Food Quality and Preference 27 (2013) 128–136

Contents lists available at SciVerse ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

Predictors and correlates of taste preferences in European children: The IDEFICS study

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ARTICLE INFO

Article history:
Received 30 September 2011
Received in revised form 18 September 2012
Accepted 18 September 2012
Available online 28 September 2012

Keywords:
Taste preference
Cross-cultural comparison
Age
Children
Europe

ABSTRACT

The present study investigated taste preferences in a sample of 1705 children aged 6 to 9 years from survey centres in Italy, Estonia, Cyprus, Belgium, Sweden, Germany, Hungary, and Spain and aimed to identify factors correlated with taste preference. Children's preferences for varying levels of sucrose (sweet) in apple juice and fat, sodium chloride (salt) and monosodium glutamate (umami) in crackers were assessed using paired-comparison tests. Socio-demographics (age, sex, parental education), early feeding practises (breastfeeding, introduction of fruits), parenting behaviour (TV viewing, using food as a reward) and taste threshold sensitivity for sucrose (sweet), sodium chloride (salt), caffeine (bitter) and monosodium glutamate (umami) were investigated as possible correlates of taste preferences. Parents reported on socio-demographics, early feeding and parenting behaviour. Taste thresholds were determined via a paired-comparison staircase method. Country of residence was the strongest factor related to preferences for all four tastes. Taste preferences also differed by age. Preference for sugar and salt increased between 6 and 9 years of age while preference for monosodium glutamate decreased. The age differences remained significant even after adjustment for sex, country of residence, parental education and early feeding habits. Sex, parental education, early feeding habits, TV viewing, using food as a reward and taste thresholds were not consistently related to taste preferences among the survey centres. In summary, the results highlight the importance of culture and age in taste preferences in children younger than 10 years of age.

1. Introduction

Consumer studies show that the taste of a food is one of the most important drivers of food choice (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998). Because of this prominent role in nutrition, taste and food preferences have been proposed to be related to health outcomes, mainly to overweight and obesity (Bartoshuk, Duffy, Hayes, Moskowitz, & Snyder, 2006; Drewnowski, Brunzell, Sande, Iverius, & Greenwood, 1985; Mela & Sacchetti, 1991; Ricketts, 1997). In fact, we previously demonstrated that a preference for fat and sweet taste was related to overweight in 6- to 9-year-old children from 8 European countries (Lanfer et al., 2012). Detecting a relationship between taste preferences in children and a health outcome calls for further investigations into taste preferences in children. However, not only the fact that taste preference is related to weight status underscores the necessity of further studies. Dietary habits develop early in childhood and remain stable throughout adolescence and into young adulthood, therefore exerting an impact on immediate as well as future health (Kelder, Perry, Klepp, & Lytle, 1994; Tabacchi, Giammanco, La Guardia, & Giammanco, 2007). Additionally, in-depth studies into

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http://dx.doi.org/10.1016/j.foodqual.2012.09.006

differential taste preferences in children can help in designing contextualised prevention programs that aim to improve eating habits. Designing these measures will require a profound understanding of the predictors and correlates of taste preferences and of groups most at risk of having taste preferences that might lead to detrimental eating habits.

Factors that possibly influence taste preferences are numerous. The development of food and taste preference is most probably linked to the food environment provided by the parents. It has been previously reported that early feeding such as breastfeeding versus formula-feeding influences acceptance of novel foods during weaning (Sullivan & Birch, 1994) and consumption of fruits and vegetables in older children (Cooke et al., 2004; Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002). Mother's milk varies in content and taste as flavour molecules can pass from the mother's blood system into breast milk, whereas the taste of milk formula is less varied. In other words, breastfed children are exposed to more taste variation than formula-fed children which might not only influence their food preferences but also their taste preferences even after weaning. Parents' influence on children's taste and food preferences does not only comprise early feeding but other factors under their control such as dietary rules, food availability or media use. For example, children have shown to develop a preference for foods that have been used as a reward by their parents for approved behaviour (Birch, 1999). Investigations on TV viewing indicated that children's preferences for fatty, sweet and salty foods is determined by their brand knowledge which, in turn, is shaped by TV viewing (Cornwell & McAlister, 2011). In line with this, Harris and Bargh found that the observed relationship between TV viewing and unhealthy dietary choices was mediated partially through the perceived taste of advertised foods (Harris & Bargh, 2009). It will be interesting to see whether these results based on self-reported food and taste preferences can be replicated with instruments that measure taste preferences with the help of taste tasks.

It is a common notion that taste sensitivity, i.e. the capability to perceive a taste, is a determinant of taste preference. However, the literature on this association is ambiguous. Most studies have focused on genetically determined sensitivity towards the bitter substance propylthiouracil (PROP) and showed that it is linked to an increased preference of sweet taste in children although results for fat preference are inconclusive (Tepper, 2008). Studies on taste qualities other than PROP have found no or ambiguous associations between taste sensitivity and preferences (Coldwell, Oswald, & Reed, 2009; Mojet, Christ-Hazelhof, & Heidema, 2005). The latter studies, however, differ in their design and were conducted in adolescents or adults. Whether taste sensitivity influences preference in younger children still needs investigation.

Parental and physiological factors may be useful in understanding underlying processes in the development of taste preference. Demographic determinants of taste indicate subgroups of the population that are prone to taste preferences that might lead to less favourable eating habits. Gender and socio-economic status have both been previously linked to taste preferences, with females and high socioeconomic groups generally having food and taste preferences that are associated with healthier food choices (Brug, Tak, te Velde, Bere, & de Bourdeaudhuij, 2008; Cooke & Wardle, 2005; Monneuse, Bellisle, & Louis-Sylvestre, 1991; Wright, Nancarrow, & Kwok, 2001). Previous studies have also found effects of age such that the preference for sweet and salty tastes declines from childhood through adolescence to adulthood (De Graaf & Zandstra, 1999; Desor & Beauchamp, 1987; Desor, Greene, & Maller, 1975; Enns, Van Itallie, & Grinker, 1979; Lawless et al., 2004). Finally, studies have shown that taste preferences are probably influenced by cultural factors and differ between countries (Prescott & Bell, 1995; Rozin & Vollmecke, 1986).

Sensory studies usually limit their investigations to one or two of the mentioned factors and are normally conducted with small convenience samples in laboratory settings. Epidemiological studies are still lacking, especially in children. However, using population-based data provides the opportunity to confirm hypotheses from laboratory studies and allows for investigation of the influence of several factors simultaneously and therefore taking account of their possible interdependence.

Against this background, the present study aims to describe taste preferences in children from eight European countries. It also aims to map predictors and correlates of taste preferences that comprise socio-demographics, early feeding, parenting behaviour and taste sensitivity.

2. Methods

2.1. Study design and participants

The study is based on data of the baseline survey of the IDEFICS study which is a European epidemiological multi-centre study that focuses on investigating the aetiology of overweight and obesity in children and on the development of effective intervention strategies. The design, study population, and data collection have been described in detail previously (Ahrens et al., 2011). A baseline survey was conducted from September 2007 until May 2008 and included 2- to 9-year-old children from survey centres in Italy, Estonia, Cyprus, Belgium, Sweden, Germany, Hungary and Spain. It had a response rate of 51% and comprised 16220 children for which full information on sex, age, weight and height were available and therefore fulfilled inclusion criteria. A random subsample of 1839 (20.8%) IDEFICS schoolchildren (6- to 9-year-old) from the baseline sample were asked to participate in taste preference and sensitivity tests during the baseline survey. Our analyses include children who participated in at least one preference test for sweet, fat, salty or umami taste. This was the case for 1705 children of the subsample. The other children either only conducted other sensory tests (128 children) or were excluded because of known food allergies or last minute refusal (6 children).

In each country, the participating centres obtained ethical approval from their responsible authority. Parents or legal guardians provided written informed consent for all examinations and/or the collection of samples, subsequent analysis, and storage of personal data and collected samples. Standardized instruments and procedures were applied in data collection that was further guaranteed by central and subsequent local trainings of field staff.

2.2. Taste preference tests

Sensory testing was performed in schools usually on the same day as the other examinations in a separate section of the general examination room. A standardised sensory test battery for taste preference, developed for epidemiological studies, was employed. A detailed description of the taste preference tests has been provided in a previous report (Knof, Lanfer, Bildstein, Buchecker, & Hilz, 2011).

Taste preference for varying content of sucrose (sweet) in apple juice as well as fat, sodium chloride (salt) and monosodium glutamate (umami) in crackers was assessed using paired-comparison preference tests. The taste preference test procedure also included a test for the preference for apple flavour but its results were not analysed in the present study.

During the taste preference tests the children had to choose their preferred food sample out of a pair that consisted of a reference sample and a corresponding modification with added sucrose (sweet), fat, sodium chloride (salt) or monosodium glutamate