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Greater Mediterranean diet adherence is observed in Dutch compared with Greek university students

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Abstract *Background and aims:* Research has demonstrated that Mediterranean youth appear to abandon the traditional diet. The present study aimed to assess Mediterranean diet (MD) adherence in Greek university students, compared with a non-Mediterranean (Dutch) population.
Methods and results: The MD was assessed through the MD score (MedDietScore, MDS) in 100 nutrition students from Amsterdam and 85 from Thessaloniki. Subjects at both sites demonstrated average MDS, which was higher in the Dutch sample (27.5 $\pm$ 3.9) compared to the Greek (26.1 $\pm$ 3.4) ($p \leq 0.001$). The highest score was observed in Amsterdam (39). Potatoes, non-refined cereals, vegetables and olive oil were more frequently consumed by Dutch students ($p \leq 0.001$), but the Greeks demonstrated a higher legume intake ($p \leq 0.05$). The Dutch diet comprised 17% protein, 50% carbohydrate and 33% fat, whereas the Greeks consumed 14% protein, 48% carbohydrate and 38% fat ($p \leq 0.001$ and $p \leq 0.031$ for between-country protein and fat intake, respectively). In Amsterdam, significantly greater amounts of polyunsaturated (PUFA) and monounsaturated (MUFA) fatty acids as a percentage of energy intake ($p \leq 0.001$, $p \leq 0.01$) were consumed.
Conclusion: The findings indicate that the MD has been transmitted to non-Mediterranean populations, probably as a result of its declared health benefits. However, it is alarming that an average adherence score was demonstrated by the Greek nutrition students and this is indicative of the need for new approaches in transmitting the Mediterranean dietary pattern.

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Introduction

Although the health-promoting qualities of the Mediterranean dietary pattern have been proved and published, researchers argue on whether the diet will persist in the future [1]. Throughout the Mediterranean basin, the youngest generations have tended to abandon the traditional dietary patterns and this trend toward a more westernized diet has been demonstrated in both children and adolescents [2]. Research in post-adulthood samples is limited as university students are a population prone to dietary mistakes and unhealthy eating, mostly because, in their majority, they live away from home [3].

In Greece, female nutrition students have been shown to have increased adiposity [4]. This is partly explained by the fact that university students are distanced from the traditional dietary pattern in favor of increased red meat and fat intake [3,5].

Studies comparing university populations are limited, as the majority of published research consists of cross-sectional studies performed on a single faculty. The first two-site observational study on Mediterranean diet (MD) adherence was conducted by Šatakić et al. [6] between circumlittoral and continental Croatian students and demonstrated low adherence in both areas. Research between two different countries demonstrated higher adherence in Italian compared with Spanish university students [7]. Whether MD or its components are transferable to populations living far from the Mediterranean area, has not yet been clarified. Apart from Keys' initial observation in the 1950s, surveys using both Mediterranean and non-Mediterranean populations have not been conducted.

Thus, the present investigation aimed to assess obesity indices and adherence to the Mediterranean dietary pattern between a Mediterranean (Greek) and a non-Mediterranean (Dutch) university student population.

Methods

Study population

One hundred students from the Hogeschool van Amsterdam in Amsterdam (The Netherlands) and 85 students from the Alexander Technological Institute of Thessaloniki (Greece) were randomly recruited in lectures and gave their informed consent before participation. The study was approved by both institutes and took place during the first months of 2008. At both sites, the recruited students were apparently healthy nutrition majors in the 2nd and 3rd year of their studies. Although the study protocol was initially designed for 100 students at each site, in Greece the ending of the term limited the recruitment of students to 86; of these, one student was omitted from the final sample due to incomplete data. The final sample consisted of 38 male and 62 female Dutch students ($n = 100$, aged 23.3 ± 2.8 years) and 14 male and 71 female Greek students ($n = 85$, aged 21.6 ± 3.2 years).

Dietary record and adherence to the Mediterranean diet

The diet of participants was recorded for two consecutive days using two 24 h recalls and the mean dietary intake was analyzed with Food Processor 7.40 computer software (ESHA Research, Portland, Oregon, USA), with the addition of Dutch and Greek recipes. Dietary data were handled as estimated levels of intake. The Goldberg method was used to evaluate adequacy in the energy intake (EI) [8]. The ratio of energy intake/expenditure (EI/EE) categorized participants as low energy reporters (LER) (EI/EE < 0.76), or acceptable reporters (AR) (EI/EE 0.76—1.24).

The MedDietScore (MDS) [9], a Mediterranean diet index based on the frequency of consumption of 11 food groups, each providing 0—5 points to the total score (55), was used to evaluate adherence to the Mediterranean dietary pattern. The index has been previously and formally validated in a Greek sample [9]. MDS was first used in the ATTICA study [10], in a large sample of 18- to 89-year-old Greeks from the Athens metropolitan area ($n = 3042$). The index consists of a food frequency questionnaire that focuses on the consumption of non-refined cereals, fish, potatoes, fruit, legumes, red meat and by-products, full-fat dairy products, olive oil, poultry and alcoholic beverages.

Anthropometric indices

The weight and height of participants were measured with a Seca 789 scale (Seca, Hamburg, Germany) with a stadiometer. Body fat was calculated by the skinfolds method, and biceps, triceps, subscapular and suprailiac skinfolds were measured from the right side of the body of each participant using a Lange set of calipers (Beta-Technology Inc, Santa-Cruz, CA, USA). Percent body fat was calculated with the Durnin and Womersley equations [11]. Body Mass Index (BMI = weight [kg]/height^2 [m]), Fat Mass Index (FMI = fat mass [kg]/height^2 [m]) and Fat-free Mass Index (FFMI = fat mass [kg]/height^2 [m]) were calculated for each student, as suggested by Schutz et al. [12]. BMI was used for classifying students as underweight (BMI $<$ 18.5 kg/m^2), of normal body weight (18.5 $\leq$ BMI$<$25 kg/m^2), overweight (25 $\leq$ BMI$<$30 kg/m^2) or obese (BMI $\geq$ 30 kg/m^2). Waist and hip perimeter were also measured at the level of the umbilicus and trochanters, respectively, with a common measuring tape and the waist/hip ratio (WH ratio) was calculated. The same researchers collected and analyzed the data at each study site (Amsterdam and Thessaloniki).

Statistical analyses

All data were tested for normality in distribution with the Kolmogorov—Smirnov test. Variables that did not fulfill the normality hypothesis were logarithmically transformed (body weight, BMI, energy intake, saturated and monounsaturated fatty acids as a percentage of energy intake, consumption of fiber, cholesterol, vitamins B6, C and E, iron and phosphorus). An independent sample t-test was performed between Dutch and Greek students for all examined continuous parameters. Pearson's correlation evaluated the associations between the examined variables. Univariate analysis of variance was used to determine the effects of sex, age, BMI, percent body fat and energy intake on the MDS at each site. A two-tailed p-value <0.05 was selected as the level of significance.