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Motor proficiency, physical activity and body mass index in preschool aged children

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Abstract

The purpose of this study was to compare the motor proficiency and the physical activity (PA) of preschool children with different body mass index (BMI). Fifty-three preschoolers (26 boys and 27 girls), aged 4-5 years, were divided, according to their BMI, to those with: a) normal BMI, b) overweight children and c) obese children. Their motor proficiency was determined by the 'Motorik' Module test battery and their PA was evaluated by using the interview 'Interviewleitfaden zur Aktivität für Kinder von 4 bis 6 Jahren'. According to the IOTF standards, the 22.6% and 9.4% of the children were categorized, as overweight and obese, accordingly and they had no statistically significant difference in their motor performance, when compared with children with normal BMI. However, the weekly participation in at least 60 min daily accumulation of physical activity, was significant lower (MD=1.80, $p<.05$) in obese children than normal weight peers. The results of the present study are particularly useful, for those who are involved in pre-school education, as they suggest that physical inactivity is strongly related to obesity in preschool children and notify the necessity of Physical Education in the Greek nursery school.

Keywords: *motor proficiency, physical activity, BMI, Motorik Modul, preschool age*

Introduction

Motor fitness and physical activity (PA) are important aspects of a healthy development in childhood and adolescence (USDHHS, 2000). The National Association for Sport and Physical Education (2002) have developed PA guidelines for preschool aged children , in an attempt to maximize the benefits derived from an active lifestyle. It is recommended that preschoolers accumulate at least 60 minutes of daily structured PA or they should engage in at least 60 min and up to several hours of daily, unstructured PA and should not be sedentary for more than 60 min at a time except when sleeping. However, many children are not only less physically active than recommended but also PA declines as children get older (Pate et al., 2002).

Motor proficiency is associated positively with physical activity, and related negatively to the percentage of time in sedentary activity in school-

aged children (Petrolini, Iughetti, Bernasconi, 1995; Graf et al., 2004).The level of mastery of the movement skills that are the foundation for the skills used in common forms of adult PA, may be one of the factors positively associated with physical activity in youth (Okely, Booth, Patterson, 2001). Although this association may be relatively weak to moderate, it is particularly important t for providing insight into motor proficiency as a determinant of physical activity (Wrotniak, Epstein, Dorn, Jones, & Kondilis, 2006).

Lack of PA is hypothesized to be an important contributing factor in the development of chronic diseases like cardiovascular disease and obesity (CDC, 2000).The preschool years may be a critical period for obesity prevention as indicated by the association of adiposity rebound and obesity in later years (Whitaker, Pepe, Wright, Seidel, & Dietz, 1998). However, there is a lack of scientific research documenting the health effects of motor proficiency and PA in preschool children.

The purpose of the study was to compare the motor proficiency and the PA of preschool children with different body mass index (BMI).It was hypothesized that there would be no sex differences on preschooler's motor performance and PA and that children with greater standardized BMI would have poorer motor proficiency and would be less physically active compared with children with a lower standardized BMI. This study has the potential to help us understand the importance of PE as an educative approach.

Method

Participants and Experimental Design

Fifty-three preschool children (26 boys and 27 girls) aged between 4 and 6 years (mean values for age, height, body mass and BMI: 4.57 ±0.5 years, 110.96± 5.98 cm and 20.44±3.84 kg and 16,43±2.08, respectively), from six nursery schools in eastern Macedonia, consented to participate in this study. Children were healthy and free from developmental conditions that could create motor proficiency or PA impairments. Written consent was obtained from each child's parent. Participants' motor abilities were assessed using the

'Motorik' Module test profile (Bös et al., 2004). Information on children's physical activity was obtained by the parent/guardian during the interview conducted with the assistance of the questionnaire 'Interviewleitfaden zur Aktivität für Kinder von 4 bis 6 Jahren' (Bös et al., 2004). The International Obesity Task Force (IOTF) method (Cole, Bellizzi, Flegal, & Dietz, 2000) was used to classify each child, according to his/her BMI, as 'overweight', 'obese', or 'normal'.

Statistics

All statistical analyses were conducted using the SPSS version11.0. One-way ANOVA was used with gender and with BMI type (normal, overweight and obese children) as independent variable, in order to examine differences in motor performance and PA respectively. The post-hoc analysis using the Scheffe test, showed the differences between the boys and girls and among normal weight, overweight and obese children. Statistical significance was set at an alpha level of 0.05.

Results

The 22.6% and 9.4% of the children were categorized, as overweight and obese accordingly. The results revealed that there was no ''sex'' influence on both children's motor performance and PA. Furthermore, the obese and overweight children, when compared with children with normal BMI, had no statistically significant differences in the motor performance. However, the weekly participation in at least 60 min daily accumulation of physical activity, was significant lower (MD=1.80, $p<.05$) in obese children than normal weight peers and the fatigue level during structured PA in kindergarten, was significant higher in overweight (MD=0.56, $p<.05$) and obese (MD=1.81, $p<.05$) children than normal weight preschoolers.

Discussion

The preschool period is an important time to prevent motor disorders during development (Zimmer, 1981) and to instil habits to prevent childhood and subsequent adult obesity (Berkowitz, Stallings, Maislin, & Stunkard, 2005). It is, therefore, important to identify behaviours associated with improvement of motor proficiency and reductions in risk of overweight and obesity. Two major findings of this study are that: 1) the prevalence of overweight and obesity among preschoolers was very high and 2) there was an inverse association between the weekly participation in at least 60 min daily accumulation of physical activity and obesity. These results are consistent with previous findings that have reported similar increases in the prevalence of overweight and obesity among preschoolers (Canning, Courage, & Frizzell,2004; Ogden, Flegal, Carroll, & Johnson, 2002; Mei et al., 1998; Ogden et al., 1997, Manios et al., 2007) or negative associations between childhood obesity and physical activity (Trost, Kerr, Ward, & Pate, 2001). Although we hypothesized that children with a greater standardized BMI would have poorer motor proficiency, the results revealed no significant effect of "BMI type" at the motor proficiency of children of that age. This finding is in contrast to a study on a sample of preschool-age children reported by Bappert, Woll, & Bös (2003) and a few other studies on older children(Graf et al., 2004; Wrotniak et al., 2006; Digelidis, Kamtsios,& Theodorakis, 2007). An explanation may be the small sample size of this study, which limited statistical power. Finally, the results revealed no significant effect of "sex" at the motor proficiency of children of that age, which is also consistent with previous studies (Zimmer & Volkamer, 1987; Kambas et al., 2003). This might be due to the similarities of the neurophysiological characteristics of boys and girls at this age.

Conclusion

The findings of this study indicate that physical inactivity is related to obesity in preschool, overweight and obesity begins early in life and notify the necessity of Physical Education in the Greek nursery school.

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