

Commentary

# Motor performance or opportunities to move? What do children need the most?

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Technological advances have increased the prevalence of sedentary behaviors, as physical inactivity has become one of the leading risk factors of death worldwide; a situation that burdens the health care system with preventable health disorders.<sup>1</sup> Increased incidence of disease decrease the quality of life, even among children, because diseases that formerly onset during adulthood are now impacting people early in their lives, as well as at the end of their lives, “by cumulative damage over time or by the biological embedding of adversities during sensitive developmental periods” (p.1).<sup>2</sup> Global calls for opportunities to engage in physical activity (PA) have had some impact,<sup>3</sup> yet we have failed to consistently identify the primary tenets of behavior change that, when combined with a measure of the quality of movement, result in lifelong PA engagement and maximal achievement. To date, limited research has focused mostly on motor performance as an enabling factor of PA engagement and reduction of health risk.<sup>4,5</sup>

Recently, I was conducting a systematic observation of a physical education student teacher when I asked the teacher to stop his lesson and have all of the 8th-grade students (who were approximately 13–14 years of age) skip the length of the basketball court and then gallop on their return to the same starting point. Much to our surprise, only one-half of the students could successfully complete this task by demonstrating all the critical elements with consistency. I stood in the gym aghast, trying to process why so many adolescents were unable to demonstrate fundamental motor skills that should have been acquired by age 8. On reflection, I generated some difficult questions: Was I perhaps unfairly asking the students to perform a task without adequately offering teaching cues or clarity in my directions? Was the inability of the students to perform fundamental locomotor skills the byproduct of an ineffective educational system fraught with under-resourced physical education programs led by low-credentialed teachers?

Were my observations the result of societally manifested inequalities among children who had too few opportunities to refine their own movements? Perhaps my student teacher and I were witnesses to all of these factors.

An inability to perform the skip and gallop, which are fundamental locomotor motor skills, inhibits a person from playing sports that require combinations of more complex skills.<sup>5</sup> The odds are that the 13-year-olds who were unable to differentiate between a skip and a gallop would be unlikely to participate in some more complex sport activities given the association between certain PAs and the 2 skills.<sup>4,6</sup> Children with unrefined motor skills are also more likely to be overweight or obese.<sup>7,8</sup> Because the optimal effectiveness of motor skill can only be achieved through practice and reinforcement,<sup>9</sup> my observations raised more questions than I could answer, even though I had been a physical education teacher for more than 25 years. In contemporary educational contexts, (a) how do effective PA programs provide opportunities for children to refine motor skills, (b) how does competency in movement forms increase PA participation, thus reducing risk for disease, and (c) to what degree should future PA programs focus on learning outcomes related to motor performance over the provision of opportunities to be physically active?

The articles in this special topic of the *Journal of Sport and Health Science (JSHS)* address these questions. Assembling international research that includes direct contextual and cultural comparisons about motor skill acquisition among children adds value to our profession. The investigators in the articles compared Portuguese and U.S. children; examined the feasibility of presenting cognitively challenging motor tasks in mainstream and special schools; explored teaching motor skills through manipulation of the environment and learning experiences; and investigated how the correlates of screen time and parent education might influence motor skill acquisition. The purpose of this article was to survey how the findings from this special topic could impact current practice in teacher education and PA leadership as a

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means of enhancing the potential cognitive benefits of PA by focusing on the quality of movement within our interventions for children.

### 1. Teaching fundamental motor skills

Historically, the acquisition of fundamental motor skills and their evolution to varied, complex movement forms have been the result of participation in movement education where children explore body awareness, space, relationship, and effort. Teacher education programs once required future teachers to take coursework focused on movement aesthetics and expression as introduced by Delsarte, and to demonstrate conceptual understanding and physical performance of the gestalt of Laban's movement education.<sup>10</sup> The ability to guide children through exploratory movement learning experiences was previously a requisite pedagogical skill in physical education teacher education programs.<sup>11</sup> The increased prevalence of sedentary behavior has substantially influenced teacher education in the United States. Instead of mastering how to apply the instructional strategies related to movement education, physical education teachers are now primarily trained to provide opportunities to move, and secondarily to improve the quality of the movement. Our preoccupation with transdisciplinary influences, such as those imposed by public health, psychology, kinesiology, and sociology, have left physical education with a muddled mission, making it difficult to prepare novice teachers to thrive in the current context.<sup>12</sup> Furthermore, with a greater emphasis being placed on the offering of transformative pedagogical strategies and culturally relevant teaching strategies, there is little time left in the teacher education curriculum to offer opportunities for future teachers to personally refine motor skills and teach movement education to children in authentic settings. Future teachers are now required to enroll in courses such as Restorative Justice, which leaves little time for a class like Teaching Rackets Skills. This commentary is not intended to fuel the ongoing debate about how to prioritize specific content in the field of physical education, but instead it is meant to acknowledge the role of teacher education in the development of motor skill competency in children.

Because of the sedentary environments, physical education teachers are being prepared for the role of PA director by learning how to implement Comprehensive School Physical Activity Programs that connect active transportation to and from school with physical education, recess, and active community events.<sup>13</sup> The goal is to promote PA, wherever and whenever possible, through coordinated efforts. We likely all agree that a child cannot improve his or her motor skills without getting out of seated or reclining positions and demanding that their own bodies expend energy and use large muscle groups in coordination. A Comprehensive School Physical Activity Program provides such opportunities for moderate-to-vigorous PA participation before, during, and after school. PA, at times, is experienced through formal instruction (e.g., physical education, sport competition) and informally (e.g., recess, active transportation to and from school) in brief, but additive, sessions.

A seminal monograph published in the *Journal of Teaching in Physical Education* attempted to identify the best ways to teach sport.<sup>14</sup> Findings from the series of studies on teaching badminton to 9th-grade students suggested that minimal levels of object control were essential and that motor skills and game strategy were linked. The implications are that teacher education and PA directors should offer children opportunities to engage in PA as a means of practicing movement in an environment that provides positive reinforcement. It is not just about opportunity, but also about increasing movement quality and efficiency. Although some of the 8th-grade students who I observed might disagree, playing the EA SPORTS FIFA Soccer video game is different from playing in a real World Cup match.

### 2. Early life experiences and motor competence

New discoveries about neuroplasticity, the brain's ability to reorganize itself by forming new neural connections in the white and grey matter, do confirm that people can learn new things in later life; however, the optimal period to develop fundamental motor skills and body awareness is during early childhood.<sup>15</sup> One would think that children who live in industrialized, economically advanced countries with access to technological innovations, high standards of living, and progressive medical screenings and treatments, would have mechanical, musculoskeletal advantages over children who live in substandard human conditions, but presently this is not the case; genetics and psychological factors have a greater influence than cultural and contextual factors.<sup>16</sup> Furthermore, our underlying assumption is that individuals who are motor competent are more likely to engage in PA and therefore have longer, healthier lives, given their access to resources and health literacy. In the study by Luz and colleagues, children ages 6–9 years old and 10–13 years old demonstrated culturally different motor competencies. As Luz et al. pointed out, the physical education curriculum in the United States (where the curriculum is based on sports, games, and fitness) is different from the physical education curriculum in Portugal (where fundamental motor skills and games are emphasized). The ways in which reinforcement of motor skills is provided vary not only culturally, but also within given communities having common educational levels, with evidence of disparities even under optimal economic conditions.

Preschool options vary widely in cost as well as in the degree of parental involvement (e.g., traditional daycare vs. a parental co-op). Surprisingly, even within these variations some early childhood programs offer PA while others do not. In their article, Palmer et al. showed that when motor skills are taught to preschoolers using a mastery approach (i.e., like an infant learning to walk) in combination with free play, PA participation, and fundamental motor skills can be enhanced.

For those programs that lack green space or where the environment prohibits educators from offering outdoor PAs (i.e., where the temperatures are too hot or the air is of poor quality), exergaming or using large skeletal muscles during game playing may be a supplemental option for providing PA

opportunities to preschoolers. The findings in the study by Gao et al. indicated that interactive gaming stations like Wii and Xbox Kinect, when used for 20 min or more of sustained gameplay, increased children's PA intensity over those children who engaged in traditional playground activities. Likewise, video-projected dance movements or movements imitating animals can also offer children the opportunity to practice fundamental motor skills and patterns, and increase the teacher's likelihood of successfully promoting the health of those children.<sup>17</sup>

From a social-ecological perspective, Zeng et al. reported that parent education is correlated with motor skills acquisition, suggesting that families can also play a key role in child development, particularly during early childhood. As Webster et al. pointed out in their study, because screen time and sedentary behaviors are directly and inversely related to some gross motor movements, by gender, parents can decrease screen time and suggest alternatives to sedentary behavior. Just because the parent turns off the television or tablet does not mean the child will choose to spend his or her time being physically active; on the contrary, the child will likely replace screen time with reading or another sedentary behavior. Because families and early childhood programs are influential in developing fundamental motor skills, both should be consistently present in a child's world, as is provided in the Comprehensive School Physical Activity Programs approach. When such an approach is implemented, children not only have the potential to develop physically, but also to improve their cognitive health and potential for achievement.

### 3. Cognitive benefits of PA and motor skills

In the United States, schools have mostly become obesogenic environments where children are sedentary and inactive for up to 6 h most days of the week.<sup>3</sup> The idea of having children participated in PA within the classroom has been 1 way to address concerns about prolonged periods of sedentary behaviors. Research suggests that getting children out of their chairs to expend energy is a "no-brainer", given the known cognitive and motor performance benefits associated with acute bouts of PA.<sup>18</sup> Although the article by Mazzoli et al. confirms that PA within the classroom is feasible, research is still equivocal regarding the timing, mode, and intensity of such engagement.

Physical fitness and PA both have related cognitive benefits for children. In the Fitness Improves Thinking (FITKids) randomized controlled trial, children who participated in an after-school program that included a total of 70 min or more of aerobic activity, a healthy snack, educational health tips, motor skill practice, and small-sided gameplay improved their cardiorespiratory fitness,<sup>19</sup> working memory,<sup>19</sup> and increased inhibitory control over wait-list control study participants.<sup>20</sup> Pesce et al.<sup>21</sup> found that PA involving coordinated motor training had additional benefits over aerobic activity among selected athletes in sport-specific training. When considering chronic PA engagement, Pesce has suggested that we should place greater emphasis on movement quality than on

movement quantity, and even provide gross motor cognitive training,<sup>22</sup> because there are likely long-term effects of motor training on both physical and cognitive performance.<sup>23</sup> Teachers who receive training in physical education should be taught to offer cognitively challenging PAs that require fundamental motor skills that in turn produce both physical and cognitive benefits.

### 4. Future directions and research

Within this special topic of *JSHS*, topics surrounding the importance of providing opportunities both to practice and reinforce motor skills across the lifespan are discussed. Furthermore, this special topic identifies timely issues in teacher education, scholarly disciplines, and health promotion. Finally, when the quality of movement is embedded within PA programs, as it is within programs like Children's Health Activity Motor Program and FITKids, there are likely to be even greater benefits for children. Therefore, this should be one of our focal points moving forward.

Specifically, as scholars we need to move beyond cross-sectional studies and focus on using more rigorous research designs. Although randomized, controlled trials and longitudinal studies remain the gold standard, we should not be bound or limited to such approaches.<sup>24</sup> Instead, I would suggest that we pursue community-based participatory research that can be responsive to the needs of individuals within a given context. Such research designs move us past the traditional treatment and control structure where 1 group is denied services to determine the effects and effectiveness of a given program. While we wait for proof of feasibility, proof of concept, findings from quasi-experimental phases, and, finally, results from experimentally designed research, some children are being denied opportunities and instead are part of the scientific comparison. I would like to suggest not only that we invite community members to participate in the research, but also that we conduct research through the lens of developmental evaluations, whereby interventions—and particularly curriculum materials—can be modified as programs are being implemented to maximize the potential results.

Because language is varied and rooted in each context, I would also like to recommend some suggestions related to health promotion. We can generally agree that fundamental movement skills are defined as a movement that uses large muscles to generate locomotion and control objects,<sup>25</sup> and we often use the term "motor skills" interchangeably with "motor competence". Within this special feature, however, in the article by Luz et al., "motor skill" is defined as "a person's capability to perform a wide range of motor acts or skills and involves both locomotor (e.g., standing long jump) and object projection (throwing and kicking skills)", whereas "motor competency" in previous research refers to the mastery of physical skills and patterns that allows someone to participate in enjoyable activities.<sup>4</sup> And then there is the emergence of physical literacy, the embodiment of well-being as a competent, self-efficacious mover.<sup>26</sup> Given all these different terms, what term or phrase should educators use for health promotion?

PA experiences are socially constructed and therefore we need to move toward the application of a single term to represent motor competence and its relationship to factors influencing health. Harkening back to the days of skill- and health-related fitness, I suggest a broader application of the term “functional fitness”, to include terms such as “functional movement”, because engagement results in proprioceptive facilitation and has the potential to resonate with some individuals who want to maximize performance. Functional movement is not without its drawbacks because the word “functional” may suggest that the tasks are at a beginning level and too rudimentary for someone who strives for high performance. An indirect association with fitness implies that participation may result in discomfort and take too long for someone to see any benefits. I will consign the wordsmithing to others, but leave you with the idea that the public desires more positive, achievable messaging surrounding the acquisition and improvement of motor competence. An older adult who wants to take up playing golf or tennis should be welcomed into such an activity setting. Like the skateboarder or toddler who both fail more than they succeed, becoming a competent mover means making mistakes, and we should create safe environments where trying new skills is celebrated and open to all ages across the lifespan. As suggested in this special feature, both quantity and quality of human movement matter, and as such we need to find ways to improve the preparation of individuals for leadership roles, to better educate parents, and to continue to develop linkages between motor skills and health promotion. If we do so, individuals will likely reap physical and cognitive benefits beyond those gained from participation in PA that does not involve complex motor tasks and decision making.

### Competing interests

The author declares that she has no competing interests.

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