DOCTORAL THESIS

# Relationship between Preschool Children's Fundamental Movement Skills, Physical Activity, Physical Fitness, and Executive Function: A Prospective Observation Study

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*Date of Award:*
2023

## ABSTRACT

**Background:** Executive function (EF) appears in early childhood and develops rapidly through complex coaction between environment and developmental processes. The preschool period is also characterized by a rapid growth in fundamental movement skills (FMS), physical activity (PA) and physical fitness (PF). The scientific research on the relationship between FMS, PA, PF, and EF in preschoolers remains to be explored.

**Objective:** The purpose of this study was to explore the age and gender differences in FMS, PA, PF, and EF in preschool children; examine the cross-sectional relationship between FMS, PA, PF, and EF and the prospective influence of preschooler's FMS, PA, and PF on EF in preschool children; and observe the preschoolers' FMS, PA, PF, and EF changes with age.

**Method:** This study consisted of two phases, phase one was a cross-sectional study. A total of 445 children aged 3-5 years were recruited. The Test of Gross Motor Development Third Edition (TGMD-3) was used to assess children's FMS. Preschool children's PA level was monitored by accelerometer ActiGraph GT3X-BT. PF was tested using grip handgrip, 4*10m shuttle run, 20m shuttle run, 30s sit-ups, sit and reach, and balance beam test. EF was tested by computer-based tasks including stop-signal and safari training task. Phase two was a 12-month follow-up study. In the phase two, all children enrolled in the baseline study were followed up, the measurements and contents of the follow-up are the same as the baseline instrument.

**Results:** This study found that older preschool children performed better in FMS, PF, and safari training task. Older children spent more time on PA than younger children. Three-year-old children performed better in stop-signal task than four and five-year-old children. Girls performed better than boys in locomotor skills, sit and reach test, and safari training task. Boys spent more time in LPA, MPA, and VPA than girls. Boys showed a significantly higher score in grip strength, stop-signal task than girls. FMS, PA, PF were positively correlated with each other in preschooler. There were positive cross-sectional and prospective relationships between FMS and EF, PF and EF. PA was not significantly associated with EF. Greater increase in FMS and safari training task from baseline to follow-up. The level of LPA showed significant decrease compared to baseline. Performance in 4*10m shuttle run, 20m shuttle run, and grip strength tests improved over 12 months. Children showed lower scores in sit-and-reach and 30s sit-ups compared to baseline.

**Conclusion:** There were age and gender differences in FMS, PA, PF, and EF in preschoolers. FMS, PA, and PF were positively correlated with each other. There were positive cross-sectional and prospective relationships between FMS and EF, PF and EF. PA was not significantly associated with EF. This study found greater increases in FMS, speed-agility, CRF, muscular strength, and working memory from baseline to follow-up. The LPA level, flexibility and muscular endurance showed significant decreases compared to baseline.