QUEEN'S UNIVERSITY BELFAST

Food4Me study: Validity and reliability of Food Choice Questionnaire in 9 European countries

Markovina, J., Stewart-knox, B. J., Rankin, A., Gibney, M., de Almeida, M. D. V., Fischer, A. R. H., Kuznesof, S. A., Poinhos, R., Panzone, L., & Frewer, L. J. (2015). Food4Me study: Validity and reliability of Food Choice Questionnaire in 9 European countries. *Food quality and preference*, *45*, 26-32. https://doi.org/10.1016/j.foodqual.2015.05.002

Published in:
Food quality and preference

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
Link to publication record in Queen's University Belfast Research Portal

Publisher rights
© 2015 Elsevier Ltd. All rights reserved.
This manuscript version is made available under the CC-BY-NC-ND 4.0 license http://creativecommons.org/licenses/by-nc-nd/4.0/,which permits distribution and reproduction for noncommercial purposes, provided the author and source are cited.

General rights
Copyright for the publications made accessible via the Queen's University Belfast Research Portal is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy
The Research Portal is Queen's institutional repository that provides access to Queen's research output. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact openaccess@qub.ac.uk.

Open Access
This research has been made openly available by Queen's academics and its Open Research team. We would love to hear how access to this research benefits you. – Share your feedback with us: http://go.qub.ac.uk/oa-feedback

Download date:18. Aug. 2023

Validity and Reliability of Food Choice Questionnaire in 9 European countries

J. Markovina, B. Stewart-Knox, A. Rankin, M. Gibney, M.D. Almeida, A. Fischer, S. Kuznesof, R. Poinhos, L. Panzone, L.J. Frewer

ABSTRACT

This analysis has been conducted to explore the validity and reliability of the Food Choice Questionnaire (FCQ) across 9 European countries. Variation in the factor structure and the perceived importance of food choice motives have been compared cross-nationally. Volunteers (N=9381) were recruited from an existing panel of a social research agency to take part in the Food4Me survey in Germany, Greece, Ireland, Poland, Portugal, Spain, the Netherlands, the UK and Norway. The survey was administered on-line. Configural, metric and scalar invariance fell within acceptable limits and were consistent across the 9 countries. All reliability parameters were above acceptable levels. Factor analysis confirmed that all items loaded onto the same 9 factors established by Steptoe and colleagues (1995). There was highly significant agreement in the relative importance of food choice factors between countries. Price was ranked as most important food choice factor in five countries (Spain, Greece, Ireland, Portugal and the Netherlands), sensory appeal was ranked first for three countries (Norway, Germany and the UK) while natural content was ranked as the most important factor in Poland. Familiarity and ethical concern were consistently ranked as least important in all countries. These data suggest that the FCQ is a suitable tool for exploring food choice motives across different European populations. Differences in relative importance of factors within countries may need to be taken into account in dietary health intervention and food product development.

Key words: Food choice questionnaire; FCQ; survey; reliability; validity; Food4Me.

1. Introduction

Understanding food choice motives is needed to plan public policies aimed at improving dietary health and wellbeing, as well as informing food product innovation and food marketing. In increasingly globalised markets and economies, it is also important to understand variations in food choice motives across different countries and cultures. Country and/or culture-specific differences in food choice motives can be used to inform intervention to change food related behaviours in different populations. The Food Choice Questionnaire (FCQ) was originally developed and tested in the United Kingdom (UK) by Steptoe and colleagues in 1995 where it has been used extensively to assess food choice motives. In its original form, the FCQ comprises 36 items designed to assess underlying motives for food choice on 9 dimensions: health; mood; convenience; sensory appeal; natural content; price; weight control; familiarity; and, ethical concern. Among the goals of previous research has been to determine if the FCQ is cross-culturally reliable and valid. One of the first cross-cultural studies of food choice motives (Prescott et al., 2002) compared responses in Japan, Taiwan, Malaysia and New Zealand. Since then, the FCQ has been compared in Canada, Belgium and Italy (Eertmans et al. 2006) and in Belgium, Hungary, Romania and the Filipines (Januszewska et al. 2011). The FCQ has also been applied in South America (e.g. Ares and Gambaro, 2007), North America (e.g. Pula et al, 2014) and certain countries in Europe (Honkanen and Frewer, 2009; Fotopoulos et al, 2009; Milošević et al, 2012; Pieniak et al, 2013).

Some studies have used modified versions of the FCQ adapted to their research aims, local population and language. Ares and Gambaro (2007) applied a modified 22-item version of the FCQ in Uruguay. Fotopoulos et al (2009) explored the possibility of using an ad-hoc short version (excluding the 'ethical concern' factor) of the FCQ with respondents in Greece. Honkanen and Frewer (2009) used a modified FCQ with Russian respondents, which included

extra items on animal welfare, political values and religious items. More recently, a large pan-European survey of 4828 respondents in 6 European countries (Belgium, France, Italy, Norway, Poland and Spain) conducted by Pieniak et al (2013) excluded the mood factor. Table 1 summarises details of previous studies that have used the FCQ.

Insert Table 1

For the purpose of this study, the FCQ was administered as a part of the Food4Me Pan European Survey investigating public attitudes to personalised nutrition. This survey appears the largest (N=9381) and most extensive, having been conducted across 9 European states. Some of the countries (Germany, Ireland, the Netherlands, Portugal) included have not been a part of any previous studies of food choice motives which adds further value to results. The aim of this study, therefore, has been to understand food choice motives across the different European countries. The objectives have been threefold: firstly, to explore the cross-cultural validity and reliability of the Food Choice Questionnaire in 9 European countries; secondly, to determine any variation in the factor structure across different countries; and, thirdly, to compare the perceived importance of food choice motives across different countries.

2. Method

Sampling and Procedure

Ethical approval for research procedures was granted by the lead academic institutions. Data were collected in February and March 2013, for a full account of which please refer to Poínhos et al., (2014). The questionnaire, which was developed in English, was translated into the various languages by each partner centre. These translations were then back-translated

into English, then reviewed and compared with the original by 2 reviewers acting independently of one another. Queries arising from this process were then discussed by these adjudicators and referred back to the translating team to ensure 'meaning' was being appropriately conveyed. Where appropriate, changes were made to the translation. Potential volunteers were drawn from an existing panel of a social research agency (GfK-NOP). Nationally representative samples (n=1000 per country) were drawn using quotas for age-group (18-29, 30-39, 40-54, 55-65 years), gender and highest level of education completed aggregated from the International Standard Classification of Education (ISCED)(ISCED 0-2, ISCED 3-4, ISCED 5-6) and region. Because of low penetration in the 55-65 years old age category in Ireland, an additional panel were recruited through another research agency (Toluna). A total of 29,450 individuals were contacted and the overall response rate was 31.9%. The resultant sample comprised 9381 participants from 9 EU countries (Germany, Greece, Ireland, Poland, Portugal, Spain, the Netherlands, the UK and Norway). Respondents were quota sampled to be nationally representative for each country, on sex, age (18-29, 30-39, 40-54, 55-65 years) and education level (highest level of education completed based on International Standard Classification of Education levels ISCED 0-2, ISCED 3-4, ISCED 5-6). Sample characteristics are summarised by country in Table 2. Data were collected in February and March 2013 using on-line survey methodology. A participant information sheet was displayed and participants provided informed consent prior to completing the questionnaire.

Food Choice Questionnaire (FCQ)

The Food Choice Questionnaire (Steptoe *et al*. 1995) contained 36 statements each preceded by “It is important to me that the food I eat on a typical day”. A full list of items can be seen in Table 4. Although the original scale was scored on a 4-point Likert scale ranging from 1 =

‘Not at all important’ to 4 = ‘Very important’, more recent studies have used either a 7-point (Dowd & Burke, 2013; Pieniak et al. 2009) or 5-point scale (Milošević et al. 2012). As responses to the other scales included within the questionnaire were on a 5-point Likert scale, the FCQ was adapted to obtain responses on a 5-point Likert scale ranging from 1 = ‘Not at all important’ to 5 = ‘Extremely important’.

Data Analysis

Statistical analysis was conducted using SPSS Statistical Package for the Social Sciences, (Version 21.0; SPSS UK Ltd; Chersey, UK), and MPlus (Version 7.3). Multi-Group Confirmatory Factor Analysis (MG-CFA) (Steenkamp & Baumgartner, 1998) was employed to test for metric and scalar measurement invariance across samples. Strict measurement invariance was alleviated as necessary to ensure that constructs were measured in an equivalent way in all countries. In the final stage, to examine cross-cultural differences, configural, metric and scalar invariances were interpreted as indicative of differences between countries. Satorra-Bentler scaled test statistics (Satorra & Bentler, 1988; 1994) were used to accommodate non-normal distributions of the scores on a number of items. To allow for potential cross-factor loadings, the 9 food choice motives (Health, Mood, Convenience, Sensory Appeal, Natural Content, Price, Weight Control, Familiarity, and Ethical concern) were analysed in one combined Multi-Group MG-CFA. In a step-wise process, configural, metric and scalar measurement invariance (Steenkamp & Ter Hofstede, 2002; Steenkamp & Baumgartner, 1998) was tested using maximum likelihood estimation with robust standard errors (MLR). Modifications (e.g. relaxing the equalities on country specific factor-loadings or intercepts) were added to the model, based on large modification indices until model fit indices were acceptable. Model fit indices presented include: Chi-square (χ^2); Degrees of Freedom (df); Root Mean Square Error of Approximation (RMSEA); the Standardized Root

Mean square Residual (SRMR); the Tucker-Lewis Index (TLI); and, the Comparative Fit Index (CFI). Values <0.07 for RMSEA and <0.08 SRMR and >0.95 for TLI and CFI suggest an acceptable model fit (Hair *et al*. 2010; Hu & Bentler, 1999). Internal consistency of the FCQ scale and food choice factors was assessed by calculating Cronbach alpha coefficients for the entire sample and by each country. Differences in the rank order of the mean importance ratings of factors between countries were tested using the non-parametric Kendall's coefficient of concordance test.

Insert table 2 here

3. Results

Measurement invariance of the FCQ

Multi group confirmatory factor analysis (MG-CFA) (Steenkamp & Baumgartner, 1998) was used to verify the original 9-factor structure of the FCQ proposed by Steptoe et al (1995). Goodness-of-fit parameters MG-CFA for the total sample (N=9381) are shown in Table 3. All the indicators for configural invariance fell within acceptable limits implying consistent measurement of constructs across all 9 countries. Goodness-of-fit indicators indicated that metric invariance was also consistent across countries. Results of multi-group CFA indicated also scalar invariance of measurement on the total sample of 9 countries.

Insert table 3 here

Construct validity and reliability of the FCQ

Standardised factor loadings and internal consistency coefficients for the entire sample are shown in Table 4. The factor loadings were statistically significant with values in the range from 0.541 to 0.923. Only three items loaded below the 0.6 mark: "helps me control my

weight" (0.541); "tastes good" (0.561); and, "comes from a country I approve of politically" (0.584). No items had factor loadings below 0.4, therefore, all 36 items were considered in the interpretation of factors. Intercorrelations between factors are shown in Table 5 (total sample data). All correlations were statistically significant at the 0.01 level. Cronbach alpha values ranged from 0.781 for the familiarity factor to 0.918 for the natural content factor (*health*=0.901; *mood*=0.897; *convenience*=0.886; *sensory appeal*=0.821; *natural content*=0.918; *price*=0.838; *weight control*=0.905; *familiarity*=0.781; and, *ethical concern*=0.808). All reliability parameters were above acceptable levels (Hair et al., 2010). Table 6 shows reliability of food choice factors by country. Reliability estimates for all factors (except for the ethical concern factor in Greece with a value of 0.65), showed values within the acceptable range from 0.7 to 0.9.

Insert tables 4, 5 and 6 here

Relative importance of food choice motives

Taking the whole sample (N=9381) price, sensory appeal and natural content were ranked as most important. The health factor was ranked as 4th, followed by convenience, mood and weight control. Least important were the factors of ethical concern and familiarity. Kendall's coefficient of concordance indicated highly significant agreement in the relative importance of food choice factors between countries (Kendall's W=0.885; df=8; $p<0.01$). The relative importance (mean and standard deviation) of items on each food choice factor are shown on Table 7. Based on these ratings, Table 8 shows rank order of food choice factors for each country in order from the most important to least important. Mean ranks of food choice factors across 9 countries are shown in Table 9. Results show that the price factor was ranked

as most important in five countries (Spain, Greece, Ireland, Portugal and the Netherlands), sensory appeal factor came first for three countries (Norway, Germany and the UK) while natural content was ranked as the most important factor in Poland. Familiarity and ethical concern were consistently ranked as least important in all countries.

Insert tables 7, 8 and 9 here

4. Discussion

Among the objectives of this study has been to determine the validity and reliability of the Food Choice Questionnaire across 9 European countries (Norway, Germany, Spain, Greece, Poland, the United Kingdom, Ireland, the Netherlands and Portugal) (N=9381). Internal consistency coefficients of reliability were high in the total sample and within all countries. Reliability indicators also appeared higher than those reported in previous research (Januszewska et al, 2011; Pieniak et al, 2009; Eertmans et al 2006). The larger sample size employed in our study compared to sample sizes in previous surveys, however, may go some way toward explaining any apparent disparities in reliability and consistency. It is also possible that on-line, web-based administration of the survey might have influenced the results. Previous studies (Pula et al. 2014; Pieniak et al. 2013) that have also been administered on-line as a part of larger studies, however, have not reported any bias related to web-based interviewing. That indicators of configural, metric and scalar invariance were satisfactory, suggests that food choice constructs had similar meaning for respondents from different countries and that any differences found in subsequent analyses have probably not been influenced by cultural or country-specific factors. Metric and scalar invariance could also imply that respondents in all countries understood the measurement scale similarly.

A second objective of this analysis has been to determine any variation in the factor structure across different countries. Factor analysis confirmed that all items loaded onto the

same 9 factors already established by Steptoe et al (1995). These results also agree with those of Januszewska et al (2011) who found the 9-factor structure of the FCQ to be invariant across four countries (Belgium, Hungary, Romania and Philippines). Previous studies that have used the FCQ on cross-national samples, however, have not always found the 9-factor structure (Steptoe et al., 1995) or indeed, any consistent factor structure across different countries. For example, Eertmans et al (2006) found differences in construct connotations between urban populations residing in Belgium, Italy and Canada. Health and natural content were included in the same single factor in all three countries and there were cross-loadings for several items in all three samples (Eertmans et al., 2006). A study by Milošević et al (2012) conducted in 6 Western Balkan countries (Croatia, Serbia, Montenegro, Slovenia, Macedonia and Bosnia-Herzegovina), similarly, found that an 8-factor structure best described the FCQ, with health and natural content loading onto one factor in all countries included in the sample. The original 9-factor structure was also not confirmed in the study of Fotopoulos et al (2009) in Greece, where the ethical concern factor was excluded owing to low reliability. More recently, Pula et al (2014) failed to confirm a 9-factor structure in a sample of respondents in the United States They found an 8-factor structure on the basis of which excluded the weight control factor and modified the ethical concern factor to reflect environmental issues (Pula et al., 2014). We observed relatively high intercorrelations between health and mood (0.797), health and natural content (0.668) and between natural content and ethical concern (0.649). Such intercorrelations between factors (higher than 0.6, but below the 0.8 mark) could indicate a problem of multi-collinearity (Tabachnick & Fidell, 2001). Similar intercorrelations were found in the Pan European study conducted by Pieniak et al. (2009). High composite reliability (>0.80) and large sample size (N=9381) in this current study, however, should have protected against effects of multi-collinearity (Grewal, Cote & Baumgartner, 2004). High intercorrelations observed in our sample could also point to how the respondents' understood

certain constructs. Health appears related to the perceived natural content of the food and associated with mood. Ethical concern may also be related to the natural content of the foods.

A third objective of this analysis was to compare the perceived relative importance of food choice motives within and across different countries. There was a high level of agreement across countries in the rankings of importance of food choice factors. Consistent with previous studies (Prescott et al., 2002; Januszewska et al., 2011), price sensory appeal and natural content were consistently ranked as the most important food choice factors (Table 8). More surprising was that the health factor was ranked relatively low (4th). This could be explained by the high intercorrelation with the natural content factor which may indicate that respondents do not differentiate between these two constructs. That ethical concern and familiarity were consistently ranked lowest is also in accordance with previous studies (Prescott et al., 2002; Januszewska et al., 2011). Familiarity was ranked as the least important factor in Taiwan, Malaysia, New Zealand, Belgium, Hungary, Romania and Filipines. Japanese people appeared different, however, in that they ranked ethical concern highly (Prescott et al., 2002).

Of the nine European countries that we surveyed, Spain, Greece, Portugal, Ireland and the Netherlands, ranked price the most important motive for food choice. This could reflect differing priorities among the public residing in what could be considered the relatively weaker European economies. Figures just prior to the time of sampling indicated that Greece had a recession of 4.4 percent of GDP, Portugal (3.3%), Italy (1.3%) and Spain (1%) (Pop, 2012). Sensory appeal, in contrast, was ranked first in what could be assumed to be those countries with relatively stronger economies. That Poland was the only Eastern European country surveyed may explain it uniqueness in selecting natural content as the most important motive for food choice. Only one previous study has considered some of the European countries included in the present analysis. Pieniak Perez-Cueto & Verbeke (2013) also

investigated responses to the FCQ in Poland, Spain and Norway as part of a pan-European survey. They researched associations between traditional food consumption and food choice motives but did not make comparison between countries. Their study used a modified version of the FCQ, which makes comparison with the results of this study difficult.

One of the potential limitations of this study is that the Food Choice Questionnaire was administered as a part of a larger research study about personalised nutrition. The context of the larger research project might have influenced attitudes in a way that would not have been present if the food choice motives were tested independently. That previous studies have also used the FCQ in studies of a variety of outcomes and produced similar findings, however, suggests that any influence of other survey items is likely to have been minimal.

For the purpose of this study, participants were recruited from existing consumer panels who agreed to take part in future studies. The response rate was 31.9% which although lower than some other survey data collection methods, is typical for web-based social research (Manfreda et al., 2008) the limitations of such a recruitment procedure, however, may be that given the volunteers consisted of those more highly motivated to take part in a health study and although representative of the on-line community, they might not have been entirely representative of the general population. Two previous studies, Pula et al (2014) and Pieniak et al (2013), also employed web-based methods. Whereas Pula et al (2014) reported that age, gender and education fell into the range of general population of the USA, the sample employed by Pieniak et al (2013), was slightly skewed toward those who were younger and had spent longer in education. A further strength of our study is that quotas were sampled to be representative of the on-line communicates in the countries surveyed (Poínhos et al., 2014).

5. Conclusion

This study appears to be the first pan-European study of food choice motives across 9 European countries. The degree to which we can draw conclusions is strengthened by the large sample size. Whereas some other studies (Pula et al., 2014; Pieniak et al., 2013; Honkanen and Frewer, 2009; Ares and Gambaro, 2007) have used modified versions of the FCQ, this study has used the original 36-item FCQ. Differences in outcomes of studies validating the FCQ, therefore, could be accounted for by differences in versions of the questionnaire that were used. Based on the results of this validation study, therefore, it is recommended that future research into food motives in European populations use the original 36-item version developed by Steptoe et al (1995). Satisfactory indicators of validity and reliability in 9 European countries imply that the Food Choice Questionnaire is a suitable tool for exploring food choice motives across different European populations. That the factor structure of food choice motives is similar across different countries implies that the results have potential to be interpreted and translated into a 'one-size-fits-all' dietary health and food innovation policies across European countries.

6. Acknowledgements

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n° 265494. Food4Me is the acronym of the project "Personalised nutrition: an integrated analysis of opportunities and challenges" http://www.food4me.org/ . The authors would like to thank the study group participants across Europe, and the social research companies for recruiting them.

7. References

1. Ares G. & Gambaro A. (2007) Influence of gender, age and motives underlying food choice on perceived healthiness and willingness to try functional foods. *Appetite*, 49(1), 148-158.
2. Dowd K. & Burke K.J. (2013) The influence of ethical values and food choice motivations on intentions to purchase sustainably sourced foods. Appetite, 69, 137-144.
3. Eertmans A., Victoir A., Notelaers G., Vansant G. & Van den Bergh O. (2006) The Food Choice Questionnaire: Factorial invariant over western urban populations? Food Quality & Preference, 17(5), 344-352.
4. Fotopoulos C., Krystallis A., Vassallo M. & Pagiaslis A. (2009) Food Choice Questionnaire (FCQ) revisited. Suggestions for the development of an enhanced general food motivation model. Appetite, 52(1), 199-208.
5. Hair J., Black B., Babin B. & Anderson R. (2010) Multivariate Data Analysis 7th Pearson Prentice Hall. Upper Saddle River, NJ.
6. Honkanen, P., Frewer, L. (2009) Russian consumers' motives for food choice Appetite, vol. 52, pp. 363–371.
7. Hu L. & Bentler P.M. (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1-55.
8. Januszewska R., Pieniak Z. & Verbeke W. (2011) Food choice questionnaire revisited in four countries. Does it still measure the same? Appetite, 57(1), 94-98.
9. Manfreda K.L., Bosniak M., Berzelak J., Haas I., Vehovar V (2008) Web surveys versus other survey modes - A meta-analysis comparing response rates. International Journal of Market Research, 50 (1), 79-104.

10. Milošević J., Žeželj I., Gorton M. & Barjolle D. (2012) Understanding the motives for food choice in Western Balkan Countries. Appetite, 58(1), 205-214.
11. Pieniak Z., Verbeke W., Vanhonacker F., Guerrero L. & Hersleth M. (2009) Association between traditional food consumption and motives for food choice in six European countries. Appetite, 53(1), 101-108.
12. Pieniak Z., Perez-Cueto, F., Verbeke W (2013) Nutritional status, self-identification as a traditional food consumer and motives for food choice in six European countries, British Food Journal, Vol. 115, No. 9, pp. 1297-1312.
13. Poínhos R., van der Lans, Ivo A., Rankin A., Fischer A.R., Bunting B., Kuznesof S., Stewart-Knox B., Frewer LJ (2014) Psychological Determinants of Consumer Acceptance of Personalised Nutrition in 9 European Countries. *PloS one*, 9(10), e110614.
14. Pop V (2012) Southern Euro-countries worst hit by recession. Euobserver February, https://euobserver.com/economic/115355 https://euobserver.com/economic/115355.
15. Pula K., Parks C.D., & Ross C.F (2014) Regulatory focus and food choice motives. Prevention orientation associated with mood, convenience and familiarity, Appetite, 78C, 15-22.
16. Prescott J., Young O., O'Neill L., Yau N. & Stevens R. (2002) Motives for food choice: a comparison of consumers from Japan, Taiwan, Malaysia and New Zealand. Food Quality & Preference, 13(7-8), 489-495.
17. Satorra, A., & Bentler, P. M. (1988). Scaling corrections for chi-square statistics in covariance structure analysis. ASA 1988 Proceedings of the Business and Economic Statistics, Section (308-313). Alexandria, VA: American Statistical Association.
18. Satorra, A., & Bentler, P. M. (1994). Corrections to test statistics and standard errors in covariance structure analysis. In A. von Eye & C. C. Clogg (Eds.), Latent variables

analysis: Applications for developmental research (pp. 399-419). Thousand Oaks, CA: Sage.

19. Steenkamp J.E. & Baumgartner H. (1998) Assessing measurement invariance in cross-national consumer research. Journal of Consumer Research, 25(1), 78-107.
20. Steenkamp J.E. & Ter Hofstede F. (2002) International market segmentation: issues and perspectives. International Journal of Research in Marketing, 19(3), 185-213.
21. Steptoe A., Pollard, T.M. (1995): Development of a Measure of the Motives Underlying the Selection of Food: the Food Choice Questionnaire, Appetite, 1995, 25, 267–284.

Table 1 Overview of previous validation studies of FCQ

Author/Year	Countries	Sample size and composition	FCQ version and methodology	FCQ Factor Structure	Variables in the study
Pula et al (2014)	USA	N=408 Male 32.4% Female 68.6% Mean age 35.8	Adapted FCQ (additional 29 items) Web-based survey	8- factor structure New "impression management" factor – opinion of others	Relation of regulatory focus and food choice motives
Pieniak, Verbeke (2013)	Belgium, France, Italy, Norway, Poland, Spain	N=4828 Male 50.8% Female 49.2% Mean age 41.5	Adapted 24-item FCQ Web-based survey	8- factor structure assumed Mood factor excluded	Subjective health Attitude and consumption of traditional food
Milošević et al (2012)	Croatia, Bosnia, Macedonia, Slovenia, Serbia, Montenegro	N=3085 Male 48.2% Female 51.8% Mean age 45.9	Original 36-item FCQ Face-to-face interviews	8- factor structure Health and Natural content loading as a single factor	Factors underlying food choice Clusters of consumers depending on food choice motives
Januszewska et al (2011)	Belgium, Hungary, Romania, Philippines	N=1420 Male 36% Female 64% Mean age 32.3	Original 36-item FCQ On-screen computer application	Confirmed original 9-factor structure	Factor invariance across four countries Mean importance and rank for food choice factors
Fotopoulos et al (2009)	Greece	N=997 Male 17.3% Female 82.7% Mean age 36	Original 36-item FCQ Self-administered in households	8- factor structure (exclusion of ethical concern factor) Ad-hoc measure proposed	Hierarchical Cluster Analysis – consumer typology
Honkanen, Frewer (2009)	Russia	N=1081 Male 49.4% Female 50.6% Mean age 31.5	Adapted FCQ Face-to-face interviews	8- factor structure assumed (adding animal welfare, political values and religion items)	Identifying consumer segments on food choice motives
Ares, Gambaro (2007)	Uruguay	N=200 Male 48.5% Female 51.5% Mean age 32.5	Adapted 22-item FCQ Paper-and-pencil application	7- factor structure (Health and nutritional value; price and convenience; Feeling good and safety)	Food choice motives, age and gender influence on willingness to try functional foods
Eertmans et al (2006)	Canada, Belgium, Italy	N=502 Male 33% Female 67% Mean age 21 (students)	Original 36-item FCQ Paper-and-pencil application	8- factor structure Health and Natural content loading as a single factor	Fit of Steptoe 9 factor model Country-specific factor structuress
Prescott et al (2002)	Japan, Taiwan, Malaysia, New Zealand	N=654 Only female sample Mean age 31	Original 36-item FCQ On screen and paper application	Assumed original 9-factor structure (not checked)	Food choice factors differences by country, age, food neophobia

Table 2 Sample description

	Total (N=9381)	Norway (n=1022)	Germany (n=1020)	Spain (n=1025)	Greece (n=1020)	Poland (n=1045)	U.K. (n=1061)	Ireland (n=1020)	NL (n=1020)	Portugal (n=1148)	P value
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	
Gender											
Males	50.6	52.6	49.9	51.3	49.4	52.1	51.0	49.8	50.3	49.5	0.808
Females	49.4	47.4	50.1	48.7	50.6	47.9	49.0	50.2	49.7	50.5	
Age											
18-29 yrs.	22.0	20.5	18.6	19.0	24.7	24.4	23.0	23.5	20.0	23.8	<0.001*
30-39 yrs.	23.4	21.6	16.4	26.6	32.1	23.9	19.4	26.4	18.3	25.7	
40-54 yrs.	34.8	30.7	40.5	35.4	37.6	28.0	36.0	32.1	38.2	34.8	
55-65 yrs.	19.8	27.1	24.5	18.9	5.6	23.6	21.6	18.0	23.4	15.7	
Education											
Low	28.7	38.8	29.6	32.3	31.5	11.2	49.0	12.2	28.8	24.9	<0.001*
Middle	38.9	31.2	52.9	43.2	35.2	61.3	15.4	37.5	35.6	37.9	
High	32.4	29.9	17.5	24.5	33.3	27.5	35.6	50.4	35.6	37.2	

UK = United Kingdom, NL = the Netherlands
Statistical significance for comparison between groups by Chi-square

* Denotes significance p<0.05

Table 3. Fit measures for measurement invariance of the Food Choice Questionnaire

Invariance	Chi-square	Df	CFI	TLI	RMSEA			SRMR
					Value	*90% LB*	*90% UB*	
Configural	10712.57	4464	0.963	0.953	0.037	0.036	0.038	0.042
Metric [a]	11163.84	4673	0.961	0.953	0.037	0.036	0.037	0.045
Scalar [ab]	11663.12	4807	0.959	0.952	0.037	0.036	0.038	0.046

Table 4 Standardised factor loadings for Food Choice Questionnaire

Food Choice Motive	Questionnaire Item	Factor Loading	Internal consistency
Health	Contains a lot of vitamins and minerals	0.759	0,901
	Keeps me healthy	0.737	
	Is nutritious	0.758	
	Is high in protein	0.722	
	Is good for my skin/teeth/hair/nails etc.	0.802	
	Is high in fibre and roughage	0.814	
Mood	Helps me cope with stress	0.763	0,897
	Helps me to cope with life	0.722	
	Helps me relax	0.711	
	Keeps me awake/alert	0.719	
	Cheers me up	0.683	
	Makes me feel good	0.752	
Convenience	Is easy to prepare	0.675	0,886
	Can be cooked very simply	0.692	
	Takes no time to prepare	0.697	
	Can be bought in shops close to where I live or work	0.717	
	Is easily available in shops and supermarkets	0.711	
Sensory Appeal	Smells nice	0.758	0,821
	Looks nice	0.682	
	Has a pleasant texture	0.749	
	Tastes good	0.561	
Natural Content	Contains no additives	0.862	0,918
	Contains natural ingredients	0.923	
	Contains no artificial ingredients	0.859	
Price	Is not expensive	0.921	0,838
	Is cheap	0.620	
	Is good value for money	0.783	
Weight Control	Is low in calories	0.759	0,905
	Helps me control my weight	0.541	
	Is low in fat	0.814	
Familiarity	Is what I normally eat	0.782	0,781
	Is well-known	0.741	
	Is like the food I ate when I was a child	0.628	
Ethical Concern	Comes from countries I approve of politically	0.584	0,808
	Has the country of origin clearly marked	0.745	
	Is packaged in an environmentally friendly way	0.842	

Table 5. Correlations among food choice factors

Construct	**Construct**							
	Health	Mood	Convenience	Sensory Appeal	Natural Content	Price	Weight Control	Familiarity
Health								
Mood	0.797							
Convenience	0.359	0.523						
Sensory Appeal	0.475	0.599	0.590					
Natural Content	0.668	0.573	0.280	0.464				
Price	0.248	0.312	0.464	0.395	0.289			
Weight Control	0.550	0.509	0.399	0.389	0.486	0.264		
Familiarity	0.452	0.485	0.495	0.489	0.406	0.294	0.595	
Ethical Concern	0.539	0.499	0.281	0.406	0.649	0.237	0.488	0.475

All correlations significant at $p < 0.001$

Table 6 Internal-consistency reliabilities of food choice factors for each country

Factor	Country								
	Norway	**Germany**	**Spain**	**Greece**	**Poland**	**UK**	**Ireland**	**Netherlands**	**Portugal**
Health	0.902	0.880	0.880	0.883	0.902	0.924	0.908	0.881	0.914
Mood	0.909	0.872	0.890	0.858	0.897	0.912	0.892	0.914	0.887
Convenience	0.896	0.873	0.900	0.886	0.887	0.897	0.873	0.903	0.883
Sensory Appeal	0.807	0.803	0.868	0.799	0.792	0.825	0.818	0.803	0.851
Natural Content	0.927	0.917	0.890	0.859	0.898	0.942	0.922	0.911	0.881
Price	0.847	0.853	0.868	0.743	0.798	0.816	0.826	0.806	0.855
Weight Control	0.765	0.928	0.923	0.904	0.918	0.924	0.915	0.910	0.897
Familiarity	0.781	0.824	0.757	0.701	0.841	0.785	0.762	0.774	0.793
Ethical Concern	0.799	0.816	0.769	0.655	0.757	0.867	0.810	0.880	0.768

Table 7: Mean ratings (scale 1-5) of the importance of each food choice factor by consumers in 9 countries

	Total (N=9381)	Norway (n=1022)	Germany (n=1020)	Spain (n=1025)	Greece (n=1020)	Poland (n=1045)	UK (n=1061)	Ireland (n=1020)	NL (n=1020)	Portugal (n=1148)
H	3.49 (0.74)	3.31 (0.80)	3.61 (0.71)	3.47 (0.67)	3.68 (0.67)	3.64 (0.66)	3.33 (0.83)	3.48 (0.78)	3.30 (0.67)	3.56 (0.72)
M	3.36 (0.83)	3.10 (0.91)	3.34 (0.80)	3.43 (0.72)	3.75 (0.67)	3.65 (0.70)	3.09 (0.91)	3.29 (0.85)	3.15 (0.81)	3.44 (0.76)
C	3.44 (0.84)	3.43 (0.87)	3.56 (0.79)	3.48 (0.78)	3.63 (0.84)	3.68 (0.72)	3.21 (0.90)	3.33 (0.86)	3.28 (0.79)	3.37 (0.85)
SA	3.67 (0.71)	3.53 (0.72)	3.84 (0.69)	3.77 (0.69)	3.79 (0.67)	3.68 (0.63)	3.59 (0.76)	3.53 (0.76)	3.43 (0.64)	3.83 (0.66)
NC	3.57 (0.96)	3.20 (1.02)	3.74 (0.89)	3.63 (0.82)	4.00 (0.79)	3.89 (0.78)	3.27 (1.05)	3.40 (1.01)	3.15 (0.95)	3.80 (0.82)
P	3.72 (0.82)	3.23 (0.90)	3.83 (0.77)	3.87 (0.75)	4.03 (0.69)	3.85 (0.68)	3.50 (0.86)	3.56 (0.87)	3.55 (0.75)	4.02 (0.74)
WC	3.18 (0.99)	2.65 (0.91)	3.17 (1.02)	3.39 (0.86)	3.52 (0.88)	3.39 (0.91)	3.03 (1.06)	3.15 (1.02)	2.83 (0.94)	3.48 (0.91)
F	2.85 (0.89)	2.50 (0.88)	2.90 (0.88)	3.06 (0.80)	2.96 (0.82)	3.26 (0.80)	2.60 (0.94)	2.72 (0.91)	2.59 (0.83)	3.02 (0.83)
EC	2.91 (1.01)	2.56 (1.03)	3.06 (0.96)	3.04 (0.91)	3.35 (0.87)	3.08 (0.87)	2.67 (1.09)	2.90 (1.03)	2.41 (0.99)	3.10 (0.95)

U.K. = United Kingdom, NL = the Netherlands,
H = Health, M = Mood, C = Convenience, SA = Sensory Appeal, NC = Natural Content, P = Price,WC = Weight Control, F = Familiarity, EC = Ethical Concern
Data expressed as Mean (SD)
Significance at $p < 0.05$

Table 8 Rank order of most to least important food choice factor for each country

	Norway	Germany	Spain	Greece	Poland	U.K.	Ireland	Netherlands	Portugal
Most important	Sensory Appeal	Sensory Appeal	Price	Price	Natural Content	Sensory Appeal	Price	Price	Price
2	Convenience	Price	Sensory Appeal	Natural Content	Price	Price	Sensory Appeal	Sensory Appeal	Sensory Appeal
3	Health	Natural Content	Natural Content	Sensory Appeal	Sensory Appeal	Health	Health	Health	Natural Content
4	Price	Health	Convenience	Mood	Convenience	Natural Content	Natural Content	Convenience	Health
5	Natural Content	Convenience	Health	Health	Mood	Convenience	Convenience	Natural Content	Weight Control
6	Mood	Mood	Mood	Convenience	Health	Mood	Mood	Mood	Convenience
7	Weight Control	Weight Control	Weight Control	Weight Control	Weight Control	Weight Control	Weight Control	Weight Control	Mood
8	Ethical Concern	Ethical Concern	Familiarity	Ethical Concern	Familiarity	Ethical Concern	Ethical Concern	Familiarity	Ethical Concern
Least important	Familiarity	Familiarity	Ethical Concern	Familiarity	Ethical Concern	Familiarity	Familiarity	Ethical Concern	Familiarity

Table 9 Mean importance rankings for food choice motives in 9 countries

Factor	Mean Rank
Price	1,67
Sensory Appeal	1,89
Natural Content	3,33
Health	4,00
Convenience	4,56
Mood	5,78
Weight Control	6,78
Ethical Concern	8,33
Familiarity	8,67