Optimized Descriptive Profile: A rapid methodology for sensory description

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ABSTRACT

The objective of this study was to propose a rapid method for obtaining sensory descriptions of foods utilizing semi-trained judges and the quantitative evaluation of sensory attributes, called the Optimized Descriptive Profile (ODP). It was proposed that reference materials be present during final evaluation of the products. Therefore the judges could compare samples with the reference materials, facilitating the allocation of attribute intensity on the unstructured scale. The description obtained by the ODP was compared with the Conventional Profile (CP). Comparative analyses were made between the graphical representations obtained by the Principal Components Analysis (PCA), *t*-test and correlation analysis. Correlation between sensory measurements obtained by both methods and the instrumental texture measurements was also evaluated. The proposed methodology provided a sensory profile that was very similar to that of the evaluation trained panel (CP) in relation to the graphical configuration of the samples and the correlation of attributes with the principal components. Results of the sensory description presented significant correlation without significant differences according to the *t*-test at the probability level of 0.10. Sensory data obtained by the CP and ODP presented significant correlation ($p < 0.10$) with the instrumental properties of texture. The proposed descriptive analysis thus has the potential to quantitatively report sensory attributes, reducing the time and cost of sensory tests and facilitating the correlation of sensory and instrumental measurements.

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1. Introduction

Descriptive sensory tests involve the detection and qualitative and quantitative description of the sensory attributes of food, by means of evaluation by a team of trained judges (Meilgaard, Civille, & Carr, 1991). The qualitative aspects of a food include the attributes that make up appearance, aroma, flavor and texture of the product. In descriptive methodologies, after evaluation and description of sensory attributes, the trained judges also quantify the perceived stimuli (Murray, Delahunty, & Baxter, 2001).

The use of descriptive sensory methods for the determination of food quality characteristics is globally established and, according to Anon (1999), possesses the potential for amplification. One of the principal contributions of the descriptive analysis is its ability to correlate sensory and instrumental measurements and to permit the segmentation of consumers according to their preferences (Bleibaum et al., 2002; Meilgaard, Civille, & Carr, 2006). Descriptive analyses are also used in quality control, in the comparison of food

prototypes with the intent to understand consumer behavior in relation to the sensory attributes and for mapping sensory products (Gacula, 1997). This analysis can also be used to track product changes over time in relation to the validity and the effects of packaging, or to investigate the effects of ingredients and processing variables on the sensory quality of final product (Murray et al., 2001).

There are several descriptive analysis methods, including the Flavor Profile (Cairncross & Sjostrom, 1950), Texture Profile (Brandt, Skinner, & Coleman, 1963), Quantitative Descriptive Analysis (Stone, Sidel, Oliver, Woolsey, & Singleton, 1974), Spectrum (Meilgaard et al., 1991), Free Profile (Langron, 1983; Thompson & MacFie, 1983) and generic methods. The specific methods reflect different sensory approaches (Lawless & Heymann, 1998), however, the generic descriptive analysis, which can combine different approaches of all these methods, is often used in practical applications in order to meet the specific objectives of the study (Murray et al., 2001).

All descriptive methods require judges with some degree of training or orientation. In most cases (with the exception of the Free Profile) the judges are also required to have a reasonable level of sensory acuity. During training, the judges qualitatively describe the sensory perceptions in their own words, and quantitatively using past experience to rank intensity. Trained judges acquire a common qualitative language and utilize a quantitative reference set over time, allowing for evaluation of standardized products on an

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intensity scale (Murray et al., 2001). Many authors have therefore recommended the use of reference materials to achieve the consensus of sensory teams (Civille & Lawless, 1986; Melo, Bolini, & Efraim, 2009; Murray & Delahunty, 2000; Richter, Almeida, Prudencio, & Benassi, 2010; Ritvanen et al., 2005), which possess both qualitative and quantitative standards (Meilgaard et al., 1991).

Recommendations on the amount of training necessary for the judges in the descriptive methodologies varies considerably by author (Dairou & Sieffermann, 2002; Meilgaard et al., 2006; Stone et al., 1974); however, in the case of the food industry and its stringent time restrictions, the performance evaluation of a panel of judges presents difficulties for the application of this quality tool. According to Labbe, Ritz, and Hugi (2004), the training of judges is a critical stage for obtaining sensory profiles in a practical industry context.

Recently, efforts have been concentrated on reducing the time of the descriptive analyses to improve their viable utilization in the food industry, as observed in the studies performed by Cartier et al. (2006), Dairou and Sieffermann (2002), Delarue and Sieffermann (2004) and Richter et al. (2010). These studies proposed different methodologies for the rapid description of foods; judges were trained briefly, while classificatory and ranking procedures were used for evaluation of the samples. The authors reported concordance with the sensory evaluations performed by the trained panels. However, classificatory and ranking evaluations of the products prevent the quantitative evaluation of the sensory attributes and, in some cases, may also impede the correlation with instrumental data.

The objective of the present study was to propose a methodology which permits the quantification of sensorial attributes, requiring only a short training of the judges. Thus, it was proposed that reference materials be presented during evaluation of the products allowing judges to compare the samples with references and facilitating the allocation of attribute intensity on the unstructured scale.

2. Presentation of the profile methods

2.1. Conventional profile

In the conventional methodology, volunteers are generally recruited based on criteria such as availability, health, absence of allergies, personality assessment, verbal creativity, concentration, motivation, non-smoking, eating habits, prior experience, no use of dentures and no drugs that can affect the analysis. After being recruited, these judges are pre-selected based on product discriminatory capacity (Murray et al., 2001; Stone & Sidel, 2004).

The training phase of the judges begins with the development of a common language that comprehensively and accurately describes product attributes. Generally the new team will develop a sensory terminology itself, but the participation of an experienced leader can assist in the learning process. An existing language may also be adapted by a new panel, although if developed by another laboratory or in a different country or region, there may be difficulties understanding and interpretation these terms. The solution to this problem is use of complete definitions of the attributes and establishment of reference materials to anchor the intensities (weak and strong) of each sensory attribute (Hunter & McEwan, 1998).

Selection of the attributes for inclusion in the final list of evaluation is generally a consensus procedure. The panel leader can influence the selection process, encouraging or emphasizing certain attributes that have been reported in the literature (however, this is not always necessary) (Murray et al., 2001). Techniques selecting of the attributes are found in literature, including the previous list method (Damásio & Costell, 1991) and the "Kelly's repertory grid method" (Moskowitz, 1983). Once selecting the terms, the team of judges is trained to use a common reference set, which illustrates and defines the attributes and also anchor its intensity (Meilgaard et al., 2006).

In general, the training procedures for standardization of sample manipulation serves to prevent errors in the interpretation of sensory attributes and clearly explain to the judges that sensory stimulus refers to each attribute as extensively as possible. The procedures adapted during training depend on the time available and the complexity of products under evaluation (Murray et al., 2001). Performance of judges can be assessed using the parameters proposed by Damásio and Costell (1991), which consist of assessing the discrimination power of the samples and repeatability of results.

2.2. Limitations of the conventional approach

The conventional method requires extensive training of judges to ensure that the vocabulary and intensity scales are used consistently and intensity the judges present consensus, ability to discriminate the samples and repeatability of results. Time demanded for implementation of the Conventional Profile is presented as a limiting factor for practical application in industry (Cartier et al., 2006; Dairou & Sieffermann, 2002; Delarue & Sieffermann, 2004; Richter et al., 2010; Rodrigue, Guillet, Fortin, & Martin, 2000). According to Delarue and Sieffermann, 2004, the main limitation of the Conventional Profile is time consumption and only for this reason, sensory evaluation is often disregarded when results are needed urgently in the industry context.

2.3. Recent alternative methodologies to the Conventional Profile

In order to reduce the time of sensory testing, several researchers have worked on developing alternative methodologies to the Conventional Profile. Dairou and Sieffermann (2002) proposed a methodology that combines the Free Profile and ranking method, which was called the Flash Profile. In this technique, each judge has an individual list of attributes and is advised to rank the samples in relation to these attributes. The definition of qualitative reference materials is unnecessary since there is no standardization of descriptive language. In development of the methodology, the authors applied the Conventional Profile (CP), the Free Profile and proposed methodology (Flash Profile) in characterization of fourteen jams samples. Sensory maps obtained by the different methodologies are very similar. The Flash profile required less time for data collection, presenting itself as a fast alternative for sensory description. It is important to note that this technique is not recommended for studies of stability and quality control, since it does not indicate the magnitude of the difference between the products. On the other hand, due to semantic terminology, this methodology is presented as a communication tool between research, development and marketing.

Cartier et al. (2006) proposed a methodology denominated Sorting Procedure, which recommends the use of a classification procedure to group similar samples. After the formation of sample groups, the judges are instructed to characterize these groups in relation to relevant sensory attributes. During the experiment, the methodology was conducted by a team without training (sorting) and by a trained team (Conventional Profile). The sensory maps were compared and there were small alterations in the graphical representation generated by the CP and the classification method. This methodology is also presented as a fast alternative to sensory description.

Richter et al. (2010) developed a methodology called the Ranking Descriptive Analysis (RDA), where the ranking test was used to evaluate samples of chocolate pudding. This method proposed that the pre-selected judges determine the sensory attributes that