

# Factors influencing adolescent eating behaviour: Application and validation of a diagnostic instrument

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## Abstract

**Introduction.** Variables that predict the eating behaviour of teenagers are a high-priority objective of nutritional educational programmes. This research work is designed to verify whether the *Food Consumption, Intentions and Preferences Assessment Test* (FCIPAT) is useful when investigating the factors influencing adolescent eating behaviour patterns.

**Method.** The sample consisted of 591 students aged 15-16 year old from the city of Melilla (Spain), distributed in diverse socio-cultural groups, mainly of Muslim (N=318) and Catholic (N=248) religion. The FCIPAT questionnaire considers a total of 118 variables, including demographic variables, eating habits, food preferences, psychosocial variables and food consumption.

**Results.** Among other aspects, the results show that the test was useful in discriminating between the most influential psychosocial factors in the most recommended food groups (natural juices, fruit and vegetables) and those least recommended (sweets and fast food). For the most recommended foods, the most important factors were accessibility, beliefs about alcohol and self-control. For the least recommended, the most important factors were interest in diet and self-control. In this work, the *religion* was not found to be a predictor of any specific food-related behaviour.

**Discussion and Conclusions.** We discuss the novelty of some results obtained, such as the influence of beliefs about alcohol, as well as the possible uniformising effect of globalisation on cultural eating habits. Some implications for educational intervention that aims to change the eating habits of adolescents also discussed.

**Keywords:** Eating behaviour, food consumption, psychosocial factors, adolescents.

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# Factores que influyen en las conductas alimentarias de los adolescentes: Aplicación y validación de un instrumento diagnóstico

## Resumen

**Introducción.** Las variables predictoras de las conductas alimentarias de los adolescentes son objetivos prioritarios de los programas educativos nutricionales. En esta investigación se trata de verificar si el *Test de Evaluación de Preferencias, Intenciones de conducta y Consumos Alimentarios* (TEPICA) es útil para indagar en los factores que influyen en las conductas alimentarias de los adolescentes.

**Método.** La muestra está formada por 591 estudiantes de 15-16 años de la ciudad de Melilla (España), distribuidos en grupos socioculturales diversos, principalmente de religión musulmana (N=318) y de religión católica (N=248). El cuestionario TEPICA contempla 118 variables, que incluyen variables demográficas, hábitos alimentarios, preferencias por los alimentos, variables psicosociales y consumos alimentarios.

**Resultados.** Los resultados muestran que el TEPICA ha sido útil, entre otros aspectos, para discriminar entre los factores psicosociales más influyentes en el consumo de alimentos más recomendados (zumos naturales, frutas y verduras) y en de los menos recomendados (dulces y fast food). Para los alimentos más recomendados, los factores más influyentes encontrados fueron la accesibilidad, las creencias sobre el alcohol y el autocontrol. Para los menos recomendados, los factores más importantes fueron el interés por la dieta y el autocontrol. En este trabajo, la variable *religión* no fue predictora de ningún comportamiento relacionado con el consumo de alimentos.

**Discusión y conclusiones.** Se discute la novedad de algunos resultados obtenidos, como la influencia de las creencias hacia el alcohol sobre el consumo de los alimentos más recomendados, así como el posible efecto uniformizante de la globalización sobre los hábitos alimenticios culturales y las implicaciones que ello conlleva para una intervención educativa que pretende la modificación de los hábitos alimentarios de los adolescentes.

**Palabras clave:** Conductas alimentarias, hábitos alimentarios, factores psicosociales, adolescentes.

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## Introduction

The eating habits of adolescents represent a problem of special social relevance in developed countries and effective diagnosis of the same must constitute a social and educational priority. This becomes especially necessary when individuals from different cultures coexist.

Eating behaviours are usually acquired in the period from 6 to 12 years of age, but may be seriously altered during the adolescent stage (González & Merino, 2000). Teenagers are liable to skip meals and develop irregular nutritional habits, thus running the risk of incurring deficiencies of certain essential nutrients, developing eating disorders and suffering weight gain or obesity. The unsuitable eating habits that may be acquired in adolescence are, in most cases, maintained throughout adult life and entail important risk factors for adult morbidity and mortality (Schneider, 2000; Southon *et al.*, 1994). In addition, it has been demonstrated that there is an intimate relation between anomalous eating behaviour and other health-related habits (Guirado & Ballester, 2005), so appropriate educational intervention for these age groups is not only necessary as a preventive measure in terms of eating disorders but also serves to help them adopt healthy lifestyle habits (Bay, Herscovici & Kovalsky, 2005; Martín-Gordillo, 2005; Ramos, Levin, Aduriz-Bravo & Meinardi, 2007).

Eating behaviour is the set of actions that establish the relation of human beings with food. Food intake is involved, i.e. the amount and type of foods in the diet, but also the habits and feelings established in relation with the act of eating. The enormous complexity of the factors that determine the eating behaviour of an individual is recognised and related with a set of biological, family and social influences.

Research into people's eating behaviours has shown the strong influence of preferences (tastes, flavours) in the choice of one food over others; also it shows how psychosocial variables managed by behavioural science theories could be predictive mediators to encourage healthy dietary changes; and, finally, that eating behaviours depend upon certain demographic variables and family habits.

The literature on the influence of preferences and the sensorial characteristics of foods on food intake reveals that they act as main predictors in conditions of free accessibility (Baranowski, Cullen & Baranowski, 1999). In addition, adolescents have different preferences and consumption habits to those of children and adults, and these preferences are favourable to sweet and salty flavours rather than acid and bitter, which gives rise to unhealthy, excessive intake of fat-rich foods (hamburgers, pizzas, candies, chocolates, etc.) and sugary drinks; and by default, of foods in the natural juices, fruit and vegetables group. Likewise, it is known that preferences are not innate but a product of the genetic and environmental factors surrounding the individual (Birch, 1999).

There are few studies that manage psychosocial variables to predict the food intake of adolescents (Baranowski, Cullen & Baranowski, 1999) and those that are available are hard to compare. Social Psychology has traditionally been the scientific area responsible for analysing the factors affecting health-related behaviour. The different theories used to do so include Ajzen's Theory of Planned Behaviour: TPB (Ajzen, 1988, 1991), and its predecessor, the Theory of Reasoned Action: TRA (Ajzen & Fishbein, 1980), both notable for the frequency with which they have been applied to the study of health behaviours and the demonstrated predictive capacity for, at least, certain specific eating behaviours, such as low-fat milk consumption (Raats, Shepherd & Sparks, 1995; Tuorila, 1987). Both models propose that behavioural intention is the factor most closely related with the behaviour or conduct per se. In TRA, this behavioural intention is determined by attitudes and subjective norms. In TPB the perceived control factor, i. e. the self-confidence that an individual has to overcome external or internal barriers to performing the behaviour, is an additional factor to the behavioural intentions predicted by the attitudes and subjective norms of the TRA. Consequently, in TPB it is attitudes, subjective norms and perceived control that determine the individual's behaviour. Attitudes encompass the knowledge, personal beliefs and evaluation of the consequences involved in improving the behaviour. Subjective norms reflect the individual's perceptions regarding social approval.

In general, the models used to predict the intake of fats, fruits and vegetables revealed low predictability, with values of  $R^2 < .3$  (where  $R^2$  is the multiple quadratic correlation coefficient of the statistical model). It should be noted that these studies show how behaviour

related with low fat food intake depends on factors different from those related with fruits, natural juices and vegetables (Baranowski, Cullen & Baranowski, 1999). For example, Gerrits *et al.* (2010) showed that the consumption of fat-rich foods could be explained by self-control, interest in diet and the prototype of the unhealthy consumer. However, only self-control and family socioeconomic level were significant in fruit and vegetable consumption. Using the TRA, Race & La Greca (2008) concluded that the adolescent's peer crowd affiliations (e.g. brains, burnouts, jocks, alternatives, populars) can be an important variable in behaviour related with weight control and the intake of associated foods. This is considered in the present work under the *lifestyle* designation.

Studies of eating disorders are much more abundant. They show that non-western populations, in contact with the western lifestyle, run a greater risk of suffering these disorders, the same conclusion as was reached in a meta-analysis of 94 works (Podar & Allik, 2009) and a research work carried out in the city of Ceuta (Ramón, 2010), which has similar sociodemographic features to those of Melilla, where this research takes place.

In general, the studies indicate that female teenagers have better eating habits than their masculine peers (Cooke & Wardle, 2005; Riediger, Shooshatari & Moghadasian, 2007), which could be associated with female students obtain lower achievement of autonomous behavior of their families (Fleming, 2008), or better scores in social values (de la Fuente, Roda Peralta & Sanchez, 2006) or greater concern with body image (Stang & Story, 2005) than do male students. Also, these habits worsen with age, so that young people from 12 to 14 years of age have more healthy eating patterns than those aged 15 to 19 (Riediger, Shooshatari & Moghadasian, 2007). Socioeconomic status seems to have a positive influence on the adoption of healthy eating habits (Aranceta, Pérez-Rodrigo, Ribas & Serra-Majén, 2003; MacFarlane, Crawford, Ball, Savidge & Worsley, 2007; Vereecken, Todd, Roberts, Mulvihill & Maes, 2006) as do the academic level of the parents (Riediger, Shooshatari & Moghadasian, 2007) and the adolescent's involvement in food purchasing and preparation (Larson, Story, Eisenberg & Neumark-Sztainer, 2006).

Finally, the variables that may be influencing eating behaviour in diverse sociocultural milieus are many and varied. Our intention was to compile them in an instrument that can

suggest to us which ones are most influential in the eating behaviour of adolescents in Melilla. In this work, TPB is used as the initial theoretical frame to investigate the factors that may be influencing the adoption of eating behaviours in adolescents. However, preferences of foods, other demographic food-related variables and family habits that proved explanatory or predictive of adolescent eating behaviour in previous studies are also considered.

### *Objectives*

So, the aim of this work is to ascertain whether an instrument (*Food Consumption, Intentions and Preferences Assessment Test* -FCIPAT questionnaire) designed to measure the variables that may be influencing eating behaviour of teenagers 14-15 years old from diverse sociocultural milieus is valid when investigating the factors that influence these eating behaviours. A suitable design for an educational intervention in healthy food behaviour must emphasise the different kinds of mediating factors or variables that may be affecting its execution. To this end, an attempt will be made to define the underlying factors in the instrument and the relations between them, with the aim of using them to identify specific areas for educational intervention and actions to improve the nutritional beliefs and conduct of the students.

## **Method**

### *Participants*

The FCIPAT questionnaire was administered in June 2010 to a sample of 700 students aged 15-16 years, taking in a total of 591 valid questionnaires, considering those completely filled in as such.

The research was carried out in Melilla, a Spanish city located in North Africa, characterised by a culturally diverse population, mainly of Berber and European origin, professing the Muslim and Catholic religions, respectively. According to the latest demographic study from the Union of Islamic Communities of Spain (UCIDE), some 51% of

the city's inhabitants are Muslims, leading to its designation as the first Spanish city with a Muslim majority.

The sample was well distributed between boys (50.3%) and girls (49.7%); it was slightly more Muslim (54.2%) than Catholic (42.2%); their ages ranged from 14 to 17 years, with predominance of 15 (68.4%) and 16 year-olds (20.8%), and consisted of 3<sup>rd</sup> year ESO (Obligatory Secondary Education) students from six public education centres and two private/state-assisted centres of the City of Melilla (60.9% study in public centres compared with 39.1% in private/state-assisted schools). 37.1% of the sample declared that only the male parent in the home was working, whereas 43.3% said both father and mother worked. As for the level of studies of the parents, the father generally had a higher level (30.8% of male parents compared to 42.5% of females had no studies or only the most basic level (primary).

It is also interesting to note that the Berber and European students included in the sample were equally spread between public and private centres (37.7% of the Berber pupils studied in private schools) and that no statistically significant differences were found in the average study levels of either the father (sig. = .528) or mother (sig. = .228).

### *Design*

The *Food Consumption, Intentions and Preferences Assessment Test* (FCIPAT) used in this work was designed in the following stages:

- A) Review of previous surveys on adolescent eating habits and their influencing factors. Among these may be highlighted: CIACS (Guirado & Ballester, 2005), YAQ (Rockett *et al.*, 1997) which mainly influenced the design of FCIPAT block III, the block kids' questionnaire (Cullen, Watson & Zakeri, 2008), as well as the semi-quantitative questionnaire on food consumption frequencies for the Arab Emirates (Dehghan, Al Hamad, Yusufali, Nusrath, Yusuf & Merchant, 2005), with the inclusion of traditional food in our context, such as churros, green tea, couscous, shawarma and doner kebab.



B) Design and validation of the first version of the questionnaire. The original questionnaire, which would give rise to block II of the definitive survey, consisted of 92 items and was validated from three perspectives. First of all, in the sense that it is based on other tests already standardised, as described in the previous paragraph. In second place, the content of the items was assessed along with their capacity to evaluate the TPB constructs. This process involved three experts from the Didactics of Experimental Sciences Department of the University of Granada and three working sessions. Finally, some items were reformulated and others removed. In third place, in a pilot study carried out with 160 students from Melilla aged 15-16, a reliability analysis was performed by means of Cronbach's alpha statistic, which led to elimination of the items that had a low correlation with the scale total (Benarroch, Cabo, Pérez, Ferrero, López & Arzola de la Rosa, 2010). After this validation process, the reliability of block II of the survey, measured with Cronbach's alpha coefficient, was .884. Moreover, block II was reduced to 45 items, so that the final questionnaire could be administered in a fifty minute classroom session.

### *Instrument*

The FCIPAT questionnaire, as presented here, consists of three blocks: block 1, with 15 closed answer questions about personal and family characteristics and the dietary preferences towards 27 food groups; block 2, with 45 Likert-style items, with options ranging from 1 (strongly disagree) to 5 (strongly agree), devised to extract the factors that influence the eating behaviour of teenagers, following the TPB; and block 3, with a single item to investigate the consumption frequencies of 27 food groups. Table 1 describes the structure of the three blocks of the questionnaire. In total, 118 variables were considered.

**Table 1. Food Consumption, Intentions and Preferences Assessment Test (FCIPAT) Structure**

<b>BLOCK I (DEMOGRAPHIC, EATING HABITS AND PREFERENCES)</b>		
ITEMS (DEMOGRAPHIC VARIABLES AND EATING HABITS)	Nº	CATEGORIES
1. Sex	1	1: Male; 2: Female
2. Religion	2	1: Catholic; 2: Muslim; 3: Other
3. Age	3	None
4. Study centre	4	1: Private; 2: Public
5. Course	5	None
6. Members of your family that work away from home	6	1: Father only; 2: Mother only; 3: Father and mother; 4: Others
7. Father's educational qualification	7	1: Primary;
8. Mother's educational qualification	8	2: Bacalaureate; 3: Secondary Education; 4: FE/Higher Education.
9. Meals usually eaten throughout the day: Breakfast, Recreation, Lunch, Afternoon Snack, Dinner, Between Meals	9-14	1: No 2: Yes
10. Who usually prepares the meals at home	15	1: Mother;
11. Who buys the food at home	16	2: Mother and others;
12. Who usually chooses what you eat at break time/recreation	17	3: Mother and father;
13. Who usually chooses what you eat as afternoon/evening snack	18	4: Father and others; 5: Father; 6: You and your brothers/sisters 7: Others
14. Which type of person do you most identify with	19	1: Intellectual; 2: Smooth talker; 3: Sporty; 4: Individualist; 5: Alternative; 6: Popular or leader; 7: others
ITEMS (PREFERENTIAL VARIABLES)	20-46	CATEGORIES
15. Food preferences: milk, sweets/candy, beef, chicken, pork, yogurt, vegetables, pulses, fruits, potatoes, white cheese, butter and margarine, white fish, blue fish, eggs, pasta, bread, seafood, fast food, dried fruit and nuts, energy drinks, soft drinks without caffeine, alcoholic beverages, green tea, coffee, natural juices, cereals.		1: I really like it 2: I quite like it 3: I don't really like it much 4: I don't like it 5: I haven't tried it
<b>BLOCK II (PSYCHOSOCIAL VARIABLES)</b>		
Items (ATTITUDINAL VARIABLES)		
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 19, 33, 34, 35, 36, 37, 38, 43		
Items (SUBJECTIVE NORM VARIABLES)		
14, 16, 17, 20, 25, 26, 30, 39, 40, 41, 42	47-91	1: Strongly agree 2: Disagree 3: Indifferent 4: Agree 5: Strongly agree
Items (PERCEIVED CONTROL VARIABLES)		
15, 21, 22, 23, 24, 28, 29, 31, 32, 44, 45		
Items (BEHAVIOURAL INTENTION VARIABLES)		
27		
<b>BLOCK III (CONSUMPTION)</b>		
Consumption frequencies; milk, sweets/candy, beef, chicken, pork, yogurt, vegetables, pulses, fruits, potatoes, white cheese, butter and margarine, white fish, blue fish, eggs, pasta, bread, seafood, fast food, dried fruit and nuts, energy drinks, soft drinks without caffeine, alcoholic beverages, green tea, coffee, natural juices, cereals.	92-118	1: More than once a day 2: Once a day 3: Two or three times a week 4: Sometimes 5: Never

In the opinion of the experts who took part in the pilot study, the 45 items in block II of the FCIPAT are spread among the factors that make up the TPB (attitudes, subjective norms and perceived control), as shown in block II of Table I. The reliability of the complete questionnaire in this instance was 0.812 and that of the block II scale was 0.854. Research scale ratings between 0.65 and 0.70 are usually considered minimally acceptable; between 0.70 and 0.80 they are already respectable (De Vellis, 1991).

### *Procedure*

The questionnaires were given by the students' teachers during class time or tutorials, for which permission was requested from the City's Provincial Education Authority. Beforehand, one of the authors of the work explained the aim of the questionnaire to the trainers and asked them to take part.

### *Statistical analyses carried out*

Analysis of the possible normal distribution of the variables was performed using the Kolmogorov-Smirnov test, which showed that the variables of this questionnaire did not fit the normal distribution; it was therefore not possible to apply the parametric analysis techniques to them.

The block II scale was validated using exploratory factor analysis. To find out if the data factorised well, the Kaiser-Meyer-Olkin (KMO) measure was used along with the Bartlett test. High KMO values indicate that the factor analysis is guaranteed. In fact,  $0.80 \geq \text{KMO} \geq 0.70$  are considered acceptable by Kaiser (1974). The value obtained for this FCIPAT scale was 0.833. The Bartlett sphericity test was used to assess the null hypothesis that the variables of the correlation matrix of the population are not correlated. The scale shows a  $\text{Chi}^2$  value of 5534.361 and a significance level of 0.000. With this test, it was concluded that the force of the interrelations between items was sufficiently strong to proceed with factor analysis of the data, varimax rotation.

For in-depth study of the predictor variables for consumption of more or less recommended foods, the regression analysis technique was used. The use of categorical regression (CATREG) is especially appropriate when the aim of the analysis is to predict a dependent variable (response) on the basis of a set of independent categorical or quantitative variables (predictors). CATREG was performed several times for each dependent variable, modifying the independent variables to seek out the model that provided the highest R-squared value. This parameter has the same meaning as in linear regression analysis, so that it is a measure of the variance explained by the model.

## **Results**

First, we present results associated with the extraction of the underlying psychosocial factors of FCIPAT block II and, subsequently, those of the analysis including variables belonging to different blocks, are shown below.

### *Block II: Extraction of underlying psychosocial factors*

The exploratory factor analysis of block II provided 13 factors with eigenvalues higher than 1. The structure was explored, examining the items and magnitudes of the loadings of each item in each factor or main component. The minimum value of 0.34 was admitted to take into account that an item is important in a factor. Table 2 shows the items that have high factor loadings in each factor.

**Table 2. Questionnaire block II item factor weightings for the 13 main components of the Exploratory Factor Analysis**

	Component												
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
<b>1. I think water is fattening if taken between meals.</b>													.35
<b>2. Alcohol is an energetic nutrient that must be consumed in moderation in a balanced diet.</b>												.78	
<b>3. Hamburgers, pizzas and similar are more nourishing than home-cooked meals.</b>													.34
4. Eating blue fish protects the heart against cardiovascular diseases.							.62						
5. Breakfast is one of the basic meals that must be eaten every day.			.42				.43						
<b>6. Fruit taken after meals causes fermentation which is unhealthy and fattening.</b>													.68
<b>7. I think wine taken before meals whets the appetite and fortifies.</b>												.59	
<b>8. Children should only eat white fish.</b>							.48						
9. You should eat fish three or four times a week.			.57										
10. Appropriate eating during adolescence prevents the appearance of pathologies in adulthood.			.66										
11. You should eat fruit and vegetables every day.			.70										
<b>12. Taking natural orange juice, orange soft drinks or vitamin C-enriched sweets is the same.</b>			.36										
<b>13. I prefer sweets to sandwiches at break time.</b>					.73								
<b>14. It's better to eat what everyone else does and not stand out.</b>									.40				
<b>15. When I fail at school or get into trouble at home I feel like eating a lot.</b>				.77									
16. Being extremely thin is fashionable but does not mean good health.							.50						
<b>17. I don't eat much fruit because that's not the done thing among my friends.</b>	.45												
18. Judaism forbids eating some foods.						.78							
19. Islamism forbids eating some foods.						.75							
<b>20. Television commercials always show very thin girls/boys because that is what we should all be like.</b>	.52												
<b>21. I dislike my looks and my body image; I feel embarrassed when people look at me.</b>				.58									
<b>22. I feel as if food controls my life.</b>									.41				
<b>23. When I feel sad I feel like eating.</b>			.80										
<b>24. At home we can't afford to buy fish, fruit and vegetables.</b>	.46							.40					
<b>25. At home we always eat precooked food or a sandwich.</b>	.59												
<b>26. We hardly ever eat together at home.</b>	.54												
27. I have decided to eat better.					.38								
<b>28. I particularly avoid eating foods with a lot of carbohydrates (for example, bread, rice, potatoes, etc.).</b>	.40								.36				
<b>29. I usually always eat the same foods.</b>	.49												
<b>30. I feel uncomfortable after eating sweets.</b>	.52												
31. I've always been able to eat everything and in reasonable amounts.							.56						

	Component												
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13
32. I have almost always had easy access to a variety of fruit and vegetables.								.68					
<b>33. I prefer buying sweets to have breakfast at break time.</b>					.73								
34. I think eating foods rich in fats and sugars on a daily basis is harmful to health.		.44											
35. I think I have sufficient knowledge about the beneficial effects of a balanced diet.		.64											
36. I know how to tell foods rich in fats, sugars and salt from foods that aren't.		.66											
37. I usually taken into account the energy intake from foods and that used up by physical exertion.		.68											
<b>38. Strict vegetarianism is a healthy way to lose weight.</b>									.76				
<b>39. I know if I was overweight I'd be ashamed to ask for help and I'd keep it a secret.</b>												.50	
<b>40. I hardly ever see my parents eat fruit or vegetables.</b>												.52	
<b>41. My mother is always on some kind of health kick or diet.</b>	.39												
<b>42. My dad love to watch TV eating peanuts and drinking coca cola.</b>	.47												.65
43. To achieve a balanced diet I usually follow the pyramid indications.		.49											
<b>44. I eat when I see other people eating.</b>										.56			
<b>45. When I see food adverts on TV or in magazines I start to feel peckish.</b>										.71			

Note: Items in bold are negative statements, so strong agreement should be given a score of 1 while strong disagreement scores 5. For the rest, strong agreement should have a score of 5 and strong disagreement scores 1.

To interpret the character of each factor, it is necessary to analyse the factor content of items and their loadings. So, for example, factor 12 is originated by the similar response patterns that provide item 2 (*Alcohol is an energetic nutrient that should be consumed in moderation in a balanced diet*) and item 7 (*I believe that wine before meals whets the appetite and gives strength*). Thus, factor 12 is identified with beliefs and myths about alcohol and its consequences on health. Table 3 shows the identifications of the remaining factors and their situation in the TPB.

**Table 3. Identification of factors and their position in TPB**

ATTITUDES		
Awareness of a healthy diet	F3	5, 9, 10, 11, 12
Interest in diet	F2	34, 35, 36, 37, 43
Beliefs about alcohol and how it affects health	F12	2, 7
Myths about other foods and their consequences for health	F13	1, 3, 6
Evaluation of consequences of eating on health	F7	4, 5, 8, 16
Knowledge of religious conditioning factors	F6	18, 19
SUBJECTIVE NORMS		
Perceptions about social approval	F1	17, 20, 24, 25, 26, 28, 29, 30, 40, 41
Perceptions about family approval	F11	39, 40, 42
PERCEIVED CONTROL		
Internal or subjective factors		
- Self-control of sadness-food association	F4	15, 21, 23
- Self-control of seeing others eating	F10	44, 45
- Self-control towards foods	F9	14, 22, 28, 38
- Self-control towards sweets and candies	F5	13, 27, 33
External factors		
- Accessibility/no barriers	F8	24(-), 31, 32

The location of items in Table III (post hoc) coincides to a great extent with what the experts had done in the pilot study and which is reproduced in Table I (pre hoc). Only items 13, 14, 16, 24, 27, 29, 33 and 38 changed position. So, for example, item 14 in the pre hoc distribution is among the subjective norms and in post hoc it is in the perceived control. The agreement in 37 of the 45 items on the questionnaire is a proof confirming the validity of the content.

The SPSS was asked to provide the array of the components rotated in the analysis and save as new variables the factor scores (FS) of the subjects obtained by the Bartlett method. These factor scores represent the values taken by each subject in each component or factor extracted. They will be important in a later analysis to identify the most influential factors in food consumption.

#### *Multi-variate associated analyses with variables from the three questionnaire blocks*

This section is intended to show the relations existing between the variables identified in the three blocks of the questionnaire. It includes Analysis of correlations and Categorical regression analysis. The following variables are considered:

- In block I, demographic and preferential variables
- In block II, the factor scores (FS) of the students obtained after the varimax factor analysis by Bartlett method.
- In block III, the variables associated with food consumption frequencies.

*A) Analysis of correlations*

*Consumption and Preferences:* the variables associated with the food consumption frequencies correlate to 99% reliability with the respective preferential variables. The Spearman correlation coefficients are variable ( $.20 < r < .60$ ) and greater when referring to more recommendable foods than when dealing with those less recommended. So, for example, an  $r = .53$  ( $p < .001$ ) was obtained for vegetables, whereas for fast food it was  $r = .23$  ( $p < .001$ ).

*Consumption and Demographic Variables:* the study of the Spearman correlations between food consumption and the personal, family and dietary preference variables showed a complex picture in which, given the interests of this work, we emphasise the following results:

- Fruit consumption presents a positive correlation with the father studies ( $r = .20$ ,  $p < .001$ ) and a lower but still significant correlation with the mother studies ( $r = .10$ ,  $p < .05$ ). A similar pattern arises for vegetable consumption, where in addition there is a positive correlation with the frequency of having breakfast ( $r = .22$ ,  $p < .001$ ). These results suggest that consumption of the most recommended foods is greater the higher the family's socioeconomic status.
- As for sweet consumption, a positive correlation with the frequency of eating between meals or grazing was obtained ( $r = .21$ ,  $p < .001$ ). A similar correlation came up for fast food consumption, although a significant correlation with lifestyle was also obtained for this variable ( $r = .16$ ,  $p < .05$ ). These results are discussed in greater depth after the regression analysis that comes next.

*Consumption and FS:* Finally, we shall discuss the correlations between food consumption and the factor scores in the thirteen subscales in block II. In view of their importance in this study, they are shown in Table 4.



**Table 4. Non-parametric correlations between food consumption frequencies and factor scores in the block II subscales.**

	Natural juices	Fruit	Alcoholic beverages	Milk	Yogurt	Pork products	Cereals	Vegetables	Potatoes	White fish	Blue fish	Beef	Cheese	Chicken	Nuts	Seafood	Bread	Legumes	Sweets	Butter/margarine	Pasta	Eggs	Fast Food	Green tea	Coffee	Energy drinks
Factor 1			-.084(*)														.116(**)									-.089(*)
Factor 2												-.087(*)					-.157(**)		-.161(**)	-.090(*)				-.103(*)		-.088(*)
Factor 3		.096(*)		.123(**)				.138(**)																-.106(*)		-.102(*)
Factor 4																										
Factor 5	.101(*)	.086(*)			.093(*)		.101(*)	.126(**)			.088(*)							.102(*)								-.109(**)
Factor 6						-.109(**)																				
Factor 7																										
Factor 8	.184(**)	.241(**)			.113(**)	-.105(*)	.130(**)	.248(**)	.133(**)	.155(**)	.209(**)	.110(**)	.085(*)		.181(**)	.187(**)		.185(**)		.089(*)		.100(*)		.196(**)	.153(**)	
Factor 9						.179(**)																		-.173(**)		
Factor 10																	-.092(*)		-.182(**)	-.132(**)			-.124(**)	-.128(**)	-.088(*)	-.155(**)
Factor 11			-.116(**)														.082(*)		-.105(*)				-.084(*)		-.106(*)	
Factor 12	.121(**)	.145(**)	-.116(**)	.112(**)	.121(**)	-.141(**)		.121(**)									.104(*)							.100(*)		
Factor 13																										.082(*)

(\*) Significance level: 95%. (\*\*) Significance level: 99%

Points to note in the Table IV are as follows:

- Consumption rates of the most recommendable foods (juices, fruits, yoghurt, vegetables, blue fish, pulses, etc.) are systematically correlated with the factor scores of subscales 5 and 8. Both are factors that have been identified with perceived control, the former associated with self-control towards sweets and candies, and the latter with accessibility. In addition to this, fruit and vegetable consumption appears to be correlated with factors F3 and F12. The correlation with F3 could have been anticipated, since this factor represents knowledge about healthy diet. However, in the case of F12, it is harder to imagine that knowledge of the effects of alcohol could be correlated with the consumption of fruits and vegetables.
- Consumption of the least recommendable foods (specifically sweets and fast food) is negatively correlated with factors F2 and F10. F2 represents interest in diet. F10 is a subjective factor related with self-control when seeing other people eat.

*B) Categorical regression analysis*

Table 5 summarises the results of the best CATREG models found to explain the consumption of the foods that most determine eating behaviour: juices, fruits, vegetables, fast food and sweets.

**Table 5.  $\beta$  coefficients of the most optimised CATREG models**

	Dependent variable				
	Juice Consumption	Fruit Consumption	Vegetable Consumption	Fast Food Consumption	Sweet Consumption
<b>R-squared</b>	<b>0.23</b>	<b>0.22</b>	<b>0.40</b>	<b>0.18</b>	<b>0.20</b>
Juice Preferences	0.36				
Afternoon Snack	0.34				
PF8	0.20				
PF12	0.18				
PF5	0.11				
Fruit Preferences		0.32			
Parentstudy		0.13			
PF8		0.24			
PF12		0.12			
PF3		0.08			
PF5		0.06			
Vegetables Preferences			0.53		
Breakfast			0.07		
PF8			0.16		
PF12			0.10		
PF3			0.08		
PF5			0.06		

Fast Food Preferences	0.23
Lifestyle	0.17
PF2	-0.18
PF10	-0.16
PF11	-0.09
Sweets Preferences	0.23
Between meals	0.15
PF2	-0.17
PF10	-0.12
PF11	-0.12

Points to note in Table V are:

- The most influential variables on all the food groups are their preferences for the same.
- The psychosocial variables most influential on food consumptions are, in most cases, those that best correlate with the respective dependent variables (see Table IV). Specifically, the predictor variables of juices, fruits and vegetables consumption are the scores in factors 8, 12, 3 and 5; the predictor variables for consumption of sweets and fast food are the scores in factors 2 and 10.
- As for the demographic variables and nutritional habits, the results show that the *afternoon snack* habit is a predictor of juices consumption; the *father's academic level* predicts fruit consumption; *breakfast habit* is a predictor of vegetable consumption; *eating between meals* is a predictor of sweet consumption and *lifestyle* of fast food consumption. So, unlike the psychosocial variables, the personal factors have a particular influence on the consumption frequencies of certain foods.

The formula expressing the dependency of the dependent variable is a linear combination of the independent variables. The coefficients of this linear combination are coefficients typified as  $\beta$ , so that, for example, for vegetable consumption, it may be established that:

$$\text{Vegetables Consumption} = 0,534 \text{ Vegetables Preferences} + 0,070 \text{ Breakfast Habit} + 0,159 \text{ PFactor 8} + 0,095 \text{ PFactor 12} + 0,075 \text{ PFactor 3} + 0,061 \text{ PFactor 5}$$

And, similarly, for sweet consumption:

$$\text{Sweets/Candy Consumption} = 0,231 \text{ Sweets/Candy Preferences} + 0,146 \text{ Eating between meals} - 0,169 \text{ PFactor 2} - 0,123 \text{ PFactor 10} - 0,120 \text{ PFactor 11}$$

So, this research appears to show that the factors influencing eating habits are different depending on what types of foods they are, in such a way that factors 8 and 12 have the greatest impact on consumption of the most recommendable foods, while factors 2 and 10 have most influence on the least recommended. However, the influence of personal, family and dietary habit variables is specific to each group of foods. For example, whereas breakfast frequency is important in terms of vegetables consumption, grazing or eating between meals affects consumption of sweets.

## Discussion and conclusions

The issue approached in this work is the identification of influential factors in food consumption in order to determine specific areas of educational intervention and actions to be taken to improve the food-related beliefs and behaviour of the students. The FCIPAT questionnaire was found to be useful for this purpose, as its design included most of the variables that were shown to be influential in previous studies. Nevertheless, the post hoc categorical regression analysis indicated that the consumption frequencies of each food group depend on quite a limited number of variables.

Specifically, it was found that accessibility and beliefs on the dangers of alcohol are, along with a specific form of self-control, the most significant predictors of consumption frequency of recommended foods, such as juices, fruit and vegetables. However, interest in diet and self-control are the best predictors of the least recommended foods (fast foods, sweets, charcuterie, etc.). These results coincide to a great extent with those reported in other studies held in very different contexts (Gerrits *et al.*, 2010) in terms of the influence of self-control and interest in diet on the consumption of foods rich in fats, as well as the influence of the family's economic situation (which in this work could be related with accessibility) and self-control on the consumption of fruit and vegetables. However, in this study it was also found that beliefs about alcohol can also be predictors of the consumption of recommended foods.

Unlike the psychosocial factors jointly affecting the food groups most and least recommended, the personal variables do so selectively on each type of food, so that, for example, lifestyle is only a predictor variable of fast food consumption.

It should be noted that, in contrast to other studies carried out in varied multicultural contexts (Ramón, 2010), in this work the Religion variable was not found to be a predictor of any specific food-related behaviour. It is highly likely that this result is the consequence of less marginal integration typologies than in other contexts. Indeed, in the student sample, the percentage of both groups, Berber and European, was well distributed between public and private/state-assisted schools. In a globalised society like the present, it is quite possible that consumption habits become homogenised and cultural nutritional differences are masked.

One limitation that should be pointed out is that, as shown in the third row of Table V, the average quadratic regression coefficients of the models reached are not very high, with the exception of vegetable consumption, which was already evidenced in earlier reviews (Baranowski *et al.*, 1999). However, in this work the target was achieved because it was possible to isolate the influential factors, and, most of all, discriminate between those that influence the consumption frequency of the most and least recommended foods, respectively. These factors could be effective mediators in educational interventions designed to promote healthy dietary changes.

An educational intervention to improve the food intake of teenagers which places special emphasis on these predictive factors is currently on trial. Thus, the analysis of the fruits and vegetables most available in each season of the year, the impact of alcohol on health, the harmful effects of a fat-rich diet and the exercise of self-control skills are, along with the most up-to-date dietary recommendations, some of the most high-priority contents in this educational intervention designed to improve adolescent eating.

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## References

- Ajzen, I. (1988). *Attitudes, personality, and behavior*. Milton Keynes: Open University Press.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Aranceta, J., Pérez-Rodrigo, C., Ribas, L. & Serra-Majem, L.L. (2003). Sociodemographic and lifestyle determinants of food patterns in Spanish children and adolescents: the enKid study. *European Journal of Clinical Nutrition*, 57, supl 1, s40–s44.
- Baranowski, T., Cullen, K.W. & Baranowski, J. (1999). Psychosocial Correlates of Dietary Intake. Advancing Dietary Intervention. *Annual Review of Nutrition*, 19, 17–40.
- Bay, L., Herscovici, C. R. & Kovalsky, I. (2005). Alteraciones alimentarias en niños y adolescentes argentinos que concurren al consultorio del pediatra. *Eating Disorders*, 13(5), 467-478.
- Benarroch, A., Cabo, J.M., Pérez Vadillo, S., Ferrero, M.T., López, C.G. & Arzola de la Rosa, L. (2010). Una investigación sobre la alimentación en adolescentes melillenses desde una perspectiva multicultural. En Lola Álvarez, René Rickenmann & Joan Vallés (eds.) *La actividad del docente: Intervención, Innovación, Investigación*. [available from <http://www.udg.edu/portals/3/didactiques2010/guiacdII/index.html>]
- Birch, L.L. (1999). Development of food preferences. *Annual Review of Nutrition*, 19, 41-62.
- Cooke, L. & Wardle, J. (2005). Age and gender differences in children's food preferences. *British Journal of Nutrition*, 93 (5), 741-746.
- Cullen, K.W., Watson, K. & Zakeri, I. (2008). Relative reliability and validity of the Block Kids Questionnaire among youth aged 10 to 17 years. *Journal of the American Dietetic Association*, 108 (5), 862-866.
- De Vellis, R.F. (1991). *Scale Development Theory and Applications*. Applied Social Research Methods Series, v. 26. Newbury Park, C.A: Sage.

- De la Fuente, J., Peralta, F. & Sánchez Roda, M.D. (2006). Valores socioperosonales y problemas de convivencia en la Educación Secundaria. *Electronical Journal of Research in Educational Psychology*, 4(2), 171-200
- Dehghan, M., Al Hamad, N., Yusufali, A., Nusrath, F., Yusuf, S. & Merchant, A. (2005). Development of a semi-quantitative food frequency questionnaire for use in United Arab Emirates and Kuwait based on local foods. *Nutrition Journal*, 27(4), 18. [available from <http://www.nutritionj.com/content/4/1/18>]
- Fleming, M. (2005). Género y autonomía en la Adolescencia: las diferencias entre chicos y chicas aumentan a los 16 años. *Electronical Journal of Research in Educational Psychology*, 3(2), 33-52.
- Gerrits, J.H., O'Hara, R.E., Piko, B.F., Gibbons, F.X., de Ridder, D.T.D., Keresztes, N., Kampe, S.V. & de Wit, B.F. (2010). Self-control, diet concerns and eater prototypes influence fatty foods consumption of adolescents in three countries. *Health Education Research*, 25 (6), 1031-1041.
- González, E. & Merino, B. (Coords) (2000). *Guía de Nutrición Saludable y Prevención de los Trastornos Alimentarios*. Madrid: MISC-MEC.  
[[http://www.msc.es/ciudadanos/proteccionSalud/docs/guia\\_nutricion\\_saludable.pdf](http://www.msc.es/ciudadanos/proteccionSalud/docs/guia_nutricion_saludable.pdf)].
- Guirado, M.C. & Ballester, R. (2005). Relación entre conductas alimentarias anómalas y otros hábitos de salud en niños de 11 a 14 años. *Anales de psicología*, 21 (1), 58-65. Murcia: Serv.Publ.Univ.
- Kaiser, H.F. (1974). An index of factorial simplicity. *Psychometrika*, 39, 31-36.
- Larson, N., Story, M., Eisenberg, M. & Neumark-Sztainer, D. (2006). Food preparation and purchasing roles among adolescents: Associations with sociodemographic characteristics and diet quality. *Journal of the American Dietetic Association*, 106 (2), 211-218.
- MacFarlane, A., Crawford, D., Ball, K., Savige, G. & Worsley A. (2007). Adolescent home food environments and socioeconomic position. *Asia Pacific Journal of Clinical Nutrition*, 16, 748-56.
- Martín-Gordillo, M. (2005). Cultura científica y participación ciudadana: materiales para la educación CTS. *Revista Iberoamericana de Ciencia, Tecnología y Sociedad*, 6(2), 123-135.

- Podar, I. & Allik, J. (2009). A cross-cultural comparison of the eating disorder inventory. *Internacional Journal of Eating Disorders*, 42, 346-355.
- Raats, M.M., Shepherd, R. & Sparks, P. (1995). Including moral dimensions of choice within the structure of the Theory of Planned Behavior. *Journal of Applied Social Psychology*, 25, 484-94.
- Race, E. & La Greca, A.M. (2008). Does This Make Me Look Fat? Peer Crowd and Peer Contributions to Adolescent Girls' Weight Control Behaviors. *Journal of Youth Adolescence*, 37, 1097-1110.
- Ramón Jarnes, F.J. (2010). La imagen corporal y conducta alimentaria en una muestra de adolescentes de distintas culturas de Ceuta. Tesis doctoral de la Universidad de Granada. [<http://hera.ugr.es/tesisugr/18935801.pdf>].
- Ramos, M., Levin, L., Aduriz-Bravo, A. & Meinardi, E. (2007). Estudio de problemas alimentarios de origen social. *Alambique. Didáctica de las Ciencias Experimentales*, 51, 114-121.
- Riediger, N. D., Shoostari, S. & Moghadasian, M.H. (2007). The influence of sociodemographic factors on patterns of fruit and vegetable consumption in Canadian adolescents. *Journal of the American Dietetic Association*, 107 (9), 1511-1518.
- Rockett, H., Breitenbach, M. A., Frazier, L., Witschi, J., Wolf, A.M., Field, A. & Colditz, G.A (1997). Validation of a Youth/Adolescent Food Frequency Questionnaire. *Preventive Medicine*, 26 (6), 808-816.
- Schneider, D. (2000). International trends in adolescent nutrition. *Social Science & Medicin*, 51, 955-967.
- Southon, S., Wright, J.A., Finglas, P.M., Bailey, A.H., Loughridge, J.M. & Walker, A.D. (1994), Dietary intake and micronutrient status of adolescents: effect of vitamin and trace element supplementation on indices of status and performance of verbal and nonverbal intelligence. *British Journal of Nutrition*, 71, 897-987.
- Stang J, Story M. (eds.) (2005). *Guidelines for adolescent nutrition services*. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology and Community Health, School of Public Health, University of Minnesota. Disponible en [http://www.epi.umn.edu/let/pubs/adol\\_book.htm](http://www.epi.umn.edu/let/pubs/adol_book.htm)



- Tuorila H. (1987). Selection of milks with varying fat contents and related overall liking, attitudes, norms and intentions. *Appetite*, 8, 1–14.
- Vereecken, C., Todd, J., Roberts, C., Mulvihill, C. & Maes, L. (2006). Television viewing behaviour and associations with food habits in different countries. *Public Health Nutrition*, 9, 244-250.

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