



Assessing children's willingness to try new foods: Validation of a Portuguese version of the child's food neophobia scale for parents of young children



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ABSTRACT

Because of the well-established effect of food neophobia on children's variety of food consumption, the availability of valid measures of food neophobia in young children is necessary. We studied a Portuguese version of the Child's Food Neophobia Scale (CFNS), assessing its validity and reliability. The CFNS was completed by 388 parents of 2- to 6-year-old children. Construct validity was examined through an exploratory factorial analysis and a confirmatory factorial analysis. Measurement invariance (child's age and sex) and reliability analysis were examined. Correlational analyses between the CFNS and children's eating habits, food preferences and temperament dimensions were run. The results support a two-factor solution, suggesting two opposite dimensions: *Food Neophobia* and *Food Neophilia*. Invariance analysis showed the same structure for both age groups (2- to 4- vs. 5- to 6-year old), although only partial metric invariance across sex groups was attained. For both *Food Neophobia* and *Food Neophilia* subscales, good internal consistency and excellent test-retest reliability were achieved, as well as a moderate negative association between the two groups of items. Higher scores in *Food Neophobia* and lower scores in *Food Neophilia* were significantly correlated with a more inhibited temperament, lower preference for healthy foods, acceptance of fewer foods, less frequent consumption of healthy foods, and consumption of a smaller variety of fruits, vegetables and legumes. Children's unhealthy food intake was not associated with both CNFS subscales. Our preliminary findings support the adequacy of this version of CFNS for the Portuguese population. Further studies are needed to confirm the two-dimensional structure of the scale and explore the implications of this structure. Assessing children's willingness to try new foods: validation of a Portuguese version of the Child's Food Neophobia Scale for parents of young children.

1. Introduction

The need to understand how eating patterns are acquired during childhood as well as the main processes influencing their acquisition is critical to the development of more effective, evidence-based strategies for improving children's diets (WHO, 2000, 2012). Over the last few decades, there has been a growing recognition that individual child characteristics may have a direct impact on children's eating patterns (Russell & Worsley, 2008) and an indirect impact on parents' feeding behaviors (Birch & Fisher, 1998).

One such characteristic is food neophobia. A substantial body of research has examined food neophobia, a trait expressed through a reluctance to eat or avoidance of unfamiliar foods, in children (Dovey, Staples, Gibson, & Halford, 2008; Pliner, 1994). Some small but consistent relationships between food neophobia and temperamental traits have been found in young children. Children with higher values of inhibition and negative emotionality were rated by mothers and

observed in laboratory tasks as more neophobic (Pliner & Loewen, 1997). Shy and emotional 3- to 8-year-old children tended to be less willing to try new foods and exhibited more food avoidant behaviors (Haycraft, Farrow, Meyer, Powell, & Blissett, 2011). According to Moding and Stifter's (2016) findings, temperament may predispose children to heightened risk for food neophobia. These authors confirmed an association between temperamental withdrawal, i.e., high levels of negative affect and low levels of positive affect when presented with novel objects at 18 months of age, and higher food neophobia (both behavioral and parent-rated) at 4.5 years of age (Moding & Stifter, 2016).

Food neophobia reaches its highest levels during early childhood, tends to remain stable when children are between 2 and 5 years old (Cooke, Carnell, & Wardle, 2006; Russell & Worsley, 2008), and then decreases until adulthood (Cashdan, 1994; Cooke, Wardle, & Gibson, 2003). Gender differences have shown mixed results (Cooke et al., 2006; Russell & Worsley, 2008).

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The negative effects of neophobia on children's everyday food intake are well documented. Higher levels of food neophobia in kindergarten children are associated with lower intake of fruit and vegetables (Cooke et al., 2004; Coulthard & Blissett, 2009), proteins (Cooke et al., 2006, 2003) and saturated fats (Falciglia, Couch, Gribble, Pabst, & Frank, 2000). Fewer neophobic children met the necessary doses of Vitamin E than do non-neophobic children (Falciglia et al., 2000). Concomitantly, early childhood neophobia was also associated with reduced preferences for all food groups (with a stronger effect for vegetables, followed by meats and fruit), less diversified preferences and lower preferences for healthy foods (Russell & Worsley, 2008). However, these findings were not completely replicated in Howard and colleagues' study in which neophobic children showed less appreciation of vegetables and fruits but not of sweet and salty non-core foods (Howard, Mallan, Byrne, Magarey, & Daniels, 2012).

The mutual influence of child's neophobia and parent's food behaviors and feeding practices has been earlier reported. Parents tend to select the food available at home and limit the child's experience with certain foods according to their own preferences (Cooke et al., 2004). Neophobia may also affect the parents' feeding attitudes in response to their children's difficult behavior when prompted to eat new or less appreciated foods. Mothers offered more fruit and vegetables to their 2- to 5-year-olds when the child's food neophobia was lower (Coulthard & Blissett, 2009). This tendency seems to be sustained in later ages, since neophobic children and teenagers between 2 and 17 years old were offered fewer uncommon foods by their parents (Koivisto & Sjöden, 1996).

Assessment of food neophobia during early childhood has been tested mainly with either a variation of a laboratory task developed by Pliner (1994), in which children are requested to make a series of choices about different new foods that they believe they will taste later, or with the Children's Food Neophobia Scale (CFNS), a questionnaire that evaluates the child's degree of willingness to try new foods, as perceived by parents. These two types of assessment can measure related but distinctive phenomena. According to Pliner (1994), the questionnaire measures a trait, while the laboratory task measures the interactions among the trait, the actual environment and the individual conditions at the time of task. The questionnaire has the advantage of being easier to use in large community studies and is more appropriate as a screening tool in health services when experimental tasks cannot be applied.

The development of CFNS was based on a prior paper and pencil measure, The Food Neophobia Scale (FNS), used to assess the degree of food neophobia of adult subjects; the decision was supported on the reasonable internal and test-retest reliability and construct validity of the FNS (Pliner & Hobden, 1992). The adequacy of the CFNS, filled by parents of young children as reliable observers of the child's degree of willingness to try unfamiliar foods, was established mainly through convergent validity, by correlating the child's willingness ratio (i.e., the degree of neophobia shown by the child in the laboratory), the child's trait neophobia score (e.g., parent's beliefs about the child's general willingness to try new foods), and the predicted child's willingness ratio (e.g., parent's predictions about the child's degree of neophobia in a specific situation).

Since then, CFNS was repeatedly used and several studies confirmed the adequacy of the scale in populations from different countries, mainly employing reliability analysis (Coulthard & Blissett, 2009; Faith, Heo, Keller, & Pietrobelli, 2013; Koivisto & Sjöden, 1996; Koivisto-Hursti & Sjöden, 1997; Mustonen, Oerlemans, & Tuorila, 2012; Pliner & Loewen, 1997; Russell & Worsley, 2008; Tuorila & Mustonen, 2010). Various studies introduced minor changes in the item formulations to correspond to the specific cultural characteristics of the sampled population (Aldridge, Dovey, Martin, & Meyer, 2016; Cooke et al., 2006; Cooke, Haworth, & Wardle, 2007; Cooke et al., 2003, 2004; Galloway, Lee, & Birch, 2003; Howard et al., 2012; Nicklaus, Boggio, Chabanet, & Issanchou, 2005; Park & Cho, 2016; Perry et al., 2015;

Vandeweghe, Vervoort, Verbeken, Moens, & Braet, 2016). However, these works lack information about factorial analysis. Furthermore, CFNS has not yet been adapted to the Portuguese language. The only two studies conducted in Portuguese-speaking countries (Paupério et al., 2014; Previato & Behrens, 2015) explored the psychometric characteristics of the FNS (Pliner & Hobden, 1992) with specific adult samples (pregnant women and students, respectively). Therefore, the conclusions from these analysis of the FNS (measure of adult's own food neophobia) cannot be applied to the CFNS (measure of parent's perception of their child's food neophobia), the scale examined in our study.

This work aimed to develop and study the Portuguese version of CFNS, through the assessment of the validity and reliability of this instrument. Several goals were pursued: a) examination of the factor structure of the instrument (comparing one-factor, two-factor and bifactor models); b) testing of the invariance (configural, metric, scalar, and residual) in sex and age groups; c) examination of the internal consistency of the scale; d) evaluation of the temporal stability of the scale (test-retest reliability coefficient); and e) assessment of concurrent and discriminant validity of the instrument through correlations with the child's temperament dimensions, eating habits and food preferences. Because earlier studies with different samples and versions of CFNS have demonstrated good reliability results, good internal consistency and test-retest reliability coefficients were also expected. Based on previous research described above (Cooke et al., 2006, 2003; Haycraft et al., 2011; Howard et al., 2012; Pliner & Loewen, 1997; Russell & Worsley, 2008), we anticipated weak to moderate positive associations between food neophobia and the child's temperament (inhibition and negative emotionality) and weak to moderate negative associations between neophobia and healthy habits, variety of food consumption, healthy food preferences and number of foods well accepted by the child.

2. Material and methods

2.1. Participants

A total of 394 parents of 2- to 6-year-old children volunteered to participate in the study and completed the research protocol (51.6% response rate). Six responses were considered ineligible for analysis ($N = 388$), due to missing or double answers for more than 5% of the total items of a questionnaire. The questionnaires were completed mainly by mothers (91.5%). Most respondents were aged between 25 and 44 years old (82.7%); 28.1% completed secondary school, and 39.9% held a university degree. Most children were 4 and 5 years old (80.4%) and lived with both parents (84.5%); 50.3% were boys. A small percentage was born premature (6.9%) or had a chronic condition (9.8%).

2.2. Measures

2.2.1. Child's food neophobia

The Child Food Neophobia Scale (CFNS) proposed by Pliner (1994) is a 10-item questionnaire aimed to assess parent's perspectives of their children's reactions to new or different foods (e.g., "My child doesn't trust new foods.", "If my child doesn't know what's in a food, she won't try it."). Parents rated their answers on a 7-point Likert scale from "I Totally disagree" to "I totally agree", and the total score of the scale was calculated by summing the individual answers to each item (ranging between 10 and 70) after reversing the ratings to the neophilic items. The CFNS has been widely used to measure food neophobia among children of different ages and revealed good internal consistency, with Cronbach alpha coefficients between 0.81 (Koivisto-Hursti & Sjöden, 1997) and 0.91 (Russell & Worsley, 2008).

The Portuguese version of the CFNS was developed considering the original scale and minor item adaptations introduced in the Australian

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