Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity

Published by: Campus Educa Sportis. Collaborator: University of A Coruña
A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons

Análisis comparativo de la efectividad de las estrategias de enseñanza sobre la condición física de los y las estudiantes en lecciones de educación física

Chawki Derbali[1]*; Seyed Houtan Shahidi[2]

1 Department of Didactics, High Institute of Sports and Physical Education of Kef, University of Jendouba, Tunisia

2 Department of Sport Coaching, Faculty of Sports Sciences, Istanbul Gedik University, Istanbul, Turkey

* Corresponding author: Chawki Derbali. chawkiderbali1@mail.com

Editorial schedule: *Article received 20/04/2025 Accepted: 20/05/2025 Published: 01/10/2025*
https://doi.org/10.17979/sportis.2025.11.4.11976

To cite this article use the following reference:
Derbali, C.; Shahidi, S.H. (2025). Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Sportis Sci J, 11 (4), 1-22 https://doi.org/10.17979/sportis.2025.11.4.11976

Author contribution: All authors contributed equally to the work.

Funding: The study did not obtain funding.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical aspects: The study declares the ethical aspects.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

Abstract
Effective teaching methods in physical education is crucial for achieving positive outcomes, nonetheless research on the impact of evolving strategies remains limited. This study compares three physical education teaching strategies among Tunisian secondary students, focusing on their impact on physical fitness. The current research employed a reflective observational design over three school trimesters, each implementing a distinct teaching strategy: controlled, motivational, and creative. Physical fitness indicators was assessed using six indicators (BMI, flexibility, vertical jump, shuttle run, long jump, push-ups) and analyzed with a mixed ANOVA model. In 2024, 67 students (32 boys, 35 girls) and aged between16 and 18 years completed six physical fitness tests. Significant differences were found in the overall training effectiveness for all students across vertical jump ($p < 0.001$, $\eta^2 = 0.183$), flexibility ($p < 0.001$, $\eta^2 = 0.028$), and 10 x 5m shuttle run ($p < 0.001$, $\eta^2 = 0.033$). Post-hoc analyses revealed that creative teaching was the most effective strategy for improving physical fitness, while motivational teaching was less effective, especially in showing poorer results in improving shuttle run performance. Gender-specific analysis revealed significant effects for flexibility ($p < 0.001$, $\eta^2 = 0.026$) in girls and push-ups ($p < 0.001$, $\eta^2 = 0.030$) in boys, with creative teaching again yielding superior results in these areas compared to other strategies. Finally, these findings show that motivational teaching encourages behavior, controlled teaching relies on oversight, and creative teaching fosters innovation and creativity. Advanced teaching strategies should tailor interventions to diverse fitness outcomes and individual behaviors.
Keywords: teaching strategies; creative teaching; physical education; physical fitness.

Resumen
Los métodos de enseñanza efectivos en educación física son cruciales para lograr resultados positivos; sin embargo, la investigación sobre el impacto de las estrategias en desarrollo sigue siendo limitada. Este estudio compara tres estrategias de enseñanza de educación física entre estudiantes secundarios tunecinos, centrándose en su impacto en la condición física. La investigación actual empleó un diseño observacional reflexivo durante tres trimestres escolares, cada uno implementando una estrategia de enseñanza distinta: controlada, motivacional y creativa. Los indicadores de condición física se evaluaron utilizando seis indicadores (IMC, flexibilidad, salto vertical, carrera de relevos, salto de longitud, flexiones) y se analizaron con un modelo ANOVA mixto. En 2024, 67 estudiantes (32 varones, 35 mujeres) de entre 16 y 18 años completaron seis pruebas de condición física. Se encontraron diferencias significativas en la efectividad general del entrenamiento para todos los estudiantes en el salto vertical ($p < 0.001$, $\eta^2 = 0.183$), flexibilidad ($p < 0.001$, $\eta^2 = 0.028$) y carrera de relevos de 10 x 5 m ($p < 0.001$, $\eta^2 = 0.033$). Los análisis post-hoc revelaron que la enseñanza creativa fue la estrategia más efectiva para mejorar la condición física, mientras que la enseñanza motivacional fue menos efectiva, especialmente al mostrar peores resultados en mejorar el rendimiento en la carrera de relevos. El análisis por género reveló efectos significativos para flexibilidad ($p < 0.001$, $\eta^2 = 0.026$) en mujeres y flexiones ($p < 0.001$, $\eta^2 = 0.030$) en varones, siendo la enseñanza creativa la que de nuevo arrojó resultados superiores en estas áreas en comparación con otras estrategias. Finalmente, estos hallazgos muestran que la enseñanza motivacional fomenta el comportamiento, la enseñanza controlada se

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

basa en la supervisión, y la enseñanza creativa promueve la innovación y la creatividad. Y que las estrategias de enseñanza avanzadas deben adaptar las intervenciones a diversos resultados de acondicionamiento físico y comportamientos individuales.
Palabras clave: estrategias de enseñanza; enseñanza creativa; educación física; condición física.

Introduction

Education is evolving with new approaches, and innovative teaching strategies are crucial to keep physical education curricula in line with modern goals and sustainability (Leibovitch et al., 2025; Tao et al., 2024, Baena-Morales & Ferriz-Valero, 2023). At the same time, Physical education (PE) is vital for students' physical and mental well-being, offering benefits beyond sports skills to support personal development. Based on the research given by Sandoval et al. (2025), the integration of motor action and behavior in universities begins with physical education, understood as a scientific discipline focused on promoting motor development, bodily awareness, and capacity building. This foundation fosters an active lifestyle, supports healthy habits, and is closely linked to the social, axiological, and affective aspects of human life. Therefore, traditional PE classes can become monotones if the same activities are done repeatedly. So, using varied and creative methods can make lessons well adapted, exciting and more efficacies.

Although physical education curricula provide teachers with the flexibility to employ educational methods grounded in scientific legitimacy and aligned with pedagogical approaches and social expectations, the choice to use these methods and tools depends on their alignment with teaching strategies and their effectiveness in the context of physical education lessons (Hodges et al., 2022; Oh, et al., 2021; Oh & Graber, 2016). In this regard, the development of skills, physical fitness, and performance outlined in the curriculum school tailored to the use of appropriate teaching strategies in PE courses (Derbali, 2020; Lenzen et al., 2016). In line with this context, the didactic treatment of physical activities and sports is influenced by the internal logic and the inherent structure of each activity, ensuring that it can be effectively taught in school setting (Lenzen et al., 2021).

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

The need to improve skills and physical fitness underscores the critical importance of proactive intervention in physical education within schools. This trend extends beyond mere changes in learning and performance, influencing motor behaviors as well. If motor behaviors are not properly managed over time, the risk of health issues and physical injuries rises, often due to outdated teaching methods and a lack of effective educational strategies. Furthermore, the lack of a structured approach to physical education can negatively impact students' mental health, potentially leading to a decline in both physical and cognitive abilities, exacerbating skill deficiencies and contributing to a broader deterioration in overall well-being.

A comparative study on teaching approaches highlights that different physical education teaching strategies lead to varied skills outcomes (Tsuda et al., 2024). Motivational strategy can vary widely, including efforts regulation to influence beliefs like self-efficacy or task value, and modifying the environment, such as reducing distractions or using inspirational quotes (Ju et al., 2024). It is grounded on Self-Determination Theory (Wang & Chen, 2021), which emphasizes the importance of autonomy, competence, and relatedness in fostering autonomous motivation (Cheon et al., 2018). In contrast, a controlling strategy motivates behavior through external pressures such as rewards, punishments, or rigid rules, whereas autonomous motivation is driven by personal values and interests (De Meyer et al., 2016). However, a creative strategy inspires individuals by promoting innovation, exploration, and problem-solving, emphasizing intrinsic motivation through autonomy, self-expression, and the chance to experiment, instead of depending on external rewards or rigid rules (Yolcu et al., 2024; Harris, 2020; Welch et al., 2020; Pill & SueSee, 2017; Al-Dababneh et al., 2017 ; Hayes, 2008).

It is therefore clear that classroom teaching is deemed academic, as it allows teachers to observe students' reactions, adjust teaching strategies, and create an engaging sports atmosphere (Sun et al, 2023). However, its limited time available can seriously hinder effective learning, as students possess varying abilities and require different amounts of time to fully grasp the knowledge. Each student learns at their own pace, with some needing more time to internalize concepts and master skills. Without sufficient time for practice and understanding, students may struggle to reach their full

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

potential. As a result, it becomes crucial to implement teaching strategies that are tailored to meet the unique needs of each student, ensuring that they have the opportunity to engage with the content at their own pace. These strategies should be flexible and adaptable, by aligning with both the individual learning needs of students and the broader educational goals of the curriculum (Joo & Schachter, 2025; Hargreaves, 2008). This didactical approach not only supports academic growth but also fosters a deeper, more meaningful understanding of the learning outcomes (Amani & Fussy, 2023).

The challenge of teaching achievement lies in effectively managing the mobilization of students' resources, including their behaviors, physical fitness, and skills. This has led teachers to adopt alternative teaching strategies. However, this shift raises questions about the effectiveness of these changes in physical education, emphasizing the need for a comprehensive review of the strategies implemented to assess their impact. Despite this, few studies have explored the effect of different teaching strategies on physical education outcomes during PE terms.

This study aims to conduct a comparative analysis of the teaching effectiveness of three distinct physical education strategies among Tunisian secondary school students, with a particular emphasis on evaluating their respective impacts on students' physical fitness levels.

Therefore, we propose the following hypotheses:

H1: There is no significant difference in the impact of various teaching strategies on individual physical skills.

H2: There is no significant difference in physical fitness test scores between boys and girls students under the same teaching strategy.

H3: There is no significant interaction effect between time and gender on physical performance.

Methodology

Subjects

The students who participated in the study consisted of 67 secondary school learners aged between 16 and 18 years (M= 17.53, SD = 1.12). The participants were

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

students from same classroom. Of the total sample, 32 were boys and 35 were girls. The basic demographic characteristics of the participants under the different teaching modes are shown in Table 1.

Table 1.

The basic demographic characteristics of students across the three time periods.

Variables	Boys(n = 32)			Girls(n = 35)		
	E1	E2	E3	E1	E2	E3
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age(years)	17.6(0.8)	17.8(0.8)	18.0(0.8)	17.2(0.6)	17.5(0.6)	17.7(0.6)
Weight(kg)	74.6(15.3)	73.5(12.7)	71.8(12.5)	58.7(9.2)	57.9(8.7)	57.2(7.9)
Height(cm)	178.5(5.4)	178.7(5.6)	178.8(5.2)	165.2(5.5)	165.3(5.4)	165.4(5.3)

Study Design

This longitudinal study employed a corresponding research design to evaluate the impact of three distinct physical education teaching strategies on students in the 2024 cohort. Repeated measures were collected from the same group of participants at multiple time points, allowing for the assessment of changes in physical fitness outcomes over time. This design was chosen to capture developmental trends and the sustained effects of instructional methods across the academic year, thereby enhancing the ability to draw causal inferences regarding teaching effectiveness.

The research examined three instructional periods aligned with extended learning cycles throughout the school year: Phase 1 (first trimester of 2023), Phase 2 (second trimester of 2024), and Phase 3 (third trimester of 2024). Each phase corresponded to a specific teaching strategy: controlling, motivational, and creative, respectively. As illustrated in Figure 1 and detailed in Table 2, each instructional phase was accompanied by corresponding physical fitness evaluations.

Setting and participants

The school setting is a natural environment for the current study effective interventions. At Tunisian secondary school, students are required to complete three trimester physical education requirement and pass three physical condition evaluations in order to accomplish the study topic. To ensure the safety and accuracy of the physical

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons
Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

condition assessments, students who were absent from physical education lessons were excluded (7 students; 4 boys and 3 girls) and only students who participated in all lessens were included in the study.

Teaching strategies at secondary school

For this study we selected a public school in kef (Tunisia) in which a long learning cycles of physical education is taught throughout the school year. The secondary school classes implemented three different physical education teaching strategies over three successive terms, namely, controlling strategy, motivational strategy, and blended strategy, in compliance with these guidelines. All the teaching strategies were implemented at a rate of two lessons per week, each lasting one hour, for a total period of two months. The process and description of the different physical education teaching strategies are shown in Figure 2 and Table 3.

Period 1: from October 2023 to December 2023. At this period, the first teaching strategy adopted by the teacher is controlling teaching. Learners were required to practice official cycle training at school in physical education sitting. Participants are engaged in physical exercise and learn sport skills during physical education lessen, and complete the physical exercise tasks at school under teacher supervisions. Teachers were required to suggest learning situations, control students' practices, guide them in physical exercise during lessens, and evaluate students practices at the end of the sequence of leaning sport cycle. In our study, classroom teaching covers two sports cycles such as gymnastic and long jump. Each class lasts for one hour, consisting of 13 min of warm-up activities, 30 min of sports skill learning and practice, and 7 min of return to calm.

Period 2: from January 2024 to March 2024. At this period, the second teaching strategy adopted by the teacher is motivational strategy in teaching. Teachers employ strategies that encourage individuals to behave in ways that align with their personal goals. Educators were required to motivate learners' engagements. During physical education lessens, both teachers and students engaged in interaction, encouragement and communication through varies motivation acts. Unlike in traditional teaching, teachers were tasked with assigning extracurricular physical exercise tasks, checking students'

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña
A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

completion of these tasks after class, and providing feedback and grades. This period of physical education teaching covers two sports cycles such as shot pull and handball. Each class lasts for one hour, including time spent on warm-up, sports practice, and relaxation.

Period 3: from April 2024 to Mai 2024. At this period, the third teaching strategy adopted by the teacher is creative strategy in teaching. Teachers were required to use different technology tools, pedagogic methods, and learning experiences. This is an integrated teaching designed at delivering on learning and performance promises. The mixed strategy involves a planned combination of approaches. Creative teaching focuses on providing flexibility and control to learners, while equipping them with the tools they need to excel in their learning. Integrate feedbacks and technology in teaching to guide students in physical exercises during lessens, and performs outcomes. The blended strategy in teaching includes not only varied approach of teaching, but also creative aspects in practice gained during physical education lessons. This period of physical education teaching covers two sports cycles such as sprint and volleyball. Each class lasts for 60 min, consisting of 10 min of warm-up activities, 35 min of practice, and 10 min of stretching.

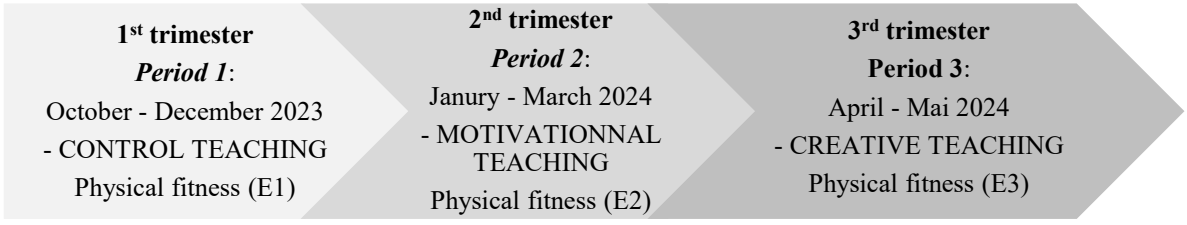

Figure 1. Teaching periods and physical fitness Evaluation (E):
A Holistic approach to performance

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

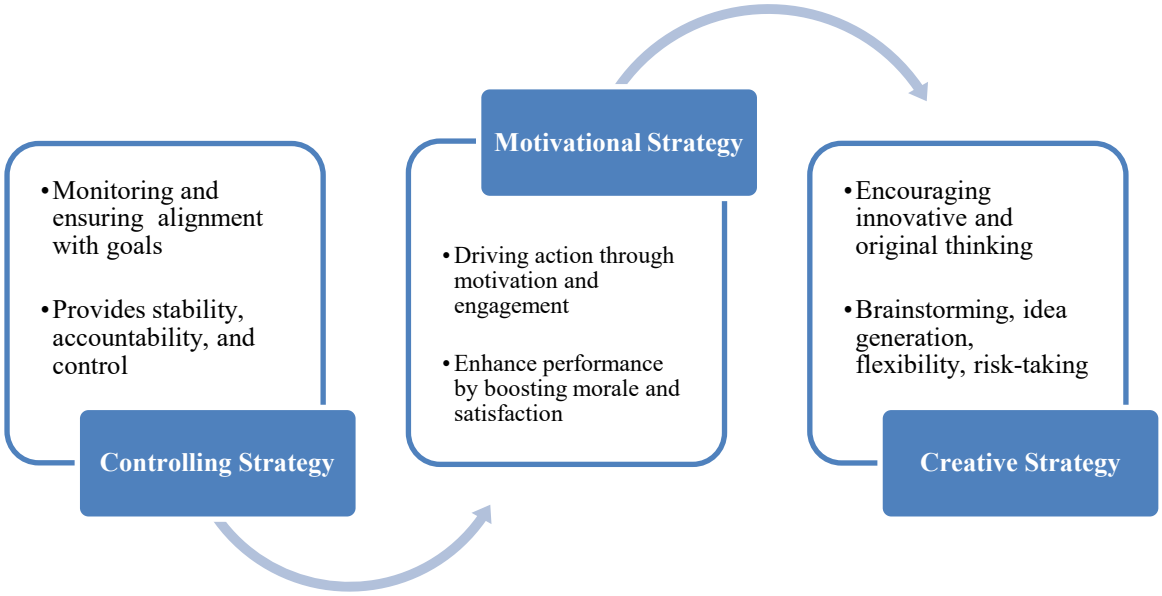

Figure 2. Classroom effective teaching strategies

Table 2.
Teaching strategies to support students' characteristics

Types of Teaching Strategies	Description
Controlling Strategy	Controlling strategies used by teachers depend on whether students construe teacher behaviors as an attempt to control and regulate their performance level or simply as methods of providing guidance or directives. Thus, teacher with controlling style should moderate the impact of a pressure induction on students' task performance.
Motivational Strategy	Motivational strategies are techniques designed to align an individual's behavior with their goals. Given the complexity of human behavior, there are numerous ways to influence it. In fact, almost any external factor a person encounters can affect their behavior. However, motivational strategies specifically involve intentional influences aimed at producing a systematic and lasting positive change in behavior.
Creative Strategy	Creative teaching often incorporates various technological tools, pedagogical strategies, and learning experiences. It is an integrated approach designed to fulfill learning and performance objectives. Creative teaching combines innovative methods, blending different strategies in a planned way. The focus of creative learning is to offer flexibility and control to learners, equipping them with all the resources necessary to excel in their learning.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

Table 3.
Classification of physical activities and teaching strategies by trimester.

Process		Physical activities and teaching strategies by trimester		
		1st Trimester	2nd Trimester	3rd Trimester
		Controlling Strategy	Motivational Strategy	Creative Strategy
		Evaluation1	Evaluation2	Evaluation3
Physical Activities	Athletic activities Collective activities Artistic activity	Gymnastic Long jump	Shot put Handball	Sprint Volleyball

Measurement of physical fitness

This study was carried out by measuring physical fitness indicators (Adam et al., 1988). A battery of 6 tests was collected for the study to measure different aspects of physical fitness, specifically, body mass index, Flexibility, vertical jump, 10 x 5m shuttle run, standing long jump, and push-ups. All physical fitness tests were conducted by the same teacher at Kef secondary school. As shown in Figure 1 each physical fitness test was administered at the end of the trimester.

Body mass index (BMI)

Body mass index (BMI) is an index that allows an individual to know his body size using a simple calculation as an indicator of overall health. It is measured with dividing weight in kilograms by the square of height in meters. BMI is a representative equivalent measure of student's body thinness and fatness.

Flexibility

Flexibility assessment of the hip flexor and knee extensor muscles, as well as the knee flexor muscles, was done with the modified Thomas test and the sit-and-reach test, respectively. Hip and knee flexion angles were measured with a goniometer, always by the same examiner.

Vertical jump

Assess your leg muscles elastic strength and power output with the Sargent Jump Test, also known as the vertical jump test. It basically involves measuring the difference between a person's standing reach and the height to which student can jump and touch as high as possible with either hand making a mark on the wall.

10 x 5m shuttle run

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
Creative Commons

The 10 x 5m shuttle run test is a measure of speed and agility. Participants run back-and-forth over 5 meters, for a total of 50m. With this test, acceleration, speed and the subject's ability to make changes of position and direction can be measured. All the students initiated the sprint from a standing position, and each student's performance was recorded in a single attempt.

Standing long jump

The standing long jump is an important index used to measure explosive power and jumping ability. It is recorded in centimeters by the farthest distance that an individual can jump in a straight line while standing. Each student underwent two measurements, and the best result was considered the student's standing long jump performance.

Push-ups

The push-up test measures upper body strength and endurance. The number of push-ups completed by an individual within 1 min was recorded. The participant gets into a push-up position with the body parallel to the ground and supported on the hands and toes for boys, and supported on the knees for girls. The student must lower his body 5 cm from the ground by bending his arms and resting only in the high position.

Statistical methods

The data collected for this study were analyzed using SPSS version 25 (George & Mallery, 2018). Descriptive statistics, including means, standard deviations, were used to summarize the data. The normality of the indicators was assessed using the Shapiro-Wilk test. A mixed model analysis of covariance (ANCOVA) was applied to analyze the results for each physical condition indicator. For the six physical fitness indicators (BMI, vertical jump, 5x10m shuttle run, standing long jump, flexibility, and push-ups), analysis was conducted based on secondary school students (boys and girls) across three periods of physical education instruction. Post-hoc tests were performed to examine the main and interaction effects, with multiple comparisons made using t-tests and Bonferroni corrections. Effect size was determined using partial eta squared (η^2) to assess the magnitude of the effect when significant main and interaction effects were found.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

Results

Sixty seven secondary students school accomplished the physical fitness test in this study. We performed various comparisons of the physical fitness test results under the three teaching strategies. Table 4 shows the mean and standard deviation of each indicator under three different teaching strategies. Statistics indicate the average score and 95% confidence interval (CI) of the physical fitness assessment, highlighting the range of variability in the results.

We evaluated the main effect of teaching phases to rigorously test Hypothesis 1 (H1), exploring its impact across the different time periods in the study. For vertical jump, F (1.98, 6597.53) = 394.76, $p < 0.001$, $\eta^2 = 0.183$. Post hoc multiple comparison analysis revealed that T1, T2, and T3 were significantly different ($p < 0.001$). The average vertical jump increased from 37.4 cm at T1 to 38.9 cm at T2 and further increased to 40.4 cm at T3, showing an increasing trend. For the flexibility, F (1.97, 5562.35) = 94.73, $p < 0.001$, $\eta^2 = 0.028$. Post hoc multiple comparison analysis revealed that T1 was significantly different between T1, T2 and T3 ($p < 0.001$), but there was no significant difference between T2 and T3 ($p = 0.076$). The average depth in the flexibility increased from 16.9 cm at T1 to 17.5 cm at T2 and further increased to 18.3 cm at T3, showing an increasing trend. For the 10 x 5m shuttle run, F (1.91, 66842.36) = 101.54, $p < 0.001$, $\eta^2 = 0.033$. Post hoc multiple comparison analysis revealed that T3 was significantly different from T1 and T2 ($p < 0.001$), but there was no significant difference between T1 and T2 ($p = 0.613$). The average of the 10 x 5m shuttle run increased from 20.41 m/s at T1 to 20.46 m/s at T2 and then decreased to 20.34 at T3, showing a trend of initial increase and subsequent decrease. For the long jump, F (1.94, 6631.86) = 327.98, $p < 0.001$, $\eta^2 = 0.173$. Post hoc multiple comparison analysis revealed that T1, T2, and T3 were significantly different ($p < 0.001$). The average number of standing long jump increased from 187.7 cm at T1 to 190.0 cm at T2 and increased to 192.3 at T3, reflecting an increasing trend. For the push-ups, F (1.93, 3364.58) = 91.69, $p < 0.001$, $\eta^2 = 0.026$. Post hoc multiple comparison analysis revealed that T1, T2, and T3 were significantly different ($p < 0.001$). The average number of

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

push-ups increased from 34.7 at T1 to 37.5 at T2 and increased to 40.3 at T3, showing an increasing trend.

We analyzed the main effect of gender to thoroughly evaluate Hypothesis 2 (H2), investigating its influence on the outcomes across both male and female participants. For BMI, F (1, 67) = 317.63, $p < 0.001$, $\eta^2 = 0.081$. For vertical jump, F (1, 67) = 6438.21, $p < 0.001$, $\eta^2 = 0.711$. For the 10 x 5m shuttle run, F (1, 67) = 8962.64, $p < 0.001$, $\eta^2 = 0.685$. For the standing long jump, F (1, 67) = 7686.56, $p < 0.001$, $\eta^2 = 0.689$. For the flexibility, F (1, 67) = 397.86, $p < 0.001$, $\eta^2 = 0.162$. For push-ups, F (1, 67) = 9766.32, $p < 0.001$, $\eta^2 = 0.763$. Post hoc analyses comparing the differences according to sex revealed that BMI and vertical jump, shuttle run, standing jump were greater in males than in females ($p < 0.001$); however, the flexibility was greater in females than in males ($p < 0.001$).The average number of push-ups increased from 30.7 at T1 to 33.0 at T2 and increased to 35.7 at T3, showing an increasing trend.

We investigated the interaction effect between time and gender on performance to test Hypothesis 3 (H3), analyzing how the combined influence of these factors impacted performance across different time points and between boys and girls participants. The analysis revealed a significant interaction (F (1.91, 66842.36) = 101.54, $p < 0.001$, $\eta^2 = 0.033$), indicating the effect of time on performance varied by gender. For girls, the average speed during the shuttle run decreased from 21.39 m/s at Time 1 (T1) to 21.61 m/s at Time 2 (T2), then slightly increased to 21.37 m/s at Time 3 (T3), showing an initial decline followed by a recovery. In contrast, boys exhibited a consistent improvement, with their average speed increasing from 19.43 m/s at T1 to 19.32 m/s at T2 and further increasing to 19.23 m/s at T3, demonstrating a steady upward trend. In addition, Gender-specific results showed significant training effects for flexibility ($p < 0.001$, $\eta^2 = 0.026$) for girls and push-ups ($p < 0.001$, $\eta^2 = 0.030$) for boys, with creative teaching yielding superior results compared to other teaching strategies.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

Table 4.
Mean and standard deviation of physical fitness indicators for male and female students.

Indicators	Total (n = 67)			Boys (n = 32)			Girls (n = 35)		
	E1	E2	E3	E1	E2	E3	E1	E2	E3
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
BMI (kg/m^2)	22.4 (3.4)	22.2 (3.5)	21.6 (3.1)	23.4 (3.9)	23.0 (4.1)	22.4 (3.6)	21.5 (3.0)	21.1 (2.9)	20.9 (2.7)
Vertical jump (cm)	37.4 (4.5)	38.9 (4.4)	40.4 (4.2)	45.1 (5.3)	46.3 (4.7)	48.2 (4.6)	29.8 (3.7)	31.6 (4.1)	32.7 (3.9)
10 x 5m shuttle run (m/s)	20.41 (1.80)	20.46 (1.52)	20.34 (1.63)	19.43 (1.53)	19.32 (1.48)	19.23 (1.81)	21.39 (2.08)	21.61 (1.57)	21.37 (1.45)
Standing long jump (cm)	187.7 (22.4)	190.0 (21.7)	192.3 (20.6)	206.9 (27.6)	210.4 (24.2)	213.5 (22.8)	168.6 (17.2)	169.7 (19.3)	171.2 (18.5)
Flexibility (cm)	16.9 (5.4)	17.7 (5.3)	18.3 (5.4)	15.7 (5.6)	16.2 (5.2)	16.5 (5.1)	18.1 (5.3)	19.3 (5.4)	20.1 (5.7)
Push-ups (count)	30.7 (7.0)	33.0 (6.7)	35.7 (6.9)	34.7 (7.8)	37.5 (7.1)	40.3 (7.3)	26.8 (6.7)	28.6 (6.3)	31.1 (6.5)

Discussion

This study focused on assessing the impact of three distinct physical education teaching strategies on the physical fitness outcomes of students in the 2024 cohort, aiming to identify the most effective approach for enhancing student performance. The results showed that the creative teaching demonstrated significant benefits in improving students' physical fitness for booth girls and boys. In addition, for gender-specific physical fitness indicators, the motivational teaching also achieved significant results in booth gender girl and boy on all skills training except relatively ineffective in shuttle run. Meanwhile, the controlling strategy was relatively ineffective for girls' push-ups and boys' flexibility in gymnastics and long jump exercises. We found also, that the index of overweight students has declined for both girls and boys. This study supports previous research, emphasizing not only the crucial role teaching strategies play in shaping students' learning strategies (Biggs et al., 2022), but also their potential to improve physical fitness and motor competence (Yolcu et al., 2024).

Our results revealed that compared to controlling strategy and motivational teaching, creative strategy of teaching can effectively improve most physical abilities of students on physical fitness indicators for booth gender girls and boys. Consistent with

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

these outcomes, creative teaching strategy has high levels of student achievement and is more effective than controlling or motivational strategies of teaching on physical education setting. Studies have indicated that creative teaching is more suitable for physical education, mainly for the complex learning of practice skills, physical fitness and sports exercises (Ashraf et al., 2025; Su et al., 2025). In addition, creative thinking improves cognitive flexibility, helping individuals tackle challenges from different angles and increasing their resilience during difficult times (Dewett et al., 2006).

The teaching strategy design adopted by the teacher is creative. Teacher used different technology tools, pedagogic methods, and learning experiences. Also, we offered students videos, along with intuitive movement demonstrations and guidance for repeated practice. Our study provided students with comprehensive instructional content, covering topics such as physical ability exercises, coordination, strength, aerobic training, and more. This is an integrated teaching approach aimed at fulfilling learning and performance objectives. The mixed strategy involves a deliberate combination of various teaching methods. Previous studies have shown that creative teaching and learning emphasize flexibility and learner control within a motivational climate, providing students with the necessary tools to excel in their education (Zahid & Nawab, 2025; Girard, et al., 2021). Feedback and technology are incorporated into the teaching process to guide students during physical exercises and support their performance outcomes. This creative strategy not only includes diverse teaching methods but also integrates creative practices gained through physical education lessons.

The findings further suggest that controlling teaching methods seem to have a lasting effect on most physical ability indicators, though they are more appropriate for specialized sports exercises like shuttle run and shot put. Our analysis suggested that while controlling strategies offer a teaching approach, students' perceptions of the teacher's behaviors, whether as attempts to control and regulate performance or simply as methods of providing guidance and direction, play a significant role. Therefore, teachers with a controlling strategy should aim to minimize the impact of pressure induction on students' task performance (Mo et al., 2025; De Meyer et al., 2016). These findings highlight the importance of controlling teaching and provide a valuable

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons
Original article. Comparative analysis of the effectiveness of teaching strategies on students' physical fitness in physical education lessons. Vol. 11, n. º 4; p. 1-22, October 2025.
https://doi.org/10.17979/sportis.2025.11.4.11976

reference for strategy development for teaching physical education to prioritize students' safety, ensure proper follow-up, and maintain controlled performance. Therefore, physical ability indicators such as flexibility, standing long jump, and are easier to perform, which led to improvements in these setting.

The results also indicated that the motivational strategy positively influenced most physical ability indicators, except for performance in the shuttle run. This may be attributed to physiological differences between genders. The motivational strategy of teaching is designed to encourage an individual's behavior in alignment with their goals. Given the complexity of student behavior, there are numerous ways of accomplishment to influence it. In fact, nearly any external stimuli or influences a person encounters can potentially impact their behavior. Motivational strategies specifically refer to deliberate efforts aimed at creating a systematic and lasting positive effect. A motivational strategy is useful for promoting and maintaining positive behavior, improving performance, achieving personal or group goals, and boosting engagement and persistence in various tasks or activities. In physical education courses, it can help individuals stay focused, overcome challenges, and reach their full potential (Guijarro-Romero et al., 2020).

On the one hand, the creative strategy emphasizes independence, exploration, and critical thinking to perform physical ability (Shaber et al., 2025), while the controlling strategy focuses on managing behavior and ensuring students meet specific goals through structure and external drive for intensive and risky practices (De Meyer et al., 2016). On the other hand, the motivational strategy is centered on boosting and sustaining student motivation, encouraging engagement with learning physical skills by balancing both intrinsic and extrinsic factors (Paek et al., 2025). In addition, the creative teaching strategy proved particularly effective in enhancing performance in competitive and complex exercises, such as volleyball and sprint, for both genders.

Conclusion

This study explored the impact of three different physical education teaching strategies on secondary school students' physical skills over the course of one year. The

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
OPEN ACCESS Creative Commons

results suggest that the creative teaching strategy effectively enhanced most physical abilities and skills, while the controlling strategy further contributed to the refinement of these abilities. The latter approach is especially valuable for high-risk physical activities, such as shot put, pole vaulting, and combat sports, and proved beneficial for both genders. These findings underscore the importance of incorporating motivational teaching strategies that promote student engagement by fostering confidence, effort, autonomy, and interest in specific activities.

Overall, the results highlight the broad benefits of creative strategies in physical education, particularly in addressing variations in students' physical performance under different instructional approaches. This study emphasizes that teaching strategies play a crucial role in shaping students' physical fitness. In particular, creative methods, such as problem-solving tasks, adaptability, critical thinking, and teamwork encourage active engagement and positively influence students' learning behaviors.

Limitations

This study has several limitations. First, the sample size may not accurately represent the larger population, which could affect the generalizability of the findings. Additionally, the sample was restricted to a specific age group (e.g., secondary school students), which may limit the applicability of the results to other age groups. Furthermore, although the teaching strategies implemented in this study have demonstrated positive outcomes, a long-term investigation may be necessary to achieve more substantial and widespread improvements in physical skill performance. Another limitation is the luck of data on students' subjective aspects. Future research should integrate qualitative tools, such as the Borg Scale or motivation questionnaires, to capture students' perceptions and better assess the holistic impact of pedagogical strategies on both physical performance and psychological engagement. Despite these limitations, the present study contributes to a deeper understanding of the effects of teaching strategies and their influence on the development of physical skills.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
Creative Commons

References

Adam, C., Klissouras, V., Ravazzolo, M., Renson, R., & Tuxworth, W. (1988). *Eurofit: European Test of Physical Fitness Council of Europe*. Committee for the Development of Sport Rome.

Al-Dababneh, K. A., Al-Zboon, E. K., & Ahmad, J. (2017). The creative environment: teachers' perceptions, self-efficacy, and teaching experience for fostering children's creativity. *Early Child Development and Care, 189*(10), 1620–1637. https://doi.org/10.1080/03004430.2017.1400969

Amani, J., & Fussy, D. S. (2023). Balancing child-centred and teacher-centred didactic approaches in early years learning. *Education 3-13, 53*(3), 353–365. https://doi.org/10.1080/03004279.2023.2189905

Ashraf, M.A., Mollah, S., Perveen, S., Shabnam, N., & Nahar, L. (2022). Pedagogical applications, prospects, and challenges of blended learning in Chinese higher education: a systematic review. *Front. Psychol. 12*, 772322. https://doi.org/10.3389/fpsyg.2021.772322

Baena-Morales, S., & Ferriz-Valero, A. (2023). What about physical education and sustainable development goals? A scoping review. *Physical Education and Sport Pedagogy*, 1–18. https://doi.org/10.1080/17408989.2023.2214572

Bennie, A., Peralta, L., Gibbons, S., Lubans, D., & Rosenkranz, R. (2016). Physical education teachers' perceptions about the effectiveness and acceptability of strategies used to increase relevance and choice for students in physical education classes. *Asia-Pacific Journal of Teacher Education, 45*(3), 302–319. https://doi.org/10.1080/1359866X.2016.1207059

Biggs, J., Tang, C., & Kennedy, G. (2022). *Teaching for quality learning at university 5e.* McGraw-hill education (UK).

Cheon, S. H., Reeve, J., & Ntoumanis, N. (2018). A needs-supportive intervention to help PE teachers enhance students' prosocial behavior and diminish antisocial behavior. *Psychology of Sport and Exercise, 35*, 74–88. https://doi.org/10.1016/j.psychsport.2017.11.010

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
Creative Commons

De Meyer, J., Soenens, B., Aelterman, N., De Bourdeaudhuij, I., & Haerens, L. (2016). The different faces of controlling teaching: implications of a distinction between externally and internally controlling teaching for students' motivation in physical education. *Physical Education and Sport Pedagogy, 21*(6), 632–652. https://doi.org/10.1080/17408989.2015.1112777

Derbali, C. (2020). Relationships between the components of physical fitness and athletic performance in youth pole vaulters: a prospective study in a Tunisian secondary school setting. *Journal of Physical Education & Health, 9*(16), 48–55. https://doi.org/10.5281/zenodo.5196166

Dewett, T. (2006). Exploring the role of risk in employee creativity. In T. Dewett (Ed.), *The journal of creative behavior* (Vol. 40, issue 1, p. 27), Wiley. https://doi.org/10.1002/j.2162-6057.2006.tb01265.x.

George, D., & Mallery, P. (2018). IBM SPSS Statistics 25 Step by Step. https://doi.org/10.4324/9781351033909

Girard, S., Desbiens, J. F., & Hogue, A. M. (2021). Effects of a training course on creation of an empowering motivational climate in physical education: a quasi-experimental study. *Physical Education and Sport Pedagogy, 28*(1), 56–75. https://doi.org/10.1080/17408989.2021.1953457

Guijarro-Romero, S., Mayorga-Vega, D., Casado-Robles, C., Viciana, J. (2020). Effect of a physical education-based fitness intermittent teaching unit on high school students' cardiorespiratory fitness: A cluster-randomized controlled trial. J Sports Med. Phys. Fitness, 60(5):700-708. 10.23736/S0022-4707.20.10328-1

Hargreaves, J. (2008). Risk: the ethics of a creative curriculum. *Innovations in Education and Teaching International, 45*(3), 227–234. https://doi.org/10.1080/14703290802176006

Hayes, B. G. (2008). The Use of Multimedia Instruction in Counselor Education: A Creative Teaching Strategy. *Journal of Creativity in Mental Health, 3*(3), 243–253. https://doi.org/10.1080/15401380802334614

Hodges, M., Phelps, A., Knipe, R., Doherty, B., Colburn, J., & Hamilton, X. D. (2022). Secondary physical education teaching methods course: through the lens of the

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
Creative Commons

preservice teachers. *Curriculum Studies in Health and Physical Education, 14*(1), 92–108. https://doi.org/10.1080/25742981.2022.2042340 https://doi.org/10.1080/17408989.2021.1999917

Joo, Y., & Schachter, R. E. (2025). Understanding how teachers' beliefs about learning are connected across curriculum, planning, and enactment. *Journal of Early Childhood Teacher Education*, 1–26. https://doi.org/10.1080/10901027.2024.2443845

Ju, R., Hong, S., & Song, J. H. (2024). Differential effects of graduate students' motivational orientations and motivational strategy interventions on learning outcomes. *Learning: Research and Practice, 10*(2), 204–218. https://doi.org/10.1080/23735082.2024.2314769

Leibovitch, Y M., Beencke, A., Ellerton, P J., Mc Brien, C., Robinson-Taylor, C-L., Brown, D J. (2025). Teachers' (evolving) beliefs about critical thinking education during professional learning: A multi- case study. *Thinking Skills and Creativity 56*, 101725. https://doi.org/10.1016/j.tsc.2024.101725

Lenzen, B., Barthe, C., Cordoba, A., Deriaz, D., Poussin, B., Pürro, C., Voisard, N. (2021). Merging observational and interview data to study and improve the adaptability of the products of didactic engineering to ordinary teaching in physical education. *Physical Education and Sport Pedagogy, 27*(2), 186–199.

Mo, Z., Lai, B., Wen, A., & Shu, G. (2025). Performance, strategy, and evaluation of truss string structure based on active control. *Structures 75*, 108706. https://doi.org/10.1016/j.istruc.2025.108706

Oh, J., & Graber, K. C. (2016). National Curriculum for Physical Education in the United States. *Quest, 69*(2), 220–235. https://doi.org/10.1080/00336297.2016.1218776

Oh, J., Graber, K. C., Mays Woods, A., & Templin, T. (2021). Assessment of the Feasibility of a National Curriculum for Improving the Quality of Physical Education in the United States. *Quest, 74*(1), 37–57. https://doi.org/10.1080/00336297.2021.2003831

Paek, S., Suehyeon, J., Katz-Buoincontro, Jen, H., Park, Hye-jeong, O., Osuagwu, Oyinyechi, T., Hurwich, Talia. (2025). How might creative problem-solving be

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333
Creative Commons

related to prosocial motivation? An exploratory pilot study. *Learning and Individual Differences. 118*, 102606. https://doi.org/10.1016/j.lindif.2024.102606

Pill, S., & SueSee, B. (2017). Including Critical Thinking and Problem Solving in Physical Education. *Journal of Physical Education, Recreation & Dance, 88*(9), 43–49. https://doi.org/10.1080/07303084.2017.1367741

Sandoval Cifuentes, A. A., Cardona Ortiz, G. A., & Villarreal Angeles, M. A. (2025). Percepción de salud de los estudiantes de pregrado de la Universidad del Tolima, usuarios del gimnasio en relación con su nivel de actividad física. *Retos, 62*, 756–764. https://doi.org/10.47197/retos.v62.109396

Santiago Guijarro-Romero, Daniel Mayorga-Vega, Carolina Casado-Robles, Jesús Viciana (2020). Does students' self-determined motivation toward Physical Education influence the effectiveness of a fitness teaching unit? A cluster-randomized controlled trial and cluster analysis. *Psychology of Sport and Exercise 51*, 101768. https://doi.org/10.1016/j.psychsport.2020.101768

Shaber, N., Shah, S. K., Imran, M., & Almusharraf, N. (2025). Exploring the relationship between critical thinking and creativity in university students: gender differences and the assessment of skills. *Education Sciences, 2*(15), 464. https://doi.org/10.3390/educsci15040464

Su, W., Wanchun, S.M., Srinivasan, Sudha Madhav, A.N., Bhat, Anjana Narayan (2025). Effects of creative movement, general movement, or seated play interventions on motor performance in children with autism spectrum disorder: A pilot randomized controlled trial. *Research in Autism Spectrum Disorders, 119*, 102501. https://doi.org/10.1016/j.rasd.2024.102501

Sun, J., Chang, J., Zhu, E., Sun, X., Tao, Y., Chen, X. (2023). Comparative research on the development of college students' physical fitness based on online physical education during the COVID-19 pandemic. *BMC Publ. Health, 23*(1) 1–7, https://doi.org/10.1186/s12889-023-15599-7

Tao, Z., Zhu, E., Sun, X. & Sun, J. (2024). Comparative effects of three different physical education teaching modes on college students' physical fitness during the COVID-19 pandemic: A longitudinal study. *Heliyon 10*, e28305. https://doi.org/10.1016/j.heliyon.2024.e28305.

Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity
Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain
E-mail: v.arufe@udc.es Web: www.sportisjournal.com
ISSN-e 2386-8333

Tsuda, E., Ward, P., Hastie, P., Ko, B., Santiago, J. A., Kim, I., Ressler, J. D. (2024). Strategies for the Teaching of Content Courses in Physical Education Teacher Education. *Journal of Physical Education, Recreation & Dance, 95*(6), 20–25. https://doi.org/10.1080/07303084.2024.2355869

Wang, L., & Chen, R. (2021). Psychological needs satisfaction, self-determined motivation, and physical activity of students in physical education: Comparison across gender and school levels. *European Journal of Sport Science, 22*(10), 1577–1585. https://doi.org/10.1080/17461391.2021.1978558

Welch, R., Alfrey, L., & Harris, A. (2020). Creativity in Australian health and physical education curriculum and pedagogy. *Sport, Education and Society, 26*(5), 471–485. https://doi.org/10.1080/13573322.2020.1763943

Yolcu, O., Hürmeriç Altunsöz, I., İnce, M. L., & Kriellaars, D. J. (2024). Use of parkour in primary school physical education to develop motor creativity, divergent thinking, movement competence, and perceived motor competence. *Physical Education and Sport Pedagogy*, 1–14. https://doi.org/10.1080/17408989.2024.2400094

Zahid, A., Nawab, A. (2025). Teaching strategies influencing learning strategies: Exploration of teaching and learning practices in a higher education context in Pakistan. *Social Sciences & Humanities Open 11*, 2025, 101442. https://doi.org/10.1016/j.ssaho.2025.101442