



Title: Development and validation of a semi-quantitative food frequency questionnaire for young school-aged children

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Background and Objectives:

Accurate assessment of food intake in children and adolescents is an essential prerequisite for conducting epidemiological and clinical research and evaluating diet-disease associations. Picture aid food frequency questionnaire (FFQ) is a tool used for nutritional assessment purposes, which is less time-consuming, inexpensive, and with a lower respondents' burden. The objective of the present study was to examine the validity for estimating energy and macronutrients intake of a newly developed picture aid, semi-quantitative FFQ for Greek children and preadolescents.

Methods:

Sixty nine children, aged 10-12 years old (48% boys), were voluntarily enrolled in the study (86% participation rate). Children were asked to complete a 48 food items and 11 more supplementary questions, picture aid, FFQ as the test instrument and a 3-day Dietary Record (3DD) as the reference method. Anthropometric and lifestyle characteristics were also measured and assessed to evaluate the factors that may be related with reporting of the dietary intake. Validity between the energy and macronutrients intake as estimated from the FFQ and the 3DD was assessed using Spearman's rho correlation coefficient (with and without adjustment for the total energy intake). Moreover, the Wilcoxon signed rank test was used to compare the distribution of energy and macronutrient intake as estimated by both nutritional assessment tools. To further evaluate the agreement between the two dietary assessment methods the graphical method of Bland and Altman was applied.

Results:

The two methods were found to agree in terms of mean energy intake according to the Bland and Altman method, although a trend in overestimating energy intake was found as the intake increased. Additionally, results of the Wilcoxon signed rank test revealed the similarity of the distribution in energy intake as estimated from the FFQ and the 3DD [median (IQR): 2038 (1264 - 2651) kcals for the FFQ vs. 1902 (1583 - 2324) kcals for the 3DD, $p=0.33$] (Table 1). Concerning macronutrients intake, according to the Bland and Altman method, although the mean difference was different than zero (all p 's <0.05), the agreement was considered adequate as the mean difference for each nutrient (with the exception of poly-unsaturated fatty acids) was $< 1SD$ of the same nutrient intake as estimated from the reference method (Table 1).

Table 1. Evaluation of the agreement between the Food Frequency Questionnaire and the 3-Day Diary for the estimated energy and macronutrients intake.

	Mean difference	Nutrients' 1 SD of the 3DD	Tang's classification	Limits of Agreement	<i>rho</i>	<i>P</i>
Energy intake, (kcals/day)	249	565	Good	(-1950, 2448)	0.60	<0.0001
Macronutrient intake, (% EI)						
Protein	1.7	3.3	Good	(-6.1, 9.6)	-0.20	0.11
Carbohydrate	4.8	7.4	Good	(-15, 25)	-0.10	0.45
Total fat	-4.9	7.5	Good	(-22, 12)	-0.29	0.02
Saturated fatty acids	2.6	2.9	Good	(-5.5, 11)	-0.01	0.94
Mono-unsaturated fatty acids	-3.3	4.2	Good	(-13, 6.0)	-0.70	<0.0001
Poly-unsaturated fatty acids	2.6	1.3	Fair	(-3.5, 8.6)	0.46	<0.0001

Conclusions:

According to the various methodologies used, the FFQ can be used to estimate mean daily energy intake in children. Concerning the validity of the macronutrients intake it was found to be acceptable and can, therefore, be used to estimate intake at the group level. However, these results need to be confirmed in a larger study.

Keywords:

Nutritional assessment; food frequency questionnaire; validation; children