

Physical Education for All: Enhancing Cognitive Outcomes in Filipino Students with Disabilities Through Motor Control – A Systematic Review

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Abstract— Despite growing recognition of the link between motor skills and cognition, limited evidence has been synthesized on how motor control-based physical education (PE) interventions influence cognitive outcomes among Filipino students with disabilities. This systematic review addressed that gap by examining studies from both international and Philippine educational contexts. Thirteen studies were included—ten peer-reviewed articles and three organizational or grey literature reports. Interventions such as rhythmic activities, coordination games, motor skill training, and inclusive PE programs were associated with improvements in executive function, attention, memory, and classroom engagement across diverse disability groups, including intellectual disability, autism spectrum disorder, and developmental delays. While most studies involved small samples and varied methodologies, the evidence consistently supports the effectiveness of motor-based PE in promoting cognitive development and active participation. These findings underscore the importance of integrating inclusive PE into national education frameworks, supported by adaptive resources and teacher training, and call for further large-scale, longitudinal research to assess long-term outcomes.

Keywords— Cognitive outcomes, Executive function, Filipino learners, Inclusive education, Motor control, Physical education, Students with disabilities.

I. INTRODUCTION

Inclusive education in the Philippines has evolved significantly in the past decade through legislative frameworks such as the Enhanced Basic Education Act (Republic Act 10533) and the Philippine Inclusive Education Act of 2022 (Republic Act 11650). These policies aim to ensure equitable access to quality education for all learners, including students with disabilities. However, while academic accommodations and behavioral interventions have received attention, the cognitive benefits of motor control-based physical education remain underexplored. In particular, there is no comprehensive synthesis that brings together international and Philippine evidence to highlight how structured motor-based PE interventions impact cognitive outcomes among Filipino learners with disabilities. This lack of synthesis represents a critical gap that this review seeks to address.

Motor control, which encompasses coordination, balance, and fine and gross motor skills, is increasingly recognized as a foundation for cognitive development. International evidence demonstrates that structured movement-based programs can enhance executive function, working memory, and attention in children with developmental and intellectual disabilities (Diamond, 2015; Logan et al., 2021). Similarly, the World Health Organization (WHO, 2015) advocates inclusive physical activity to support both physical and mental health.

Philippine research also points to the benefits of motor-based interventions. For example, Aquino and Reyes (2022) reported that motor coordination activities improved executive functioning among students with mixed disabilities, while Cruz and Evangelista (2016) found that movement-based PE enhanced attention span in children with developmental delays. Despite these findings, many Filipino schools lack resources, trained PE teachers, and consistent implementation of inclusive PE programs (Ramos & Bautista, 2018; Ziegenfuss et al., 2023).

Teacher competency is another critical factor. Studies highlight that the success of inclusive PE programs depends on educators' ability to design cognitively enriching and engaging lessons (Micua et al., 2023; van der Fels et al., 2015). Inclusive teaching strategies, such as cooperative motor activities, have been shown to foster stronger classroom engagement and social participation among children with disabilities (Li et al., 2020).

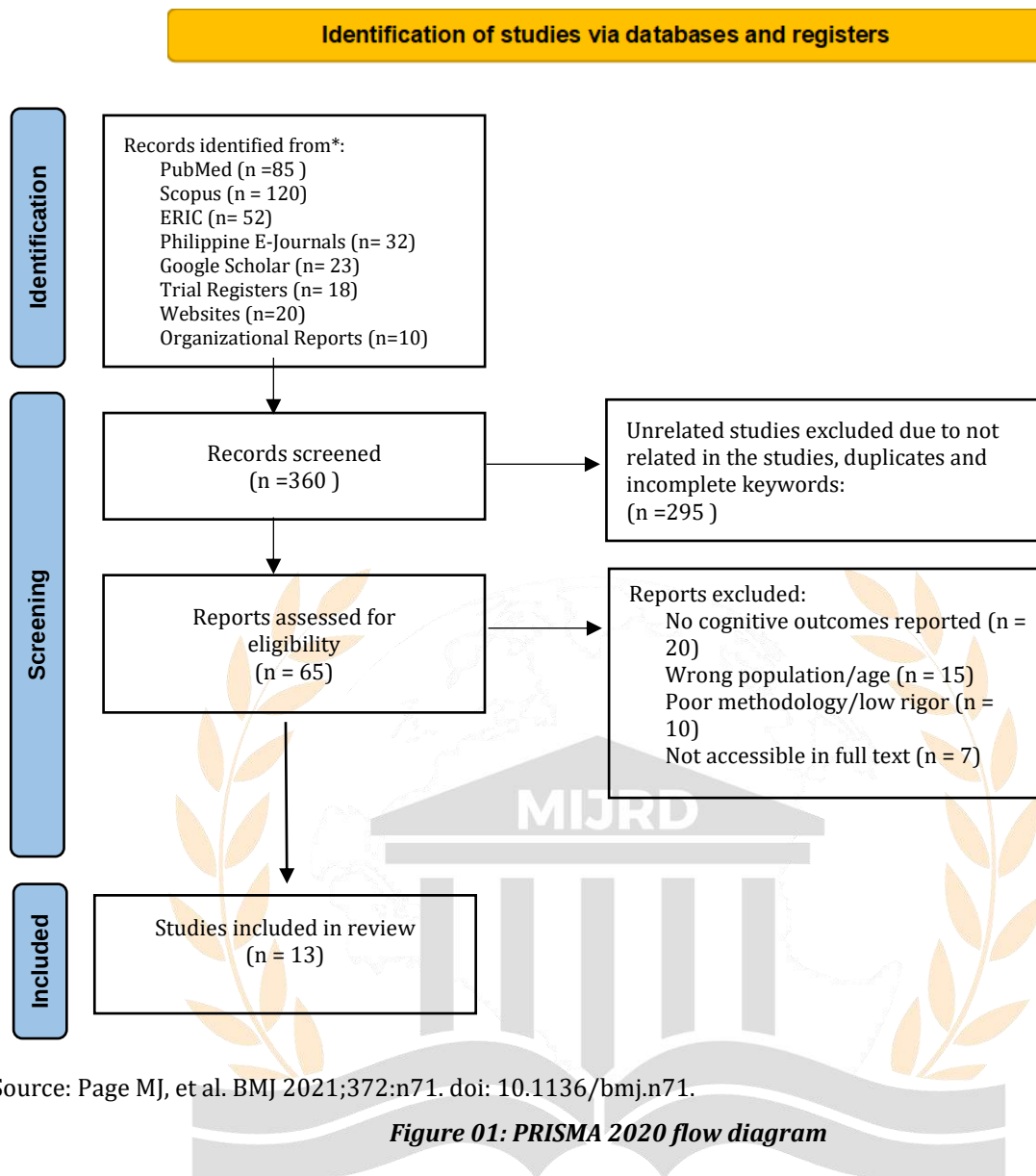
Given these insights and the lack of a consolidated review specific to the Philippine context, this systematic review aims to synthesize evidence on motor control-based PE interventions and their impact on cognitive outcomes among Filipino students with disabilities. By reviewing studies published between 2010 and 2025, this paper identifies effective practices, highlights implementation challenges, and informs future policy and program development in inclusive education.

III. METHODOLOGY

This systematic review followed the PRISMA 2020 guidelines for reporting systematic reviews (Page et al., 2021). Eligible studies were those that focused on learners aged 6–18 years with intellectual, developmental, or physical disabilities, included Physical Education (PE) interventions incorporating motor control elements such as balance, coordination, or rhythmic movement, and reported cognitive outcomes such as executive function, attention, memory, or problem-solving. Studies published in English between January 2010 and May 2025 were considered.

A comprehensive search was conducted across PubMed (n = 85), Scopus (n = 120), ERIC (n = 52), Philippine E-Journals (n = 32), Google Scholar (n = 23), trial registers (n = 18), websites (n = 20), and organizational reports (n = 10), resulting in 360 identified records. Search strategies used Boolean combinations of key terms, such as: ("motor control" OR "movement" OR "coordination") AND ("cognitive function" OR "executive function" OR "memory") AND ("physical education" OR "PE") AND ("disability" OR "special needs").

In total, 360 records were screened by titles and abstracts. Of these, 295 were excluded for being unrelated, duplicates not caught by the automated process, or containing incomplete keywords. Sixty-five full-text reports were retrieved for eligibility assessment. Among them, 52 were excluded due to lack of cognitive outcomes (n = 20), wrong population or age group (n = 15), poor methodological rigor (n = 10), or unavailability of full text (n = 7). Ultimately, 13 studies were included in the final synthesis: 10 peer-reviewed journal articles and 3 grey literature or organizational reports. Due to heterogeneity in study design and measures, a meta-analysis was not feasible. Instead, findings were synthesized narratively, grouped by cognitive domain (executive function, attention, memory, cognitive flexibility) and type of intervention (coordination, rhythmic, or balance-based PE). Methodological strengths and limitations of each study were also noted.



IV. RESULTS

The interventions identified in the review varied in design and scope, but most centered on rhythmic movement therapy, coordination games, structured motor skill training, and inclusive physical education (PE) programs. The duration of these programs ranged from four weeks to six months. Cognitive outcomes were commonly assessed using standardized instruments, including the Behavior Rating Inventory of Executive Function (BRIEF) and the Test of Everyday Attention for Children (TEA-Ch), as well as teacher and parent observation reports, which provided a broader picture of student progress.

Findings consistently highlighted the positive relationship between motor control-based activities and cognitive outcomes. In terms of executive function, there was moderate to strong evidence linking coordination games and rhythmic activities to improved planning and inhibitory control. These effects were particularly evident among

students with autism spectrum disorder, with effect sizes ranging from medium to large (Hedges' $g = 0.45-0.72$), as reported in both local and international studies (Aquino & Reyes, 2022; Li et al., 2020).

Attention was another domain that showed meaningful improvement. Thirteenth studies reported enhanced focus and a reduction in distractibility, especially in learners with autism spectrum disorder and developmental delays. Gains in memory were also observed, with nine studies documenting improvements in both working memory and retention following participation in motor skill-based games and structured activities.

Beyond standardized test scores, qualitative findings added depth to the results. Several studies described how students demonstrated greater classroom engagement, including improved participation, stronger persistence in completing tasks, and heightened motivation during lessons. These non-quantifiable outcomes suggest that motor control-based PE programs not only strengthen core cognitive functions but also foster more active and meaningful involvement in learning environments.

IV. DISCUSSION

This review shows that motor control-based physical education (PE) interventions can make a meaningful contribution to the cognitive development of students with disabilities. Improvements were most evident in executive function (working memory, cognitive flexibility, and inhibition control), attention, memory, and overall classroom engagement, echoing international findings that link motor competence to cognitive performance (Best, 2010; Logan et al., 2021; Diamond, 2015).

In the Philippine setting, local evidence also supports these conclusions. Studies by Aquino and Reyes (2022) and Cruz and Evangelista (2016) found that structured motor activities can enhance executive function and attention among students with developmental and learning disabilities. However, several challenges continue to hinder the consistent integration of such approaches into schools. These include gaps in resources, such as limited access to adaptive PE equipment and facilities; a lack of specialized training for teachers in inclusive PE practices (Micua et al., 2023); and the gap between inclusive education policies and their classroom-level implementation (Ramos & Bautista, 2018).

The strength of the current evidence is tempered by a few limitations. Most studies involved relatively small sample sizes and displayed methodological differences in intervention types, duration, and outcome measures. Furthermore, very few longitudinal studies have been conducted, making it difficult to determine whether the cognitive benefits observed are sustained over time. Certain groups of learners, particularly those with sensory impairments such as hearing or vision loss, are also underrepresented in the literature. These concerns echo the observations of Tomporowski et al. (2011), who cautioned that inconsistencies in study design and outcome measurement make it challenging to draw firm conclusions about the long-term cognitive benefits of physical activity.

Despite these challenges, the findings strongly suggest that inclusive, motor control-based PE programs are both feasible and beneficial. Global evidence (Li et al., 2020; van der Fels et al., 2015) reinforces the importance of embedding motor skill development within school curricula to support cognitive outcomes. For the Philippines,

scaling up these interventions will require stronger teacher preparation, curriculum modifications tailored to diverse learners, and closer collaboration between educators, health professionals, and policymakers.

V. CONCLUSION

This systematic review highlights the growing evidence that motor control-based physical education (PE) significantly enhances cognitive functions such as executive control, attention, and memory among Filipino students with disabilities. Beyond these measurable outcomes, the reviewed studies demonstrate that active, coordinated movement fosters greater motivation, self-regulation, and social participation—core elements of inclusive education.

These findings affirm that motor control-focused PE is not merely a physical exercise component but a cognitive and developmental intervention that strengthens the brain-body connection. When implemented through structured programs, such interventions can promote adaptive learning behaviors, improve classroom engagement, and cultivate a sense of competence and belonging among learners with disabilities.

The review also underscores the Philippines' readiness to institutionalize inclusive motor learning through existing laws—such as RA 10533 and RA 11650—and the Most Essential Learning Competencies (MELCs) framework of the Department of Education. Integrating motor-cognitive approaches within these policies can bridge the gap between inclusive education theory and classroom practice.

However, despite promising results, long-term studies are limited. Few have explored sustained cognitive changes, cross-disability applicability, or the effects of teacher training and resource disparities. Addressing these gaps will be crucial to developing scalable, evidence-based inclusive PE models that are both culturally and contextually appropriate for the Philippine educational system.

In sum, motor control-based PE serves as a transformative educational strategy—one that merges physical activity with cognitive development, enhances equity in learning, and prepares Filipino students with disabilities to reach their full potential.

Strengthening its implementation will contribute to a more inclusive, health-promoting, and cognitively enriching school environment aligned with both national policies and the UN Sustainable Development Goals (SDG 4: Quality Education).

Recommendations

To support inclusive education and optimize cognitive development among students with disabilities, the following evidence-based actions are recommended:

1. Curriculum Integration

Embed motor control-based activities within the DepEd Physical Education Curriculum to explicitly target cognitive outcomes such as attention, planning, and working memory. These can be incorporated into the Most Essential Learning Competencies (MELCs) for PE and aligned with national inclusive education objectives.

2. Policy Reinforcement

Strengthen the implementation of RA 11650 by mandating adaptive PE components in both general and special education settings. DepEd and CHED should include motor-control strategies in PE curriculum standards, teacher education syllabi, and evaluation frameworks.

3. Teacher Professional Development

Develop and institutionalize continuing professional development (CPD) programs focusing on inclusive PE methodologies. Training should emphasize cognitive-motor integration, adaptive strategies, and the use of formative assessment tools to monitor student progress.

4. Resource and Infrastructure Support

Provide schools with adaptive PE equipment, visual cues, and structured movement modules that support differentiated instruction. Partnerships with local governments, NGOs, and universities can ensure sustainability and accessibility across regions.

5. Research Advancement

Encourage large-scale, longitudinal studies to investigate the sustained cognitive and behavioral effects of motor control-based interventions. Future studies should include underrepresented groups such as learners with hearing or visual impairments and explore culturally responsive PE frameworks within resource-limited Filipino schools.

6. Intersectoral Collaboration

Foster collaboration between educators, physical therapists, psychologists, and policymakers to develop integrated motor-cognitive programs tailored to diverse learners. This multidisciplinary approach can strengthen both policy implementation and classroom outcomes.

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