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Changes in SKJ student gymnastics learning outcomes following an audiovisual-based flipped classroom in vocational high school students

Perubahan hasil belajar senam SKJ Pelajar setelah penerapan flipped classroom berbasis media audiovisual pada siswa sekolah menengah kejuruan

Muharam Ahmad Aulian[1]

[1] *Universitas Muhammadiyah Indonesia, Indonesia*
email: muharamahmadaulian@gmail.com

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ABSTRACT

Background: Low student engagement and learning outcomes in SKJ Student Gymnastics remain a challenge in physical education, particularly when instruction is dominated by teacher-centered approaches.
Objective: This study aimed to describe changes in SKJ Student Gymnastics learning outcomes following the implementation of an audiovisual-based flipped classroom among Grade X DKV students at SMK Insan Cendikia Srengseng.
Methods: The study employed a Classroom Action Research design conducted over two cycles, each comprising planning, action, observation, and reflection. Participants were 15 students, including eight females and seven males. Audiovisual learning materials were provided through instructional videos that students studied independently at home via a WhatsApp group, while classroom sessions were used for movement practice, discussion, and direct teacher feedback. Learning outcomes were assessed across affective, cognitive, and psychomotor domains and analyzed descriptively using mean scores and learning-mastery percentages.
Results: The mean learning outcome score increased from 65.0 in the pre-cycle to 72.6 in Cycle I and 81.9 in Cycle II. Learning mastery also increased from 20.0% in the pre-cycle to 46.7% in Cycle I and 86.7% in Cycle II.
Conclusion: These findings indicate that the implementation of an audiovisual-based flipped classroom was accompanied by progressive improvements in SKJ Student Gymnastics learning outcomes across the action cycles. This approach may support students' preparation before class while allowing more classroom time for movement practice and teacher feedback. Future studies should employ comparative designs and larger samples to provide stronger evidence regarding its effectiveness.

ABSTRAK

Latar belakang: Rendahnya keterlibatan dan hasil belajar siswa dalam pembelajaran senam SKJ Pelajar menjadi salah satu tantangan dalam pendidikan jasmani, terutama ketika proses pembelajaran masih didominasi pendekatan satu arah.
Tujuan: Penelitian ini bertujuan untuk mendeskripsikan perubahan hasil belajar senam SKJ Pelajar setelah penerapan model *flipped classroom* berbasis media audiovisual pada siswa kelas X DKV SMK Insan Cendikia Srengseng.
Metode: Penelitian menggunakan desain Penelitian Tindakan Kelas yang dilaksanakan dalam dua siklus melalui tahapan perencanaan, tindakan, observasi, dan refleksi. Partisipan terdiri atas 15 siswa, yaitu 8 perempuan dan 7 laki-laki. Media audiovisual berupa *video* pembelajaran dipelajari siswa secara mandiri di rumah melalui grup *WhatsApp*, sedangkan waktu pembelajaran di kelas digunakan untuk praktik gerak, diskusi, dan umpan balik langsung dari guru. Hasil belajar dinilai pada domain afektif, kognitif, dan psikomotor, kemudian dianalisis secara deskriptif berdasarkan nilai rata-rata dan persentase ketuntasan belajar.
Hasil: Rata-rata hasil belajar meningkat dari 65,0 pada pra-siklus menjadi 72,6 pada siklus I dan 81,9 pada siklus II. Persentase ketuntasan juga meningkat dari 20,0% pada pra-siklus menjadi 46,7% pada siklus I dan 86,7% pada siklus II.
Kesimpulan: Temuan ini menunjukkan bahwa penerapan flipped classroom berbasis audiovisual disertai peningkatan hasil belajar senam SKJ Pelajar selama proses tindakan. Model ini berpotensi mendukung kesiapan belajar sebelum kelas dan memberikan lebih banyak waktu untuk praktik serta umpan balik pada pembelajaran gerak. Penelitian

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selanjutnya disarankan menggunakan desain pembanding dan sampel yang lebih besar untuk menguji efektivitasnya secara lebih kuat.

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Highlights

- ✓ Audiovisual-based flipped classroom learning was accompanied by progressive improvements in SKJ Student Gymnastics outcomes.
- ✓ Mean learning scores increased from 65.0 in the pre-cycle to 81.9 by the end of Cycle II.
- ✓ Learning mastery increased from 20.0% to 86.7% across the classroom action research cycles.

Introduction

Physical education is concerned not only with physical activity but also with the development of movement competence, knowledge, attitudes, and students' active engagement in the learning process. In rhythmic gymnastics activities such as SKJ Student Gymnastics, students are expected to remember movement sequences, synchronize their movements with rhythm, maintain coordination, and perform the skills accurately. However, preliminary observations of Grade X DKV students at SMK Insan Cendikia Srengseng revealed several learning challenges, including low student enthusiasm, limited mastery of movement sequences, and the predominance of teacher-centered instruction. These conditions were reflected in the pre-cycle results, in which the mean learning outcome score was 65.0 and only 3 of 15 students (20%) achieved the learning mastery criterion. This situation highlights the need for an instructional strategy that allows students to prepare learning materials before class while providing more time for practice and feedback during face-to-face sessions.

One potentially relevant approach is the flipped classroom, a model in which part of the instructional content is delivered outside the classroom through digital learning resources so that face-to-face time can be devoted to application, practice, discussion, and feedback. This approach is particularly relevant to physical education because limited instructional time often requires teachers to divide classroom time among conceptual explanation, demonstration, skill practice, and technical correction. In a scoping review of flipped learning in physical education, Østerlie et al. (2023) showed that this approach has been implemented across a range of physical education contexts and has the potential to support learning, motivation, and student engagement. However, the review also indicated considerable variation in implementation strategies and reported outcomes, suggesting that its effectiveness and underlying mechanisms should continue to be examined across different skills, populations, and instructional contexts.

Previous studies have provided evidence supporting the use of flipped learning in physical education. Østerlie and Mehus (2020) found that flipped learning in secondary physical education was associated with improvements in cognitive knowledge and intrinsic motivation. Ferriz-Valero et al. (2022a) reported that the flipped classroom could be effectively applied to volleyball instruction among lower secondary school students, while Ferriz-Valero et al. (2022b) found benefits for learning and motivation among upper secondary school students. Botella et al. (2021) also reported increased student motivation following the implementation of flipped learning in physical education. More broadly, a meta-analysis by Wu et al. (2025) involving 13 studies found positive effects of the flipped classroom on intrinsic motivation, self-efficacy, and learning satisfaction in physical education. However, the heterogeneity across studies indicated that these effects may depend on the instructional context, learning content, and design of the intervention.

In addition to the flipped learning structure itself, video-based instruction is also relevant to motor-skill learning because it enables students to observe demonstrations repeatedly before and after face-to-face sessions. Fauzi et al. (2026), for example, showed that digital video feedback can support round-off learning outcomes in gymnastics instruction. This finding reinforces the potential value of visual media not only for delivering information but also for helping students recognize movement sequences and refine their performance. However, the effects of audiovisual media are not necessarily uniform across contexts. Araujo et al. (2026) found that music and video stimuli did not produce consistent changes in mood following high-intensity aerobic exercise, suggesting that the benefits of audiovisual media are strongly influenced by task characteristics and the context in which they are used.

Despite the growing body of research on flipped learning in physical education, several gaps remain. First, many previous studies have focused on sport-based activities such as volleyball, basketball, martial arts, or on psychological outcomes such as motivation, self-efficacy, and learning satisfaction, whereas its application to school-based rhythmic gymnastics remains relatively limited. Second, studies combining audiovisual video materials for pre-class learning with structured in-class practice and direct teacher feedback in the context of SKJ Student Gymnastics are still rarely reported. Third, most previous studies have used experimental or quasi-experimental designs, while evidence regarding the cyclical use of this approach to improve classroom learning through planning, action, observation, and reflection remains limited. Fourth, relatively few studies have examined changes in learning outcomes across affective, cognitive, and psychomotor domains simultaneously in the context of SKJ Student Gymnastics.

Based on these gaps, the novelty of the present study lies in the contextual implementation of an audiovisual-based flipped classroom for SKJ Student Gymnastics in a vocational high school setting using a Classroom Action Research design. Changes in learning outcomes were evaluated across affective, cognitive, and psychomotor domains from the pre-cycle stage through two successive action cycles. The novelty does not lie in the development of a new flipped classroom model, but rather in its contextual application to rhythmic gymnastics through the integration of pre-class instructional videos, in-class movement practice, and direct teacher feedback.

This study aimed to describe changes in SKJ Student Gymnastics learning outcomes following the implementation of an audiovisual-based flipped classroom among Grade X DKV students at SMK Insan Cendikia Srengseng. From a practical perspective, the study is expected to provide physical education teachers with an alternative instructional strategy for optimizing face-to-face learning time, improving students' readiness before practice, and increasing opportunities for movement practice and feedback. From an academic perspective, the study provides contextual evidence regarding the implementation of flipped learning in rhythmic gymnastics within vocational education and may serve as a foundation for future experimental studies involving larger samples and comparison groups.

Materials and Methods

Study Design

This study employed a Classroom Action Research (CAR) design to improve the learning process and learning outcomes in SKJ Student Gymnastics through the implementation of an audiovisual-based flipped classroom. The study was conducted over two cycles, and each cycle consisted of four main stages: planning, action, observation, and reflection (Figure 1). The results of observation and reflection from each cycle were used as the basis for refining the subsequent cycle.

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Before Cycle I was implemented, a pre-cycle stage was conducted to obtain baseline information on students' learning outcomes in SKJ Student Gymnastics. The pre-cycle assessment was conducted on April 28, 2025, Cycle I on May 6, 2025, and Cycle II on May 20, 2025. Overall, the study was conducted over approximately one month during the second semester of the 2024/2025 academic year.

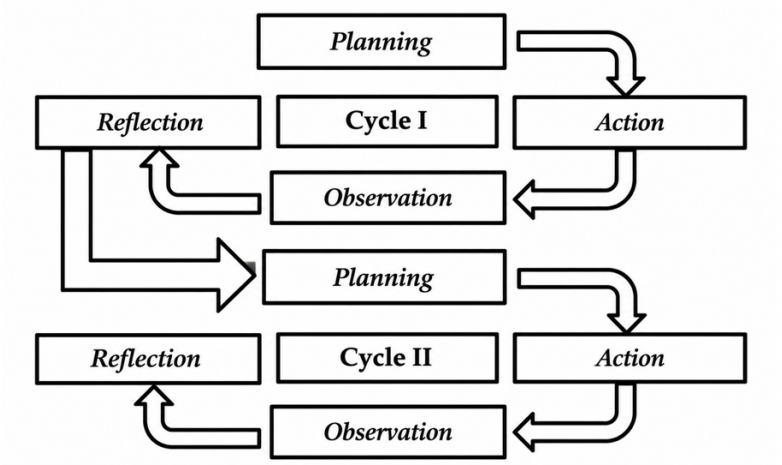


Figure 1. Classroom Action Research design

Participants

The study was conducted at SMK Insan Cendikia Srengseng, West Jakarta. The participants were all Grade X DKV students enrolled in physical education in the class where the action research was implemented. The class consisted of 15 students, including eight females and seven males. The class was selected within the context of Classroom Action Research because the researcher was the teacher responsible for the class and had identified learning difficulties related to SKJ Student Gymnastics that required improvement.

Action Procedures

Pre-cycle

The pre-cycle stage was conducted to identify the initial learning conditions and students' learning outcomes before the implementation of the flipped classroom. Preliminary observations indicated that some students had difficulty following the sequence and rhythm of SKJ Student Gymnastics movements, showed low enthusiasm, and had not yet achieved the expected learning outcomes. The pre-cycle data were subsequently used as the basis for designing the intervention in Cycle I.

Cycle I

During the planning stage, the teacher prepared SKJ Student Gymnastics learning materials and audiovisual media in the form of instructional videos to be used as pre-class learning resources. During the action stage, the instructional videos were shared with the Grade X students through a class WhatsApp group for independent study at home.

During face-to-face lessons, classroom time was devoted to practicing SKJ Student Gymnastics movements under the teacher's guidance. The teacher observed students' movement performance and provided direct feedback on identified errors. During the observation stage, both the learning process and students' learning outcomes were observed and documented. The data obtained were used to identify students' progress as well as challenges encountered during the intervention. During the reflection stage, the results from Cycle I were reviewed to determine the refinements required for Cycle II.

Cycle II

Cycle II retained the flipped classroom structure used in Cycle I while incorporating several enhancements. The SKJ Student Gymnastics instructional videos were again distributed through the WhatsApp group for students to study before the face-to-face lesson. In addition, students were provided with independent practice activities and a brief reflection before the classroom session, while in-class activities continued to focus on movement practice, teacher guidance, and feedback.

Instruments and Assessment of Learning Outcomes

Data collection in the original study included observation, field notes, documentation, tests, and photographs. Students' learning outcomes were evaluated across three domains: affective, cognitive, and psychomotor. In calculating the final scores reported in the results tables, the three domains were weighted as follows: 30% for the affective domain, 20% for the cognitive domain, and 50% for the psychomotor domain.

Data Collection

Data were collected at each stage of the study. During the pre-cycle stage, the data were used to establish students' baseline performance. In Cycle I and Cycle II, the teacher and observer documented the intervention process and students' learning progress through observations, tests, field notes, and supporting documentation. The observation results were then used during the reflection stage to determine whether the intervention required modification in the subsequent cycle.

Statistical analysis

The data were analyzed descriptively to illustrate changes in learning outcomes from the pre-cycle stage through Cycle I and Cycle II. The analysis included mean learning outcome scores, highest and lowest scores, the number of students who achieved the mastery criterion, and the percentage of students achieving classical learning mastery at each stage.

The mean learning outcome score was calculated by dividing the sum of all student scores by the total number of students. The learning mastery percentage was calculated as the proportion of students who achieved the minimum mastery criterion (Kriteria Ketuntasan Minimal; KKM) relative to the total number of students.

Results

The results are presented according to changes in students' learning outcomes across the pre-cycle stage, Cycle I, and Cycle II. Learning outcomes were assessed across three domains: affective, cognitive, and psychomotor, weighted at 30%, 20%, and 50%, respectively. Changes in learning outcomes were analyzed

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descriptively using mean scores and the percentage of students who achieved the learning mastery criterion.

Pre-cycle

Table 1 shows that students' initial performance was relatively low across all three learning domains. Mean scores for the affective, cognitive, and psychomotor domains ranged from 64 to 65, while only one-fifth of the students had achieved the learning mastery criterion. These pre-cycle findings served as the basis for implementing the intervention in Cycle I.

Cycle I

During Cycle I, students began participating in learning activities using an audiovisual-based flipped classroom model. SKJ Student Gymnastics instructional videos were shared through a WhatsApp group for students to study before the face-to-face session, while classroom activities focused on movement practice and teacher feedback.

Following the Cycle I intervention, the mean final score increased to 72.6. The mean scores for the affective, cognitive, and psychomotor domains were 72.06, 71.13, and 73.86, respectively. Seven of the 15 students achieved the learning mastery criterion, while eight had not yet achieved mastery. Accordingly, the learning mastery percentage increased to 46.7%. The original data rounded this value to 47%.

As shown in Table 2, Cycle I demonstrated improvements across all learning domains compared with the pre-cycle stage. The mean final score increased by 7.6 points, from 65.0 to 72.6. The number of students achieving mastery also increased from three to seven. Nevertheless, more than half of the students had not yet achieved mastery by the end of Cycle I; therefore, the intervention was continued and refined in Cycle II.

Cycle II

Based on the reflection from Cycle I, the intervention was continued in Cycle II. Students again studied SKJ Student Gymnastics videos before the classroom session through the WhatsApp group and received additional reinforcement in the form of independent practice and brief reflection before class. Face-to-face sessions were then used for movement practice and feedback on students' performance.

Table 1
Students' learning outcomes at the pre-cycle stage

Indicator	Result
Mean affective domain score	64.0
Mean cognitive domain score	65.0
Mean psychomotor domain score	65.0
Mean final score	65.0
Highest score	81.5
Lowest score	51.4
Students achieving mastery	3 (20.0%)
Students not achieving mastery	12 (80.0%)

Table 2
Students' learning outcomes in Cycle I

Indicator	Result
Mean affective domain score	72.06
Mean cognitive domain score	71.13
Mean psychomotor domain score	73.86
Mean final score	72.6
Highest score	84.6
Lowest score	63.5
Students achieving mastery	7 (46.7%)
Students not achieving mastery	8 (53.3%)

Table 3
Students' learning outcomes in Cycle II

Indicator	Result
Mean affective domain score	81.0
Mean cognitive domain score	80.4
Mean psychomotor domain score	83.1
Mean final score	81.9
Highest score	92.3
Lowest score	69.5
Students achieving mastery	13 (86.7%)
Students not achieving mastery	2 (13.3%)

Table 4
Changes in learning outcomes from the pre-cycle stage to Cycle II

Indicator	Pre-cycle	Cycle I	Cycle II	Change from pre-cycle to Cycle II
Affective domain	64.0	72.06	81.0	+17.0
Cognitive domain	65.0	71.13	80.4	+15.4
Psychomotor domain	65.0	73.86	83.1	+18.1
Final score	65.0	72.6	81.9	+16.9
Students achieving mastery, n	3	7	13	+10 students
Learning mastery (%)	20.0	46.7	86.7	+66.7 percentage points

By the end of Cycle II, the mean final score had increased to 81.9, with mean scores of 81.0 for the affective domain, 80.4 for the cognitive domain, and 83.1 for the psychomotor domain. Thirteen students achieved the learning mastery criterion, while two

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had not yet achieved mastery. Thus, the learning mastery percentage reached 86.7%, which may be rounded to 87%.

Table 3 shows improvements across all three learning domains compared with Cycle I. The psychomotor domain had the highest mean score (83.1), followed by the affective domain (81.0) and the cognitive domain (80.4). The learning mastery percentage increased to 86.7%, indicating that most students had achieved the mastery criterion by the end of the intervention.

Based on the summary data presented in Table 4, learning outcomes showed a consistent descriptive pattern of improvement from the pre-cycle stage through Cycle II. The mean final score increased by 16.9 points, from 65.0 to 81.9. The largest improvement across domains was observed in the psychomotor domain, which increased by 18.1 points, followed by the affective domain with an increase of 17.0 points and the cognitive domain with an increase of 15.4 points. The learning mastery percentage increased by 66.7 percentage points, from 20.0% to 86.7%.

These changes indicate that students' learning outcomes improved progressively across the cycles during the implementation of the audiovisual-based flipped classroom. However, because the study employed a Classroom Action Research design without a comparison group and relied on descriptive analysis, the findings should be interpreted as improvements observed during the intervention rather than as causal evidence that all changes were solely attributable to the flipped classroom model.

Discussion

The findings showed a gradual improvement in students' learning outcomes during the implementation of the audiovisual-based flipped classroom. The mean final score increased from 65.0 in the pre-cycle stage to 72.6 in Cycle I and 81.9 in Cycle II. The percentage of students achieving learning mastery also increased from 20.0% to 46.7% and subsequently to 86.7%. Improvements were observed across all three learning domains, with the largest change occurring in the psychomotor domain, followed by the affective and cognitive domains. These findings indicate that, throughout the action cycles, students became increasingly able to participate in SKJ Student Gymnastics learning in terms of movement performance, understanding of the material, and engagement in the learning process.

These findings are consistent with previous studies on the implementation of flipped learning in physical education. Østerlie and Mehus (2020) reported that flipped learning can support the development of cognitive knowledge and intrinsic motivation in physical education. Ferriz-Valero et al. (2022a) also demonstrated benefits of the flipped classroom in volleyball instruction, while Ferriz-Valero et al. (2022b) reported improvements in learning and motivation among upper secondary school students. In the psychomotor domain, Hatami and Savaş (2024) showed that flipped learning can support the acquisition of technical skills in basketball instruction. The present findings are also consistent with the review by Østerlie et al. (2023), which suggested that flipped learning has the potential to support a range of learning outcomes in physical education, although its effectiveness may vary depending on the context and the way in which it is implemented.

The observed improvements may be explained by the characteristics of the instructional approach used in this study. Students received SKJ Student Gymnastics videos before class, allowing them to observe and repeatedly review movement sequences independently before classroom practice. Face-to-face time could therefore be devoted more extensively to movement practice and direct teacher feedback. This mechanism is consistent with Fauzi et al. (2026), who demonstrated the benefits of digital video feedback in gymnastics skill learning, and Carey et al. (2023), who emphasized the role of the flipped classroom in creating more opportunities for analysis and feedback during learning activities. Thus, the changes in learning outcomes observed in this study were likely related not only to access to instructional videos but also to the combination of repeated visual exposure, practice, teacher feedback, and iterative refinement of the intervention from one cycle to the next.

Nevertheless, audiovisual media should not be assumed to automatically produce better learning outcomes or psychological responses in all situations. Araujo et al. (2026), for example, found that exposure to music or video did not result in consistent differences in mood responses following high-intensity aerobic exercise. This finding suggests that the benefits of audiovisual media depend strongly on the purpose, type of activity, and manner in which the stimulus is used. In the present study, video was integrated into the learning process as a source of movement demonstration rather than used as a passive audiovisual stimulus. Therefore, the observed improvement is more plausibly associated with the overall flipped classroom design than with the mere presence of video media.

Clinical implications

From a practical perspective, these findings suggest that physical education teachers may use an audiovisual-based flipped classroom for learning activities that require mastery of movement sequences and techniques, such as SKJ Student Gymnastics. Providing demonstrations before class may help students prepare for practice, while face-to-face time can be focused on rehearsal, technical correction, and individualized feedback. This approach also gives students opportunities to revisit movement demonstrations according to their individual learning needs and may provide an alternative strategy for optimizing limited practice time in physical education lessons.

Study limitations

This study has several limitations. First, it involved only 15 students from a single class and school, limiting the generalizability of the findings. Second, the Classroom Action Research design did not include a comparison group, which prevents causal conclusions that the improvement in learning outcomes was entirely attributable to the flipped classroom. The observed changes may also have been influenced by repeated practice, increased familiarity with SKJ Student Gymnastics, teacher feedback, adaptation to the learning process, and repeated-measurement effects. Third, the researcher also served as the classroom teacher; therefore, the possibility of teacher–researcher bias should be considered. Future studies should involve larger samples, include comparison groups, use validated assessment instruments, and evaluate intervention fidelity to strengthen the evidence regarding the effectiveness of audiovisual-based flipped classrooms in physical education.

Conslusions

The implementation of an audiovisual-based flipped classroom in SKJ Student Gymnastics was accompanied by a gradual improvement in students' learning outcomes from the pre-cycle stage through Cycle II. Improvements were observed across the affective, cognitive, and psychomotor domains, with the mean final score increasing from 65.0 to 81.9 and the learning mastery percentage increasing from 20.0% to 86.7%. These findings suggest that the use of instructional videos as pre-class learning materials, followed by movement practice and direct feedback during face-to-face sessions, may support students' learning readiness and skill development.

However, because the study employed a Classroom Action Research design in a single class without a comparison group, these findings should be interpreted as improvements observed during the action process rather than as definitive causal evidence. Future research should involve larger samples, comparison groups, and validated assessment instruments to provide stronger evidence regarding the effectiveness of this approach in physical education.

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Author contributions

Conceptualization: M.A.A.; Methodology: M.A.A.; Investigation: M.A.A.; Data curation: M.A.A.; Formal analysis: M.A.A.; Project administration: M.A.A.; Visualization: M.A.A.; Writing – original draft: M.A.A.; Writing – review & editing: M.A.A. The author has read and approved the final version of the manuscript and agrees to be accountable for the integrity and accuracy of the work.

Ethical statement

This study was conducted in accordance with generally accepted ethical principles for educational research involving human participants. Formal ethical clearance from an institutional ethics committee was not obtained for this classroom action research. However, permission to conduct the study was obtained from the school prior to data collection. Participation was voluntary, and the confidentiality and anonymity of the students were maintained throughout the research process. The study activities were integrated into regular physical education instruction and were conducted with due consideration for the students' welfare, privacy, and right to withdraw from research participation without academic penalty.

Informed consent

Written informed consent was obtained from the parents or legal guardians of the participating students prior to data collection. In addition, the students were informed about the purpose and procedures of the study in language appropriate to their age and voluntarily agreed to participate. Students and their parents or legal guardians were informed that participation in the research component was voluntary and that withdrawal would not affect the students' grades, academic standing, or access to regular physical education instruction. No personally identifiable information was included in the analysis or reported in the manuscript.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this manuscript, the author used ChatGPT (OpenAI) solely to improve language, grammar, and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the accuracy, integrity, and content of the publication.

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Conflicts of interest

The author declare no conflicts of interest.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to appropriate ethical and privacy considerations.

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