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PHYSICAL EDUCATION IN EARLY CHILDHOOD: A FOUNDATION FOR HOLISTIC DEVELOPMENT AND LIFELONG HEALTH

Antonia Barla[i]
Kindergarten Teacher,
15th Kindergarten school of Ilion,
Theatre Educator,
Greece

Abstract:
Early childhood (0–6 years) is a critical developmental period during which neurobiological, motor, cognitive, and socio-emotional foundations are established[1]. Systematic physical activity (PA) and structured physical education in childcare and kindergarten settings are not limited to improving fitness; they function as a lever for holistic development, influencing fundamental movement skills, perceived competence, self-regulation, executive functions, and psychological wellbeing. International guidance, including the World Health Organization's 24-hour movement guidelines, emphasizes that from the earliest years children need an integrated balance of sufficient PA, reduced sedentary behaviour, and adequate, high-quality sleep to support overall health.[2] This article presents an updated, theoretically grounded and pedagogically applicable framework for physical education in early childhood, drawing on an international literature review and a mapping of the Greek institutional context. It discusses: (a) motor competence and fundamental movement skills and their "*spiral*" developmental trajectories; (b) mechanisms through which movement influences the brain, thinking and behaviour; (c) evidence on the effectiveness of PA interventions for children aged 0–6; (d) principles for pedagogical design and assessment in kindergarten; (e) inclusion, safety and school leadership considerations; and (f) future directions for research and policy. The article concludes with proposals for fostering a "*culture of movement*" in Greek kindergarten, where learning is permeated by movement and movement is understood as a right rather than an optional activity.

Keywords: early childhood, physical activity, fundamental movement skills, cognitive development, psychomotor education, inclusion

[i] Correspondence: email tamayojheck@gmail.com

1. Introduction

Movement is the infant's and young child's first "*mode of being*" in the world. Before language is fully developed, children explore, test, and communicate through the body: they touch, climb, move, fall and get up again. In this sense, physical education and physical activity in early childhood should not be treated as an "*extra lesson*", but as an integral part of everyday life and pedagogical practice.

International research shows that adequate PA in early childhood is associated with better cardiorespiratory and musculoskeletal health, healthier weight regulation, stronger fundamental movement skills (FMS), and higher levels of physical activity later in life (Carson *et al.*, 2017; Logan *et al.*, 2015; Robinson *et al.*, 2015). At the same time, evidence is increasingly persuasive regarding the positive effects of movement on executive functions, attention, working memory, and school readiness (Carson *et al.*, 2016; Zeng *et al.*, 2017).

The World Health Organization's guidance for children under five recommends multiple episodes of daily PA, limits on screen time, and sufficient sleep as complementary components of a 24-hour cycle of health (WHO, 2019)[2].

Within Greece, the national kindergarten curriculum framework and the "*Kindergarten Teacher's Guide*" embed psychomotor education within an overall vision of holistic development, emphasizing interdisciplinarity, play, rhythm and experiential learning (Hellenic Ministry of Education/Pedagogical Institute, 2003/2011; Institute of Educational Policy, 2014/2022)[3].

However, studies indicate that most preschool children worldwide do not reach recommended PA levels, while sedentary time and screen exposure are increasing (Carson *et al.*, 2017; UNICEF, 2020). In this context, the role of kindergarten and educators is critical for cultivating positive movement experiences, strengthening motor competence, and supporting favourable lifelong trajectories of health and development.

2. Theoretical framework: Motor competence, fundamental movement skills, and spiral developmental trajectories

Motor competence refers to a child's ability to perform effectively a broad range of movement skills across different environments (Robinson *et al.*, 2015).

At its core are fundamental movement skills (FMS), which are typically grouped into:

- locomotor skills (running, jumping, hopping, climbing),
- object-control/manipulative skills (throwing, catching, kicking, striking),
- balance/stability skills (static and dynamic balance, turning, rolling).

FMS are considered "*building blocks*" for the development of more complex movement skills across childhood, adolescence and adulthood (Gallahue & Ozmun, 2012; Logan *et al.*, 2015). Competence in these skills is positively associated with higher PA

levels, better physical fitness, healthier body composition, and more favourable indicators of mental health (Logan *et al.*, 2015; Robinson *et al.*, 2015; Barnett *et al.*, 2016).

Developmental models, such as Stodden *et al.* (2008), describe a positive spiral of feedback:

- improvements in FMS,
- strengthen perceived competence and children's confidence,
- children participate more often and with greater enjoyment in PA,
- increased participation leads to further gains in skills, fitness and health.

Conversely, low motor competence may lead to avoidance of PA, social withdrawal, and an accumulation of risks for obesity, low self-esteem and a negative relationship with exercise. In early childhood, when FMS develop rapidly, interventions through structured, play-based programs are particularly effective (Logan *et al.*, 2015; Goodway & Branta, 2003).

3. Public health: Why "so much" movement so early?

From a public health perspective, early childhood is a window of opportunity to prevent overweight and obesity and to promote healthy behaviours across the lifespan. Rising rates of childhood obesity, coupled with sedentary lifestyles and increasing screen time, make early intervention essential (WHO, 2016; UNICEF, 2020).

In a systematic review, Carson *et al.* (2017) found that higher PA levels in children aged 0–4 years are associated with more favourable body composition, better cardiorespiratory and muscular fitness, and stronger motor competence. The same review suggests that children who are more active in early childhood are more likely to remain active later.

Reducing sedentary behaviour is equally important—not only by decreasing screen time, but also by reshaping the daily routine to include:

- short movement breaks,
- frequent posture changes (sitting–standing–floor-based postures),
- active transitions within the classroom and outdoor area.

The WHO 24-hour movement guidelines (WHO, 2019) emphasize that PA, sedentary behaviour and sleep should be treated as interconnected components of a single 24-hour cycle; excessive sedentary time and insufficient sleep can offset some of the benefits of PA[2].

4. Mechanisms of impact: From the body to the brain and back

The influence of PA on development is not only mechanical or "*muscular*". In the short term, movement increases heart rate and cerebral blood flow, supports the release of neurotrophic factors (e.g., BDNF), regulates arousal, and can improve concentration (Donnelly *et al.*, 2016; Diamond, 2015).

In the long term, systematic practice of FMS and high-quality movement experiences:

- strengthen coordination between sensorimotor and executive networks,
- contribute to improved visuospatial perception,
- support the development of self-control skills and action planning.

Studies in preschool children indicate that PA interventions which are playful, structured, repetitive and require self-regulation (e.g., rule-based games, role switching, waiting for a signal) can improve attention, working memory and inhibitory control (Carson *et al.*, 2016; Zeng *et al.*, 2017).

In this sense, physical education in early childhood can be seen as a "*laboratory*" for training the brain—not through drills, but through lived scenarios of movement and play.

5. Links to cognitive development and school readiness

School readiness is not limited to language and early numeracy; it also involves a child's capacity to regulate behaviour, sustain attention, cooperate and persist (Blair & Raver, 2015).

Movement programs that integrate rhythm, spatiotemporal concepts, sequences and rules have been linked to improvements in:

- pre-mathematical concepts (counting, comparison, sequencing),
- pre-literacy skills (pattern recognition, spatial orientation on the page),
- verbalization and narrative skills.

For example, activities such as:

- movement-based dramatization of stories,
- role-play games with movement (e.g., "*my body becomes a scale*", "*I freeze when I hear a particular sound*"),
- station circuits (e.g., "*walk along the line, jump into the hoop, throw the beanbag at the target*"),
- activate language, executive and social skills simultaneously. Systematic reviews (Carson *et al.*, 2016; Zeng *et al.*, 2017) report small-to-moderate but consistent positive effects of early PA interventions on cognitive outcomes and school-readiness tasks.

This supports the view that time devoted to movement does not compete with learning; it can facilitate learning.

6. Social-emotional development and wellbeing

Physical education in early childhood offers a rich context for the development of socio-emotional skills—cooperation, empathy, self-control and conflict management.

Through active group games, children learn to:

- wait for their turn,

- negotiate rules,
- manage group wins and losses,
- express feelings and needs.

Perceived motor competence—the child's belief that they can "*do it*" in movement tasks—predicts later participation in PA (Robinson *et al.*, 2015; Weiss & Amorose, 2008). Children who experience regular success (e.g., "*I managed to balance*", "*I hit the target*") and receive encouraging, non-comparative feedback from the teacher are more likely to develop a positive self-concept and to engage joyfully in movement.

Self-Determination Theory (Deci & Ryan, 2000) argues that intrinsic motivation increases when the psychological needs for competence, autonomy and relatedness are met.

In kindergarten physical education, this translates into:

- activities with clear, achievable levels of difficulty (competence),
- opportunities for choice (e.g., "*choose which station you will visit first*") (autonomy),
- a positive climate and cooperative missions (relatedness).

7. Evidence on the effectiveness of early childhood interventions

Systematic reviews and meta-analyses confirm that structured PA interventions in early childhood improve:

- fundamental movement skills,
- physical fitness,
- cognitive indicators (attention, executive functions),
- psychosocial indicators (self-perception, social skills) (Carson *et al.*, 2017; Zeng *et al.*, 2017; Timmons *et al.*, 2012).

Programs that explicitly target FMS through systematic repetition, clear progressive challenges and sufficient duration (e.g., 2–3 times per week for more than 8–10 weeks) achieve better outcomes than "*opportunistic*" or occasional movement approaches (Logan *et al.*, 2015; Goodway & Branta, 2003).

Moreover, programs that actively involve educators and families (e.g., "*movement cards*" for home use) appear to have more sustained effects, as they create coherent movement environments inside and outside school (UNICEF, 2020).

8. Principles of pedagogical design for kindergartens

Translating the above evidence into practice requires clear and realistic design principles.

The following are suggested:

- **Movement every day, multiple times per day:** short episodes of movement (3–10 minutes) distributed across the day, beyond the traditional recess or a single "*PE time*".
- **Targeted FMS with progression:** from simple locomotor and balance tasks to more complex throwing/catching and combined skills.

- **Play-based learning with meaning:** roles, stories and missions (e.g., "*help the animals cross the river*") that make effort purposeful.
- **Rich and flexible materials:** hoops, ropes, beanbags, cones, as well as everyday materials (lids, boxes, floor tape).
- **Reducing sedentary behaviour:** in-class movement micro-breaks, standing activities, and active transitions.
- **Inclusion and differentiation:** adapting rules, materials and goals so that all children participate with dignity (see Section 11).
- **Partnerships with families and the community:** parent communication, home-based ideas, and collaboration with local organizations.
- **Safety and pedagogical ethics:** warm-up/cool-down, clear safety rules, supervision and positive behaviour support.

9. Examples of micro-interventions (in the classroom and outdoors):

a) Mini FMS workshops (2×/week, 20–30 minutes)
- Balance station (walking on a line, on foam beams).
- Throwing/catching station (beanbag throws to targets at different heights).
- Jumping station (jumping in/out of hoops, over "*rivers*" made from ribbons).
- Rolling station (forward/backward rolls on mats).

b) "*Movement-in-the-classroom*" (4–6×/day, 3–5 minutes)
- Rhythmic sequences (clapping, tapping the floor, stepping patterns).
- "*Freeze–move*" games on the teacher's signal.
- Short movement stories (e.g., "*our bodies become trees bending in the wind*").

c) "*A yard that moves*"
- Play zones with different challenges (jumping, throwing, balancing).
- Weekly "*movement missions*" (e.g., "*try three new ways to cross the line*").
- Self-reflection routines ("*what did I achieve today?*" using pictures/symbols).

10. Assessing learning and progress

In early childhood, assessment should be formative, descriptive and observation-based. Useful tools include:
- FMS checklists with simple descriptors (e.g., "*can jump with both feet together*").
- Observation protocols for participation (frequency, affect, persistence).
- Simple self- and peer-reports using pictograms (e.g., happy/neutral/sad face for how the child felt).
- Portfolios and "*learning walls*" with photo documentation (without identifying faces) and short child comments (e.g., "*here I jump high*").

Assessment is not intended to rank children; it is used to map development, identify needs and plan next steps.

11. Inclusion: Adaptations for all children

Early childhood education must ensure that all children—regardless of motor, cognitive, sensory or socio-economic differences—have meaningful access to physical education.

The Universal Design for Learning (UDL) framework promotes multiple pathways to the same learning outcome through:

- different modes of participation (e.g., a child using a wheelchair participating in throwing tasks or upper-body exercises),
- adapted rules (e.g., more attempts, shorter target distance),
- varied materials (lighter balls, larger hoops).

For children with autism spectrum conditions or ADHD, helpful practices include:

- visual routines with pictures showing the activity sequence,
- breaking tasks into smaller steps,
- advance warning for transitions ("*we will change stations in a moment*"),
- combining structured options with free choices.

Inclusion does not mean identical activities for everyone; it means equal value and recognition of each child's participation and effort.

12. Safety and risk management

Safety is a prerequisite for movement—not an obstacle to it. Overemphasis on risk often leads to excessive immobility.

The pedagogical challenge is to offer controlled, developmentally appropriate risk experiences through:

- regular checks of space and equipment,
- clear, few safety rules (e.g., "*no running with objects in hands*", "*stop on the signal*"),
- warm-up and gentle cool-down,
- gradual increases in task difficulty.

The teacher should position themselves strategically to maintain visual supervision, intervene when needed, and encourage children's safe initiative-taking.

13. The role of the kindergarten teacher: High-impact teaching practices

The kindergarten teacher acts as an instructional designer, facilitator and movement role model.

High-impact practices include:

- clear objectives (e.g., "*today we learn to throw near and far*"),
- skill modelling with verbal "*key cues*" (e.g., "*bend knees*", "*look at the target*"),
- offering multiple difficulty levels ("*easy–medium–hard*"),

- immediate, specific feedback focused on process, not only outcome,
- minimizing waiting time and organizing work in small groups/stations,
- a positive climate that reinforces effort and collaboration.

14. Mapping to the Greek curriculum framework

In Greece's national kindergarten curriculum framework, psychomotor education is embedded in a broader vision of holistic development and interdisciplinary organization, with emphasis on the relationship between body–space–time, rhythm and play (Hellenic Ministry of Education/Pedagogical Institute, 2003/2011).

The "*Kindergarten Teacher's Guide*" (Institute of Educational Policy, 2014/2022) encourages daily routines in which movement is not confined to a single "*PE hour*", but permeates[3]:

- routines (arrival, tidying, dismissal),
- language and mathematics activities (through movement),
- skills workshops,
- outdoor and community-based activities.

Integrating PA into project work (e.g., "*my body*", "*how animals move*") and into innovative initiatives (e.g., a "*school that moves*") can strengthen program coherence and make movement visible as a pedagogical priority.

15. School–family–community partnership

Building a "*culture of movement*" cannot be the kindergarten's responsibility alone.

It requires:

- systematic communication and awareness-raising with parents about the benefits of PA,
- practical, low-barrier suggestions for movement at home,
- use of neighbourhood spaces (parks, squares, pedestrian areas),
- collaboration with municipalities, cultural and sports organizations.

Practical examples include:

- a "*movement day*" involving parents in the school yard,
- loanable "movement bags" with balls, ropes and idea cards,
- participation in local health-promotion initiatives.

16. Barriers and enablers of implementation

Common barriers to systematic physical education in kindergarten include:

- limited space (small yards, crowded classrooms),
- time constraints due to dense daily schedules,
- concerns about accidents,
- insufficient teacher training in PA and movement development.

Enablers may include:

- low-cost micro-interventions (movement-in-the-classroom, temporary furniture rearrangement),
- creative use of simple materials,
- collaborative planning within the teaching team to adopt a shared movement strategy,
- professional development and teacher communities of practice.

17. Policy and school leadership

A school unit can adopt a "*school that moves*" strategy by implementing:

- an annual action plan for PA,
- specific goals (e.g., "*three short movement episodes per day in each class*"),
- role allocation (e.g., a psychomotor education lead, a municipal liaison),
- monitoring of simple indicators (frequency of activities, participation).

At the system level, priorities include:

- improving outdoor play infrastructure,
- providing basic PA equipment,
- guidance for embedding 24-hour movement principles into curricula,
- cross-sector collaboration between education, health, sport and local government (UNICEF, 2020; WHO, 2019).

18. Methodological notes and limits of the evidence

Despite a growing evidence base, important limitations remain:

- many studies are correlational and do not allow causal conclusions,
- there is heterogeneity in how FMS and PA are measured,
- samples are often small or not representative,
- implementation fidelity is not always described adequately.

More randomized intervention studies are needed, with clear protocols, long-term follow-up, and the integration of qualitative methods (interviews with children, teachers and parents) to capture lived movement experiences.

19. Future research directions

Future work may focus on:

- co-designing interventions with teachers and families,
- using low-cost technologies (e.g., basic accelerometers, interactive games without excessive screen exposure),
- implementation and scale-up studies across networks of kindergartens,
- examining effects of PA on sleep, emotional regulation and classroom behaviour within the 24-hour movement framework.

20. Conclusions

Physical education in early childhood is neither a luxury nor a secondary subject; it is a foundation for holistic development and health. Targeted, play-based and systematic FMS programs integrated into the daily flow of kindergarten and the wider community can create positive "*spiral trajectories*" of movement, learning and wellbeing.

The challenge is not simply to "*find time*" for movement, but to redesign educational experiences so that they flow through movement. This requires empowered kindergarten teachers, support from school leadership, partnerships with families and communities, and a clear message from educational policy: children's right to movement is also a right to health, learning and dignity.

Footnotes

[1]In this article, the term "*early childhood*" is used primarily to refer to ages 3–6, while also including references to ages 0–3 where this is relevant to international guidance.
[2]The "*24-hour movement guidelines*" consolidate recommendations for physical activity, sedentary behaviour and sleep within a single integrated framework.
[3]In Greek scholarship, psychomotor education is closely linked to interdisciplinary teaching, drama-in-education, music-and-movement, and Skills Workshops; this can be leveraged to strengthen PA within the kindergarten program.

Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

I am a kindergarten teacher and a theatre specialist. For the past 17 years, I have been teaching in a kindergarten in Athens. I hold a Master's degree in Educational Leadership, and I currently pursuing my second master degree in Career Guidance and Counseling.

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