Original Research Article

Associations Between Sedentary Behavior and Motor Coordination in Children

LUÍS LOPES,[1*] RUTE SANTOS,[2,3] BEATRIZ PEREIRA,[1] AND VÍTOR PIRES LOPES[4]
[1]*Department of Theoretical Education and Artistic and Physical Education, Research Centre on Child Studies (CIEC), Institute of Education, Minho University, Braga, Portugal*
[2]*Faculty of Sports, Research Centre for Physical Activity, Health and Leisure (CIAFEL), University of Porto, Porto, Portugal*
[3]*Maia Institute of Higher Education, Maia, Portugal*
[4]*Department of Sports Science of Polytechnic Institute of Bragança, Research Center in Sports Sciences, Health Sciences and Human Development (CIDESD), Bragança, Portugal*

Objectives: This study was conducted to evaluate the relationship between objectively measured sedentary behavior (SB) and motor coordination (MC) in Portuguese children, accounting for physical activity (PA), accelerometer wear time, waist-to-height ratio, and mother's education level.

Methods: A cross-sectional school-based study was conducted on 213 children (110 girls and 103 boys) aged 9–10 in the north of Portugal during the spring of 2010. Accelerometers were used to obtain detailed objective information about daily PA and SB over five consecutive days. MC was measured with a body coordination test (Körperkoordination Test für Kinder). Waist and height were measured by standardized protocols and the waist-to-height ratio (WHtR) was calculated. A questionnaire was used to assess mothers' educational levels. Receiver-operating characteristic (ROC) and logistic regressions were used.

Results: ROC analysis showed that sedentary time significantly discriminated between children with low MC and high MC, with a best trade off between sensitivity and specificity being achieved at $\geq$77.29% and $\geq$76.48% for girls and boys, respectively ($P < 0.05$ for both). In both genders, the low sedentary group had significantly higher odds of having good MC than the higher sedentary group, independent of PA, accelerometer wear time, WHtR, and mother's education level ($P < 0.05$ for both).

Conclusions: Our findings suggested that PA levels *per se* may not overcome the deleterious influence of high levels of SB on MC. Our data stress the importance of discouraging SB among children to improve MC. Am. J. Hum. Biol. 00:000–000, 2012.

The importance of promoting active lifestyles from a young age is widely recognized and the health benefits of regular physical activity (PA) are extensively acknowledged (Strong et al., 2005). The incorporation of PA into daily life and the achievement of recommended health-related levels of PA are major public health challenges. Many children and adolescents do not meet the current PA recommendations (Jago et al., 2005; Riddoch et al., 2007; Strong et al., 2005). Moreover, previous research has shown a decline in PA from childhood to adolescence (Goran et al., 1998; Lopes et al., 2007), with the end of elementary school (9–11 years old) being a critical period of change (Goran et al., 1998; Nader et al., 2008).

The importance of promoting the development of motor coordination (MC) at younger ages relies on the evidence that there are current and future benefits associated with the acquisition and the maintenance of motor proficiency (Lubans et al., 2010). It has been suggested that an appropriate acquisition of gross MC contributes to children's physical, cognitive, and social development (Lopes et al., 2011b; Payne and Isaacs, 1995). A proper MC level is essential for strong general development, as well as for health, psychosocial development, and well-being (Haga, 2008; Piek et al., 2006). Although a rudimentary form of movement pattern may naturally be develop, a mature form of motor proficiency is more likely to be achieved with appropriate practice, encouragement, feedback, and instruction (Gallahue and Ozmun, 2006; Logan et al., 2011). Likewise, these skills need to be learned, practiced, and reinforced through developmentally appropriate movement programs (Logan et al., 2011). The early childhood years are a critical time for the development of these skills, which are considered the building blocks of more complex movements (Clark and Metcalfe, 2002).

Lately, there has been increasing interest in the relationships between MC and health-related behaviors and outcomes. Indeed, a recent review (Lubans et al., 2010) of the relationship between MC and health benefits in children and adolescents indicated that MC levels are inversely correlated with weight status, but positively correlated with PA, cardiorespiratory fitness, and perceived physical competence in cross-sectional and longitudinal data. In another systematic review of the literature conducted to synthesize the recent available data on fitness and PA in children with developmental coordination disorder (a neurodevelopmental condition characterized by poor motor proficiency that interferes with a child's activities of daily living). Body composition, cardiorespiratory fitness, muscle strength and endurance, anaerobic capacity, power, and PA have all been negatively associated, to various degrees, with poor motor proficiency (Rivilis et al., 2011).

Current efforts to increase youth's PA have had limited success, with effective changes achieved only in smaller

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*Correspondence to: Luís Carlos Oliveira Lopes, Campus de Gualtar, 4710-057 Braga, Portugal. E-mail: luis.iec.um@hotmail.com

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