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Testing the Abbreviated Food Technology Neophobia Scale and its relation to satisfaction with food-related life in university students

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ABSTRACT

The aims of this study were to test the relationships between food neophobia, satisfaction with food-related life and food technology neophobia, distinguishing consumer segments according to these variables and characterizing them according to willingness to purchase food produced with novel technologies. A survey was conducted with 372 university students (mean aged = 20.4 years, SD = 2.4). The questionnaire included the Abbreviated version of the Food Technology Neophobia Scale (AFTNS), Satisfaction with Life Scale (SWLS), and a 6-item version of the Food Neophobia Scale (FNS). Using confirmatory factor analysis, it was confirmed that SWFL correlated inversely with FNS, whereas FNS correlated inversely with AFTNS. No relationship was found between SWFL and AFTNS. Two main segments were identified using cluster analysis; these segments differed according to gender and family size. Group 1 (57.8%) possessed higher AFTNS and FNS scores than Group 2 (28.5%). However, these groups did not differ in their SWFL scores. Group 1 was less willing to purchase foods produced with new technologies than Group 2. The AFTNS and the 6-item version of the FNS are suitable instruments to measure acceptance of foods produced using new technologies in South American developing countries. The AFTNS constitutes a parsimonious alternative for the international study of food technology neophobia.

1. Introduction

Technological progress promotes the development of new processing technologies (Perrea, Grunert & Krystallis, 2015), causing both new food and food packaging techniques to emerge (Siegrist, Hartmann & Sütterlin, 2016). Nonetheless, not all technologies are equally accepted by consumers (Siegrist et al., 2016). There is a coexistence between a demand for modernity and for naturalness regarding diet and food, including the need for novelty (neophilia) as well as caution, and even aversion, concerning new, unknown food (neophobia) (Coppola, Verneau & Caracciolo, 2014). Food neophobia is the reluctance to try new foods, with consumers differing in their degree of food neophobia (Pliner & Hobden, 1992). Studies have shown that the Food Neophobia Scale (FNS) (Pliner & Hobden, 1992) accurately predicts responses to novel or unfamiliar food (e.g. Donadini, Fumi & Porretta, 2012; Salgado, Camarena & Díaz, 2016), but is less suitable for assessing acceptance of foods produced by new technologies (Cox & Evans, 2008; Evans, Kermarrec, Sable & Cox, 2010). However, a recent study with an adult sample suggested that a 6-item version (grouped into a single dimension) of the FNS may be suitable to measure acceptance of food produced with new technologies in a developing South American country (Schnettler, Crisóstomo, Sepúlveda, et al., 2013). More recently, the unidimensional structure of the FNS with six items was validated with confirmatory factor analysis (CFA) in a university student sample from Chile (Schnettler, Höger et al., n.d.). In this regard, Ritchey, Frank, Hursti, and Tuorila (2003) suggested that cultural variables may play an important role in influencing responses to new foods. In fact, Ritchey et al. (2003) found that an 8-item unidimesional model of the FNS fit well between US and Swedish adult samples allowing comparisons between the food neophobia levels of the US and Sweden. The same authors also reported an acceptable fit for a 6-item version of the FNS when data from the US,

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Sweden and Finland were used.

Cox and Evans (2008) developed the Food Technology Neophobia Scale (FTNS) with 13 items grouped into four factors, concluding that it had predictive validity regarding the willingness to consume foods produced by novel food technologies. These authors proved the predictive validity of the scale correlating the magnitude of the FTNS with an index of "willing to try current technologies" (pasteurization, high pressure and modified atmosphere packaging) and another index of "willing to try novel technologies" (triploidy, genetic modification, bioactives) in fruit juice, salads, prawns, yogurt and oilseed that is high in omega-3. Most studies using the FTNS have been performed in developed countries, according to the classification of the World Economic and Prospects (WESP, 2014). Evans et al. (2010) confirmed the validity of the FNTS in Australia, evaluating the willingness to try and taste a variety of common foods (water, oranges, juice, bread, yogurt, cheese, smoked salmon and prawns) labeled as current or new technology, both established (pasteurization, selective breeding, fortification) and novel (bioactives, triploidy, genetic modification and nanotechnology). In Italy, Caracciolo, Coppola, and Verneau (2011) reported that the first two factors of the FTNS (perceived risk and uselessness of a technology) are key in determining the probability of buying products that consumers can associate with a greater (functional foods, low calories foods, ready to eat foods) or lesser (typical foods, organic foods, short chain foods) use of modern technologies. In Canada, Hosseini et al. (2012) related food technology neophobia with attitudes towards nanotechnology, nano food packaging, and nano foods in general. Also in Canada, Chen, Anders, and An (2013) concluded that FTNS scores were significantly correlated with food safety perceptions of using vacuum packaging of fresh beef with different prices, ageing and number of shelf life days under different information treatments (risk and benefits of the vacuum packaging). Coppola et al. (2014) reported that consumer attitudes to technologies and sociodemographic characteristics determine the probability of buying products with a higher degree of processing in Italy, by using the same six foods categories as the study conducted by Caracciolo et al. (2011). In the same country, Verneau, Caracciolo, Coppola, and Lombardi (2014) studied demographic variables vs. attitudes towards technologies in predicting the consumption behavior of three familiar categories of highly processed foods; namely fat-reduced, functional (enriched drinks and yogurt) and ready-to eat-frozen food, concluding that the four independent FTNS components help clarify the influence of each neophobia-neophilia force on food choices. In Finland, Deegan, Palmujoki, Isotalo, and Tuorila (2015) found that FTNS had a significant effect on expected purchase intent of a novel Emmental-type cheese made from low-pressure homogenized milk and reported a significant but low positive correlation between FNS and FTNS scores. Jeżewska-Zychowicz and Królak (2015) found that Polish consumers with positive attitudes towards new food technologies were more likely to consume cereals fortified with fiber. In Italy, Sodano, Gorgitano, and Verneau (2016) found that willingness to buy nanofoods (creamier ice cream with the same fat content, salt and sugar that do not form lumps with moisture, fruit juices enriched with bioactive molecules, bread enriched with omega-3, plastic bottles for beer, and antimicrobial food packaging for meat) is affected by food technology neophobia level. La Barbera, Amato, and Sannino (2016) found that only the healthy choice subscale of the FTNS was a significant predictor of premium prices for crushed tomatoes enriched with lycopene than for the conventional choice among Italian undergraduate students.

The first study in a developing country (WESP, 2014) in which the FTNS was validated was conducted in Brazil (Vidigal et al., 2014). In South Korea, Kim, Jang, and Kim (2014) found that FTNS components influence consumers' attitudes and behavioral norms, affecting genetically modified (GM) food-purchasing behavior in general. Vidigal et al. (2015) studied the behavior of Brazilian consumers in relation to the different technologies used in yogurt (traditional, pasteurized, organic, GM, enriched with bioactive proteins and nanotechnology). These authors reported that neophobia regarding food technology is an important factor in explaining consumer behavior in relation to new technologies, especially for nanotechnology. De Steur, Odongo, and Gellynck (2016) used the FTNS to assess consumer preference of fresh vs. processed matooke (cooking banana) flour. These authors found that Ugandan respondents are relatively neophobic towards new technologies, indicating risk perception, healthiness and the perceived need for technologies as key factors influencing consumer's preferences.

In summation, studies that have utilized the FTNS in both developed and developing countries have evaluated the levels of acceptance towards food produced with current and novel technologies (Cox & Evans, 2008; Evans et al., 2010; Vidigal et al., 2015), with nanotechnology applications in food and packaging (Hosseini et al., 2012; Sodano et al., 2016), GM foods in general (Kim et al., 2014), current technologies applied to the food or the package (Chen et al., 2013; Deegan et al., 2015; De Steur et al., 2016), highly processed foods (Caracciolo et al., 2011; Coppola et al., 2014; Verneau et al., 2014) and functional foods without indicating the technology used in the making of the food (Jeżewska-Zychowicz & Królak, 2015; La Barbera et al., 2016). Only six of these studies have used the FTNS to evaluate acceptance of foods produced via controversial technologies such as GM and nanotechnology (Cox & Evans, 2008; Evans et al., 2010; Hosseini et al., 2012; Kim et al., 2014; Sodano et al., 2016; Vidigal et al., 2015), and only three have considered animal products (Cox & Evans, 2008, Evans et al., 2010, Sodano et al., 2016). None of these studies has used the FTNS to evaluate only the acceptance of foods produced using controversial technologies, and the acceptance of this type of food has not been distinguished and compared according to the vegetal or animal origin, all of which will be addressed in the present research.

In parallel, as noted by De Steur et al. (2016) and Schnettler, Miranda-Zapata, et al. (2016), FTNS factor solutions range between two and four in previous studies, and statements assigned to these factors also differ, indicating a lack of stability of the instrument. In Chile, Schnettler, Miranda-Zapata, et al. (2016) tested the original FTNS model (Cox & Evans, 2008) and seven other models using confirmatory factor analysis (CFA). This study found no evidence of validity for the original model, and the remaining models showed a bad fit to the data. Therefore, these authors proposed an Abbreviated version of the FTNS (AFTNS), reducing 13 items to nine and four factors to one. However, these authors did not evaluate the ability of the AFTNS to predict acceptance of foods produced by novel technologies. Therefore, this study focuses on relating food neophobia and food technology neophobia levels using the 6-item version of the FNS previously used satisfactorily in Chile (Schnettler, Crisóstomo, Sepúlveda, et al., 2013; Schnettler, Velásquez, et al., 2016) and the AFTNS (Schnettler, Miranda-Zapata, et al. (2016)) with the willingness to purchase foods of plant and animal origin produced with nanotechnology, GM and cloning. We also relate these levels to the willingness to purchase foods in a package produced with nanotechnology.

A factor that influences food choices is the perceived impact of food on health and well-being (Jeżewska-Zychowicz & Królak, 2015). One instrument to measure food-related well-being is the Satisfaction with Food-related Life (SWFL) scale (Grunert, Dean, Raats, Nielsen & Lumbers, 2007). The SWFL measures a person's overall assessment regarding their food and eating habits (Grunert et al., 2007). Schnettler, Crisóstomo, Sepúlveda, et al. (2013) and Schnettler, Höger, et al. (n.d.) categorized consumer segments of Chilean adults and university students, respectively, based on their food neophobia and SWFL levels. Segment composition suggested that food neophobia correlated inversely and significantly with SWFL levels. Therefore, we expect to confirm this inverse relation in this study and explore the relationship between food technology neophobia and SWFL levels. As new technologies used in food production are perceived as risky by consumers (Perrea et al., 2015; Siegrist et al., 2016; Siegrist, Stampfli, Kastenholz & Keller, 2008), we expect to find an inverse

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