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Psychometric analysis of the Food Technology Neophobia Scale in a Chilean sample

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ABSTRACT

The aim of this study was to determine the psychometric properties of the Food Technology Neophobia Scale (FTNS) in a developing South American country. A convenience sample of 400 adults from Temuco, Chile, was obtained. Two hundred subjects were surveyed at a supermarket and 200 were university students. After a data cleansing process, a sample of 332 subjects was obtained. The questionnaire included the 13-item FTNS and socio-demographic questions. Using confirmatory factor analysis (CFA), the original FTNS model proposed by Cox and Evans (2008) was tested, along with other seven models that resulted from statistically based variations. There was no evidence of validity for the original model, and the remaining models also showed a bad fit to data. However, a CFA was conducted testing the factorial invariance by student or working adult status. Thus, a one-dimensional model was tested, which showed a good fit to data and presented a good reliability for students and non-students. This model presented strong factorial invariance. To encourage parsimony, this model is proposed as an abbreviated version of the FTNS (AFTNS), which is reduced from 13 to 9 items and from four to one factor. In order to obtain improved goodness of fit indexes, it is recommended to consider the categorical variable student/non-student in the analysis if this variable is present in the data, especially for the use of the AFTNS in populations with similar characteristics.

1. Introduction

Food neophobia is the reluctance to try new foods, but people differ in their degree of food neophobia (Pliner & Hobden, 1992), with some individuals showing great pleasure in eating new foods and others showing a strong aversion to them (Ritchey, Frank, Hurstic, & Tuorila, 2003). Research on the subject has been aided by the development of the Food Neophobia Scale or FNS (Pliner & Hobden, 1992), which provides a standardized measure of food neophobia. Numerous studies have shown that the FNS accurately predicts responses to novel or unfamiliar food (Ritchey et al., 2003; Tuorila, Lähteenmäki, Pohjalainen, & Lotti, 2001), but it is less suitable for assessing receptivity to foods produced by new technologies (Backstrom, Pirttila-Backman, & Tuorila, 2004; Cox & Evans, 2008; Flight, Leppard, & Cox, 2003; Grunert, Bredahl, & Scholderer, 2003; Lähteenmäki et al., 2002; Pliner & Salvy, 2007; Siegrist, 2008; Tuorila et al., 2001). However, all these studies have been conducted in developed countries. A more recent study, carried out in a developing country in South America, suggested that the FNS might also be a suitable instrument for measuring acceptance of food produced with new technologies in this kind of nations (Schnettler et al., 2013).

Building on this line of research, Cox and Evans (2008) developed the Food Technology Neophobia Scale (FTNS). According to Coppola, Verneau, and Caracciolo (2014), the FTNS may be a better instrument for predicting consumers' willingness to try novel food technologies than the FNS, because of its specific focus on technology rather than on food. The aim of Cox and Evans (2008) was to create a tool to identify consumer segments that accept or reject novel food technologies. In a three-stage validation procedure using factor analysis, 81 food and food technology items were

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reduced to 13, grouped into four factors with loadings greater than 0.50. A factor should consist of at least three items (Costello & Osborne, 2005; Velicer & Fava, 1998), although one latent variable (Factor 4) had only one indicator (item 13). Cox and Evans (2008) found a high internal reliability for the scale (Cronbach's $\alpha = 0.84$), but they did not calculate internal reliability for each factor.

More recently, Evans, Kermarrec, Sable, and Cox (2010) further tested the FTNS to assess scale reliability. Although the scale factors nor Cronbach's α were reported, the results of the analysis of the full FTNS data confirm not only the reliability of the scale, but also that the measure is relatively stable over time. Also, Evans et al. (2010) concluded that the FTNS is a valid index of behavior towards foods produced using novel technologies.

There are a number of studies that have used the FTNS. In Canada, Hosseini et al. (2012) related food technology neophobia with attitudes towards nanotechnology and food packaging and foods. Also in Canada, Chen, Anders, and An (2013) following a factor analysis, found that the FTNS scale items loaded only on two factors. Neither of these studies reported the scale's Cronbach's α. Based on these data, Chen et al. (2013) concluded that the participants' FTNS scores were significantly correlated with their stated food safety perceptions. Almli, Van Wezemael, Verbeke, and Ueland (2013), using some items from the FTNS, found that Belgian consumers tend to be more conservative and traditional than Norwegian consumers regarding food production technologies. Coppola et al. (2014) and Verneau, Caracciolo, Coppola, and Lombardi (2014) found a similar four-factor model as did Cox and Evans (2008). Although Cronbach's α was not reported by Coppola et al. (2014), the authors asserted that each factor was a predictor of food purchase behavior in specific food categories. Verneau et al. (2014) reported Cronbach's α as 0.75 for the 13-item scale, but they did not report Cronbach's α by factor. In South Korea, Kim, Jang, and Kim (2014) found that the traits in the FTNS are moderating influences on consumers' attitudes, norms, and behavioral intentions, which are key determinants of food-purchasing behavior. The FTNS Cronbach's α was not reported in this study.

Food technology neophobia has been less explored in developing countries. Vidigal et al. (2014) translated and validated the 13-item FTNS into Portuguese and the reported Cronbach's α for this version was 0.756. In a follow-up study, Vidigal et al. (2015) determined the relationship between neophobia and attitude to nanotechnology in a Brazilian sample. Cronbach's α in this study was 0.73 and a three-factor FTNS model was found. The authors explained that there might be a difference in the perception of the items between the English and Portuguese populations, resulting in the discrepancy between both models.

However, to our knowledge, the psychometric properties of the FTNS have not been previously assessed. Assessing the psychometric properties of a scale is important to establish the reliability and validity of interpretations of scores obtained with it (DeVellis, 2003; Messick, 1995). These properties are evaluated to determine the degree of stability of scale scores and the degree to which the scale is assessing what it is expected (Kline, 2005a,b). On this background, this study seeks to determine the psychometric properties of the FTNS using the procedures recommended for ordinal scales, and to find evidence of structural validity in Chile, a developing country in South America. Chen et al. (2013) in Canada and Vidigal et al. (2015) in Brazil showed different results regarding the reliability and validity (different number of factors or dimensions) in comparison to the original model by Cox and Evans (2008). These findings, as well as the lack of studies on the FTNS behavior in Chile or another Spanish language country of South America, support the need to evaluate the psychometric properties of FTNS in a Chilean sample, with the alternative hypothesis that the behavior of FTNS would be different to its behavior in other countries.

Considering that age is associated with both acceptance towards foods produced with newer technologies (Butler, Wolf, & Bandoni, 2008; Mucci, Hough, & Ziliani, 2004; Nayga, Fisher, & Onyango, 2006; Rollin, Kennedy, & Wills, 2011; Schnettler, Crisóstomo et al., 2013) and food neophobia (Camarena, Sanjuán, & Philippidis, 2011; D'Antuono & Bignami, 2012; Meiselman, King, & Gillette, 2010; Sanjuán-López, Philippidis, & Resano-Ezcaray, 2011; Schnettler, Crisóstomo et al., 2013), the study is conducted on two subsamples: the first one, working adults, represents an older generation that, independent of their educational level, is responsible for purchasing food for their household. The second subsample comprises young adults, represented by undergraduate university students. According to the literature, the former are less receptive to the new technologies applied to food production and are more neophobic than younger people.

2. Materials and methods

2.1. Sample and procedure

Prior to the survey, the questionnaire was pretested with 20 working adults and 20 university students. The interviewer approached them in supermarkets or in the university campus, respectively, explained to them the objectives of the survey and the strictly confidential treatment of the information obtained, and asked if they were willing to answer the questionnaire. If they responded positively, the participants responded immediately to the survey while the interviewer marked the responses on the questionnaire. As no problems were detected, no changes were required in either the questionnaire or the interview procedure. The questionnaires obtained in the pretest were not incorporated into the analysis of the results.

The survey was conducted in July and August 2013 using the same method of addressing the participants as in pretest. Thus an accidental non-probability sampling was used to recruit 400 participants from Temuco, Chile. 200 supermarket shoppers were approached at selected supermarkets and 200 were students from Universidad de La Frontera, located in the same city. The participants signed informed consent statements before responding. The Ethics Committee of the Universidad de La Frontera from Chile approved the execution of the study.

This sample satisfied the conditions regularly required by psychometric analysis with confirmatory factor analysis (CFA, Jöreskog, 1971), i.e. to include 10 cases per variable (Nunnally, 1967), five observations per estimated parameter (Bentler & Chou, 1984; Bollen, 1989) and a minimum sample size of 100 participants (Boomsma, 1982; Myers, Ahn, & Jin, 2011).

2.2. Data collection instrument

The questionnaire included the 13-item FTNS (Cox & Evans, 2008). Two bilingual translators translated all original items from English to Spanish (Table 1). 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 agreeing on the final versions of the two scales. In the 13-items FTNS, respondents had to indicate their degree of agreement using a Likert 7-point agree/disagree scale (Cox & Evans, 2008). Most research has retained the original 7-point scale (Almli, Van Wezemael, Verbeke, & Ueland, 2013; Coppola et al., 2014; Evans et al., 2010; Kim et al., 2014; Verneau et al., 2014; Vidigal et al., 2014, 2015), but others use shorter scales (5-point scale), such as Hosseini et al. (2012) and Chen et al. (2013). This