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Projective Mapping for interpreting wine aroma differences as perceived by naïve and experienced assessors

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ABSTRACT

The perceptions of differences in the aroma of high quality Italian red wines were compared in experts and consumers by Projective Mapping. Quality and typicality assessments from experts, and liking ratings from consumers, were collected on the same wine set. The sensory profiles of the wines were described by a panel of trained subjects. The results suggest that product separation by experts was mainly based on the perceived overall quality rather than on specific sensory differences. Product differentiation by consumers was poor and worse than that of experts and trained subjects. Consumers' internal preference map showed a good sample separation based on liking data and allowed the identification of the aroma attributes that drove their preferences. Results from consumer tests indicated that differences among samples based on liking data were more evident than those from Projective Mapping. An increased differentiation ability was observed for those consumers able to match the duplicate samples in the Projective Mapping test. In this group, sample differentiation based mainly on liking was observed. The socio-cognitive traits of these subjects highlighted their high level of wine knowledge.

In general, the results indicate that Projective Mapping can be a valuable method for investigating the perceived similarities/dissimilarities among samples with subtle sensory differences when assessors share a high level of knowledge and experience about the product.

1. Introduction

The strategic role of consumer input for product development, advertisement, marketing positioning and communication led to the development of a number of methods to gather information about consumers' perceptions of the sensory properties of food products. Projective Mapping (PM) is a comparative sensory technique which allows consumers to evaluate products in an overall and simple way by expressing perceptual similarities/dissimilarities by a two dimensional projection. Subjects are asked to use their own criteria to position objects according to the rule that the more similar two objects are perceived, the closer they are placed on the map and the product coordinates on the two-dimensional space quantify their separation (Risvik, McEwan, Colwill, Rogers, & Lyon, 1994; Risvik, McEwan, & Rødbotten, 1997). PM is supposed to be a simpler and faster way to obtain product inter-distances than similarity scaling (Risvik et al., 1997). This method may provide more graded information than sorting, because it is based on the individuation of similarities and differences using a graphic representation and not a nominal categorization (Nestrud & Lawless, 2008; Pagès, 2005). Perceptual maps are generated from PM data by means of multidimensional analysis methods (Multidimensional Scaling – MDS, Generalized Procrustes Analysis – GPA and Principal Component Analysis – PCA) (King, Cliff, & Hall, 1998; Risvik et al., 1994, 1997). Multiple factor analysis (MFA) has been proposed for PM data for the more specific "nappe" or napping method (Morand & Pagès, 2005; Pagès, 2003, 2005).

The main technical advantages of PM are that training is not required, high numbers of samples (10–12) can be evaluated in each session and it is a user-friendly procedure (Pagès, 2005). Because of these characteristics this technique has become of interest in food sensory science and in wine research in particular. However, PM procedure shows some weakness. As reported by Nestrud and Lawless (2008) one important issue include the reliability of the results from this method.

With PM it is possible to get a representation of the products, which integrates the relative importance for the subjects of the

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characteristics of the products; however, this does not characterize the product itself (Pagès, 2005). Sensory attributes have been shown to be a measure of consumers' perceptions of food sample similarities/dissimilarities by the use of a PM technique combined with descriptive sensory data from both conventional profiling (Kennedy & Heymann, 2009; Perrin et al., 2008; Risvik et al., 1997), and other descriptive methods such as free choice profile (Perrin et al., 2008) and flash profile (Albert, Varela, Salvador, Hough, & Fiszman, 2011; Moussaoui & Varela, 2010; Perrin et al., 2008; Veinand, Godefroy, Adam, & Delarue, 2011).

Risvik et al. (1997) compared consensus mapping dimensions from consumers to those from the profile data and noted a good agreement on the obvious aspects of the product. This tendency was confirmed in further studies (Barcenas, Pérez Elortondo, & Albisu, 2004).

Associating PM data collection with a verbalization task further highlighted the importance of sensory attributes in sample differentiation by consumers (Nestrud & Lawless, 2010; Albert et al., 2011; Veinand et al., 2011). Furthermore, the analysis of terms used by consumers to describe sample groups led to the identification of hedonic dimensions as relevant to product differentiation (Ares, Deliza, Barreiro, Giménez, & Gámbaro, 2010). The most liked samples tend to be positioned close each other on perceptual maps (Ares, Varela, Rado, & Giménez, 2011; Risvik et al., 1997), however, a strong relationship between consumer preferences and perceptual space from PM has not been demonstrated.

Different configurations have been observed comparing results from PM carried out with naïve consumers, experts and trained subjects (Barcenas et al., 2004; Risvik et al., 1997; Pagès, 2005; Perrin et al., 2008; Nestrud & Lawless, 2010). The way subjects gain experience of a product (sensory experience) and their level of product knowledge (particularly for experts and professionals) significantly influence product differentiation (Maitre, Symoneaux, Jourjon, & Mehinagic, 2010). Specifically trained subjects tend to use non-hedonic criteria for sample discrimination irrespective of the product under evaluation (Delarue & Sieffermann, 2004). Moreover, the improved short term memory ability reported for trained panellists (Avancini De Almeida, Cubero, & O'Mahony, 1999) might account for the higher discrimination ability of experts when compared to naïve consumers, in a categorization task requiring the comparison of several samples (Chollet, Lelièvre, Abdi, & Valentin, 2011). Comparing trained with untrained subjects for repeatability and ability to match the duplicate sample in food categorization task, showed a similar performance of both subject groups (Chollet et al., 2011). However, the consensus level of their perceptual maps seemed to be affected by both the level and the kind of expertise. Formally trained subjects were more consensual than untrained subjects.

Comparing PM results from consumers and chefs, Nestrud and Lawless (2008) found a relatively low consensus level for chefs, consistently with the notion of a higher level of idiosyncratic criteria. Authors hypothesized that for panelists who have experience with tasting or a specific product set, the PM may be a useful tool to uncover criteria that are difficult elucidate with traditional consensus-derived attribute lists.

The potentiality for uncovering aspects of food perception related to psychophysical and cognitive models of individuals and subject groups, which are difficult to access by scaling sensory data collection methods, represents an original feature of the PM technique. From an applicative perspective, the perceptual maps obtained from this technique associated to descriptive data and hedonic responses could represent a useful tool to explain the consumer food like/dislike dimension thus helping for effective product development and marketing strategies.

Primary aroma is considered one of the most important distinctive traits of mono-varietal wines. In the current study, the perception of aroma similarities/dissimilarities among mono-varietal red wines by experts and consumers was assessed using the PM technique. Quality assessment from experts and liking ratings from consumers were also collected on the same wine set. Furthermore, sensory profiles of the wines were described by a separate panel of trained subjects. Perceptual maps were compared with the aim of gaining further insights into differentiation criteria used by assessors with different levels of expertise and to investigate the role of sensory properties and hedonic responses as drivers for wine differentiation by experts and consumers. Finally, the relationship between consumers' ability to match duplicate samples in PM test and their background variables were explored; its effect on map consensus levels and on wine differentiation criteria was investigated.

2. Materials and methods

2.1. Wine samples

Eleven wines served as stimuli (Table 1). Six Tuscan PDO Sangiovese wines represented the whole sensory variability of PDO Sangiovese wines, based on a previous study aimed at describing sensory similarities and differences among 24 PDO Sangiovese wines (Recchia, Picchi, Fia, Bertuccioli, & Monteleone, 2009). A further five Italian mono-varietal wines were selected by wine experts of the National "*Enoteca*" of Siena to represent high quality standard Italian regional wines, belonging to the same segment of Sangiovese wine from Tuscany in terms of price (20–30 euros) and availability (mainly in wine shops rather than supermarkets).

2.2. Subjects

2.2.1. Trained panel

The trained panel was composed of nine subjects (4 males, 5 females, 22–28 years, mean age 25). They were selected from the wine-trained panel operating at the Agricultural Biotechnology Department of Florence University. They had participated in previous tests aimed at describing the aroma of red wines in general and Sangiovese wines in particular. Before evaluating the samples they participated to 10 one-hour training sessions.

2.2.2. Wine expert panel

The panel of experts was composed of thirteen Tuscan professionals (oenologists and wine producers; 8 males, 5 female, mean age of 40). They had an average of 10 years experience in the wine industry.

2.2.3. Consumers

Eighty-one wine consumers from Florence area (50 males, 31 females, 22–59 years, mean age 34) participated in the study. They had seen or received an invitation and volunteered based on their interest and availability. Subjects were informed that the test

Table 1
Red wines samples.

Wine code	Wine name	Grape cultivar	Origin region
SG1	Nobile di Montepulciano	Sangiovese	Tuscany
SG2	Chianti	Sangiovese	Tuscany
SG3	Brunello di Montalcino	Sangiovese	Tuscany
SG4	Nobile di Montepulciano	Sangiovese	Tuscany
SG5a–SG5b	Chianti	Sangiovese	Tuscany
SG6	Brunello di Montalcino	Sangiovese	Tuscany
PrM	Primitivo di Manduria	Primitivo	Puglia
BR	Barolo	Nebbiolo	Piedmont
AV	Aglianico del Vulture	Aglianico	Basilicata
NA	Nero d'Avola	Nero d'Avola	Sicily
CS	Cabernet Sauvignon	Cabernet Sauvignon	Veneto