

Academic Performance in Relation to Adherence to the Mediterranean Diet and Energy Balance Behaviors in Greek Primary Schoolchildren

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ABSTRACT

Objective: To explore possible links between adherence to the Mediterranean Diet (MeD), excess body weight, energy balance behaviors, and academic performance in Greek primary schoolchildren.

Design: Cross-sectional study.

Setting: Primary schools in Athens, Greece.

Participants: A total of 528 students (256 boys and 272 girls), 10–12 years of age, were recruited from 21 primary schools in the area of Athens, Greece.

Main Outcome Measures: Students completed a specifically designed energy balance behaviors questionnaire together with the KIDMED index, which evaluates the degree of adherence to the MeD. The teacher assessed academic performance through a specifically designed, 5-scale questionnaire. Standard anthropometric measurements were also taken.

Analysis: Block stepwise regression analysis was conducted.

Results: Adherence to the MeD ($\beta = .140$; $P = .001$), obesity ($\beta = -.095$; $P = .001$), physical activity levels ($\beta = .206$; $P = .001$), hours of sleep ($\beta = .100$; $P = .003$), television viewing ($\beta = -.068$; $P = .05$), and global self-esteem levels ($\beta = .122$; $P = .001$) are significant factors in predicting academic performance in primary schoolchildren.

Conclusions and Implications: Poor adherence to the MeD, obesity, and low physical activity levels seem to negatively affect academic performance in children. Understanding these interrelationships could facilitate the formation of policies focused on improving children's academic achievement.

Key Words: Mediterranean diet, obesity, academic performance, children, energy balance (*J Nutr Educ Behav.* 2014;46:164-170.)

Accepted November 10, 2013. Published online January 13, 2014.

INTRODUCTION

Ensuring optimum nutrition and healthy energy balance behaviors in childhood is of paramount importance, because it affects general well-being, levels of health, and risk of disease later in life.¹⁻³ A healthy diet has also been linked with improved cognition and academic performance in both children and adults.⁴⁻⁷

There is evidence that academic performance in childhood can affect

future educational attainment and health, and could therefore be treated as an important public health concern.^{8,9} A number of factors have been implicated in school performance, such as gender, ethnicity, school environment and school experience, child health, and socioeconomic status.¹⁰⁻¹³ A healthy diet is also associated with improved school performance.^{5,14}

The great majority of the nutritional studies on academic performance to

date have mainly focused on the effects of hunger, malnutrition, and specific micronutrient deficiencies.¹⁵⁻¹⁷ There is good evidence that nutritionally compromised children have decreased attendance, poor attention and academic performance, and more health problems compared with well-nourished children.⁴⁻⁶ Even short-term fasting, such as skipping breakfast, has been associated with decreased cognitive ability in childhood.¹⁸⁻²⁰

Physical activity and fitness, associated with an increase in energy expenditure, also seem to have a beneficial effect on cognitive and brain health and scholastic performance in children.²¹⁻²⁶ On the other hand, available results²⁷ have identified that overconsumption of energy and excess body weight are linked with deficits in academic achievement in school-aged children; however, the

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<http://dx.doi.org/10.1016/j.jneb.2013.11.001>

body of research is currently limited.²⁷ Because the prevalence of obesity in children continues to rise in Greece,²⁸ better understanding of the possible effects of increased weight on scholastic performance is of great importance.

The rates of childhood and adolescent obesity in Greece are among the highest in Europe,²⁸ and adherence to the Mediterranean diet (MeD) for both childhood and adolescence is low.^{29,30} The MeD is characterized by an abundance of plant foods (fruits, vegetables, cereals, beans, nuts, and seeds), moderate amounts of dairy products, low to moderate amounts of fish and poultry, red meat in low amounts, and olive oil as the main source of fat in the diet. It is well documented that greater adherence to the MeD is associated with a significant improvement in general physical and psychological health, longevity, and lower levels of obesity.^{1,31-33} The possible role of the MeD on academic performance in children has not been investigated in the past.

The purpose of this study was to explore possible links between adherence to the MeD, excess body weight, selected energy balance behaviors, and academic performance of Greek schoolchildren.

METHODS

Participants

A total of 588 students, 10–12 years of age, were recruited from 21 primary schools in the area of Athens, Greece. Before acceptance, children's parents or guardians were fully informed about the objectives and methods of the study and signed an informed consent. From a sample of 1,013 parents, parental consent was obtained for 588 students (response rate, 58%). Twenty-nine students were absent on the day of the research, and 31 were excluded from further analyses either because they did not complete all of the questionnaires ($n = 17$) or because they had learning disabilities and attention problems (as identified by the Greek Child Mental Health Centre or School Psychoeducational Service) that would affect study results ($n = 14$). The final study sample consisted of 528 children

(256 boys and 272 girls). The Greek Pedagogical Institute, Ethical Committee of Harokopio University, and head teachers of the schools granted approval to conduct the study.

Procedures

Experienced and specifically trained researchers conducted the survey between October and December, 2010. The parents of all participants received a full verbal and written explanation of the purpose of the study and its anonymous nature, and signed consent forms. The parents were also provided with a specially designed self-administered questionnaire to collect information about their age, ethnicity, education level, weight, height, and family income. Students' questionnaires were administered during class time in the presence of the teacher and the researcher. The students were asked to complete the entire questionnaire and to ask the researcher for help if they had problems or had questions that needed clarification. Completion of the questionnaire lasted 60 minutes on average, after which anthropometric measurements were conducted.

Study Design

General background and energy balance behaviors questionnaire. The authors used a specially designed self-administered questionnaire to collect information from parents about age, ethnicity, education, weight, height, and income. Children also completed a self-administered questionnaire about their general eating habits and dietary behaviors, such as consumption of water and soft drinks, consumption of breakfast, number of daily meals and consumption of meals with family members, and fast-food intake. Moreover, the children recorded the time spent on sedentary activities during the day (eg, television viewing, use of computers) and hours of sleep.

Assessment of diet quality. The researchers assessed adherence to the MeD through KIDMED, a Mediterranean diet quality index.³⁴ The KIDMED index was developed in an attempt to combine the MeD

guidelines for adults as well as the general dietary guidelines for children into a single index.^{34,35} The questionnaire aims to assess levels of adherence to the MeD by children. More specifically, the KIDMED consists of questions on daily fruit and vegetable consumption and weekly fish and legume intake, as well as questions on frequent intake of fast foods and of sweets and soft drinks. The index is composed of 16 yes/no questions, 12 of which are positively scored and 4 negatively scored, so the total score ranges from 0 to 12. Questions denoting a negative connotation are assigned a value of -1 and those with a positive aspect, $+1$. The total score is divided into 3 levels: 0–3 means diet quality is very low; 4–7 means an improvement is needed to adjust intake to follow a Mediterranean-style diet; and 8–12 means that a Mediterranean-style diet is optimal.

Assessment of physical activity. The Physical Activity and Lifestyle Questionnaire is a self-administered questionnaire designed to assess the physical activity of children ages 10–18 years.^{36,37} The questionnaire is made up of 2 parts. Part 1 records participation in physical activity during leisure time, whereas part 2 assesses the responder's participation in physical activities during the past 7 days. The scoring procedure results in a total score of energy expenditure for each responder that can be calculated using the Compendium of Physical Activities.³⁸ Subjects are assigned to 1 of 4 categories according to their score: very inactive, inactive, moderately active, or active. According to the study planning, only the second part of the Physical Activity and Lifestyle Questionnaire was used. After the analysis of children's answers, no student in the present study was found to be in the "very inactive" category.

Assessment of body image dissatisfaction. The authors used a pictorial instrument of child figures to assess body image perceptions.³⁹ This scale consisted of 7 male and 7 female child figures illustrating body weight ranging from very thin to obese. The child was asked to use the pictorial instrument to make 3 figure selections:

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