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Cognitive-Reflective Motor Learning – Based Physical Education to Enhance Critical Thinking Abilities: Does RASCH Analysis Model show the Significant Evidence?

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Abstract

Background. This study addresses the need to enhance cognitive-reflective competencies in physical education, which often prioritizes mastering basic sports skills at the expense of cognitive development. In the information era, critical thinking is a crucial cognitive-reflective skill that must be fostered.

Objectives. The study aimed to examine the structural design of instructional didactics and to assess changes in the difficulty levels of critical thinking among students in physical education settings.

Materials and methods. A posttest-only control group design was employed, with critical thinking data collected after the physical education sessions. The study involved two groups: an experimental class that integrated cognitive learning through tennis and a control class that participated in futsal extracurricular activities, each comprising 30 junior high school students (aged 13-14 years).

Results. Results analyzed using RASCH modelling revealed significant shifts in critical thinking difficulty levels. Specifically, indicators of critical thinking, including inference, assumption recognition, deductive reasoning, interpretation, and argument assessment, showed a 70% reduction in difficulty for students in the experimental group compared to those in the control group.

Conclusions. These findings suggest that cognitive-reflective learning in physical education can significantly enhance students' critical thinking abilities, with students in the experimental class demonstrating higher critical thinking skills than their counterparts in the control group.

Keywords: physical education, cognitive-reflective learning, critical thinking, RASCH model, junior high school.

Introduction

Physical education is widely recognized as an educational process that utilizes physical activity as a medium to cultivate various dimensions of human potential (Vaughan et al., 2019). The instructional process in physical education is deliberately structured to facilitate meaningful learning experiences, thereby promoting students' physical, emotional, social, and intellectual development (Boelens et al., 2017; Nur et al. 2023). To achieve these outcomes, physical education must transcend its traditional focus on physical skills and serve as a conduit for holistic student development. Effective programs should engage the full range of student competencies—cognitive, psychomotor, and affective (Robinson et al., 2018). However, a critical yet often neglected pedagogical objective is the cultivation of students' cognitive-reflective abilities. While the discipline continues to emphasize immediate outcomes such as physical fitness, skill acquisition, and sportsmanship (Kelly, 2019), cognitive-reflective competencies—especially those that encourage students to reflect on their learning processes and outcomes—are frequently underdeveloped.

This concern is further supported by evidence indicating that quality physical education should integrate not only socio-motor and techno-motor development but also the cognitive-reflective domain (Lorente Sanz et al., 2023; Van Deventer, 2014). Cognitive-reflective competence, particularly in relation to metacognitive awareness and critical evaluation, plays a crucial role in improving students' capacity for lifelong learning and decision-making. Neurocognitive research suggests that physical activity can enhance synaptic plasticity in the cerebral cortex, a region associated with higher-order thinking and executive function, thus reinforcing the link between movement and cognitive development (Donnelly et al., 2013).

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Despite these insights, prior research underscores a persistent gap in physical education pedagogy, notably the limited emphasis on cognitive engagement and student attitudes (Norris et al., 2020). The dominance of teacher-centered instruction and an overemphasis on the mastery of technical sport skills have constrained opportunities for students to engage in deeper cognitive processing (Burhaein et al., 2020). Within the reflective cognitive domain, the development of critical thinking is especially imperative in today's complex, information-rich world. Critical thinking is defined as the application of cognitive strategies that enhance the probability of achieving desired outcomes through purposeful, reasoned, and goal-directed thought (Lai, 2011). It encompasses skills such as problem-solving, inference, and evaluative reasoning, and involves the capacity to provide justifiable decisions based on reflective judgment (Ennis, 2015; Halpern, 1998). Researchers further assert that critical thinking requires the ability to connect abstract concepts, understand complex information, and apply knowledge effectively across contexts (Beyer, 1988; Elder & Paul, 2020; Solso et al., 2005).

In physical education, critical thinking manifests in the ability to analyze and solve movement-based problems, devise strategic responses, and coordinate sequences of bodily movements in context-specific scenarios (Pill & SueSee, 2017; Tishman & Perkins, 1995). Teaching strategies that integrate movement problems challenge students to analyze, evaluate, and synthesize information, thereby promoting critical reflection and decision-making (Bidzan-Bluma & Lipowska, 2018). The integration of critical thinking into physical education aligns with broader educational mandates that aim to foster students' intellectual capabilities as part of national development agendas (National Research Council, 2012). Consequently, there is an urgent need to reconceptualize physical education not only as a platform for physical skill acquisition but also as a space for cognitive development.

Despite growing recognition of the cognitive potential of physical education, research in this domain—particularly in the national context—remains limited. Addressing this gap, the present study investigates how physical education teachers can purposefully design instructional strategies to cultivate students' critical thinking skills. Specifically, this research examines changes in the difficulty levels of students' critical thinking using a cognitive-reflective instructional model in tennis classes, compared to traditional futsal extracurricular activities, through the lens of the RASCH measurement model.

The novelty of this research lies in its application of the RASCH model—typically used in affective assessments—to evaluate critical thinking within physical education settings. While previous studies have predominantly focused on emotional and behavioral outcomes (Muslihin et al., 2022; Nur et al., 2020; Nur et al., 2022; Nur et al., 2025), this study provides empirical insights into the cognitive dimension of motor learning. Furthermore, the integration of cognitive-reflective strategies in different physical education contexts (tennis vs. futsal) offers innovative pedagogical alternatives for enhancing students' critical thinking abilities. The aim of this research is to provide empirical evidence on the effectiveness of cognitive-reflective motor learning approaches in fostering critical thinking in physical education, thereby broadening the pedagogical scope and assessment practices within the discipline.

Materials and Methods

Study Participants

The study involved 60 junior high school students aged 13–14 years, who were randomly assigned into two groups: an experimental group (n = 30) and a control group (n = 30). Participants were selected from the same school to maintain environmental consistency and to ensure comparable levels of physical and cognitive development across both groups. Informed consent was obtained from both students and their guardians prior to participation.

Study Organization

This experimental study employed a posttest-only control group design, adapted from Ennis (1987). The aim was to evaluate the relative impact of a cognitive-based physical education intervention on students' critical thinking skills. The research design is illustrated in Figure 1.

Experimental group (S_E)	R ---A_1 ----------------	X_1 ----------------	T
Control group (S_K)	R --- A_2 ----------------	X_2 ----------------	T

Fig. 1. Research Design (Posttest-Only Control Group Design). Information: R: Random assignment. A_1: Experimental group. A_2: Control group. X_1: Treatment involving cognitive-reflective instruction using tennis. X_2: Conventional extracurricular futsal activity. T: Posttest measurement of critical thinking skills

The experimental group (SE) received instructional treatment that integrated cognitive-reflective learning through tennis games. The intervention focused on aligning physical movement with cognitive processes using a movement/game problem-situated learning approach. The control group (SK) participated in regular futsal extracurricular activities without targeted cognitive integration. The treatment was implemented through a structured didactic sequence over eight sessions, each designed to develop specific critical thinking components. The instructional stages included: 1) getting students' attention and attention; 2) facilitating students to actively move to learn and actively learn to move in the relationship of critical thinking abilities; 3) facilitating students to think critically through the presentation of movement/games problem situated learning; 4) developing games/movement problem situated learning with elements of critical thinking abilities; 5) making the relevance of critical thinking abilities in movement and play situations with critical thinking abilities in everyday life. These stages are methodically carried out in sequence, as in Figure 2.

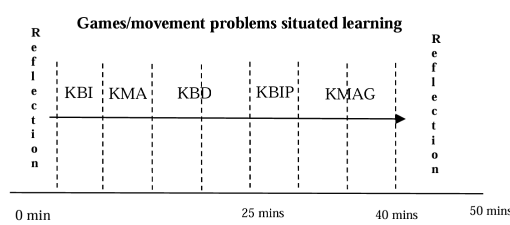

Fig. 2. Methodical treatment in the games/movement problem situated learning stage

The effectiveness of movement-based learning is reinforced through game and movement-situated activities. Students' critical thinking skills are developed by presenting progressively challenging movement tasks and game scenarios. The instructional treatment was administered over eight sessions, each designed to align with the components of critical thinking within these movement or game-based learning contexts. By associating movement tasks and games with critical thinking elements, students were encouraged to engage in deeper, reflective thinking. Figure 3 illustrates the repetition and structure of this treatment across the eight sessions.

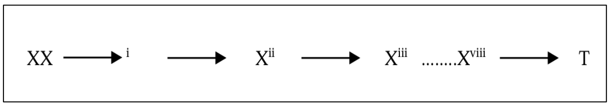

Fig. 3. Series of 8-meeting treatments

To assess critical thinking ability, a 40-item questionnaire was developed based on Ennis's (1987) critical thinking framework. Items were distributed across five key indicators, each comprising eight items on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). This instrument was developed by following the grid as shown in table 1. The instrument underwent expert review and field validation. Validity testing showed that all items were statistically valid, with t-count values exceeding the t-table value of 2.14. Reliability analysis yielded a Cronbach's Alpha of 0.885, indicating a high internal consistency of 88.5%.

Table 1. Critical Thinking Instrument Grid

No	Indicator	Total Item	Item Number
1	Inferential Thinking Ability (IBT) Seeking relevance Determining the evidence Drawing conclusions Expanding alternatives	8	1-8
2	Ability to Recognize Assumptions (KMA) Recognizing logical basis Doing categories Emphasizing the meaning Testing ideas	8	9-16
3	Deductive Thinking Ability (DBT) Looking for evidence Stating the conclusion Justifying procedures Presenting arguments	8	17-24
4	Interpretive Thinking Skills (KBIP) Categorizing Marking significance Emphasizing the meaning Positioning one's own opinion	8	25-32
5	Ability to Evaluate Arguments (KMAG) Recognizing arguments Analyzing arguments Assessing arguments Expressing an opinion	8	33-40

Statistical Analysis

Quantitative data were analyzed using a two-stage statistical approach. First, SPSS version 24 was employed to evaluate the validity and reliability of the critical thinking instrument. Second, the posttest data from both groups were analyzed using RASCH modeling via Winsteps software version 5.3.2.0. This psychometric method allowed for a detailed evaluation of item difficulty and student ability across indicators of critical thinking. RASCH analysis was particularly instrumental in identifying shifts in task difficulty levels between the experimental and control groups, offering nuanced insights into the impact of the cognitive-reflective intervention.

Results

RASCH analysis will determine the extent to which diversity is measured by an instrument so that it can be known whether the instrument can measure what should be measured (Ary et al. 2018). Data on the pattern of changes in the level of difficulty of critical thinking items is obtained through the items filled in by respondents. Items in the control class are marked with the letter code (A), and (B) is the code for items in the experimental class. In the results of this data, researchers will reveal and analyze the differences in the level of difficulty of critical thinking items in the control class and the experimental class by paying attention to the standard deviation value (0.22) and the logit value in the measure column for each item. The level of difficulty of the items is classified into four categories, namely: (1) very difficult group, namely > + 1 SD (0.22); (2) difficult group for 0.0 logit to +1 SD (0.22); (3) easy group for 0.0 logit to -1 SD (1, 10); and (4) very easy group is < - 1 SD (0.22) (Andrich, 2010; Sumintono, 2018). The following table shows the level of difficulty of critical thinking items in the control class and experimental class.

Next, a table will be presented showing the percentage of the level of difficulty of critical thinking items in the control class and the experimental class.

Table 3 shows that as many as 67.5% of critical thinking items can be categorized as very difficult and difficult and 32.5% of critical thinking items can be categorized as easy and very easy for students in the control class, which can be interpreted those students in the control class experience cognitive problems in developing critical thinking skills. While the cognitive conditions of students in the experimental class show that only 35% of critical thinking items can be categorized as very difficult and difficult and 65% of critical thinking items can be categorized as easy and very easy, which means that students' cognitive abilities are quite high in developing critical thinking skills.

Furthermore, the pattern of changes in the magnitude of the level of difficulty of critical thinking items in the control and experimental classes that show significant changes can be seen through the difference in values (logit differences) in the control and experimental classes or using racking analysis through RASCH modeling (Laliyo et al. 2022).

Table 4 shows the differences in the difficulty levels of the items, some are negative, and some are positive. In critical thinking item number 1, it is shown that the item in the control class has a positive value (+) while in the

Table 2. Comparison of the Level of Difficulty of Critical Thinking Instrument Items in the Control and Experimental Classes

Items in Control Class			Items in Experimental Class		
Items	Measure	Item Category	Items	Measure	Item Category
A01	0.06	Difficult	B01	-0.11	Easy
A02	0.11	Difficult	B02	0.15	Difficult
A03	0.00	Difficult	B03	0.06	Difficult
A04	0.3	Very difficult	B04	0.25	Very difficult
A05	0.25	Very difficult	B05	0.22	Difficult
A06	-0.16	Easy	B06	-0.34	Very easy
A07	-0.36	Very easy	B07	-0.08	Easy
A08	-0.18	Easy	B08	-0.01	Easy
A09	-0.21	Easy	B09	-0.38	Very easy
A10	0.00	Difficult	B10	-0.29	Very easy
A11	0.15	Difficult	B11	0.41	Very difficult
A12	0.02	Difficult	B12	0.05	Difficult
A13	-0.46	Very easy	B13	-0.76	Very easy
A14	0.33	Very difficult	B14	0.08	Difficult
A15	-0.01	Easy	B15	-0.03	Easy
A16	-0.72	Very easy	B16	-0.55	Very easy
A17	-0.36	Very easy	B17	-0.21	Difficult
A18	0.28	Very difficult	B18	0.22	Difficult
A19	0.18	Difficult	B19	0.11	Difficult
A20	0.06	Difficult	B20	-0.14	Easy
A21	0.02	Difficult	B21	-0.15	Easy
A22	-0.14	Easy	B22	-0.19	Easy
A23	-0.15	Easy	B23	-0.31	Very easy
A24	0.11	Difficult	B24	-0.12	Easy
A25	0.13	Difficult	B25	0.38	Very difficult
A26	-0.11	Easy	B26	-0.08	Easy
A27	0.22	Difficult	B27	0.06	Difficult
A28	0.22	Difficult	B28	-0.18	Easy
A29	-0.01	Easy	B29	-0.27	Very easy
A30	0.04	Difficult	B30	0.05	Difficult
A31	-0.05	Easy	B31	-0.07	Easy
A32	0.02	Difficult	B32	-0.01	Easy
A33	0.21	Difficult	B33	-0.09	Easy
A34	0.18	Difficult	B34	-0.05	Easy
A35	0.24	Very difficult	B35	-0.14	Easy
A36	0.23	Very difficult	B36	-0.05	Easy
A37	0.14	Difficult	B37	0.20	Difficult
A38	0.17	Difficult	B38	-0.07	Easy
A39	0.14	Difficult	B39	-0.14	Easy
A40	0.25	Very difficult	B40	-0.02	Easy

Table 3. Percentage of Critical Thinking Instrument Item Difficulty in Control and Experimental Classes

Control Class			Experimental Class		
Category	Total	Percentage	Category	Total	Percentage
Very difficult	7	17.5 %	Very difficult	3	7.5 %
Difficult	20	50 %	Difficult	11	27.5 %
Easy	9	22.5 %	Easy	19	47.5 %
Very easy	4	10 %	Very easy	7	17.5 %

Table 4. Critical Thinking Ability Instrument Racking Analysis

Item	Class Control	Class Experimental	Logit Difference
1	0.06	-0.11	0.17
2	0.11	0.15	-0.04
3	0.00	0.06	-0.06
4	0.3	0.25	0.05
5	0.25	0.22	0.03
6	-0.16	-0.34	0.18
7	-0.36	-0.08	-0.28
8	-0.18	-0.01	-0.17
9	-0.21	-0.38	0.17
10	0.00	-0.29	0.29
11	0.15	0.41	-0.26
12	0.02	0.05	-0.03
13	-0.46	-0.76	0.3
14	0.33	0.08	0.25
15	-0.01	-0.03	0.02
16	-0.72	-0.55	-0.17
17	-0.36	-0.21	-0.15
18	0.28	0.22	0.06
19	0.18	0.11	0.07
20	0.06	-0.14	0.2
21	0.02	-0.15	0.17
22	-0.14	-0.19	0.05
23	-0.15	-0.31	0.16
24	0.11	-0.12	0.23
25	0.13	0.38	-0.25
26	-0.11	-0.08	-0.03
27	0.22	0.06	0.16
28	0.22	-0.18	0.4
29	-0.01	-0.27	0.26
30	0.04	0.05	-0.01
31	-0.05	-0.07	0.02
32	0.02	-0.01	0.03
33	0.21	-0.09	0.3
34	0.18	-0.05	0.23
35	0.24	-0.14	0.38
36	0.23	-0.05	0.28
37	0.14	0.20	-0.06
38	0.17	-0.07	0.24
39	0.14	-0.14	0.28
40	0.25	-0.02	0.27

experimental class it has a negative value (-), meaning that the item has a difference where in the control class the item means difficult, while in the experimental class the item means easy. As for the logit difference, it will show the level of significance of the difference in the logit of the critical thinking item in the control and experimental classes. For the logit value, it is stated to have a high level of significance if the logit difference value is > 0.05, a positive value in the logit difference means that there is an increase in the item difference while a negative value in the logit difference means that there is a decrease in the item difference. In this case, item number 1 has a logit value of 0.17 which means that item 1 experiences an increase in student cognitive,

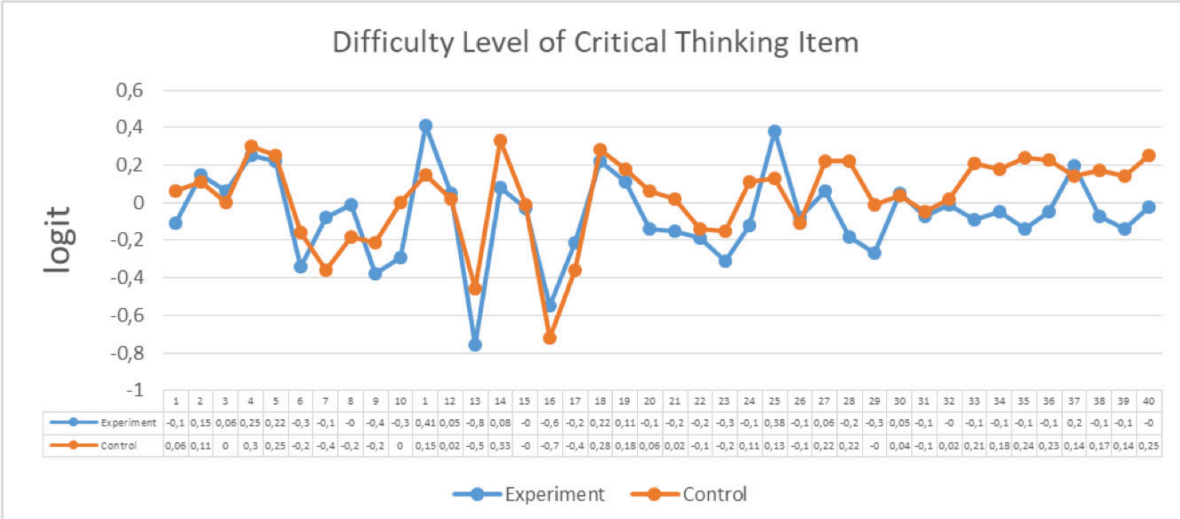

Fig. 4. Level of Difficulty in Critical Thinking Items

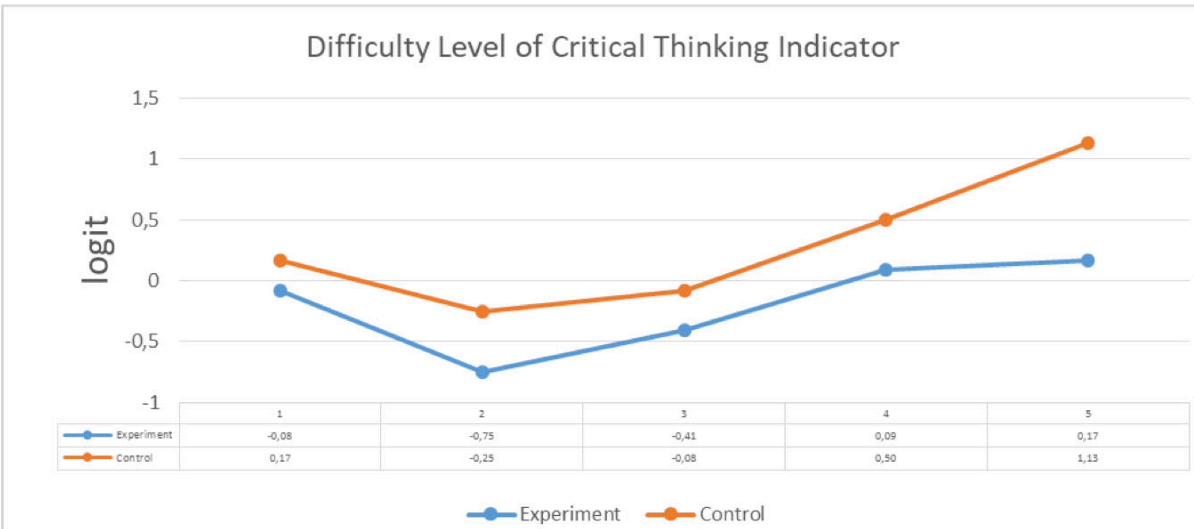

Fig. 5. Level of Difficulty in Critical Thinking Items

where students' critical thinking skills (item number 1) are better in the experimental class than in the control class. Based on the logit difference in critical thinking items, there are 28 items with positive values, which means that there is cognitive mastery in the experimental class in developing critical thinking skills by 70%. Furthermore, information regarding the differences in logit or the level of difficulty of critical thinking items is presented in the graph.

The graph in Figure 4 illustrates the changes in item difficulty levels. Significant decreases in difficulty (indicating easier items) were observed in items 1, 4, 6, 9, 10, 13, 14, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 33, 34, 35, 36, 37, 38, and 39, accounting for 28 items (60%). Items with an insignificant decrease in difficulty included 5, 15, 31, and 32, representing 4 items (10%). Conversely, significant increases in item difficulty (indicating more complex tasks) were noted in items 3, 7, 8, 11, 16, 17, 25, and 37, totaling 8 items (20%). Items 30, 26, 12, and 2 showed an insignificant increase in difficulty, covering 4 items (10%). These findings suggest that while students demonstrated progress in cognitive processes related to critical thinking development, there is still a need for further cognitive teaching support to enhance these skills. A detailed analysis of each critical thinking indicator is depicted in the graph.

The graphic results in Figure 5 indicate that for each critical thinking indicator—namely, inference ability, the ability to recognize assumptions, deductive reasoning, interpretation skills, and the ability to assess arguments—there was a notable decrease in difficulty levels. Specifically, 70% of the critical thinking items completed by students in the control class exhibited a lower difficulty level when compared to those completed by students in the experimental class. This suggests that students in the experimental class developed higher critical thinking skills than those in the control group.

Discussion

Based on the main hypothesis in this study, it is assumed that there is a significant difference in the level of difficulty of the critical thinking instrument items between the control and experimental classes as a result of the application of different learning strategies. RASCH analysis was used to evaluate the validity and accuracy of the instrument in measuring critical thinking skills as well as identifying changes in the pattern of item difficulty levels in each group. The results showed that the distribution of item difficulty levels in the control class was dominated by the "difficult" and "very difficult" categories (67.5%), while the experimental class showed dominance in the "easy" and "very easy" categories (65%). This finding shows that the learning strategy applied in the experimental class has a positive impact on the development of students' critical thinking skills, which is in line with the results of previous research which states that innovative learning approaches can improve students' higher-order thinking skills (Sumintono, 2018; Laliyo et al., 2022).

Comparison of data between control and experimental classes shows significant logit differences in most items, especially in 28 out of 40 items that show positive logit values with a difference of more than 0.05, indicating an increase in cognitive mastery in the experimental class. For example, on item number 1, there is a logit difference of 0.17, indicating that students in the experimental class were able to solve the problem more easily than students in the control class. This finding strengthens the argument that pedagogical interventions designed with a structured approach and based on critical thinking competencies are able to direct students in building more adaptive cognitive strategies (Ary et al., 2018; Andrich, 2010).

The process of cultivating critical thinking through movement tasks, such as tennis instruction, focuses primarily on providing reasons and evaluations of movement task performance. This involves the ability to explain what and how a movement task is executed, helping to sharpen the mind's ability to process these tasks. Key skills developed include decision-making regarding movements, predicting ball trajectories, evaluating shot outcomes, synthesizing movement sequences, understanding shot positioning, classifying shot types, and comparing different playing styles. These cognitive processes during movement tasks demonstrate the positive role of physical activity in enhancing critical thinking skills (Huang & Ning, 2021). Through this rigorous process, students develop memories and knowledge related to the efficiency and effectiveness of playing tennis. Information is processed from both the teacher and the learning environment, creating diverse, meaningful, and contextual movement programs that enrich students' knowledge, thus promoting critical thinking.

The findings of this study align with previous research, which suggests that physical activity directly affects brain function, and this effect subsequently enhances cognitive abilities (Hötting & Röder, 2013; Suwabe et al. 2017). This perspective underscores that engaging in physical activities leads to better cognitive function, facilitated through neurotransmitter activity (Lista & Sorrentino, 2010). Therefore, physical activity stimulates cognitive functions, leading to improved mental processing.

The study provides insights into a structured cognitive teaching approach that supports critical thinking development through physical education. It offers essential guidelines, emphasizing that physical education should engage mental procedures, develop models, test hypotheses, collect learning data, and interpret outcomes to demonstrate desired movement tasks (Morales-Belando & Arias-Estero, 2017; Renshaw et al. 2016). Furthermore, trust and engagement are fostered through physical activities, such as discussions, which provide students with opportunities to express their thoughts, ideas, and feelings (Clark et al 2011; Hings et al. 2020). The study results show a positive correlation between physical activities in physical education and critical thinking skills, supporting previous research that emphasizes the need for teachers to employ both direct and indirect teaching methods. These methods should facilitate student learning through questioning, problem-solving, and critical thinking, while also enabling repeated practice of learned concepts (Donnelly et al. 1999; Kpazaï et al. 2015).

Conclusions

Cognitive-reflective learning in physical education, through game-based or movement problem-situated approaches, effectively strengthens critical thinking skills. The study demonstrated that cognitive teaching in tennis and extracurricular futsal sessions had varying impacts on students' ability to address critical thinking tasks. Specifically, 70% of critical thinking items showed a reduced level of difficulty among students participating in extracurricular futsal, compared to those engaged in cognitive tennis instruction. This finding underscores the potential of physical education to serve as a holistic educational approach that integrates intellectual value, provided that the instructional design actively promotes cognitive development. Moreover, it is essential to recognize that movement learning extends beyond physical activity; it also involves cognitive engagement. The integration of cognitive-reflective elements in physical education has been shown to enhance cognitive performance and function. Therefore, a strong relationship exists between movement tasks in physical education and the development of critical thinking skills. By intentionally designing physical education lessons to foster cognitive skills, educators can contribute meaningfully to the overall intellectual growth of students.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Фізичне виховання на основі когнітивно-рефлексивного моторного навчання сприяє підвищенню здібностей до критичного мислення: Чи демонструє модель аналізу Раша значущі докази?

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 9 с., 4 табл., 5 рис., 41 джерело.

Історія питання. У цьому дослідженні розглядається питання необхідності підвищення когнітивно-рефлексивних компетентностей у фізичному вихованні, в якому часто надається пріоритет оволодінню базовими спортивними навичками за рахунок когнітивного розвитку. В інформаційну епоху критичне мислення є ключовою когнітивно-рефлексивною навичкою, яку необхідно розвивати.

Мета дослідження. Мета дослідження полягала у вивченні структурної моделі інструктивної дидактики та оцінці змін у рівнях складності критичного мислення серед учнів у контексті фізичного виховання.

Матеріали та методи. Застосовано посттестовий дизайн контрольної групи, в якому збір даних щодо критичного мислення проводився після занять з фізичного виховання. До дослідження було залучено дві групи: експериментальний клас, який інтегрував когнітивне навчання через теніс, та контрольний клас, який брав участь у позакласних заняттях з футзалу, кожна з яких складалася з 30 учнів середньої школи (віком 13-14 років).

Результати. Аналіз результатів із застосуванням моделювання Раша виявив значні зміни в рівнях складності критичного мислення. Зокрема, показники критичного мислення, включаючи інференцію, розпізнавання припущень, дедуктивне міркування, інтерпретацію та оцінку аргументів, показали зниження складності на 70% для учнів експериментальної групи порівняно з учасниками контрольної групи.

Висновки. Отримані результати свідчать про те, що когнітивно-рефлексивне навчання у фізичному вихованні сприяє значному поліпшенню здібностей учнів до критичного мислення, оскільки учні експериментального класу демонструють кращі навички критичного мислення, ніж їхні однолітки з контрольної групи.

Ключові слова: фізичне виховання, когнітивно-рефлексивне навчання, критичне мислення, модель Раша, середня школа.

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