv Region (Ukraine). At this stage, two main objectives were addressed. First, attitudes of students and their parents toward distance physical education lessons, as well as the level of children's activity during such classes, were examined using a remote questionnaire. Second, baseline testing of essential motor skill development was conducted for all study participants.

Parents of students with special educational needs completed an online questionnaire using a Google Form. The questionnaire included items addressing children's attitudes toward the subject of physical education, their level of participation in lessons, and parents' perceptions of the clarity and accessibility of distance learning tasks. A separate section assessed the perceived interest of distance physical education lessons using a five-category scale: "interesting," "rather interesting," "not always interesting," "uninteresting," and "boring." A similar online questionnaire was completed by the students; in the case of children with delayed psychological and intellectual development, parents assisted them in formulating and entering their responses.

In parallel with the questionnaire survey, students' motor and coordination skills were assessed. The assessment was conducted under standard physical education class conditions, with uniform instructions provided to all participants in the study.

Movement accuracy was evaluated using a ball-throwing test aimed at a vertical target with a diameter of 30 cm. Each student performed throws from a distance of 3 m. The deviation of the hits from the center of the target was recorded, allowing for the assessment of visuomotor coordination and the accuracy of goal-directed movements.

Balance was assessed using the Romberg test. Participants alternately stood on the right and left leg with their eyes open. The duration of maintaining a stable position without additional support or trunk displacement was recorded. This test characterized static balance and postural control ability.

Movement coordination during locomotion was determined using a 2 m line-walking test. The student performed the task at a comfortable pace, attempting to maintain the prescribed trajectory. The magnitude of deviation from the line was measured, reflecting the level of movement coordination and spatial control.

Speed–strength characteristics of the lower limbs were assessed using a step-up test performed over 10 s. The total number of step-ups completed within the allotted time was recorded. This test allowed for the evaluation of strength endurance and the execution tempo of cyclic movements.

Fine motor skills and the serial organization of movements were assessed using two consecutive tasks. In the first task, the student transferred 20 pencils from the right hand to the left hand and then placed them on a table. Each subsequent pencil could be taken only after completion of the previous action. The total task completion time was recorded, reflecting the accuracy, rhythm, and sequential organization of motor actions.

In the second task, the student tossed a ball upward, clapped their hands, and then caught the ball. The number of successful tosses with a clap completed within a fixed time interval was recorded. This task characterized complex movement coordination, action synchronization, and the speed of motor response.

The formative stage lasted five months and involved the implementation of an inclusive physical education teaching approach with the

mandatory participation of a teaching assistant. The assistant supported students with special educational needs by helping them understand instructions, selecting appropriate and feasible exercise variations, providing support during balance and coordination tasks, and encouraging participation in joint activities with classmates. The lesson content largely followed the requirements of the standard curriculum. At the same time, the classes included ball games as well as coordination and balance exercises. For some students, simplified or step-by-step versions of motor tasks were used.

Upon completion of the formative stage, repeated testing of the same motor and coordination indicators as those assessed at the baseline stage was conducted. A follow-up survey of students and parents was again administered remotely via a Google Form using the same scales for evaluating interest and activity during lessons. This approach ensured data comparability and made it possible to track changes in the level of essential motor skill development and in attitudes toward physical education lessons as a result of the pedagogical intervention.

*Statistical Analysis*

Statistical data processing was performed using Microsoft Excel 2019. For all quantitative variables, mean values and standard deviations were calculated ($\bar{X} \pm SD$). Comparisons between typically developing students and children with delayed psychological and intellectual development were conducted using Student's *t*-test for independent samples. Within-group changes among students with special educational needs were analyzed using the paired Student's *t*-test. Statistical significance was set at $p < 0.05$. Questionnaire data were analyzed using percentage distribution of responses.

## Results

To determine the baseline level of students' interest in distance physical education lessons, a questionnaire survey was conducted among two groups of schoolchildren. The assessment was carried out using a six-point scale reflecting the degree of subjective attractiveness of the lessons. The distribution of responses is presented in Figure 1.

The analysis of response distribution revealed differences between the two study groups. Among students without developmental impairments, the most frequent rating was category 3, indicating a moderate level of interest in distance physical education classes. Categories 2 and 1 were also reported, but less frequently, suggesting reduced or selective interest. A small number of students rated the lessons as completely uninteresting, reflecting heterogeneity in motivational perception.

Among students with delayed psychological and intellectual development, category 3 was also the dominant rating, with its proportion being noticeably higher than that observed among typically developing peers. This indicates that the distance learning format was perceived by these students primarily as moderately interesting but not consistently motivating. In addition, lower ratings were reported more frequently in this group,

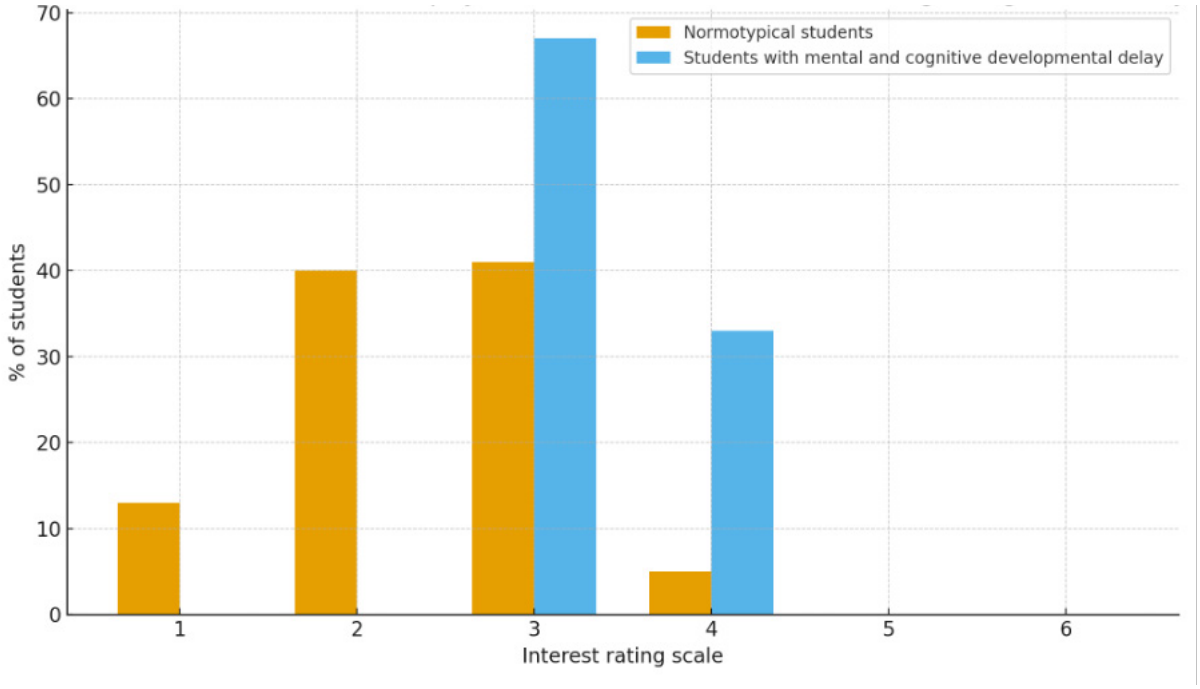


**Figure 1.** Students' interest in distance physical education lessons at the beginning of the study. (1 – interesting lessons; 2 – rather interesting lessons; 3 – sometimes interesting lessons; 4 – uninteresting lessons; 5 – boring lessons).

suggesting difficulties in maintaining sustained attention and motivation during distance-based activities.

Overall, the data presented in Figure 1 indicate that distance physical education lessons were perceived by both groups as moderately attractive. However, students with special educational needs experienced greater challenges in sustaining interest. These findings support the need to adapt the content and instructional methods of distance physical education lessons in order to enhance their motivational value and accessibility.

To clarify the relationships between indicators of interest and activity during distance physical education lessons, a correlation analysis was conducted. Table 1 presents the correlation coefficients between students' level of interest in the lessons, their activity during classes, and the frequency of camera use.

The results indicate strong positive associations between students' interest in distance lessons and their activity levels, as well as between activity and camera engagement, suggesting that higher interest is linked to greater participation and visibility during online classes.

The data presented in Table 1 indicate that students' interest in distance physical education lessons is positively associated with their learning activity. The correlation coefficient of 0.75 reflects a strong relationship between these parameters, suggesting that increased interest is accompanied by higher levels of engagement in the learning process. Camera engagement also demonstrated a moderate association with the level of interest and a strong association with students' activity. The coefficients of 0.56 and 0.85, respectively, indicate that students tend to be more active and attentive when they remain connected to the communicative space of the lesson. These findings highlight the importance of maintaining motivational components and social interactivity within distance learning formats.

To assess the level of essential motor skill development in primary school students, a comparative analysis of physical and coordination indicators was conducted between students in the main group and those with special educational needs. The results of this analysis are presented in Table 2.

As shown in Table 2, statistically significant differences were observed between the two groups across all examined indicators. Students with special educational needs demonstrated higher performance in tasks related to strength and movement speed. Pronounced differences were identified in the step-up test and the pencil transfer task, where the values of group $n^2$ were higher. This is confirmed by $t$ values of 7.91 and 9.40 and significance levels of $p < 0.01$.

In coordination and balance tasks, participants from group $n^1$ showed more stable performance, which is reflected in higher mean values combined with lower standard deviations. These differences were also statistically significant. The $p$ values of $< 0.05$ and $< 0.01$ confirm substantial contrasts in the development of coordination skills between students from the two samples.

Thus, the data demonstrate differences in the characteristics of motor preparedness between students in the main group and those with special educational needs. These differences should be taken into account when organizing inclusive physical education lessons.

To provide a more detailed analysis of changes in essential motor skill development among students

**Table 1.** Interest and activity of students during distance physical education lessons (% of students)

| Indicator | Interest in distance lessons, points | Activity during lessons, points |
|---|---|---|
| Interest in distance lessons, points | – | – |
| Activity during lessons, points | 0.75 | – |
| Camera engagement | 0.56 | 0.85 |

**Table 2.** Comparison of essential motor skill indicators of fourth-grade students participating in the study ($n^1 = 29$; $n^2 = 3$) ($\bar{X} \pm SD$)

| Indicator | Ball throw to a vertical target, cm | Static balance maintenance, s | Line walking (2 m), cm | Step-ups in 10 s, repetitions | Transfer of 20 pencils, s | Ball toss with clap, repetitions |
|---|---|---|---|---|---|---|
| $n^1 = 29$ | 37.5 ± 2.31 | 24.6 ± 2.01 | 20.3 ± 2.61 | 42.4 ± 3.25 | 15.6 ± 1.25 | 45.6 ± 2.65 |
| $n^2 = 3$ | 42.5 ± 2.01 | 18.1 ± 3.01 | 16.53 ± 2.21 | 62.4 ± 4.25 | 9.4 ± 1.05 | 65.6 ± 3.65 |
| $t$ | 4.03 | 3.65 | 2.76 | 7.91 | 9.40 | 9.23 |
| $p$ | < 0.01 | < 0.01 | < 0.05 | < 0.01 | < 0.01 | < 0.01 |

Note. $n^1 = 29$ indicates the number of students in the main group. $n^2 = 3$ indicates the number of students with special educational needs.

with delayed psychological and intellectual development, their performance indicators at the beginning and at the end of the study were compared. The measurements included assessments of movement accuracy, balance, coordination, execution speed, and the ability to perform serial motor actions. The results are presented in Table 3.

The analysis of the data presented in Table 3 showed that changes in the performance of students with delayed psychological and intellectual development were heterogeneous. Statistically significant improvements were observed in static balance maintenance, line walking over a distance of two meters, step-ups performed over ten seconds, and ball tosses with a clap. These findings are confirmed by significance levels of $p < 0.05$. Improvements in these tests indicate positive dynamics in the development of coordination, strength, and stability of motor actions.

At the same time, the indicators for the ball throw to a vertical target and the pencil transfer tasks did not demonstrate statistically significant changes. The $p$ values greater than 0.05 suggest that, over the study period, improvements in these skills did not reach statistical significance. This may reflect individual characteristics of fine motor skill development and movement accuracy in children within this category.

Overall, the presented data indicate that participation in adapted physical education classes is associated with improvements in certain components of motor preparedness among students. At the same time, the development of movement accuracy and elements of fine motor skills appears to require a longer or more specialized intervention program.

To examine changes in students' attitudes toward distance physical education lessons, a comparative analysis of lesson ratings was conducted among children with delayed psychological and intellectual development and their peers. Comparing data collected at the beginning and at the end of the study makes it possible to identify the direction of changes in the emotional perception of lessons and in students' levels of engagement. A graphical representation of the results is presented in Figure 2.

As shown in Figure 2, by the end of the

**Table 3.** Indicators of essential motor skill development in fourth-grade students with delayed psychological and intellectual development participating in the study (n = 3) ($\bar{x} \pm SD$)

| Indicator | Ball throw to a vertical target, cm | Static balance maintenance, s | Line walking (2 m), cm | Step-ups in 10 s, repetitions | Transfer of 20 pencils, s | Ball toss with clap, repetitions |
|---|---|---|---|---|---|---|
| Beginning of the study | 42.5 ± 2.01 | 18.1 ± 3.01 | 16.53 ± 2.21 | 62.4 ± 4.25 | 9.4 ± 1.05 | 65.6 ± 3.65 |
| End of the study | 40.5 ± 1.51 | 21.9 ± 1.01 | 18.2 ± 2.04 | 56.8 ± 2.25 | 9.9 ± 1.15 | 57.4 ± 1.42 |
| $p$ | > 0.05 | < 0.05 | < 0.05 | < 0.05 | > 0.05 | < 0.05 |

Note. Mean values are presented with standard deviations ($\bar{x} \pm SD$).

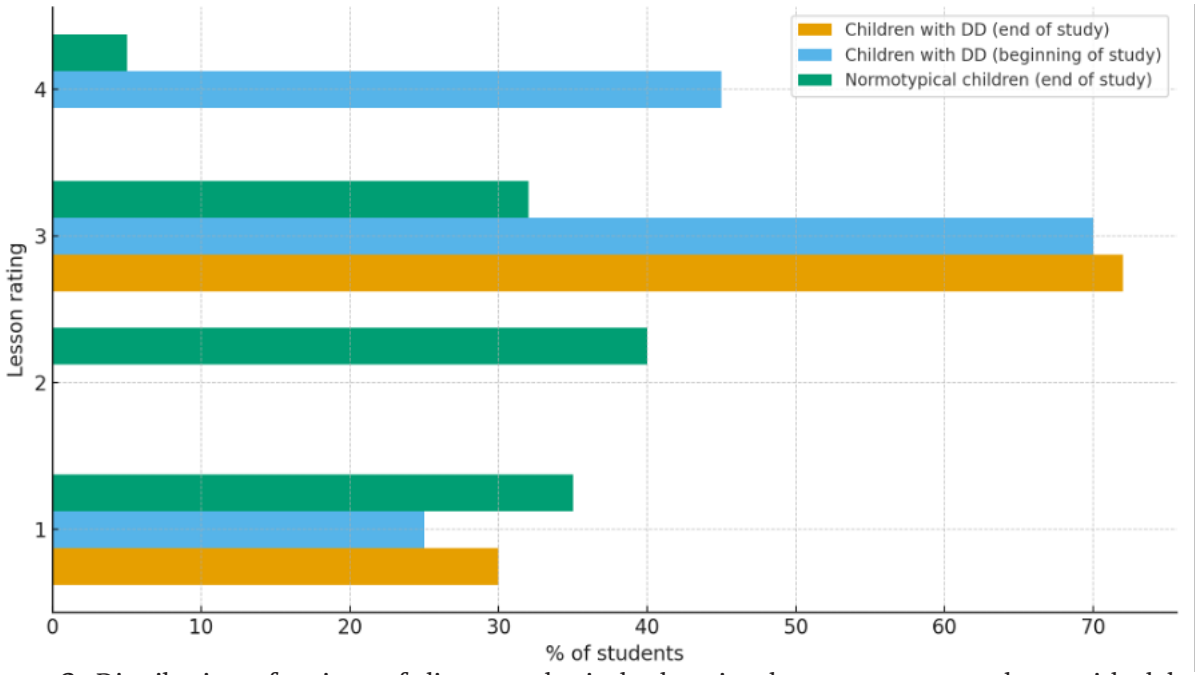


**Figure 2.** Distribution of ratings of distance physical education lessons among students with delayed psychological and intellectual development and typically developing schoolchildren at the beginning and at the end of the study

study, students with delayed psychological and intellectual development more frequently rated physical education lessons as more interesting and comfortable. The proportion of students in this group who assigned a rating of 3 increased compared with the beginning of the study, indicating an improvement in their emotional perception of the lessons. At the same time, the number of low ratings, particularly at levels 1 and 2, decreased.

Typically developing students also demonstrated positive levels of satisfaction with the lessons. The majority of them rated the lessons at levels 2 and 3, which confirms a stable interest in distance learning formats. At the same time, the distribution of ratings in both groups became more balanced by the end of the study. This indicates a stabilization of emotional attitudes toward the lessons and an improvement in the overall quality of learning perception.

The obtained results suggest that structured planning of distance physical education lessons, combined with adaptation of instructional content, contributes to increased student interest and the creation of a more positive emotional climate in physical education learning.

## Discussion

The aim of the present study was to evaluate the effect of an adapted inclusive physical education program on motor skills and academic engagement of children aged 9–10 years. The obtained results demonstrate positive changes in the development of selected essential motor skills among students with special educational needs and reflect shifts in their attitudes toward physical education lessons.

Data analysis showed that, following the implementation of an inclusive approach involving a teaching assistant, students with delayed psychological and intellectual development exhibited improvements in balance, coordination, serial motor skills, and selected components of motor activity ($p < 0.05$). At the same time, the proportion of negative evaluations of distance physical education lessons decreased, while the share of ratings indicating a more positive perception of the lessons increased. Typically developing students also demonstrated stable positive motivation and satisfaction with the lessons, which supports the appropriateness and effectiveness of the implemented pedagogical strategies.

The presented findings allow the inclusive model of organizing physical education lessons to be regarded as an effective approach that promotes increased engagement of students with special educational needs and the development of their motor skills within a shared learning environment.

The obtained results are consistent with previous studies demonstrating the effectiveness of adapted methodologies and pedagogical support in enhancing motor and coordination skills among children with special educational needs. The improvements observed in students with delayed psychological and intellectual development correspond to the conclusions reported by Pocock et al. [4] and Wilhelmsen [3], who noted that structured adaptation of exercises contributes to greater coordination stability and the development of basic motor skills. Similar effects were confirmed in a randomized controlled study by Sun et al. [16], which concluded that an adapted physical activity program led to improvements in physical fitness among adolescents with intellectual disabilities.

Changes in interest ratings are consistent with the findings of Haegele and Sutherland [6] and Liu et al. [10]. These authors reported results highlighting the importance of task accessibility, clarity of instructions, and interpersonal support in shaping positive attitudes toward physical activity. The significance of organizational conditions and pedagogical support is confirmed both by the data reported by Fröberg [1] and Rekaa et al. [2], as well as by more recent findings from Bertills and Björk [17]. According to these authors, teachers' involvement in adapting lesson structure represents a decisive factor for the successful inclusion of students with disabilities. Additional evidence supporting the role of inclusive methodological approaches is provided by the study of Paquibot et al. [18], which demonstrates that targeted pedagogical strategies increase engagement and improve the emotional perception of lessons among children with special educational needs.

The improvements in motor and coordination skills observed in students with delayed psychological and intellectual development are consistent with findings from recent studies confirming the effectiveness of adapted physical activity programs. Specifically, Shen et al. [19] and Claire [20] demonstrated that structured adapted programs contribute to motor development and improved functional fitness in children and adolescents with intellectual disabilities. Similar conclusions were reported by Astuti et al. [21], who emphasized the role of adapted games and step-by-step exercises in the formation of basic motor skills.

The contribution of the pedagogical environment is further supported by the findings of Ben Rakaa, Lourenço et al. [22] and Paquibot et al. [18]. According to these authors, the use of adapted strategies, individualized instructions, and flexible teaching methods increases the engagement of students with intellectual disabilities in physical education lessons. A broader systemic perspective is reflected in the studies by Burhaein et al. [23] and Fierro-Saldaña and Treviño-Villarreal [24], which emphasize that the success of inclusive education is determined not only by the content of adapted exercises but also by the coherence of organizational conditions and supportive pedagogical practices.

Taken together, these findings confirm that the positive dynamics identified in the present study represent an expected outcome of targeted lesson adaptation and structured pedagogical support.

The positive changes in motor and motivational indicators observed among students with delayed psychological and intellectual development may be explained by the influence of key components of the inclusive methodology, including exercise adaptation, structured organization of motor activities, and individualized pedagogical support. The effectiveness of step-by-step organized physical activity is supported by the findings of Shen et al. [19] and Claire [20], as well as by the results of Lima et al. [25], which indicate a relationship between the level of physical activity and the development of motor competence. The importance of early motor skill formation for subsequent physical development is emphasized in the systematic review by García-Hermoso et al. [26]. The increase in motivation and emotional well-being reported by Ben Rakaa and Lourenço et al. [22] is consistent with the pedagogical conclusions of Kot [27] regarding the role of adaptation and supportive guidance in enhancing student engagement. Taken together, these data confirm that the combination of structured motor activity and targeted pedagogical support constitutes a key mechanism underlying the effectiveness of inclusive physical education lessons.

The obtained results indicate the need for purposeful adaptation of the structure of physical education lessons. Step-by-step presentation of motor tasks facilitates clearer understanding and acquisition of exercises by students with delayed psychological and intellectual development. Individualized pedagogical support also influences the formation and development of their motor skills. The effectiveness of such approaches is supported by the studies of Shen et al. [19] and Claire [20], which reported that adapted programs contributed to motor development and greater stability in exercise performance. These conclusions are complemented by the findings of Lima et al. [25], who demonstrated a stable relationship between the level of organized physical activity and the development of motor competence in childhood. The results of the systematic review by García-Hermoso et al. [26] also highlight the importance of early motor skill development for children's subsequent physical development. The increase in motivation and engagement identified in the present study is consistent with the findings of Ben Rakaa et al. [11], which emphasize the significance of an emotionally safe educational environment and child-accessible forms of physical activity.

From a practical perspective, strengthening pedagogical support is of particular importance, including the active role of a teaching assistant and the use of varied instructional methods, as supported by the recommendations of Yun and Beamer [13] and the findings of Sit et al. [14]. In addition, the study by Alhumaid et al. [15] demonstrated that the effectiveness of inclusive lessons is directly related to teachers' professional self-efficacy and their readiness to adapt lesson content and organizational approaches. Improvements in motor development were also reported in the studies of Karakaş et al. [12], which highlighted the value of using specially selected exercises aligned with children's individual capabilities.

At the organizational level, the effectiveness of inclusive education depends on the coherence of teachers' actions, the availability of resources, and institutional support, as emphasized in the systemic analysis by Fierro-Saldaña and Treviño-Villarreal [24]. This perspective is further supported by the pedagogical conclusions of Kot [27]. Overall, the present findings indicate that sustained student progress is achievable through the integration of individualized instructional approaches, structured lesson organization, and coordinated institutional support for inclusive practice.

*Study Limitations*

Despite the positive findings, this study has several limitations that should be considered when interpreting the results. First, the small number of students with delayed psychological and intellectual development limits the generalizability of the findings and does not allow for more advanced statistical analyses. In addition, the study was conducted within a single school setting, which reduces the transferability of the results to other educational contexts with different organizational conditions and inclusive education practices. The predominant use of quantitative methods to assess motor preparedness also limits the ability to fully capture students' subjective experiences and the quality of pedagogical interactions.

Future research would benefit from expanding the sample to include different categories of students with special educational needs and from conducting interschool comparative studies. The application of mixed-method approaches that combine motor skill testing, observation, and qualitative interviews is also recommended. Such approaches would allow for a deeper understanding of the mechanisms through which inclusive methodologies influence motivation and participation among children with special educational needs. An important direction for further research is the analysis of the effectiveness of specific components of pedagogical support, including the role of the teaching assistant, the structuring of exercises, and the adaptation of the learning environment. This would help to identify optimal conditions for organizing inclusive physical education lessons.

## Conclusions

The present study demonstrated that the application of an inclusive physical education teaching methodology incorporating adapted motor tasks, structured lesson organization, and individualized pedagogical support contributes to the improvement of essential motor skills and increased motivation among students with delayed psychological and intellectual development. The observed positive dynamics in coordination and motor indicators confirm the effectiveness of accessible, step-by-step exercises and targeted assistance provided by the teacher and the teaching assistant. Changes in students' interest ratings highlight the importance of an emotionally safe and predictable educational environment, which enhances engagement and readiness to actively participate in physical activity.

The study findings emphasize the importance of integrating adaptive pedagogical strategies into the daily practice of physical education lessons as a condition for the successful inclusion of children with special educational needs. The implementation of such approaches may be considered an effective pathway to improving accessibility, effectiveness, and the social significance of inclusive education in primary schools.

## Conflict of interests

The authors declare that there is no conflict of interests.t.

### References


1. Fröberg A. Perspectives on the integration of students with disabilities in physical education: An umbrella review of reviews published between 2010 and 2020. *European Journal of Adapted Physical Activity*, 2021;14(2): 9–9. https://doi.org/10.5507/euj.2021.002
2. Rekaa H, Hanisch H, Ytterhus B. Inclusion in Physical Education: Teacher Attitudes and Student Experiences. A Systematic Review. *International Journal of Disability, Development and Education*, 2019;66(1): 36–55. https://doi.org/10.1080/1034912X.2018.1435852
3. Wilhelmsen T, Sørensen M. Inclusion of Children With Disabilities in Physical Education: A Systematic Review of Literature From 2009 to 2015. *Adapted Physical Activity Quarterly*, 2017;34(3): 311–337. https://doi.org/10.1123/apaq.2016-0017
4. Pocock T, Miyahara M. Inclusion of students with disability in physical education: a qualitative meta-analysis. *International Journal of Inclusive Education*, 2018;22(7): 751–766. https://doi.org/10.1080/13603116.2017.1412508
5. Qi J, Ha AS. Inclusion in Physical Education: A review of literature. *International Journal of Disability, Development and Education*, 2012;59(3): 257–281. https://doi.org/10.1080/1034912X.2012.697737
6. Haegele JA, Sutherland S. Perspectives of Students with Disabilities Toward Physical Education: A Qualitative Inquiry Review. *Quest*, 2015;67(3): 255–273. https://doi.org/10.1080/00336297.2015.1050118
7. Haegele JA, Hodge SR, Zhu X, Holland SK, Wilson WJ. Understanding the Inclusiveness of Integrated Physical Education From the Perspectives of Adults With Visual Impairments. *Adapted Physical Activity Quarterly*, 2020;37(2): 141–159. https://doi.org/10.1123/apaq.2019-0094
8. Antala B, Průžek M, Popluhárová M. Self-Efficacy and Attitudes of Physical Education Teachers towards Inclusion of Pupils with Disabilities. *Sustainability*, 2022;14(20): 13292. https://doi.org/10.3390/su142013292
9. McNamara S, Healy S, Haegele J. Use of Social Media for Professional Development by Physical Educators Who Teach Students with Disabilities. *International Journal of Disability, Development and Education*, 2021;68(5): 690–701. https://doi.org/10.1080/1034912X.2019.1699649
10. Liu X, Han H, Li Z, Huang S, Zhao Y, Xiao Q, et al. Barriers and facilitators to participation in physical activity for students with disabilities in an integrated school setting: a meta-synthesis of qualitative research evidence. *Frontiers in Public Health*, 2025;13: 1496631. https://doi.org/10.3389/fpubh.2025.1496631
11. Ben Rakaa O, Bassiri M, Lotfi S. Adapted pedagogical strategies in inclusive physical education for students with special educational needs: a systematic review. *Pedagogy of Physical Culture and Sports*, 2025;29(2): 67–85. https://doi.org/10.15561/26649837.2025.0201
12. Karakaş G, Eroğlu Kolayiş I, Bayazıt B. Effects of adapted physical activity on the motor development of children with mild intellectual disability. *International Journal of Developmental Disabilities*, 2025;71(5): 777–787. https://doi.org/10.1080/20473869.2024.2332751
13. Yun J, Beamer J. Promoting Physical Activity in Adapted Physical Education. *Journal of Physical Education, Recreation & Dance*, 2018;89(4): 7–13. https://doi.org/10.1080/07303084.2018.1430628
14. Sit C, Aubert S, Carty C, Silva DAS, López-Gil JF, Asunta P, et al. Promoting Physical Activity Among Children and Adolescents With Disabilities: The Translation of Policy to Practice Internationally. *Journal of Physical Activity and Health*, 2022;19(11): 758–768. https://doi.org/10.1123/jpah.2022-0351
15. Alhumaid MM, Khoo S, Bastos T. The Effect of an Adapted Physical Activity Intervention Program on Pre-Service Physical Education Teachers' Self-Efficacy towards Inclusion in Saudi Arabia. *Sustainability*, 2021;13(6): 3459. https://doi.org/10.3390/su13063459
16. Sun Y, Yu S, Wang A, Chan HCK, Ou AX, Zhang D, et al. Effectiveness of an adapted physical activity intervention on health-related physical fitness in adolescents with intellectual disability: a randomized

controlled trial. *Scientific Reports*, 2022;12(1): 22583. https://doi.org/10.1038/s41598-022-26024-1
17. Bertills K, Björk M. Facilitating regular Physical Education for students with disability – PE teachers' views. *Frontiers in Sports and Active Living*, 2024;6: 1400192. https://doi.org/10.3389/fspor.2024.1400192
18. Paquibot PWVI, Paquibot PWVI, Poquita JK, Puentenegra EG, Pulgo JL, Tangente KAT, Velarde CD, Quinco-Cadosales MN. Inclusive teaching practices in physical education for students with special needs. *International Journal of Progressive Sciences and Technologies, 2025;16(2), 345–356.*
19. Shen X, Huang P, Nie B, Su M, Liu D, Guo Y, Zheng L. An adapted physical activity program for adolescents with an intellectual disability: An International Classification of Functioning, Disability, and Health perspective. *Life*. 2024;14(10):1314. https://doi.org/10.3390/life14101314
20. Claire H. Effectiveness of adaptive physical education programs for students with disabilities in Canada. *International Journal of Physical Education, Recreation and Sports*. 2025;3(1):1–11. https://doi.org/10.47604/ijpers.3181
21. Astuti Y, Orhan BE, Erianti, Amsari D, Sari DN. Improving fundamental motor skills in children with intellectual disabilities through adapted sports and games. *Journal of Physical Education and Sport*. 2024;24(1):96–102. https://doi.org/10.7752/jpes.2024.01013
22. Ben Rakaa O, Lourenço C, Bassiri M, Lotfi S. The Effect of Adapted Physical Activity and Inclusive Sport on the Motivation and Psychological Health of Children with Disabilities: A Randomized Control Trial. *Physical Education Theory and Methodology*, 2025;25(3): 642–651. https://doi.org/10.17309/tmfv.2025.3.21
23. Burhaein E, Phytanza DTP, Lourenço CCV. Adapted physical education: how the character development of students with physical disabilities in Yogyakarta, Indonesia? *Retos*. 2025;62:815–826.
24. Fierro-Saldaña B, Treviño-Villarreal E. Inclusion of students with disabilities in physical education: the crossroads of systemic coherence. *Physical Culture and Sport. Studies and Research*. 2025;107(1):37–47. https://doi.org/10.2478/pcssr-2025-0004
25. Lima RA, Pfeiffer K, Larsen LR, Bugge A, Moller NC, Anderson LB, et al. Physical Activity and Motor Competence Present a Positive Reciprocal Longitudinal Relationship Across Childhood and Early Adolescence. *Journal of Physical Activity and Health*, 2017;14(6): 440–447. https://doi.org/10.1123/jpah.2016-0473
26. García-Hermoso A, Izquierdo M, Ramírez-Vélez R. Tracking of physical fitness levels from childhood and adolescence to adulthood: a systematic review and meta-analysis. *Translational Pediatrics*, 2022;11(4): 474–486. https://doi.org/10.21037/tp-21-507
27. Kot NA. Pedagogical strategies for compensating educational losses in preschoolers' physical education under martial law conditions. *Collection of Research Papers Pedagogical sciences*, 2025;(110): 39–47. https://doi.org/10.32999/ksu2413-1865/2025-110-5

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