

Guest editorial

## Children's motor skill competence, physical activity, fitness, and health promotion

The high prevalence of childhood obesity, evident globally in the past decade, is partly due to low physical activity (PA).<sup>1</sup> Obesity and low cardiovascular fitness in children may increase the risk of hypertension and hypercholesterolemia during childhood and may contribute to the development of chronic diseases in adulthood, such as hypertension and diabetes.<sup>2</sup> Participating in regular PA plays a significant role in the prevention of and decrease in childhood obesity and chronic diseases, thereby contributing to the prevention of chronic diseases later in adulthood.<sup>3</sup>

Motor skill competence (MSC) is defined in terms of common fundamental motor skills, specifically, the development of object control (e.g., throwing, kicking) and locomotor skills (e.g., running, jumping, hopping).<sup>4</sup> The development of MSC has been proposed to be a causal determinant promoting physical fitness, PA behaviors, and health outcomes in childhood, because learning to move is a necessary skill underlying future PA.<sup>4,5</sup> Research has shown that the development of MSC in childhood and adolescence is associated with increased cardiovascular fitness, muscular endurance, muscular strength, PA, and perceived competence.<sup>6,7</sup> Longitudinal data in children also indicate that higher MSC is associated with sustained levels of PA and health-related physical fitness over time.<sup>8</sup> However, previous studies targeted only older children and adolescents,<sup>9,10</sup> missing an opportunity to examine PA interventions in early childhood to improve health outcomes in this critical period of child development. Additionally, the study of the correlates and determinants (e.g., cultural contexts) of MSC, PA, and sedentary behavior in childhood has become an emerging trend in the field, because the research investigating such associations in recent years has provided new insights.<sup>11–13</sup>

In response, this special topic in the *Journal of Sport and Health Science (JSHS)* was aimed at examining the effectiveness of PA on MSC, fitness, and health outcomes in early childhood, as well as investigating correlates and determinants of MSC and PA in childhood through experimental and observational research. Specifically, novel database findings from 6 separate studies from Australia, Portugal, and the United States are presented. These studies attempted to (1) explore the effectiveness of various PA programs on preschool children's health-related outcomes, MSC, and perceived competence; (2) provide

insight concerning the correlates and determinants of MSC, PA, and sedentary behaviors in children; (3) investigate the current status of MSC and fitness in children across various countries; and (4) provide directions for future research and practice to improve MSC and PA in childhood.

### 1. Intervention effectiveness in preschool children

Available intervention studies on preschool children's PA have yielded inconclusive findings, with some indicating significant increases in PA,<sup>14</sup> whereas others suggest no significant differences.<sup>15</sup> Additionally, some studies show significant improvements in cardiovascular fitness and decreases in skinfold thickness measurements, but not in body mass index, in experimental compared with control children.<sup>14</sup> However, all previous intervention studies have demonstrated positive impacts on some components of MSC.<sup>14,16,17</sup>

The first 2 studies in this special topic investigated the effectiveness of differing PA interventions on preschool children's MSC, perceived competence, and PA. Palmer and colleagues examined the effects of a 5-week motor skill intervention on preschoolers' MSC (as measured by the Test of Gross Motor Development-3) and accelerometer-determined PA behaviors compared with outdoor free play (i.e., recess). Children in the intervention group demonstrated greater increases in MSC compared with the control group over time. Although there was no group difference in PA, children's PA significantly increased after the intervention. Yet such increases did not translate to more PA outside of the intervention setting. Using exergaming (i.e., active video games) as the intervention channel, Gao et al. examined the effect of a school-based exergaming intervention on preschool children's perceived competence, MSC, and PA compared with usual care (i.e., recess) at school. The researchers observed exergaming to positively affect the promotion of preschool children's moderate-to-vigorous PA (MVPA) at school and to enhance perceived competence and MSC. The preschool years are critical to the development of children's MSC, as their MSC significantly improved even after just 8 weeks. In addition, boys demonstrated higher levels of MVPA than girls at both time points. These 2 studies suggested that implementing a structured PA program beyond regular recess benefited preschool children's MSC and possibly PA at Head Start centers or schools in the United States.

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## 2. Correlates of MSC and PA in children

Previous studies have consistently shown positive associations among children's MSC, PA, health-related physical fitness, and perceived competence.<sup>6,7,18,19</sup> Nevertheless, the correlates of MSC and PA in preschool children remain largely unexplored. In the third article, Webster and colleagues investigated the relationships among children's MSC, parent-reported screen time, accelerometer-determined PA, and sedentary behavior. Findings indicated that children's MSC was positively related to vigorous PA and inversely related to screen time. However, children's screen time and having a television in the bedroom were not significantly associated with their daily sedentary time, total PA, MVPA, or vigorous PA. Similar to many previous studies, boys engaged in more MVPA and vigorous PA and less sedentary time compared with girls. Zeng et al. investigated the correlates (e.g., perceived competence, number of children in family, parent age, body mass index, education, employment status, family income, perception of child coordination, and home PA environment) of preschool children's MSC from the social ecological perspective. They observed young children's MSC correlates to be multidimensional. In detail, children's perceived competence was positively related to children's locomotor skills and object control skills. Moreover, at the family level, parent education was significantly correlated with children's locomotor skills. Last, at the environmental level, the physical environment was positively associated with children's locomotor skills. Such findings suggest that professionals need to consider different levels or factors (e.g., individual, social, environment, etc.) while implementing interventions aimed to improve MSC.

Working with a sample from an older pediatric population, Luz et al. examined the effects of culture and age on MSC and health-related physical fitness (e.g., cardiorespiratory fitness, upper body strength) among children from Portugal and the United States from a cross-cultural perspective. Children were classified into 2 age groups: 6–9 years old and 10–13 years old. The results indicated that Portuguese children, regardless of age, had higher locomotor skills (e.g., jumping) and cardiorespiratory fitness scores in comparison with U.S. children. However, U.S. children demonstrated higher scores in object control skills (e.g., throwing) and upper body strength. Interestingly, Portuguese boys and U.S. girls outperformed their internationally matched counterparts in object control skills (i.e., kicking). Future research is warranted to explore and identify the underlying reasons leading to such differences.

Mazzoli and associates examined the feasibility of implementing a cognitively challenging MSC program during recess in mainstream and special primary schools. Twelve teachers and 34 primary school children were interviewed through individual interviews or focus groups concerning a 4-min cognitively challenging active break that focused on MSC development. The researchers reported the cognitively challenging MSC program to be feasible for interrupting children's sitting time and to promote PA in mainstream schools. Yet such a program might require modifications in special schools,

because the teachers deemed the task complex and potentially frustrating for the children. Further investigation is required to assess the feasibility and effectiveness of PA programs at different types of schools. Finally, Castelli contributed a commentary paper summarizing these empirical studies, and offered advice on the practical implications and directions for future studies.

## 3. Directions for future studies

Harter's competence motivation theory<sup>20</sup> posits that an individual's behavior is positively related to his or her perceived competence and MSC. Particularly, successful mastering of skills/tasks (e.g., MSC development while playing sports) will enhance perceived competence, which in turn stimulates motivated behaviors (e.g., engaging in PA) and actual performance (e.g., fitness tests, MSC). The existing literature reveals that many children who have lower perceived competence in PA (e.g., playing basketball) opt out of PA because (1) they feel they are not as competent as their peers,<sup>21</sup> (2) they do not want to demonstrate low MSC, and (3) because they have fewer skill options and movement opportunities, they will be less motivated to participate in PA and activities (e.g., playing basketball), which will be less enjoyable for them compared with their more advanced peers.<sup>22</sup> Longitudinal and cross-sectional studies indicate that perceived competence mediates the relationships between childhood MSC and adolescent PA and fitness.<sup>18</sup> However, the mediating effect of perceived competence has not yet been addressed among young children who tend to possess high perceived competence yet low MSC. Additionally, regular PA participation and high levels of fitness have also been observed to reinforce the maintenance or development of MSC.<sup>20</sup> However, the potential mediating effect of perceived competence on PA and fitness on future MSC has not been examined, thus calling for future research on this topic among young children. Stodden and colleagues<sup>4</sup> developmental trajectories in children illustrates 2 engagement feedback loops (i.e., positive or negative). A positive spiral of engagement reflects a positive trajectory for PA and fitness with high MSC, and a poor MSC may lead to lower levels of perceived competence, thereby decreasing PA and fitness over time, which may result in a poor future MSC in children. The development of MSC through participation in innovative PA programs, such as exergaming programs,<sup>23</sup> may help to promote these specific recursive relationships and have the potential to influence lifespan trajectories of PA and fitness.

Understanding the correlates and mechanisms of PA behaviors and health-related physical fitness across the lifespan is a multifaceted problem with many behavioral, psychosocial, environmental, and cultural constraints possibly influencing PA and fitness trajectories across the lifespan. Thus, it is necessary to develop innovative PA approaches to promote healthy behavior in children that will lead to sustained PA and fitness trajectories over time in attempts to promote health and prevent chronic diseases. Investigating the long-term impact and sustainability of novel PA programs on various aspects of

child development is needed in the future and will lead to a better understanding of how different approaches may be used in communities and schools to promote physically active lifestyles. In addition, limited studies have addressed the long-term effects of PA programs on young children's MSC and perceived competence. More research, particularly longitudinal research in early childhood, is warranted. With this special topic of the *JSHS*, we intend to assist health professionals in recognizing the correlates/determinants of MSC and effectiveness of PA programs on MSC and other outcomes, and bring attention to the need to provide interesting and innovative PA programs for young children. We hope that more research endeavors focusing on MSC and relevant health outcomes among children will be burgeoning in the future.

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