CSP CADERNOS DE SAÚDE PÚBLICA
REPORTS IN PUBLIC HEALTH

ARTIGO
ARTICLE

Food neophobia, life satisfaction and family eating habits in university students

Neofobia alimentaria, satisfacción con la vida y hábitos alimentarios familiares entre estudiantes universitarios

Neofobia alimentar, satisfação com a vida e hábitos alimentares familiares entre estudantes universitários

Berta Schnettler [1]
Yesli Höger [1]
Ligia Orellana [1]
Horacio Miranda [1]
Germán Lobos [2]
José Sepúlveda [1]
Mercedes Sanchez [3]
Edgardo Miranda-Zapata [1]
Marianela Denegri [1]
Klaus G. Grunert [4]
Natalia Salinas-Oñate [1]

doi: 10.1590/0102-311X00165615

Abstract

The aim of this study was to categorize university students based on their association between food neophobia and levels of subjective well-being, in general and in the food domain, and their perception of their family's eating habits. A survey was conducted among 372 university students from southern Chile. The questionnaire included the Food Neophobia Scale *(FNS),* Satisfaction with Life Scale *(SWLS),* Satisfaction with Food-related Life *(SWFL),* Health-related Quality of Life Index *(HRQOL-4), and* Family Eating Habits Questionnaire *(FEHQ). Three student types were distinguished by cluster analysis: Group 1 (26.9%) had the highest scores on the FNS, SWLS and SWFL. Group 2 (40.8%) had a high score on the FNS but the lowest scores on the SWLS and SWFL. Group 3 (32.3%) had the lowest FNS score and high scores on the SWLS and SWFL. Group 2 stood out in having a low score on the FEHQ's component for cohesiveness of family eating. These results suggest that both neophobic and non-neophobic students have positive levels of satisfaction with life and food-related life, and that satisfaction among neophobic students is related to family eating patterns, especially cohesiveness in family eating.*

Food Habits; Quality of Life; Students

Correspondence
B. Schnettler
Universidad de La Frontera.
Avenida Francisco Salazar 01145, Temuco, Región de La Araucanía - Casilla 54-D, Chile.
berta.schnettler@ufrontera.cl

[1] Universidad de La Frontera, Temuco, Chile.
[2] Universidad de Talca, Talca, Chile.
[3] Universidad Pública de Navarra, Navarra, España.
[4] Aarhus University, Aarhus, Denmark.

Food neophobia is the avoidance of, or reluctance to eat, new foods. It appears in all age groups and its severity varies between individuals [1], with some showing great pleasure in eating new foods and others showing a strong aversion to them [2]. Food neophobia is generally characterized as a personality trait, a continuum in terms of the person's tendency to accept or avoid new foods [1].

Some studies show different levels of food neophobia among consumers from different countries, with examples including: in adults from Sweden, the USA and Finland [2]; Belgians and Hispanic immigrants in Belgium [3]; undergraduate students from Lebanon and the US [4]; and Asian and European postgraduate students [5].

The interest to study food neophobia in emergent adults, such as university students, has increased in recent years. Understanding food neophobia in this population is especially relevant given that their eating habits are usually characterized as unhealthy, due to excessive consumption of fatty foods, sugars and salt, and insufficient consumption of fruit, vegetables and fiber [6]. Among young adults, it has been found that food neophobia correlates negatively with variety-seeking [7], with consumption frequency of fruits and vegetables [8] and some socio-demographic characteristics [9].

There is an expanding interest beyond the implication of neophobia on dietary behaviors, to include well-being, and particularly food-related well-being [10,11,12,13]. Ares et al. [10] found that food-related well-being is linked to physical health, body functioning, intellectual capacity, positive emotions and social contact and relationships. Higher levels of life satisfaction and satisfaction with food-related life are related not only to general health, via a healthy diet, but also to better mental health [12,13]. Food appears to be one of the important domains of life that affect life satisfaction [11,12,13], thus suggesting that satisfaction with food-related life is positively related to overall life satisfaction.

Schnettler et al. [14] categorized types of Chilean adults based on their food neophobia and satisfaction with life and with food-related life. The composition of these types suggested that food neophobia correlated inversely and significantly with life satisfaction and satisfaction with food-related life. We would expect to find similar profiles in a sample of Chilean university students. A possible explanation for these results is that food induces emotional responses, and when these entail negative emotions, like disgust [15], overall and food-related subjective well-being tend to decrease.

Factors affecting food choice are many, both innate and learned, but imitation of parents and peers, and parental education practices [16] are involved. Although neophobia is highly heritable, it may also be a result of the environment in which individuals grow up [8]. With repeated exposure, children can learn to prefer and consume, or dislike and reject foods, depending on the social contexts in which the foods are eaten and the physiological consequences of their consumption [16]. The family influence on food choices may continue beyond adolescence: a study of German university students found that those living with their family tended to eat more healthily than those living independently [17]. Therefore, family eating practices may have an impact on food choices, eating behavior and consequently food-related well-being among university students.

Against this background, the aim of this study is to distinguish types of university students according to their satisfaction with life, satisfaction with their food-related life and food neophobia, and describe these types based on the perception of their family's eating habits, some health-related aspects and socio-demographic characteristics.

Data and methods

Design, sampling and participants

The study used a non-probabilistic sample comprising 372 university students belonging to the six faculties of the Universidad de La Frontera, in Temuco, Chile. The inclusion criterion in the sample was being a student enrolled at this institution at the time of the survey.

Procedure

Students were contacted on campus and once they voluntarily agreed to participate, they signed an informed consent prior to application of the survey. A trained surveyor administered the question-

naires in October and November 2014, and the anonymity of the respondents was ensured. The questionnaire was validated by a preliminary test with 10% of the survey sample, following the same method of addressing the participants as in the definitive survey. As the validation of the instrument was satisfactory, no changes were required in either the questionnaire or the interview procedure. The Ethics Committee of the Universidad de La Frontera approved the study.

Measures

- **The questionnaire included the following scales**

The *Food Neophobia Scale* (FNS [18]) is composed of ten items: (1) "I am constantly sampling new and different foods"; (2) "I don't trust new foods"; (3) "If I don't know what a food is, I won't try it"; (4) "I like foods from different cultures"; (5) "Ethnic food looks too weird to eat"; (6) "At dinner parties, I will try new foods"; (7) "I am afraid to eat things I have never had before"; (8) "I am very particular about the foods I eat"; (9) "I will eat almost anything"; (10) "I like to try new ethnic restaurants". Respondents had to indicate their degree of agreement with the ten items on the FNS using a 6-level Likert scale (1 = disagree completely to 6 = agree completely). Given that the psychometric properties of the FNS had not previously been studied in university students in South America, an exploratory factor analysis (EFA) was conducted, followed by a confirmatory factor analysis (CFA). The EFA was implemented using SPSS 16.0 (SPSS Inc., Chicago, USA) and the CFA using LISREL 8.8 (Linear Structural Relationships. Jöreskog K, Sörbom D. Scientific Software International, Lincolnwood, USA). The parameters in the CFA were estimated by robust maximum likelihood [19]. The results of the EFA revealed one factor that grouped six of the ten original items (65.3% explained variance), consistent with Ritchey et al. [2]. Items 2, 3, 8 and 9 were eliminated because they presented communality values below 0.4. For the six remaining items, the FNS presented an acceptable level of internal consistency (Cronbach's α = 0.738). The CFA performed with the six items of the FNS showed that the one-dimensional structure of the FNS could be validated in university students with an acceptable goodness-of-fit (RMSEA = 0.079, GFI = 0.99, AGFI = 0.94) and statistically significant factor loadings for the six items (higher than 0.63). This confirms the results obtained by Schnettler et al. [14] in a study with Chilean adults. A food neophobia index, with a potential 6-36 range, was obtained by adding the individual item scores, after the positive items were reversed [20]. In the present study the mean FNS score of all participants was 17.3 (SD = 5.1; range = 6-33). In order to classify the types into neophobics and non-neophobics, the mean was used as the cut-off point for the FNS; therefore, those with a score equal to or higher than the mean were considered to be neophobic, and those with lower scores were considered to be non-neophobic.

The *Satisfaction with Life Scale* (SWLS [21]) and the *Satisfaction with Food-related Life* (SWFL [11]) scale. The SWLS is a five-item scale to evaluate overall cognitive judgments about a person's own life. The SWLS consist of five items grouped into a single factor: "In most ways my life is close to my ideal"; "The conditions of my life are excellent"; "I am satisfied with my life"; "So far I have gotten the important things I want in life"; "If I could live my life over, I would change almost nothing". The SWFL is a similar scale that evaluates cognitive judgements on the person's food-related life. The five items from the SWFL are: "Food and meals are positive elements"; "I am generally pleased with my food"; "My life in relation to food and meals is close to ideal"; "With regard to food, the conditions of my life are excellent"; "Food and meals give me satisfaction in daily life". In each scale the respondents were asked to indicate their degree of agreement with the statements using a 6-level Likert scale (1 = disagree completely to 6 = agree completely). Both scales presented adequate levels of internal consistency (Cronbach's α: 0.829, 0.868, respectively) and the existence of a single factor for all the items (explained variance: 65.7 and 62.3%, respectively). SWLS and SWFL scores are the sum of the five items of each scale. Higher scores indicate greater satisfaction with life or with food-related life, respectively. In order to classify the types according to the participants' satisfaction with life and with food-related life the following ranges were used: 5-10 = extremely unsatisfied; 11-15 = unsatisfied; 16-20 = moderately satisfied; 21-25 = satisfied; 26-30 = extremely satisfied. The mean SWLS score of all participants was 22.6 (SD = 4.4, range = 6-30). The mean SWFL score of all participants was 21.2 (SD = 5.1, range = 5-30).

The *Health-related Quality of Life Index* (HRQOL-4 [22]) consists of four items that explore the self-perception of health, recent physical health, recent mental health, and recent limitations on activity.

The *Family Eating Questionnaire* (FEHQ [23]) consists of 14 items to assess how individuals perceive their family's eating habits: (1) "My family eats large meals"; (2) "Meals are an important part of my family life"; (3) "In my family, members are encouraged to have second helpings at meals"; (4) "Healthy meals are prepared in my family"; (5) "Eating together is the most important part of our holidays and celebrations"; (6) "If I am eating less than usual, family members become concerned"; (7) "Eating is an important part of my family life"; (8) "In my family, large portions of food are served"; (9) "Family members pressure me to eat even if I am not hungry"; (10) "My family takes a long time to finish a meal together"; (11) "My family members suggest eating when I seem stressed out or upset"; (12) "All of my family members eat together on a regular basis; (13) "Healthy eating is encouraged in my family"; (14) "My family members try to eat together whenever possible". Respondents were asked to score each item on a five-level Likert scale with the options from "Never" to "Always". Using principal components analysis (PCA), Klempel et al. [23] identified four components with 72% of the total variance of the scoring responses. In this study, using PCA, three components were detected that grouped 10 of the 14 original items, with an explained variance of 65.6%: "Importance of Eating to Family Members" (items 1, 3 and 8; Cronbach's $\alpha = 0.821$), "Cohesiveness of Family Eating" (items 2, 5, 7 and 12; Cronbach's $\alpha = 0.767$) and "Pressure to eat" (items 6, 9, and 11; Cronbach's $\alpha = 0.733$). The value of the KMO sample adequacy test is considered good (0.806), and Bartlett's test of sphericity was significant ($p \leq 0.001$).

Spanish-language versions of the FNS, SWLS, SWFL and HRQOL-4 were used in this study. These scales showed good levels of internal reliability in studies in Chile [13,14,24]. Two bilingual translators translated all the original items of the FEHQ from English to Spanish. Subsequently a third bilingual translator back-translated the Spanish version of the scale into English. The differences found were resolved by discussion, with all the translators arriving at agreed final versions of the scale.

Classification questions were included to establish gender, age, area of residence, ethnic origin, place of residence during the semester, and the education level and occupation of the head of the household. The combination of the education level and occupation of the head of the household in a matrix allows the socioeconomic status to be determined [25], categorized as high, upper middle, mid-middle, lower middle, low, and very low.

Statistical analyses

A cluster analysis (hierarchical conglomerates) was used to determine typologies of university students according to their satisfaction with life, satisfaction with food-related life and food neophobia, with linkage by Ward's method and the squared Euclidian distance as the measure of similarity between objects [19]. The number of groups was obtained by the percentage change of the recomposed conglomeration coefficients. To find differences between the typologies, the Crosstab procedure and Pearson's χ^2 test were applied to the discrete variables ($p \leq 0.05$). The adjusted standardized residuals were used to distinguish and describe differences between groups. An adjusted residual greater than 1.96 (2.0 is used by convention) indicates that the number of cases in that cell is significantly larger than would be expected if the null hypothesis were true. An adjusted residual less than -2.0 indicates that the number of cases in that cell is significantly smaller than would be expected if the null hypothesis were true [19]. To distinguish differences between the typologies for the continuous variables, an analysis of variance was carried out. The continuous variables in which the Levene's statistic indicated homogeneous variances and for which the analysis of variance resulted in significant differences were subjected to Tukey's multiple comparisons test. The continuous variables in which the Levene's statistic indicated non-homogeneous variances and for which the analysis of variance resulted in significant differences were subjected to Dunnett's T3 Multiple Comparisons test. These results were analyzed using the SPSS v. 16.0 software for Windows in Spanish.

Results

The mean age of the sample was 20.4 years, 56.5% were women and 90.3% resided in an urban area. 65.2% of the sample reported Chilean origin and the remainder reported Mapuche origin, the largest indigenous group in Chile. The sample was mainly comprised of students living with their parents all year round (35.5%) or living with their parents on weekends or for vacations (38.7%). Most students belonged to families, the head of which had secondary school (39.2%) and university studies (40.8%). 32.5% of the sample belonged to the mid-middle SES and 35.5% to the lower-middle (Table 1).

According to the first question from the HRQOL-4, most students perceived their health as good (39.2%) or very good (33.1%). The average number of days with physical health-related problems in the last month was 3.9 (SD = 7.1); the average with emotional or mental health problems was 6.6 days (SD = 7.9); and the average number of days in which the students could not carry out their usual activities due to health problems was 2.6 (SD = 6.4).

Table 2 shows the Pearson's correlation coefficients between the FNS, SWLS, SWFL and the factors of the FEHQ. In line with previous studies [11,12,13,14], the SWLS and SWFL scores correlated directly and significantly. The FNS scores correlated directly and significantly with the z-score of the "Pressure to eat" component of the FEHQ, which suggests that members of the family group are probably pressuring the neophobic to eat when they are reluctant to try new foods. The z-score of the "Cohesiveness of family eating habits" factor of the FEHQ correlated directly and significantly with the scores of the SWLS and SWFL. These results underscore the existence of a relation between life satisfaction, satisfaction with food-related life, and perceived family eating habits in university students. Finally, the z-scores of the "Pressure to eat" component of the FEHQ correlated inversely and significantly with the SWLS score, but the correlation was not significant with the SWFL score.

Cluster analysis resulted in three types of university students with significant differences in the average values of the FNS, SWLS and SWFL scales ($p \leq 0.001$), the average number of days with mental health problems ($p \leq 0.05$) (Table 3), and in the FEHQ's component "Cohesiveness of family eating" score (Table 4). The types also differed in terms of health self-perception and ethnic background ($p \leq 0.001$) (Table 5). There were no significant differences for the other items of the HRQOL, the other components of the FEHQ. In addition, there were no significant differences in terms of gender, age, zone of residence, place of residence during study period, educational level of the head of the household nor socioeconomic status (Table 1). Each type is discussed in detail below.

Neophobics satisfied with their life and their food-related life

Group 1 (n = 100), which represented 26.9% of the sample surveyed, presented the highest score on the FNS, although it did not differ statistically from Group 2. The scores obtained on the SWLS and SWFL were similar to Group 3 and significantly higher than Group 2. This group registered the lowest number of days affected by mental health problems although it did not differ statistically from Group 3 (Table 3). Based on the adjusted standardized residuals analysis, Group 1 contained a greater proportion of students who perceived their health as very good (49%), and of non-Mapuche origin (92%) (Table 5).

Neophobics moderately satisfied with their life and their food-related life

Group 2, which represented 40.8% of the sample surveyed (n = 152), had a score on the FNS that was statistically similar to Group 1. This group presented the lowest scores on the SWLS and SWFL, significantly lower than the rest of the types. Group 2 registered the highest number of days affected by mental health problems, significantly higher than the rest of the types (Table 3). This group had the significantly lowest score on the FEHQ's component "Cohesiveness of family eating" (Table 4). Based on the adjusted standardized residuals analysis, Group 2 contained a significant proportion of students who perceived their health was fair (25%), and who reported Mapuche origin (19.7%) (Table 5).

Table 1

Socio-demographic characteristics of a university student sample in Chile. November 2014 (n = 372).

Characteristics	Total	Group 1 (n = 100)	Group 2 (n = 152)	Group 3 (n = 120)
Gender (%)				
Female	56.5	57.0	56.6	55.8
Male	43.5	43.0	43.4	44.2
Mean age (SD)	20.4 (2.4)	20.2 (0.21)	20.5 (0.22)	20.5 (0.21)
Zone of residence (%)				
Urban	90.3	91.0	90.7	89.2
Rural	9.7	9.0	9.3	10.8
Ethnic origin (%)				
Non-Mapuche (Chilean)	65.2	92.0	80.3	85.8
Mapuche	14.8	8.0	19.7	14.2
Place of residence during study period (%)				
With parents the entire year	35.5	36.0	36.2	41.7
With parents the entire year although he/she travels for the day to attend class	16.1	17.0	19.1	11.7
With their parents only on weekends or for vacations	38.7	40.0	33.6	36.7
Independent of parents	9.7	7.0	11.2	10.0
Education level of the head of household (%)				
Elementary	14.2	15.0	16.1	15.5
Secondary	39.2	38.0	41.4	37.5
University	40.8	42.0	35.9	40.3
Postgraduate	5.7	5.0	6.6	6.7
Socioeconomic level (%)				
High and upper-middle *	14.8	15.0	12.5	15.5
Mid-middle **	32.5	32.0	30.6	39.2
Lower-middle ***	35.0	29.0	30.0	24.2
Low #	22.8	18.0	21.6	15.8
Very low ##	4.8	6.0	5.3	5.3

SD: standard deviation.

* High and upper-middle represents 7.2% of the population. The household head's education averages 16.2 years, which typically means completed university studies. Monthly incomes in high and upper-middle homes range from between USD 3,500 and USD 7,200 or more;

** Mid-middle represents 15.4% of the Chilean population. The household head's education averages 14 years, which typically means completed technical studies or incomplete university studies. Monthly incomes in mid homes range between USD 1,400 and USD 2,500;

*** Lower-middle represents 22.4% of the population. The household head's education averages 11.6 years, which typically means completed high school studies. Monthly incomes in lower-middle homes range from between USD 830 and USD 1,050;

Low represents 34.8% of the population. The household head's education averages 7.7 years, which typically means incomplete high school studies. Monthly incomes in low homes range from between USD 415 and USD 620;

Very low represents 20.3% of the population. The household head's education averages 3.7 years, which typically means incomplete elementary school studies. Monthly incomes in very low homes are below USD 330.

Non-neophobics satisfied with their life and their food-related life

Group 3 represented 32.3% of the sample (n = 120); it had the lowest score on the FNS, differing statistically from the other groups. The scores obtained on the SWLS and SWFL were similar to Group 1 (Table 3). Based on the adjusted standardized residuals analysis, Group 3 had a greater presence of students who perceived their health as excellent (15.8%) (Table 5).

Table 2

Pearson's correlation coefficients between *Food Neophobia Scale* (FNS), *Satisfaction with Life Scale* (SWLS), *Satisfaction with Food-related Life* (SWFL) and *Family Eating Habits Questionnaire* (FEHQ) components.

	FNS	SWLS	SWFL	FEHQ		
				Importance of eating to family members	Cohesiveness of family eating	Pressure to eat
FNS	1.000					
SWLS	-0.198 *	1.000				
SWFL	-0.189 *	0.347 *	1.000			
FEHQ						
Importance of eating to family members	-0.026	-0.058	0.034	1.000		
Cohesiveness of family eating	-0.085	0.285 *	0.330 *	0.000	1.000	
Pressure to eat	0.128 **	-0.162 *	-0.005	0.000	0.000	1.000

* The correlation is significant at the level of 0.01 (bilateral);

** The correlation is significant at the level of 0.05 (bilateral).

Note: corresponds to the (bilateral) asymptotic significance obtained in Pearson's chi squared test.

Table 3

Food Neophobia Scale (FNS), *Satisfaction with Life Scal*e (SWLS), *Satisfaction with Food-related Life* (SWFL), and days on which the respondent's mental health was not good in the last month. Mean scores for the three clusters and overall in a university student sample.

Scale	Total sample (n = 372)	Group 1 (n = 100)	Group 2 (n = 152)	Group 3 (n = 120)	F	p-value
FNS	17.27	20.52 a	19,33 a	11.95 b	210.252	0.000 *
SWLS	22.56	25.32 a	19.69 b	23.89 a	82.560	0.000 *
SWFL	21.23	23.97 a	17.25 b	24.00 a	132.331	0.000 *
The number of days on which the respondent's mental health was not good in the last month (HRQOL)	5.59	3.94 b	7.17 a	4.01 b	5.730	0.004 **

HRQOL: *Health-related Quality of Life Index.*

* Significant at 1%;

** Significant at 5%.

Note: different letters in vertical lines indicate statically significant differences according to Dunnett's T3 multiple comparison test; "a" is significantly higher than "b".

Table 4

Mean z-scores from the components of the *Family Eating Habits Questionnaire* scores for the three clusters and overall in a university student sample. Chile, November 2014.

Component	Group 1 (n = 100)	Group 2 (n = 152)	Group 3 (n = 120)	F	p-value
Importance of eating to family members	-0.019	-0,009	0.027	0.072	0.931
Cohesiveness of family eating	0.356 a	-0.396 b	0.205 a	23.292	0.000 *
Pressure to eat	-0.021	0.112	-0.124	1.915	0.149

* Significant at 1%.

Note: different letters in the line indicate significant differences according to Dunnett's T3 multiple comparisons test ($p \leq 0.05$); "a" is significantly higher than "b". Asymptotic significance obtained in Pearson's chi squared test.

Table 5

Characteristics (%) with significant differences between the groups obtained using cluster analysis in university students.

	Group 1 (n = 100)	Group 2 (n = 152)	Group 3 (n = 120)
Self-perception of health (HRQOL)		p = 0.000	
Very poor health	0.2	2.6	0.2
Fair health	6.8	25.0	14.8
Good health	37.0	44.1	35.0
Very good health	49.0	21.7	34.2
Excellent health	7.0	6.6	15.8
Ethnic origin		p = 0.000	
Mapuche	8.0	19.7	14.2
Non-Mapuche	92.0	80.3	85.8

HRQOL: *Health-related Quality of Life Index.*

Note: p-value corresponds to the (bilateral) asymptotic significance obtained in Pearson's chi squared test.

Discussion

This study aimed to distinguishing types of university students that differed with regard to their satisfaction with life, satisfaction with food-related life and food neophobia. Food neophobia and well-being were also linked, which has not been reported for this population. Although in this study it was possible to confirm that the scores of the FNS correlated inversely and significantly with the scores from the SWLS and the SWFL, the correlation values were lower than those obtained by Schnettler et al. [14] in an adult sample.

67.7% (Groups 1 and 2) of respondents classified as neophobics in this study, whereas Schnettler et al. [14] reported 47.8% classified as neophobics. However, this percentage would not be considered extremely neophobic because the classification was based on the mean of the total sample, and both groups were slightly above average (SD for Group 1 = 0.27; Group 2 = 0.33; Group 3 = 0.28). From late childhood, the levels of neophobia seem to decrease until adulthood, when this tendency reaches its minimum level 3, and with aging, food neophobia levels slowly rise again [20]. Therefore, it can be hypothesized that university students, considered emergent adults, have still not reached the minimum level of food neophobia.

A possible reason for the low correlation between the FTS, SWLS and SWFL scales becomes clear when looking at the results of the cluster analysis. Group 1, "neophobics satisfied with their life and their food-related life", had satisfaction with life and food-related life values that were statistically similar to Group 3, "non-neophobics satisfied with their life and their food-related life". This finding confirms that both neophobics and non-neophobics can be satisfied with their life and their food-related life 14, and one reason may be that both groups had high scores on cohesiveness of family eating, in contrast to Group 2, "neophobics moderately satisfied with their life and their food-related life". While the group of non-neophobic students reported a generally high level of satisfaction with life and food-related life, this was the case for the neophobic students only when they scored highly on cohesiveness of family eating. This result underscores the importance of family eating patterns in determining the effects of food neophobia.

Recent studies have reported that family promotes healthier eating in university students [12,13,17]. These findings indicate that family eating habits, such as eating regularly as a family, are also related to food-related and general well-being for university students, i.e. family meals not only promote healthier eating habits, but are also a source of well-being for the students.

These results indicate that even when university students enjoy greater independence from their parents, whether or not they live with them, pleasant family interaction around food benefits their subjective well-being in general and in the domain of food, as stated by others [12,13]. Yet, contrary to what was expected, these results cannot establish a relationship between students' level of food

neophobia and family eating habits as reported by Knaapila et al. [8]. In fact, "neophobics satisfied with their life and their food-related life" and "non-neophobics satisfied with their life and their food-related life" did not differ in the FEHQ's component "Cohesiveness of family eating" z-score, whereas the FNS score only correlated inversely and significantly with the FEHQ's component "Pressure to eat". In addition, we found no statistical differences regarding place of residence during the semester among the university student's types.

The expected relationship was obtained in the type "neophobics moderately satisfied with their life and their food-related life", which presented significantly lower scores on the SWLS and SWFL. However, in this type the low level of subjective well-being in general and in the domain of food may not be associated with their level of food neophobia alone. In terms of differences in the HRQOL-4, "neophobics moderately satisfied with their life and their food-related life" had more students who reported negative general and mental health than those satisfied with life and food-related life, whether they were neophobic or not. This finding is consistent with studies that concluded that students with a negative self-perception of their health scored lower in life satisfaction and satisfaction with food-related life [12,13]. However, it was also confirmed that higher levels of life satisfaction and satisfaction with food-related life are related to better mental health in university students [13]. In addition, the type "neophobics moderately satisfied with their life and their food-related life" scored lower in the FEHQ's component "cohesiveness of family eating" than the other groups. This finding is consistent with previous studies that found university students' satisfaction with life and with food-related life to be associated positively with eating at home more frequently [12,13], behaviors closely related to the items of the FEHQ's component "cohesiveness of family eating".

Some authors report differences in the demographic profile of neophobic and neophilic young adults, such as socioeconomic status and residence area [9], while others have reported that there are no such differences [4]. This study's results are in line with the latter, but culture may also have an impact on food neophobia [26] and in the acceptance of new food products [27] in university students [4]. In this study, we found the type "neophobics moderately satisfied with their life and their food-related life" had a higher presence of students of Mapuche origin than the other types, which may be explained by the study being conducted at the Universidad de La Frontera, in the Araucania region, which has the largest indigenous population in the country [28]. The existence of a gradual process of collective acculturation of the Mapuche people towards Chilean culture, including food has been reported [29]. However, at the same time, a considerable number of Mapuches still consume their traditional foods [29] which may be linked to a higher level of food neophobia. Therefore, it may be suggested that the relationship between culture and food neophobia does not only appear in people of different countries of origin [3,4,5], but there may also be a relationship between food neophobia and ethnic origin within the same country. This finding is particularly important for developing countries in South America, as most have various ethnic groups coexisting, as well as a presence of indigenous populations. Nevertheless, this result must be confirmed with populations belonging to other indigenous ethnic groups in other countries in future research, because the increased presence of students of Mapuche origin may also be related to the degrees of subjective well-being. In an exploratory study conducted with university students in southern Chile, Schnettler et al. [30] found that Mapuche students scored lower than non-Mapuche students on the SWLS and SWFL scales.

Implications and limitations of the study

This investigation suggests that both neophobic and non-neophobic university students can have a positive level of subjective well-being overall and in the domain of food. However, the high proportion of neophobic university students in the sample is cause for concern. The period at university is associated with unhealthy eating habits [6], which may be aggravated in neophobic university students, because food neophobia negatively affects dietary variety [6,20]. In addition, among the psychological factors affecting an individual's relationship with food, the systematic reluctance to try novel or unknown foods appears to play a critical role in the development of possible eating disorders [31]. Accordingly, university authorities and other relevant institutions may create strategies and campaigns to reduce students' level of food neophobia by fostering exposure to novel foods [32].

In this regard, the type "neophobics moderately satisfied with their life and their food-related life" merits special attention, because some research results associate eating disorders with low levels of life satisfaction and food-related life satisfaction [24] in young people. According to this study's results, students in this typology perceive their health unfavorably, have a greater number of days with mental health problems, and do not have the family support that family interaction around food offers. Indeed, family support has a greater effect on university students' life satisfaction and satisfaction with food-related life [12,13]. Therefore, these findings may be useful for university authorities to design and develop activities that prevent eating disorders, mental health disorders while simultaneously improving levels of life satisfaction and satisfaction with food-related student life.

From the standpoint of research related to food acceptance, it may be suggested that aspects related to subjective well-being can be useful in explaining or associating preferences for different foods. In addition, this study confirms that both neophobics and non-neophobics experience food-related well-being [14], and this is also correlated with family eating habits. Finally, as stressed by Verbeke & Poquiviqui [3], food neophobia seems to be an important barrier to novel food acceptance, and marketers should take this into account when trying to introduce new products, especially to those university students that tend to have high levels of neophobia. This is particularly relevant in the introduction of healthy foods.

One of the limitations of this study is that it was conducted in the context of only one country, Chile. Considering that food neophobia differs among countries, new research in different nations is needed to support these results. Another limitation of this study is the non-probabilistic sample and its relatively small size, which does not allow for generalization of the results. Additionally, the sample presented a similar composition to the population of university students enrolled throughout the country in 2013, in terms of gender, area of residence and age [33]. However, this sample shows a greater proportion of students with a native background than the one reported by Blanco & Meneses [34], corresponding to 6.7% of the general student population. Finally, all data were self-reported, thus responses may be affected by recall bias or social desirability.

Therefore, in southern Chile, three types of university students were distinguished with significant differences in the average values of the FNS, SWLS and SWFL scales: Neophobics satisfied with their life and their food-related life, Neophobics moderately satisfied with their life and their food-related life and Non-neophobics satisfied with their life and their food-related life. These types presented distinct profiles in terms of numbers of days with mental health problems, health self-perception, ethnic origin and level of "Cohesiveness of family eating". These results suggest that both neophobic and non-neophobic students have positive levels of satisfaction with life and food-related life, and that satisfaction among neophobic students is related to family eating patterns, especially cohesiveness in family eating. Low levels of satisfaction with life and food related-life are linked to general and mental health problems, Mapuche origin, and low importance given to cohesiveness of family eating.

Contributors

B. Schnettler was responsible for design of the research project, analysis and interpretation of data, drafting the article, all aspects of the study and ensuring the accuracy and integrity of any part of the work. L. Orellana and N. Salinas-Oñate contributed in the drafting the article and critical review of important intellectual content. Y. Höger and J. Sepúlveda contributed in data collection and in the drafting the article. G. Lobos, H. Miranda and E. Miranda-Zapata contributed in the analysis and interpretation of data and in the drafting the article. M. Sanchez, M. Denegri and K. G. Grunert reviewed the drafts and final approval of the version to be published.

Acknowledgments

The results presented correspond to Fondecyt Project 1130165 and Fondecyt Project 1160005.

References

1. Pliner P, Salvy SJ. Food neophobia in humans. In: Shepherd R, Raats M, editors. The psychology of food choice. Wallingford: CABI Publishing; 2006. p. 75-92.
2. Ritchey P, Frank R, Hurstic U, Tuorila H. Validation and cross-national comparison of the food neophobia scale (FNS) using confirmatory factor analysis. Appetite 2003; 40:163-73.
3. Verbeke W, Poquiviqui G. Ethnic food attitudes and behaviour among Belgians and Hispanics living in Belgium. Br Food J 2005; 107:823-40.
4. Olabi A, Najm NEO, Baghdadi OK, Morton JM. Food neophobia levels of Lebanese and American college students. Food Qual Prefer 2009; 20:353-62.
5. Edwards JSA, Hartwell HL, Brown L. Changes in food neophobia and dietary habits of international students. J Hum Nutr Diet 2010; 23:301-11.
6. Ramalho AA, Dalamaria T, Souza OF. Consumo regular de frutas e hortaliças por estudantes universitários em Rio Branco, Acre, Brasil: prevalência e fatores associados. Cad Saúde Pública 2012; 28:1405-13.
7. Meiselman HL, Mastroianni G, Buller M, Edwards J. Longitudinal measurement of three eating behaviour scales during a period of change. Food Qual Prefer 1999; 10:1-8.
8. Knaapila A, Silventoinen K, Broms U, Rose RJ, Perola M, Kaprio J, et al. Food neophobia in young adults: genetic architecture and relation to personality, pleasantness and use frequency of foods, and body mass index – a twin study. Behav Genet 2011; 41:512-21.

9. Flight I, Leppard P, Cox DN. Food neophobia and associations with cultural diversity and socio-economic status amongst rural and urban Australian adolescents. Appetite 2003; 41:51-9.
10. Ares G, De Saldamando L, Giménez A, Deliza R. Food and wellbeing. Towards a consumer-based approach. Appetite 2014; 74:61-9.
11. Grunert K, Dean D, Raats M, Nielsen N, Lumbers M. A measure of satisfaction with food-related life. Appetite 2007; 49:486-93.
12. Schnettler B, Denegri M, Miranda H, Sepúlveda J, Orellana L, Paiva G, et al. Family support and subjective well-being: an exploratory study of university students in southern Chile. Soc Indic Res 2015; 122:833-64.
13. Schnettler B, Miranda H, Lobos G, Orellana L, Sepúlveda J, Denegri M, et al. Eating habits and subjective well-being: a typology of students in Chilean state universities. Appetite 2015; 89:203-14.
14. Schnettler B, Crisostomo G, Sepúlveda J, Mora M, Lobos G, Miranda H, et al. Food neophobia, nanotechnology and satisfaction with life. Appetite 2013; 69:71-9.
15. Raudenbush B, Frank RA. Assessing food neophobia: the role of stimulus familiarity. Appetite 1999; 32:261-71.
16. Birch LL. Psychological influences on the childhood diet. J Nutr 1998; 128:407S-10S.
17. Sharma B, Harker M, Harker D, Reinhard K. Living independently and the impact on young adult eating behaviour in Germany. Br Food J 2009; 111:436-51.
18. Pliner P, Hobden K. Development of a scale to measure the trait of food neophobia in humans. Appetite 1992; 19:105-20.
19. Hair J, Anderson R, Tatham R, Black W. Análisis multivariante. 3rd Ed. Madrid: Prentice Hall Internacional; 1999.
20. Tuorila H, Lähteenmäki L, Pohjalainen L, Lotti L. Food neophobia among the Finns and related responses to familiar and unfamiliar foods. Food Qual Prefer 2001; 12:29-37.
21. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess 1985; 49:71-5.
22. Hennessy C, Moriarty D, Zack M, Scherr P, Brackbill R. Measuring health-related quality of life for public health surveillance. Public Health Rep 1994; 109:665-72.
23. Klempel MC, Kroeger CM, Varady KA. Alternate day fasting increases LDL particle size independently of dietary fat content in obese humans. Eur J Clin Nutr 2013; 67:783-5.
24. Schnettler B, Miranda H, Sepúlveda J, Orellana L, Etchebarne S, Lobos G, et al. Dietary restraint and subjective well-being in university students in Chile. Nutr Hosp 2014; 30:453-61.
25. Mapa socioeconómico de Chile, 2004. http://www.adimark.cl (accessed on 10/Jun/2012).
26. Siegrist M, Hartmann C, Keller C. Antecedents of food neophobia and its association with eating behavior and food choices. Food Quality and Preference 2013; 30:293-8.
27. Barrena R, García T, Sánchez M. Analysis of personal and cultural values as key determinants of novel food acceptance. Application to an ethnic product. Appetite 2015; 87:205-14.
28. Instituto Nacional de Estadísticas. Estadísticas sociales de los pueblos indígenas en Chile. Censo 2002. http://www.ine.cl/canales/chile_estadistico/estadisticas_sociales_culturales/etnias/pdf/estadisticas_indigenas_2002_11_09_09.pdf (accessed on 15/Jan/2015).
29. Schnettler B, Miranda H, Mora M, Lobos G, Viviani JL, Denegri M, et al. Acculturation and food consumption among the main indigenous people in Chile. Int J Intercult Relat 2013; 37:249-59.
30. Schnettler B, Miranda H, Sepúlveda J, Denegri M. Satisfacción con la alimentación y la vida, un estudio exploratorio en estudiantes de la Universidad de La Frontera, Temuco- Chile. Psicol Soc (Impr) 2011; 23:426-35.
31. Benton D. Role of parents in the determination of the food preferences of children and the development of obesity. Int J Obes Relat Metab Disord 2004: 28:857-69.
32. Herbert G, Butler L, Kennedy O, Lobb A. Young UK adults and the 5 A DAY campaign: perceived benefits and barriers of eating more fruits and vegetables. Int J Consum Stud 2010; 34:657-64.
33. Consejo Nacional de Educación. Estadísticas y bases de datos INDICES, CNED, Chile. http://www.cned.cl/public/Secciones/SeccionIndicesEstadisticas/indices_estadisticas.aspx (accessed on 15/Jan/2015).
34. Blanco C, Meneses F. Estudiantes indígenas y educación superior en Chile: acceso y beneficio. In: Inclusión social, interculturalidad y equidad en educación superior. Seminario Internacional Inclusión Social y Equidad en la Educación Superior/2º Encuentro Interuniversitario de Educación Superior. Temuco: Fundación EQUITAS; 2011. p. 88-115.

Resumen

El objetivo fue categorizar a los estudiantes universitarios en base a la asociación entre la neofobia alimentaria y los niveles de bienestar subjetivo general (y específico del dominio alimentario), además de la percepción de los estudiantes, en relación con los hábitos alimentarios de la familia. Se realizó una encuesta entre 372 universitarios del sur de Chile. El cuestionario incluyó la Food Neophobia Scale *(FNS),* Satisfaction with Life Scale *(SWLS),* Satisfaction with Food-related Life *(SWFL),* Health-related Quality of Life Index *(HRQOL-4) y* Family Eating Habits Questionnaire *(FEHQ). El análisis de clústeres distinguió tres tipos de universitarios: el grupo 1 (26,9%) obtuvo las puntuaciones más altas en la FNS, SWLS y SWFL. El grupo 2 (40,8%) tuvo una puntuación alta en la FNS, aunque con puntuaciones más bajas en la SWLS y SWFL. El grupo 3 (32,3%) tuvo la FNS más baja y puntuaciones altas en la SWLS y SWFL. El grupo 2 se destacó por tener una puntuación baja en el componente del FEHQ, referente a la cohesión de la alimentación familiar. Los resultados sugieren que estudiantes neofóbicos y no-neofóbicos tienen niveles positivos de satisfacción con la vida, y con la vida relacionada con la alimentación, y que la satisfacción entre estudiantes neofóbicos está relacionada con los patrones alimentarios de la familia, sobre todo con la cohesión de la alimentación familiar.*

Hábitos Alimenticios; Calidad de Vida; Estudiantes

Resumo

Objetivou-se categorizar os estudantes universitários com base na associação entre a neofobia alimentar e níveis de bem-estar subjetivo geral (e específico ao domínio alimentar), além da percepção dos estudantes em relação aos hábitos alimentares da família. Foi realizado um inquérito entre 372 universitários do Sul do Chile. O questionário incluiu a Food Neophobia Scale *(FNS),* Satisfaction with Life Scale *(SWLS),* Satisfaction with Food-related Life *(SWFL),* Health-related Quality of Life Index *(HRQOL-4) e* Family Eating Habits Questionnaire *(FEHQ). A análise de clusters distinguiu três tipos de universitários: o grupo 1 (26,9%) obteve as pontuações mais altas na FNS, SWLS e SWFL. O grupo 2 (40,8%) teve pontuação alta na FNS, porém as pontuações mais baixas na SWLS e SWFL. O grupo 3 (32,3%) teve a FNS mais baixa e pontuações altas na SWLS e SWFL. O Grupo 2 se destacou por ter pontuação baixa no componente do FEHQ referente à coesão da alimentação familiar. Os resultados sugerem que estudantes neofóbicos e não-neofóbicos têm níveis positivos de satisfação com a vida, e com a vida relacionada à alimentação, e que a satisfação entre estudantes neofóbicos está relacionada aos padrões alimentares da família, sobretudo à coesão da alimentação familiar.*

Hábitos Alimentares; Qualidade de Vida; Estudantes

Submitted on 08/Oct/2015
Final version resubmitted on 05/May/2016
Approved on 12/May/2016