

# EUROPEAN PSYCHOMOTRICITY JOURNAL

<http://www.psychomotor.gr/epj.htm>

ISSN 1791-3837

*European Psychomotricity Journal* 2008; 1; 1, 47-53

**Special Issue: 1<sup>st</sup> Symposium of SPA-Hellas**

Published by: Athlotypo Sports Publishing

<http://www.athlotypo.gr/>

On behalf of:

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## **Relationship between BMI, physical activity and TV-watching in preschool children.**

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### **Abstract**

The aim of this study is to identify the relationship between BMI, physical activity, and hours of watching TV in preschool aged children. The sample consisted of 102 children (49 boys and 53 girls) aged 48 to 79 months (Mean=60.67, S.D.=7.07). Physical activity was measured using an OMRON walking style II pedometer, while hours of TV watching and occupation with "digital" games were recorded using a parent questionnaire. Differences between groups were assessed using one way analysis of variance (ANOVA). From the results was not found any statistically significant effect of BMI in number of steps/week ( $F = .411$ ,  $p = .672$ ), in number of covered km/week ( $F = .411$ ,  $p = .673$ ) and in hours of TV watching/day ( $F = .004$ ,  $p = .996$ ). However, statistically significant difference was found in the level of physical activity between children that watched less than 1h TV per day, (number of steps/week: Mean=61426.75, SD=10766.28) and total km/week: Mean=24.54, SD=4.31) and children that watched above 5h TV per day, (number of steps/week: Mean=37753.25, SD= 2975.89 and km/week: Mean=15.07, SD=1.18). Consequently, BMI is not a perfect predictor for preschool aged children to show any differentiations in relation to older children. However a negative association is possible to exist between physical activity and hours of TV watching at a sensitive time period.

**Key words:** *body mass, body height, pedometer, sedentary behavior, preschool*

### **Introduction**

During the past two decades dramatic increases in childhood overweight and obesity have been documented worldwide. At the same time, the proportion of inactive children and youth is considerably high. The benefits of physical activity for the health and well-being of human beings are well recognized. In children such benefits include weight control, lower blood pressure and fitness which are related with health and mental well-being. A major concern about childhood obesity is that it somewhat tracks to adulthood. It is important that health and well-being of adults springs from behaviours that are consolidated from both childhood and puberty. So for young persons who are addicted in sedentary behaviours, it is very difficult to become physical active adults (Steinbeck, 2001).

Also there is a widespread belief that children are not active enough and that the amount of physical activity has been decreasing as the opportunities for pleasurable sedentary activities have increased. Moreover, increasing time spent on television viewing, video games and computer use, is contributing immensely to the inactivity epidemic

among children and youth. Dietz (1995) supported that the most constant behaviour that is related with obesity is T.V. watching. It is also connected with an increase in a consumption of foods and snacks that are advertised in television.

Video games have a smaller effect, because they do not send food messages and the energy that is spent in order to play a video game approaches exercise of low intensity. Dietz (1995) pointed out conclusively the importance of convenient guidance to the restriction of hours of TV watching, so that the risk of obesity is decreased. Janz et al (2002) supported that increasing children's active play and reducing hours of TV watching, can have protective effect against obesity later in their life. Wake, Hesketh and Waters (2003) also found significant relation between BMI and hours of TV watching weekly (> 30 hours/week), in 5-13 year - old children, while significant relation between BMI and "digital" games was not found. On the other hand Biddle, Gorely, Marshall, Murdey and Cameron (2004) supported that hours of TV watching do not constitute sedentary behaviour, neither limits physical activity of children, as there is plenty of time for both. Just exposing claimed children in front of T.V. without watching, increases the risk of becoming overweight (Lumeng, Rahnama, Appugliese, Kaciroti and Bradley, 2006).

Particularly preschool age constitutes a sensitive time period for adiposity rebound (AR) around age of 6, that is dangerous for the prevalence of obesity and which provides the base for targeted interventions. Scientific research shows that children, who reached the minimum point (nadir) of adiposity before 5.5 years, have higher risk of obesity as adults (Rolland - Cachera et al, 1984; Whitaker, Pepe, Wright, Seidel and Dietz, 1998). Moore et al (2003), in their study supported that high levels of physical activity, from preschool age, can already delay the assault of critical period of adiposity rebound, after age 6. The purpose of this study was to examine the association between BMI, physical activity and sedentary behaviors of preschool children, as important factors which related with childhood obesity.

## **Method**

### *Participants*

A total of 102 children (49 boys and 53 girls) 48 - 79 months old (Mean= 60.67, SD=7.07), participated in the study, from Kindergartens of Serres. The group of children

was a random sample. Parents and legal guardians were informed about the aim and the procedure of the study and provided written consent. They also reported hours of TV viewing by filling out a structured questionnaire.

#### *Procedure*

##### *Body mass index (BMI)*

Height was measured using a portable stadiometer and weight was measured using digital balance scale (Model Seca). BMI was calculated as weight in kilograms (Kg) divided by squared height in meters (m<sup>2</sup>) (BMI=Kg/m<sup>2</sup>). Children were classified as normal weight, overweight and obese according to international BMI cut-off points (Cole, Bellizzi, Flegal και Dietz, 2000).

##### *Pedometer-determined physical activity*

Habitual physical activity was measured using sealed multi-day-memory pedometers (Model OMRON walking style II). The pedometers were placed in the children's right hip for one week, all day, except while sleeping, bathing or doing other water activities.

## **Results**

The SPSS package software was used for the statistical analysis. Differences between groups were assessed using one way analysis of variance (ANOVA). The significance level was set up at  $p < .05$ .

#### *Effects of BMI in physical activity variables and h of TV watching*

From the analysis of the data statistically significant main effect of BMI in total number of steps/week, ( $F_{2,96}=.411$ ,  $p=.672$ ) and in total distance in kilometres/week, ( $F_{2,96}=.411$ ,  $p=.673$ ) was not found. However overweight and obese children were less physically active than normal weight children (Table 1). Also statistically significant main effect between BMI and hours of T.V. watching/day ( $F_{2,96}=.004$ ,  $p = .996$ ) didn't exist. Group means and standard deviations for physical activity variables and h/day of watching TV are shown in Table 1.

Table 1. Number of steps/week, Km/week and hours watching TV/day for preschool children stratified by BMI.

Physical Activity	Normal weight (N=52)		Overweight (N=31)		Obese (N=19)	
	Mean	SD	Mean	SD	Mean	SD
Steps/week	56622,17	16704,37	49707,80	9418,99	49525,33	15579,53
Km/week	22,62	6,69	19,85	3,77	19,78	6,23
Hours TV/day	2,67	2,42	2,80	2,49	2,67	2,89

Effect of h of TV watching in physical activity variables

From the analysis of the data statistically significant main effect of hours of TV watching/day in the total number of steps/week ( $F_{2,96}=10.239$ ,  $p<.05$ ) and in total Kilometres/week ( $F_{2,96}=10.254$ ,  $p<.05$ ) was found. Post Hoc test Bonferroni showed statistically significant difference in number of steps/week (Mean=61426.75, SD=10766.28) and in total km/week (Mean=24.54, SD=4.31) of children that watched less than 1 hour television/day, in regard to the number of steps/week (Mean=37753.25, SD=2975.89) and km/week (Mean=15.07, SD=1.18) of children that watched above 5 hours television /day (Figure 1 and 2). Thus the children who watched less than 1 h television/day walked on average 23.674 steps more and covered distance of 9.5 kilometres more weekly from children who watched more than 5 hours television/day.

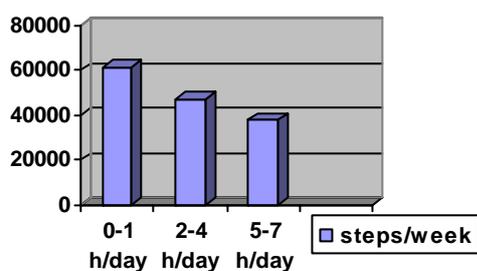


Figure 1. Group differences between total steps/week and hours of T.V. watching

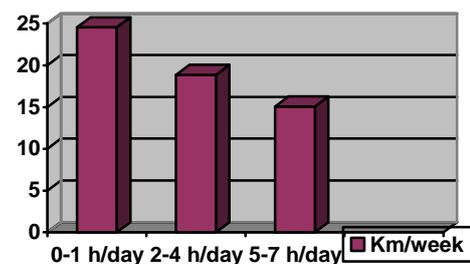


Figure 2. Group differences between total Km/week and hours of T.V. watching

## Discussion

From the results statistically significant relation between BMI and physical activity was not found. Children in their majority, independent of BMI, had significantly lower mean steps per day (Mean=7.500) comparatively to the optimal step cut-off points

(Mean=14.000), recommended by Tudor-Locke et al (2004) and Duncan, Schofield & Duncan (2007). Our findings are not entirely consistent with studies that differentiated their results concerning sex, where BMI appeared to influence considerably boy's physical activity contrary to girls (Troost, Sirard, Dowda, Pfeiffer & Pate, 2003; Ara, Moreno, Leiva, Gutin & Casajus, 2007).

No relationship was found between child BMI and hours of TV watching. Preschool children did not appear to be so addicted in watching television, while parents appear to control the quantity and the quality of TV programs that their children watch. These findings are consistent with studies which support that watching television less than 2 hours per day does not appear to influence BMI (Crespo et al, 2001; Gyovai, Gonzales, Ferran & Wolff, 2003). Present findings showed that TV watching is a weak index of making preschool children to become obese, but is associated with increased risk of inactivity. Many hours of TV watching (>5 h/day) reflected reduced physical activity, results that are consistent with those of Janz et al (2002).

One of the weaknesses of the study was the cross-sectional nature of the study which didn't infer a causal relation between preschool physical activity and BMI. Also unpredictable factors maybe affected the data of pedometers. Finally it is possible that parental reports about hours of their children's T.V. watching to compromised the reliability and the objectivity of data.

## **Conclusions and Applications**

It is a fact that there are not international standards for the type and quantity of physical activity of preschool children (Timmons, Naylor & Pfeifer, 2007). A previous attempt at formulating physical activity guidelines for children under age of 5 years is available from the United States (National Association for Sport and Physical Education, 2002). According to these guidelines, preschoolers should accumulate daily at least 60 min of structured physical activity or 60 min and up to several hours of daily unstructured

physical activity and should not be sedentary for more than 60 min at a time except when sleeping.

When young children are physically active tend to participate in short periods of movement, spending very little time in movements that require high intensity. Active play in preschool children can be considered as a type of physical activity with various levels of intensity. It is important to be noted that preschool children spend hardly 2 min per hour in physical activity of high intensity, while half of their free time is dedicated to sedentary behaviours or in soft physical activity (Pate, Pfeiffer, Trost, Ziegler & Dowda, 2004). So, types of activities that children engaged in during the preschool day may be hardly influenced by excess adiposity.

The present study does not determine whether inactivity causes fatness or whether fatness causes inactivity. It is likely, that weight for height indices are imperfect measures of adiposity, particularly among young children (Edmunds, Waters & Elliott, 2005). Also it seems unlikely that simply banning the television set will have a great impact on child's physical activity, without other interventions aimed at the child, the family and the community. It is important to note that interventions which are directed either at the increase of physical activity, or at the reduction of sedentary behaviours, they have encouraging results for overweight or obese children. Broad intervening approaches, taking into account the multifactorial nature of obesity, may be more likely to succeed.

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