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Research Article

A Study of the Role of Metacognitive Strategies in Enhancing the Teaching Effectiveness of Physical Education Teachers in India

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ABSTRACT

The study investigated how metacognitive strategies influence the teaching effectiveness of 200 Physical Education (PE) teachers in Haryana, India, using a questionnaire. The research explored teachers' reflection, planning, instructional adaptation, and self-assessment, offering insights into successful PE instruction. Findings showed that most PE teachers demonstrate strong metacognitive behaviors, particularly in reviewing past lessons to inform current planning, which is vital for professional growth. However, nearly one-third do not regularly engage in such reflection, highlighting a need for professional development. While 60% tailor instruction to student needs, a significant minority does not consistently apply this, potentially limiting effectiveness. Only half engage in mental rehearsal of lessons, a missed opportunity for optimizing outcomes. Though 60% actively monitor students during instruction, 20% do not, which could hinder timely interventions. Encouragingly, 70% adapt instruction and perform post-lesson reflection, demonstrating flexibility and commitment to improvement. A large 80% show self-awareness and seek feedback. In conclusion, while many PE teachers use metacognitive strategies effectively, targeted support is needed to ensure consistent application across all educators, ultimately enhancing teaching quality and student outcomes in PE.

Keywords: Metacognitive Strategies, Physical Education, Effectiveness, Teaching, Empirical research

1. Introduction

Modern education increasingly sees Physical Education (PE) not merely as a tool for enhancing physical fitness and motor skills, but as a foundational part of holistic student development (Deng, & Legge, 2022). There is growing appreciation for PE's significant impact on fostering cognitive abilities, supporting social-emotional well-being, and encouraging the adoption of lasting healthy lifestyles.

1.1 The Evolving Landscape of Physical Education

Effective PE programs significantly contribute to students' well-being by improving concentration, boosting self-esteem, enhancing stress management, and cultivating vital interpersonal skills like teamwork, communication, and resilience. Consequently, PE teachers are crucial not just for physical activity instruction, but for shaping students' holistic development and fostering a lifelong positive attitude toward physical activity (Ramires, *et. al,* 2023). However, the PE environment, characterized by its dynamic and often unpredictable nature, presents unique pedagogical challenges, as it involves managing large groups of students with diverse abilities and needs in non-traditional settings. The quality and impact of PE instruction heavily depend on the teaching effectiveness of PE teachers. This encompasses a broad range of competencies, including astute instructional planning, adept classroom management, differentiated instruction, skillful assessment, and the capacity to meaningfully motivate and engage all students. With educational paradigms shifting towards more learner-centered approaches, there is a growing emphasis on empowering teachers with skills to reflect on, adapt, and continuously refine their teaching practices to meet these complex demands.

1.2 Enhancing Teaching Effectiveness in Physical Education

Despite recognizing the importance of effective PE teaching, a persistent issue is the inconsistency in instructional quality, which subsequently affects student learning and engagement. Traditional teacher preparation often falls short in equipping PE teachers with the higher-order thinking skills needed to navigate the dynamic and often unpredictable PE environment. Teachers frequently encounter situations demanding immediate and thoughtful responses beyond pre-planned lessons, highlighting the critical need for self-awareness, critical reflection, and real-time strategic adjustment (Chen & Zhou, 2021). While extensive research exists on general teaching effectiveness and various pedagogical models in PE, there is a notable gap in understanding the internal cognitive processes that drive highly effective teaching within this specific domain. Specifically, the role of metacognitive strategies—how individuals think about and regulate their own thinking and learning—in enhancing PE teachers' effectiveness remains largely unexplored. This study aims to fill this void by examining how metacognitive strategies can improve PE teachers' instructional practices and student outcomes, positing that heightened awareness of teaching thought processes, assumptions, and impacts, combined with strategic planning, monitoring, and evaluation, could significantly boost overall effectiveness.

1.3 Introduction to Metacognitive Strategies

Metacognition, often described as "thinking about thinking," involves an individual's awareness and control of their cognitive processes and is essential for effective learning and teaching. It consists of two key components: metacognitive knowledge and metacognitive regulation (Rhodes, 2019). Metacognitive knowledge refers to understanding one's learning preferences, task requirements, and appropriate learning strategies, which, for educators, includes recognizing instructional strengths and adapting teaching methods to suit different situations. Metacognitive regulation involves planning (setting goals and preparing strategies), monitoring (assessing performance and understanding during tasks), and evaluating (reflecting on outcomes and improving future approaches). The deliberate use of these strategies has been consistently linked to enhanced learning, better problem-solving, and academic achievement, making their integration into professional practices like teaching a highly valuable advancement.

1.4 Metacognitive Strategies in Teacher Education and Effectiveness

Integrating metacognitive theory into teacher education and professional development highlights the significant advantages of fostering metacognitive awareness among educators. Teachers with strong metacognitive skills are better prepared to make thoughtful pedagogical decisions, tailor their instruction to address the varied needs of students, and pursue continuous professional improvement through reflective practice. Such educators are more deliberate in their lesson planning, taking into account diverse learning styles, possible obstacles, and effective assessment strategies (Zohar et al., 2022). They actively monitor classroom dynamics, adjusting instructional methods in response to student feedback and engagement. Metacognitive teachers also critically evaluate their own teaching, recognizing what works and identifying areas for growth. This reflective capability enhances their problem-solving abilities, allowing them to approach pedagogical challenges with creativity and insight. Furthermore, they embody the mindset of lifelong learners, continually seeking new knowledge and innovative teaching strategies (Phelps et al., 2004). Empirical research in general education supports these findings, consistently linking teachers' metacognitive abilities with higher instructional effectiveness, increased student engagement, and improved academic outcomes. These teachers tend to be more organized, adaptable, and adept at creating supportive and responsive learning environments.

1.5 The Unique Context and Needs of Physical Education Teachers

The dynamic and unpredictable nature of the Physical Education (PE) environment requires teachers to be highly adaptable and capable of making swift, effective decisions. Unlike traditional classroom settings focused on static cognitive tasks, PE involves managing large groups in open spaces, maintaining safety, ensuring participation, and handling behavior, all while accommodating a wide range of physical abilities and motor skills through inclusive instruction. PE teachers must also effectively teach psychomotor skills with accurate demonstrations, constructive feedback, and a structured progression, while nurturing affective outcomes such as sportsmanship, teamwork, and a positive attitude towards physical activity. Additionally, they often need to make rapid adjustments due to variables like weather conditions, equipment issues, or unexpected student responses (Rieser et al., 2016). In this complex setting, the application of metacognitive strategies becomes essential. Metacognitively aware PE teachers are better equipped to plan by anticipating common learning challenges and preparing multiple instructional methods; to monitor by observing student engagement and modifying drills or activities on the spot; and to evaluate by reflecting on lesson outcomes and strategizing improvements for future sessions. Developing such metacognitive skills among PE teachers can greatly enhance their instructional effectiveness, leading to more meaningful student learning experiences, improved skill acquisition, and more positive attitudes towards lifelong physical activity.

2. Literature Review

Stephanou and Karamountzos (2020) investigated the effectiveness of the Teaching Games for Understanding (TGfU) tactical-game approach in fostering metacognitive knowledge (including declarative, procedural, conditional knowledge, and information management) and metacognitive regulation (such as planning, monitoring, problem-solving strategies, evaluation, and imagery), alongside game-play performance in physical education. Their experimental intervention study in basketball involved pre- and post-intervention measurements. Key findings revealed that, post-intervention, the TGfU student group demonstrated higher metacognition in perceptual knowledge, information management, conditional knowledge, problem-solving strategies, and evaluation, in addition to better game performance, when compared to a technical teaching group. Furthermore, in the post- versus pre-teaching comparison, the technical teaching group only showed increased use of declarative knowledge. In contrast, the TGfU group achieved superior game performance and reported more frequent use of metacognitive knowledge (declarative, perceptual, information management, and conditional) and metacognitive regulation (planning, problem-solving strategies, and evaluation).

A study by Halamish (2018) explored the metacognitive awareness of effective learning strategies among pre-service and in-service teachers. The research involved 83 university students in a teacher training program and 82 experienced elementary, junior-high, and high school teachers. Participants were presented with learning scenarios and asked to predict which of two learning strategies would yield better outcomes. The findings revealed that neither pre-service nor in-service teachers accurately identified the benefits of strategies like testing, spacing, and interleaving. Moreover, their understanding of these strategies did not improve with increased teaching experience. The study concluded that explicit instruction on evidence-based learning strategies should be integrated into teacher training and professional development programs to enhance educators' metacognitive knowledge and, consequently, student learning outcomes.

A study by Fathima et al. (2014) examined the development of teaching competencies among graduate teacher trainees across five key domains: induction, pedagogy, organization, and assessment. The research demonstrated consistent improvement in all these areas. The authors emphasized the necessity for educators to continuously update their skills with innovative strategies to adapt to changes in the educational system. They proposed that integrating metacognitive intervention strategies into teacher education programs could significantly enhance teaching competencies, enabling future educators to approach their roles with greater confidence and effectiveness.

DeJaeghere et al. (2023) investigated teaching practices in Vietnamese secondary schools to understand how students in natural classroom settings achieve high levels of learning. The study utilized qualitative data, drawing from teacher interviews and video observations in both high- and low-performing classrooms across Vietnam. Their findings revealed that metacognitive teaching strategies were predominantly employed by teachers in high-performing classrooms. These strategies included: explicit strategy instruction, where teachers directly taught students how to use learning strategies; verbalizing, encouraging students to articulate their thought processes; assessment integration, embedding assessment to monitor understanding; consistent practice, providing regular opportunities for skill application; and fostering a positive learning environment. This research illuminated practical classroom approaches that promote metacognition, offering valuable insights into how these practices can significantly enhance the quality of student learning. The study underscores the importance of intentional metacognitive support in diverse educational contexts.

A mixed-methods study by Vellanki et al. (2022) at an Omani university investigated teachers' perspectives on Metacognitive Strategy Instruction (MSI) in remote listening instruction. The research aimed to understand teachers' perceptions of students' listening challenges, their awareness of metacognitive strategies, and the impact of explicit MSI on student engagement and listening proficiency. Data were collected from 10 faculty members and 75 students through questionnaires and interviews. The findings revealed that teachers faced several challenges in remote listening instruction, including time limitations, shortened semesters, unfamiliar course materials, and assessment practices. To address these challenges, teachers employed collaborative lesson planning, shared resources, and virtual flipped classrooms for strategy instruction. These approaches aimed to enhance student participation and listening skills. The study concluded that MSI can provide better scaffolding during listening instruction, offering improved support for students. The researchers recommended further exploration of how students utilize metacognitive strategies in other academic contexts to enhance learning outcomes. This research underscores the importance of integrating MSI into remote teaching practices to foster learner autonomy and improve listening comprehension skills

Antonio and Prudente (2021) conducted a meta-analysis to evaluate the effectiveness of metacognitive instruction on science learning achievement. Utilizing the Comprehensive Meta-Analysis (CMA) Version 3 software, they analyzed data from ten empirical studies involving 1,079 students across various educational levels and scientific disciplines. The overall effect size (ES=0.808) indicated a significantly large and positive impact of metacognitive instruction on student learning outcomes. Moderator analysis revealed variations in effect sizes based on students' educational levels and the specific scientific disciplines studied. Despite these differences, the consistently large effect sizes suggest that metacognitive strategies can be effectively implemented across elementary, secondary, and tertiary education, as well as in both Biological and Physical Sciences. The study also found that metacognitive strategies were often integrated with Information and Communication Technology (ICT), primarily through metacognitive prompts. Other effective practices

included student-led metacognitive discussions, concept mapping, metacognitive writing, and dedicated metacognitive practice and training. The researchers concluded that incorporating metacognitive strategies into science instruction significantly enhances student learning achievement and recommended that science teachers be equipped with pedagogical knowledge on the implementation and integration of metacognition in classroom instruction.

3. Objectives

This study aims to investigate the role of metacognitive strategies in enhancing the teaching effectiveness of Physical Education teachers through their own perspectives on the utility and feasibility of using metacognitive strategies.

4. Research Methodology

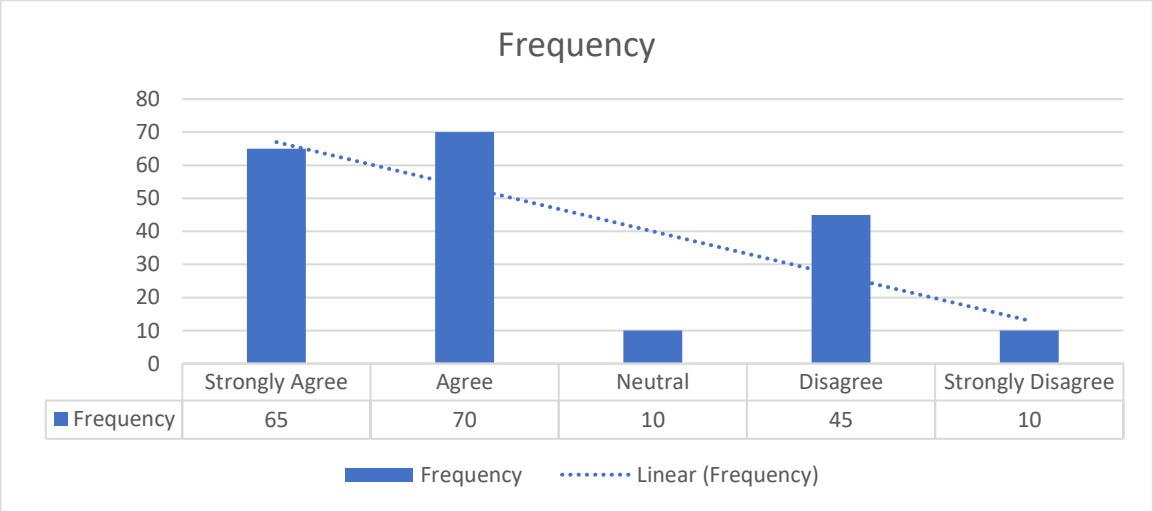
This research employs an exploratory and descriptive approach to investigate its objectives. The primary data for this study was gathered from a sample of 200 PE teachers located in Haryana. To ensure the representativeness of the sample and to fulfill the study's aims, participants were randomly selected. A questionnaire served as the primary instrument for collecting this crucial primary data from the PE teachers. This method allowed for the systematic collection of information regarding their perspectives, experiences, and various characteristics relevant to the study's scope. In addition to the primary data, the research also incorporated secondary data. This supplementary information was sourced from a variety of reliable and authentic materials, including different journals, magazines, websites, and other verified publications. The integration of secondary data helped to provide a broader context for the study, support the interpretation of primary findings, and ensure a comprehensive understanding of the research topic. Once collected, both primary and secondary data underwent rigorous analysis. The descriptive characteristics of the sample were summarized and presented using various statistical tools. This included the use of percentage analysis, which helped to illustrate the distribution of various attributes within the sample. Furthermore, tables, charts, and graphs were utilized to visually represent the data, making complex information more accessible and understandable. These descriptive statistics were fundamental in characterizing the sample and forming the basis for drawing informed inferences and conclusions related to the study's objectives. The careful selection of the sample and the systematic approach to data collection and analysis aimed to ensure the validity and reliability of the research findings.

5. Analysis and Interpretation

The following statements are considered to study the role of metacognitive strategies in enhancing the Teaching Effectiveness of Physical Education Teachers:

Statement 1- PE teachers systematically review the outcomes and challenges of previous lessons to inform the planning and objectives of current ones.

Figure 1. Responses for Statement 1



Source: Author's own

Based on the responses in Figure 1, a majority of PE teachers (67.5%) agree that they systematically review the outcomes and challenges of previous lessons to inform current planning and objectives. This indicates a strong tendency toward reflective practice and metacognitive awareness, which supports their intellectual development. However, 27.5% of teachers disagree with this statement, suggesting that a significant minority may not consistently engage in this important habit. This gap highlights the need for targeted professional

development to encourage more consistent reflection and adaptive planning among PE teachers, ultimately enhancing the quality of physical education instruction.

Statement 2- PE teachers consciously select specific instructional strategies and drills based on their understanding of student learning needs and the demands of the particular physical skill being taught.

Figure 2. Responses for Statement 2

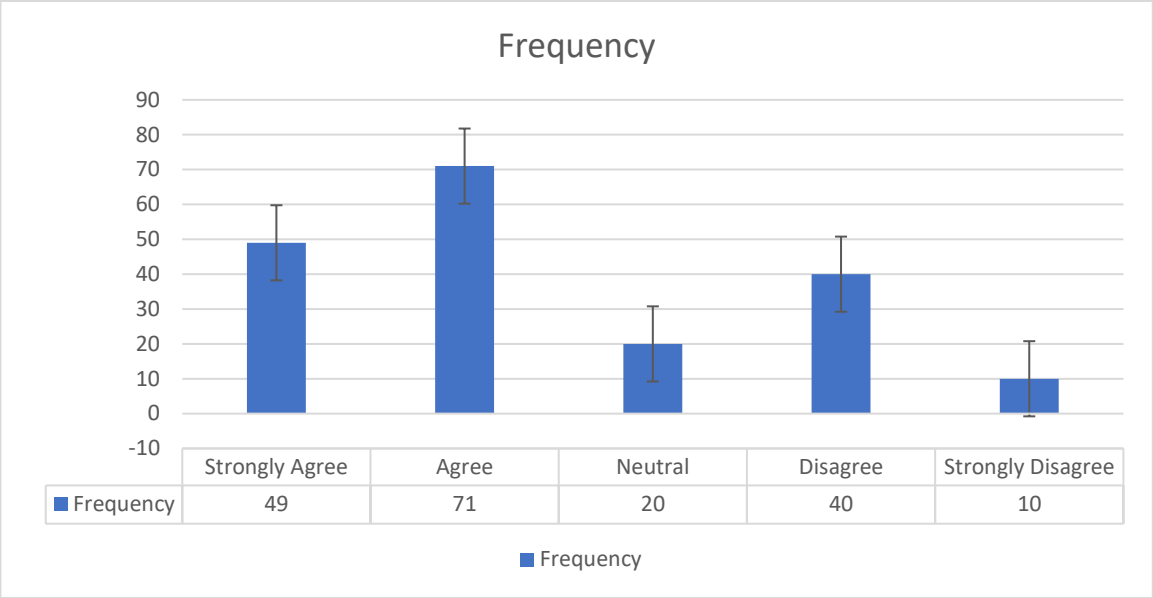


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Figure 2 shows that 60% of PE teachers (49 strongly agree and 71 agree) consciously select instructional strategies and drills tailored to student learning needs and the demands of the physical skills being taught. This reflects a thoughtful and student-centered approach to teaching, demonstrating metacognitive skills and professional judgment. However, 25% of teachers (40 disagree and 10 strongly disagree) do not consistently apply this practice, which may limit their effectiveness in addressing diverse learner needs. The 10% neutral responses suggest some uncertainty. Strengthening awareness and training in adaptive instructional planning could improve overall teaching quality.

Statement 3- PE teachers mentally rehearse lesson segments or anticipate potential student misconceptions before the actual teaching session.

Figure 3. Responses for Statement 3

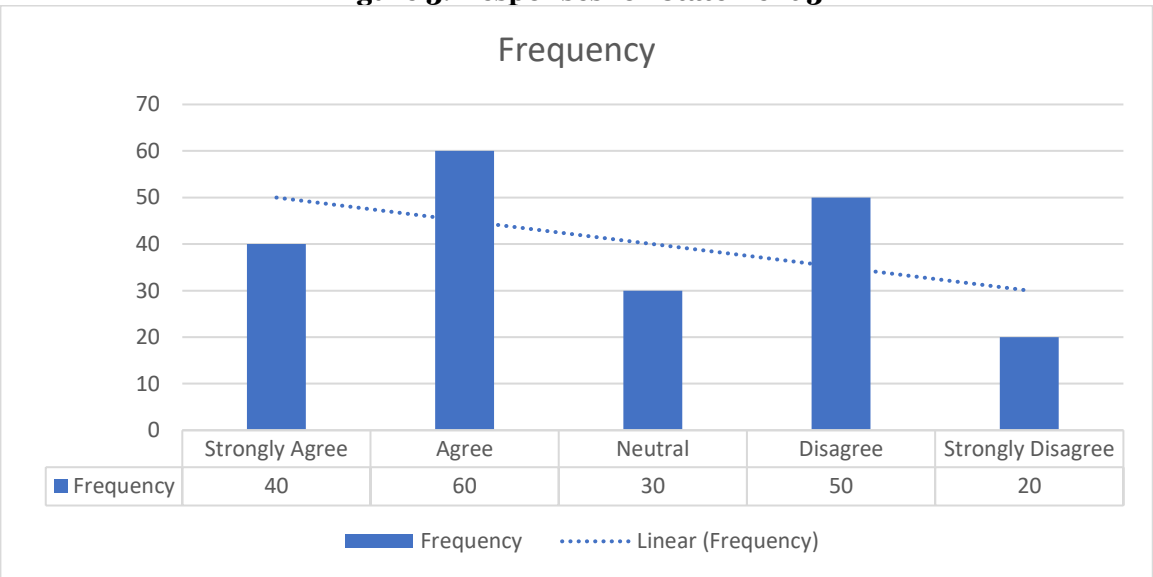

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Figure 3 indicates that 50% of PE teachers (40 strongly agree and 60 agree) mentally rehearse lesson segments or anticipate student misconceptions before teaching, showing proactive metacognitive preparation. However,

a substantial portion—35% (50 disagree and 20 strongly disagree)—do not engage in this anticipatory practice, potentially missing opportunities to address challenges effectively. The 15% neutral responses may reflect uncertainty or inconsistent habits. This suggests that while half of the teachers demonstrate strong reflective planning, there is considerable room to encourage more widespread use of mental rehearsal to enhance lesson delivery and student understanding.

Statement 4- During instruction, PE teachers actively monitor student engagement, understanding, and skill execution, making frequent visual scans and targeted observations.

Figure 4. Responses for Statement 4

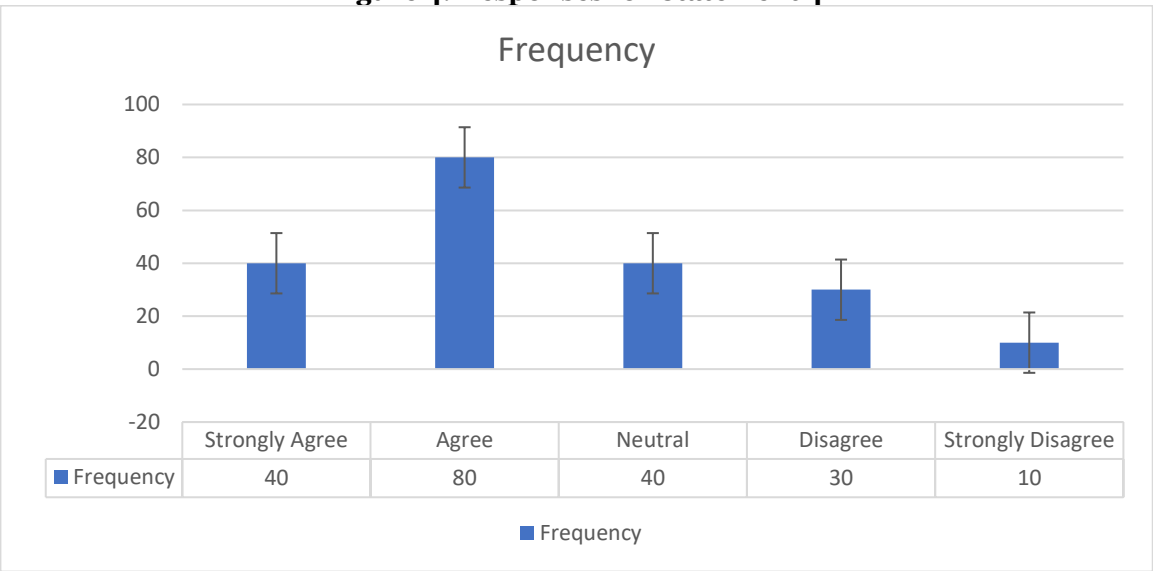

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Figure 4 reveals that 60% of PE teachers (40 strongly agree and 80 agree) actively monitor student engagement, understanding, and skill execution during instruction through frequent visual scans and targeted observations. This indicates a strong commitment to responsive teaching and real-time assessment, reflecting effective metacognitive and instructional habits. Meanwhile, 20% (30 disagree and 10 strongly disagree) do not consistently engage in such monitoring, which may hinder timely intervention and support. The 20% neutral responses suggest some ambivalence or variability in practice. Enhancing awareness of active monitoring could further improve teaching quality and student outcomes.

Statement 5- PE teachers deliberately adjust their instructional pace, explanations, or activities in real-time based on observed student responses and emerging needs within the lesson.

Figure 5. Responses for Statement 5

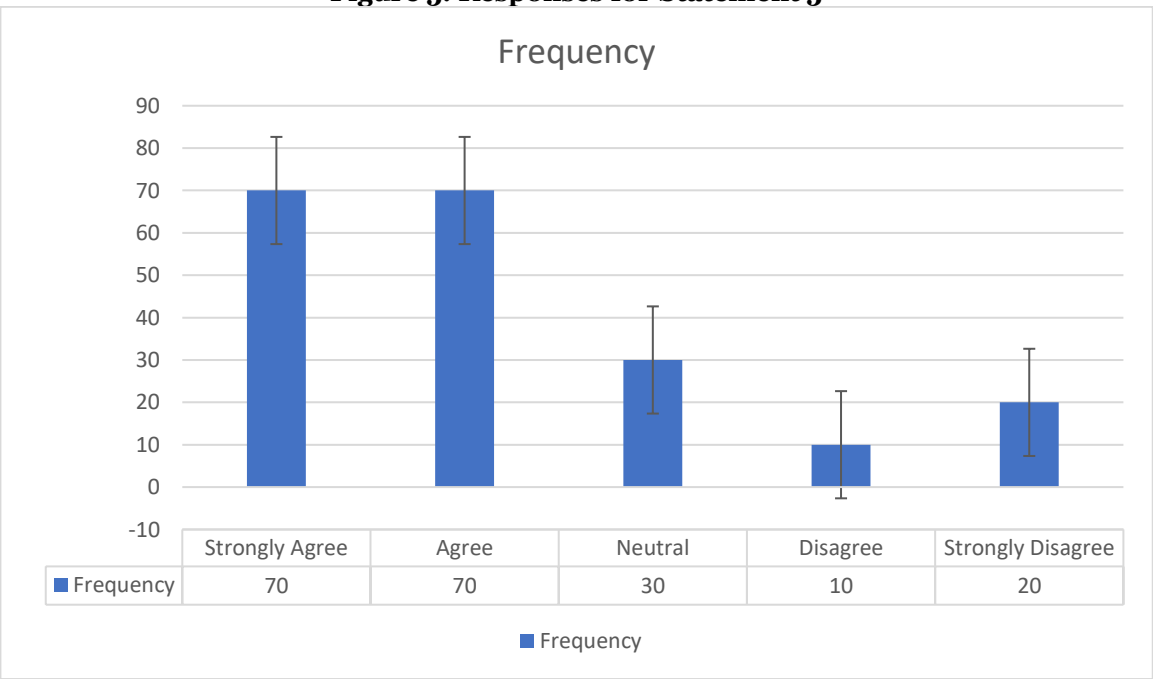

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Figure 5 shows that 70% of PE teachers (70 strongly agree and 70 agree) deliberately adjust instructional pace, explanations, or activities in real-time based on student responses and emerging needs. This demonstrates a high level of adaptive teaching and metacognitive responsiveness, essential for effective physical education. Only 15% (10 disagree and 20 strongly disagree) do not consistently make such adjustments, potentially limiting lesson effectiveness. The 15% neutral responses indicate some uncertainty or inconsistency. Overall, most PE teachers exhibit strong real-time instructional flexibility, highlighting a positive habit that supports better student engagement and skill development.

Statement 6- PE teachers critically analyze the effectiveness of their chosen activities and management techniques in achieving the intended learning outcomes after the lesson concludes.

Figure 6. Responses for Statement 6

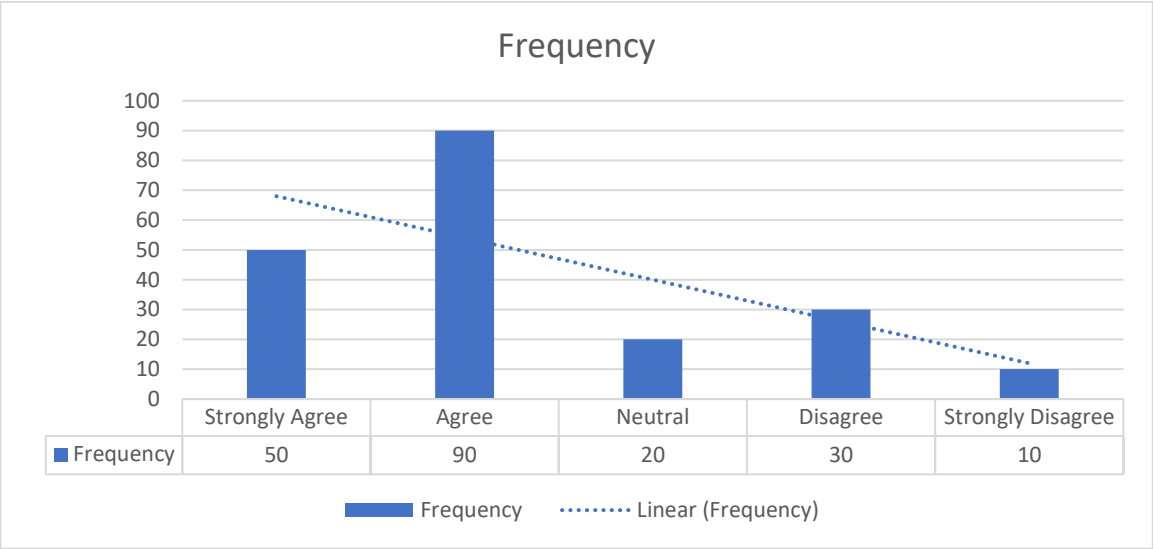

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Figure 6 indicates that 70% of PE teachers (50 strongly agree and 90 agree) critically analyze the effectiveness of their activities and management techniques after lessons to evaluate whether intended learning outcomes were achieved. This reflects a strong culture of reflective practice and continuous improvement, key components of metacognitive development and intellectual growth. However, 20% (30 disagree and 10 strongly disagree) do not consistently engage in this critical reflection, which may hinder their ability to refine teaching methods. The 10% neutral responses suggest some uncertainty. Encouraging more consistent post-lesson analysis could further enhance teaching effectiveness and student learning.

Statement 7- PE teachers demonstrate an awareness of their own teaching strengths and weaknesses, and actively seek feedback or new knowledge to address areas needing improvement.

Figure 7. Responses for Statement 7

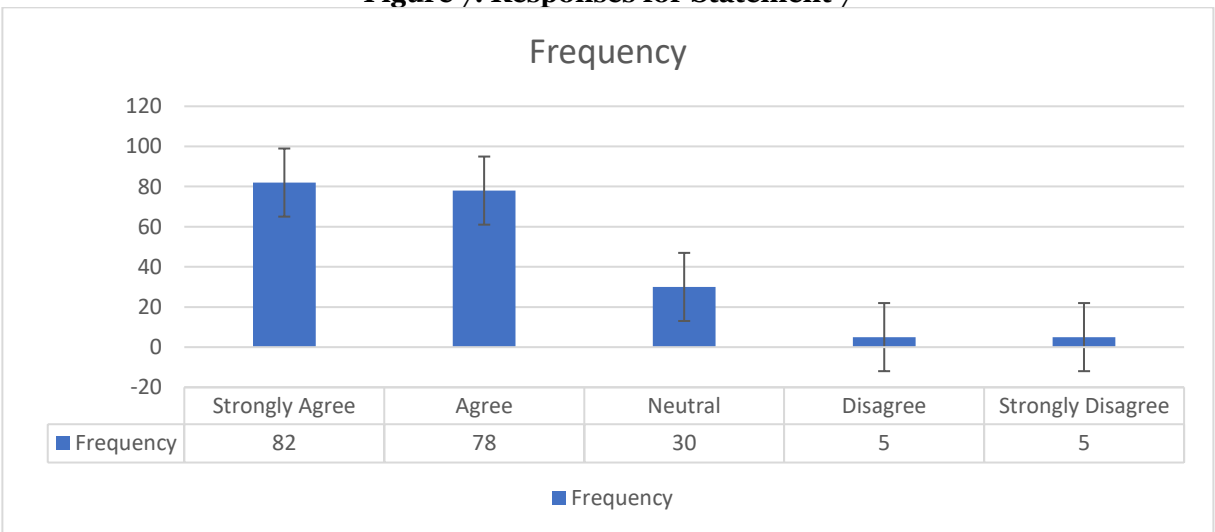

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Figure 7 reveals that a significant majority of PE teachers (82 strongly agree and 78 agree, totalling 80%) demonstrate awareness of their teaching strengths and weaknesses and actively seek feedback or new knowledge to improve. This reflects strong metacognitive insight and a growth mindset essential for ongoing intellectual and professional development. Only a small fraction (5 disagree and 5 strongly disagree, 5%) do not engage in such reflective practices. The 15% neutral responses may indicate uncertainty or inconsistent effort. Overall, these findings suggest that most PE teachers are committed to self-improvement and responsive teaching.

6. Findings

The study investigated the role of Metacognitive Strategies in Enhancing the Teaching Effectiveness of Physical Education Teachers. The data collected from multiple survey items revealed significant insights into how PE teachers reflect, plan, and adapt their instructional methods to improve student learning outcomes. Firstly, it was found that a majority of PE teachers (67.5%) systematically review the outcomes and challenges of previous lessons to inform current planning and objectives. This behavior indicates a strong presence of reflective practice and metacognitive awareness among most teachers, which is critical for intellectual development. However, nearly one-third of respondents do not consistently engage in this reflection, suggesting room for improvement in adopting habitual reflective routines. The study also showed that 60% of PE teachers consciously select instructional strategies and drills based on their understanding of student learning needs and the demands of specific physical skills. This tailored approach underscores a student-centred philosophy, highlighting the teachers' ability to adjust teaching methods thoughtfully. Nonetheless, about a quarter of teachers do not consistently practice this, potentially limiting the effectiveness of their instruction. Mental rehearsal and anticipation of student misconceptions, an important aspect of metacognitive preparation, was reported by half of the teachers surveyed. The 50% engagement in this practice suggests a moderate level of proactive planning. However, a considerable 35% do not engage in such anticipatory strategies, indicating a gap that could affect lesson delivery and student comprehension. During instruction, 60% of PE teachers actively monitor student engagement, understanding, and skill execution through frequent visual scans and observations. This real-time feedback mechanism is essential for adaptive teaching and immediate intervention. While the majority demonstrate this habit, 20% do not, which could hinder their ability to respond to students' emerging needs effectively. A higher percentage (70%) of PE teachers reported deliberately adjusting their instructional pace, explanations, or activities in real-time based on student responses and needs. This adaptive flexibility reflects advanced metacognitive skills and responsiveness, essential traits for effective teaching in dynamic learning environments. Only a small minority (15%) do not consistently apply these adjustments, suggesting a need for further professional development in adaptive instruction. Post-lesson reflection and critical analysis of teaching methods were also prevalent, with 70% of teachers engaging in evaluating the effectiveness of their activities and management techniques. Such critical reflection is vital for continuous intellectual growth and refining pedagogical approaches. Still, a notable 20% do not consistently practice post-lesson analysis, which could limit opportunities for improvement. Finally, the study highlighted that a substantial majority (80%) of PE teachers demonstrate awareness of their teaching strengths and weaknesses and actively seek feedback or new knowledge to address areas for improvement. This shows a strong growth mindset and commitment to professional development. Only a small fraction (5%) does not engage in such reflective behavior, suggesting that most PE teachers are motivated toward self-improvement. Thus, the findings reveal that most PE teachers exhibit important metacognitive and habitual behaviors that support their intellectual development and teaching effectiveness. Reflective practice, adaptive instruction, and continuous self-assessment are prevalent among the majority, though there remain significant pockets of teachers who could benefit from targeted training to enhance these skills. Strengthening these habits will likely contribute to improved teaching quality and better student outcomes in physical education.

7. Conclusion

This study examined the critical role of metacognitive strategies in enhancing the teaching effectiveness of 200 Physical Education (PE) teachers in Haryana, India using a questionnaire. By exploring how these educators reflect on their teaching, plan lessons, adapt their instructional methods, and engage in self-assessment, the research provided valuable insights into the habits and intellectual development that underpin successful PE instruction. The findings reveal that a majority of PE teachers demonstrate strong metacognitive behaviors, particularly in systematically reviewing previous lesson outcomes and challenges to guide current lesson planning. This reflective practice is foundational to professional growth and intellectual development, enabling teachers to critically evaluate their instructional approaches and make informed adjustments. However, the presence of nearly one-third of teachers who do not regularly engage in such reflection points to an important area for professional growth. This gap underscores the need for schools and educational leaders to foster a culture that prioritizes habitual reflection as an integral part of teaching practice. Furthermore, the study highlighted that 60% of PE teachers consciously tailor their instructional strategies and drills based on an understanding of student learning needs and the demands of the physical skills being taught. This student-

centered approach aligns with best teaching practices, emphasizing differentiation and responsiveness to learners' varied abilities. Yet, a significant minority still does not consistently apply this practice, which may limit the overall effectiveness of instruction and student engagement. Professional development programs that emphasize adaptive teaching strategies could help bridge this divide, equipping more teachers to meet diverse student needs effectively. Mental rehearsal and anticipation of potential student misconceptions were reported by only half of the respondents, indicating a moderate level of metacognitive preparation before lessons. Mental rehearsal allows teachers to proactively plan for possible difficulties students might encounter and to adjust lesson delivery accordingly. The fact that 35% of teachers do not engage in this practice suggests a missed opportunity to optimize lesson outcomes. Encouraging PE teachers to integrate such anticipatory thinking into their routine could lead to smoother lesson execution and improved student understanding. Active monitoring of students during instruction emerged as a common practice, with 60% of teachers frequently scanning and observing student engagement, comprehension, and skill execution. This real-time assessment enables immediate interventions and adjustments, reinforcing effective teaching. Nevertheless, the 20% of teachers who do not consistently monitor students in this way might struggle to respond promptly to emerging learning challenges, potentially impacting student progress. Enhancing teachers' observational skills and emphasizing the importance of continuous formative assessment could therefore be beneficial. Adaptive instruction—deliberately adjusting pace, explanations, and activities based on student responses—was reported by 70% of PE teachers, demonstrating a high degree of instructional flexibility. This responsiveness is a hallmark of expert teaching and is closely linked to metacognitive awareness. However, the minority who do not regularly adapt their teaching may miss critical moments to clarify concepts or adjust difficulty, reducing lesson effectiveness. Targeted training to build confidence and skills in real-time instructional adjustment can further elevate teaching quality.

Post-lesson reflection and critical analysis were practiced by 70% of teachers, illustrating a commitment to continuous intellectual growth and pedagogical refinement. Reflection after instruction helps teachers understand what worked well and what requires improvement, driving ongoing development. Yet, 20% of teachers do not consistently engage in post-lesson analysis, potentially hindering their ability to learn from experience. Cultivating reflective habits and providing structured reflection opportunities can encourage all teachers to benefit from this vital practice. Importantly, a large majority (80%) of PE teachers demonstrated self-awareness regarding their strengths and weaknesses and actively sought feedback or new knowledge to improve. This growth mindset and proactive approach to professional development are essential for maintaining high teaching standards. Only a small percentage do not participate in these reflective behaviors, highlighting that most PE teachers are motivated and open to self-improvement. In conclusion, this study underscores that metacognitive strategies and habitual reflective practices play a crucial role in the intellectual and professional development of PE teachers. While many teachers demonstrate strong metacognitive habits—such as lesson review, adaptive instruction, and self-assessment—there remain notable gaps where targeted support and professional learning can foster more consistent application. Strengthening these metacognitive and habitual behaviors will likely enhance teaching effectiveness, promote student engagement, and improve learning outcomes in physical education. Educational stakeholders should prioritize ongoing training and reflective cultures to support PE teachers in becoming more reflective, adaptive, and intellectually engaged professionals. Such efforts will not only benefit teachers but will ultimately lead to richer, more effective physical education experiences for students.

8. Suggestions

To enhance the teaching effectiveness of Physical Education (PE) teachers, it is crucial to foster a culture of reflective practice within educational institutions, as the study revealed that while a majority engage in systematic review of past lessons, a significant minority do not consistently do so. Schools should implement regular structured reflection opportunities such as peer discussions, reflective journaling, or portfolios that enable teachers to critically evaluate lesson outcomes and challenges, thereby deepening metacognitive awareness and informing future planning. Additionally, targeted professional development is essential to equip teachers with skills in adaptive instruction, given that some teachers do not consistently tailor their strategies or adjust pacing and activities in response to student needs. Workshops focusing on differentiation techniques, quick assessment methods, and real-time instructional flexibility would empower teachers to meet diverse learner demands effectively. The study also indicated that only half of PE teachers mentally rehearse lessons or anticipate student misconceptions, highlighting the need for training programs that introduce mental simulation techniques and encourage proactive lesson visualization. Modeling such strategies through coaching or professional learning communities can help integrate mental rehearsal into routine preparation, reducing instructional disruptions. Enhancing real-time monitoring skills is equally important, as some teachers lack effective observation and formative assessment practices during lessons. Training teachers to perform frequent visual scans, use checklists, and incorporate peer or self-assessment tools can improve their ability to provide immediate feedback and make timely instructional adjustments. Moreover, post-lesson reflection and critical analysis, although practiced by many, should be encouraged universally by providing structured reflection templates or digital tools and fostering collaborative environments for sharing insights, thus supporting continuous professional growth. Since a majority of teachers already demonstrate a growth

mindset by actively seeking feedback and new knowledge, educational leaders should further promote this culture by creating supportive spaces for constructive feedback, implementing mentorship programs, and recognizing efforts toward self-improvement. Integrating metacognitive strategy training into pre-service teacher education is another vital recommendation, ensuring that future PE teachers develop skills in planning, monitoring, and evaluating their teaching practices from the outset, which will better prepare them for reflective and adaptive instruction. Furthermore, leveraging technology can greatly assist teachers in reflection and adaptation; tools such as video recordings of lessons, digital planners, and apps for student feedback provide valuable data for analysis and decision-making. Schools should therefore invest in and encourage the use of these technologies to enhance teaching practices. Finally, ongoing research and evaluation are necessary to continuously assess the effectiveness of these interventions and identify emerging challenges. Engaging teachers in feedback and participatory research will help refine professional development initiatives and inform policy decisions. Overall, by systematically implementing these suggestions—cultivating reflective routines, promoting adaptive teaching skills, encouraging proactive mental rehearsal, strengthening real-time monitoring, supporting post-lesson analysis, fostering a growth mindset, embedding metacognitive training in teacher education, utilizing technology, and committing to ongoing research—educational institutions can significantly improve the intellectual development and instructional effectiveness of PE teachers, leading to more responsive teaching and improved student outcomes in physical education.

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