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Research report

Could the Food Neophobia Scale be adapted to pregnant women? A confirmatory factor analysis in a Portuguese sample ☆

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ABSTRACT

Background: The Food Neophobia Scale (FNS) is widely used in different countries, however appropriate psychometric analyses are required to allow cross-cultural comparisons. To our knowledge, most studies have been conducted among children and adult populations, with no reference to pregnant women. The objective of this study was to translate and test the psychometric properties of a Portuguese version of the FNS, and to identify clusters of food neophobia during pregnancy. *Methods:* The FNS was translated into Portuguese by three health researchers, and back-translated into English by an independent native English speaker and professional translator. The scale was self-administered in a sample of 219 women from the baseline evaluation of the Taste intervention study (HabEat project: http://www.habeat.eu/), who attended medical visits in two hospitals from Porto, Portugal, reporting food neophobia during the last trimester of pregnancy. The FNS consists of 10 items with a 7-point rating scale. An exploratory analysis was performed to evaluate the scale's dimensionality, followed by a confirmatory factor analysis to test the fit of the previous model by using different indexes. Cronbach's alpha coefficient was calculated to evaluate the internal reliability of the scale. The construct validity was assessed by comparing the FNS scores by categories of education, age and fruit and vegetables intake by ANOVA. A Model-based clustering was used to identify patterns of food neophobia; the number of latent classes was defined according to the Bayesian information criterion. *Results:* A two-factor model solution was obtained (after excluding item 8 with a factor loading <0.4), explaining 51% of the total variance. Cronbach's alpha was 0.75 for factor 1 (5 items) and 0.71 for factor 2 (4 items). Items 1, 4, 6, 9 and 10 loaded into the first factor (i.e. more willingness to try new foods; less neophobic traits) and items 2, 3, 5 and 7 loaded into a second factor (i.e. more neophobic traits). A good global of fitness of the model was confirmed by fit indexes: TLI = 0.876, CFI = 0.911, RMSEA = 0.088 and SRMR = 0.051. The higher the education, age, and fruit and vegetables intake the lower the neophobic tendency, measured by the Portuguese FNS. Three patterns (i.e. clusters) of food neophobia, characterizing neophobia traits of pregnant women were identified: Moderate Neophilic, Moderate Neophobic, and Extreme Neophilic (cut-off points were provided). *Conclusion:* The Portuguese version of the FNS has the basic requirements of a valid and reliable measure of food neophobia and permits the identification of clusters of neophobic traits during pregnancy.
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Introduction

Food neophobia, defined as reluctance to eat unfamiliar foods, is an individual trait that influences food choices and consequently food acceptance and consumption (Pliner & Hobden, 1992). Food neophobia has been associated with the "Omnivore's Dilemma", in which humans must decide whether or not to consume novel foods; that is, they must weigh up the possible benefit of consumption (receiving valuable nutrition) against the possibility of harm (ingesting poisons or toxins) (Dovey, Staples, Gibson, & Halford,

Abbreviations: BIC, Bayesian information criterion; CFA, confirmatory factor analysis; CFI, comparative fit index; EFA, exploratory factor analysis; FNS, Food Neophobia Scale; P-FNS, Portuguese version of the Food Neophobia Scale; R, reversed scores; RMSEA, route mean square error of approximation; SRMR, standardized root mean square residual; SD, standard deviation; TLI, Tucker–Lewis Index.

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2008; Pliner & Hobden, 1992). In the broadly safe food environment of the 21st century, the protective function of neophobia is less salient than in the distant past. Rejection of new foods nowadays may have an adverse effect on food choices, compromising quality and variety of diet, particularly the consumption of fruit and vegetables, since in the modern environment food safety is mostly guaranteed (Cooke, Carnell, & Wardle, 2006; Cooke, Haworth, & Wardle, 2007; Pliner & Melo, 1997). According to previous literature, food neophobia, in general, tends to decline with age (Pliner & Melo, 1997), being minimal during the infancy, peaking around the age of 4, and gradually decreasing during adult life (Birch, 1999; Dovey et al., 2008). Food neophobia scores seem also to decrease with education. A higher education level probably enhances the access, experience and exposure to novel foods, and it could help to decrease the neophobic response (Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001).

To assess food neophobia, Pliner and Hobden (1992) developed the Food Neophobia Scale (FNS), a validated psychometric instrument specifically designed to assess this reluctance to consume new foods (Pliner & Hobden, 1992). This scale is a self-administrated ten-item questionnaire, where a lower score represents more willingness to try or choose new foods (food neophilia) and a higher score represents those less willing to try new foods; more neophobic. The FNS is the most common measure used for assessing food neophobia and it has been widely used, but since the scale was originally developed using a sample of Canadian students (Pliner & Hobden, 1992), care must be taken in interpreting results from different populations. In order to allow for cross-cultural comparison, its psychometric properties need to be tested in different countries.

Several validation studies have been conducted to explore the properties of the FNS (Fernández-Ruiz, 2012; Ritchey, Frank, Hursti, & Tuorila, 2003; Schickenberg, Van Assema, Brug, & de Vries, 2008; Tuorila et al., 2001) and the results from these different studies suggest that the FNS is a valid tool for assessing food neophobia in different populations. The scale has been used to identify individuals with more neophobic traits, who might require proper intervention and medical advice, supporting its usefulness and importance.

To our knowledge, this scale has not been used in the Portuguese population, and most studies have been conducted among children (with a different FNS version) (Cooke, Carnell, & Wardle, 2006; Cooke, Haworth, & Wardle, 2007; Cooke, Wardle, & Gibson, 2003; Dovey et al., 2008; Falciglia, Couch, Gribble, Pabst, & Frank, 2000; Flight, Leppard, & Cox, 2003; Galloway, Lee, & Birch, 2003; Koivisto & Sjödén, 1996, 1997; Monneuse et al., 2008; Mustonen, Oerlemans, & Tuorila, 2012) and adult populations (Arvola, Lahteenmaki, & Tuorila, 1999; Edwards, Hartwell, & Brown, 2010; Knaapila et al., 2011, 2007; Nordin, Broman, Garvill, & Nyroos, 2004; Pliner, Eng, & Krishnan, 1995; Pliner & Melo, 1997) with no reference to pregnant women. During pregnancy, significant physiological, psychological and social changes occur (Abduljalil, Furness, Johnson, Rostami-Hodjegan, & Soltani, 2012) that require adaption of pregnant woman. Food choices are influenced by environmental factors such as cultural food practices and beliefs, internal factors such as food cravings and food aversions, and some digestive disorders such as reflux, nausea and vomiting that together may influence the intake of certain foods (Forestell & Mennella, 2008; Kramer, Bowen, Stewart, & Muhajarine, 2013). During this period, maternal dietary intake is particularly important to meet with increased nutritional needs and metabolic demands of mother and fetus (Picciano, 2003), and can greatly impact health status and life expectancy of both (Abu-Saad & Fraser, 2010; Le Clair, Abbi, Sandhu, & Tappia, 2009; Roseboom, de Rooij, & Painter, 2006). At the same time, pregnant women should be cautious, avoiding potentially toxic and hazardous food. Thus, physiological and psychosocial changes occurring during pregnancy can predispose the more neophobic women to express a higher neophobic response during this stage. Although pregnancy can be a sensitive period for more neophobic responses, the existing information is still very scarce, and to our knowledge no study has evaluated neophobia in pregnant women. Since neophobia might affect both the quality and variety of diet (Falciglia et al., 2000), it seems relevant to explore food neophobia in pregnant woman.

This study aims to translate, culturally adapt and test the psychometric properties of the FNS in a sample of Portuguese women who reported food neophobia during the last trimester of pregnancy. We also aim to identify clusters of food neophobia among pregnant women.

Methods

Participants

Participants were pregnant women who were in their final trimester of pregnancy (mean weeks of gestation was 36.62 (S.D. = 3.36) and mothers of newborns in the first week of life ($n = 219$). Pregnant women were consecutively approached between April–July 2011, before their attendance to medical visits in two hospitals from Porto (main public hospital and private antenatal clinic), and they were invited to take part in the baseline evaluation of the Taste intervention, included in the HabEat project that aims to determine factors and critical periods in food habit formation and breaking in early childhood in several European countries (more detailed information could be find at http://www.habeat.eu/). All participants signed an informed consent form to participate in the study. The research protocol was approved by the local ethical committee (Ethical committee of São João Hospital/University of Porto Medical School) and the study procedures complied with the Helsinki Declaration. Participants did not receive any financial support.

Data collection

Mothers self-completed questionnaires (including the FNS and other characteristics) on their convenience: during the visit or at home, reporting the questionnaire in the next visit or sending it by post (in a prepaid envelope).

The original FNS consists of 10 items with a 7-point rating scale ranging from (1) strongly disagree' to (7) strongly agree', with (4) corresponding to the neutral position 'neither agree nor disagree'.

The FNS, originally written in English, was translated into Portuguese by three health researchers, and the result was the Portuguese Food Neophobia Scale (P-FNS). This Portuguese version was back-translated into English by an independent native English speaker and professional translator (who was blinded to the original version) and it was compared with the original version of FNS to ensure equivalence between the two versions. Discrepancies were decided by unanimous agreement. Therefore, the instrument was piloted in a convenience sample ($n = 10$) to evaluate its cultural adaptation.

The P-FNS was self-administered and had as reference period the third trimester of gestation. The 10 items of the P-FNS appear in the same order as in the original version (see Appendix A.). Before analysis, the scores of 5 items marked with (R) were reversed to obtain ratings in the same direction (Pliner & Hobden, 1992). The total score could range from 10 to 70, as the original one.

The questionnaire administered during the recruitment process also provided socio-demographic information and maternal fruit and vegetable intake, obtained by a food frequency questionnaire (FFQ). The FFQ reported in this paper included one global item for fruits and one for vegetables, and 8 categories of frequency, ranging from less than 1 per week to 4 or more times per day. Educational levels were categorized into mandatory education (1–9

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