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Rapid descriptive sensory methods – Comparison of Free Multiple Sorting, Partial Napping, Napping, Flash Profiling and conventional profiling

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ABSTRACT

Two new rapid descriptive sensory evaluation methods are introduced to the field of food sensory evaluation. The first method, free multiple sorting, allows subjects to perform ad libitum free sortings, until they feel that no more relevant dissimilarities among products remain. The second method is a modal restriction of Napping to specific sensory modalities, directing sensation and still allowing a holistic approach to products. The new methods are compared to Flash Profiling, Napping and conventional descriptive sensory profiling. Evaluations are performed by several panels of expert assessors originating from two distinct research environments. Evaluations are performed on the same nine pâté products and within the same period of time. Results are analysed configurationally (graphically) as well as with RV coefficients, semantically and practically. Parametric bootstrapped confidence ellipses are applied for the graphical validation and comparisons. This allows similar comparisons and is applicable to single-block evaluation designs such as Napping. The partial Napping allows repetitions on multiple sensory modalities, e.g. appearance, taste and mouthfeel, and shows the average of these repetitions to be significantly more closely related to the conventional profile than other methods. Semantic comparison shows large differences, with closest relations found between the two conventional profiles. This suggests that semantic results from an assessor in an evaluation type with no training sessions are dependent on the assessors' personal semantic skills. Comparisons of the methods' practical differences highlight the time advantage of the rapid approaches and their individual differences in the number of attributes generated.

1. Introduction

Since the introduction of the flavour profile method (Cairncross & Sjôstrom, 1950) a number of different sensory profiling methods have been developed. Some methods focus on the training of subjects on a sensory vocabulary, whereas other methods let subject more freely decide how to indicate differences between samples.

Beside conventional descriptive profiling techniques such as Quantitative Descriptive Analysis and the Spectrum method (Civille & Lyon, 1996; Stone, Sidel, Oliver, Woolsey, & Singleto, 1974), faster alternatives have gained some popularity for instance Projective Mapping (Risvik, McEwan, Colwill, Rogers, & Lyon, 1994) and its subsequent variants e.g. Napping (Pagès, 2003, 2005), the Flash Profile (FP) (Dairou & Sieffermann, 2002) and Sorting (Rosenberg, Nelson, & Vivekana, 1968).

Sorting was introduced to the field of food sensory evaluation in a cheese-based study by Lawless, Sheng, and Knoops (1995) with references to earlier free sorting of non-food personality impressions by Rosenberg et al. (1968). In this sorting procedure, the assessors were asked to sort samples once into groups in a way that made sense to the individual assessor only. However, a sorting procedure known as the Free Sorting (Steinberg, 1967) had previously been introduced, with an important difference in the methodological approach. While Steinberg asked subjects to perform multiple sortings, provided it made sense to the subject, Rosenberg et al. only asked for one sorting per subject. When performing multiple sortings, the assessor was allowed to make additional sortings of the same sample set, as long as it made sense to the individual. After the evaluation, data analysis was performed on the merged data. Despite including only two sortings per subject from the multiple sorting in the analysis, Rosenberg later concluded that multiple sorting would often be superior when compared with single sorting (Rosenberg & Kim, 1975). In the present study, the Free Multiple Sorting (FMS) approach including all individual sortings is introduced to the field of food science, representing the branch of sorting methodologies. The free single sorting evaluation has been evaluated several times with various results (Faye et al., 2004; Lelievre, Chollet, Abdi, & Valentin, 2008), whereas the free multiple sorting as applied here has not.

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When Free-choice profiling was introduced by Williams and Langron (1984), development and training of the ideosyncratic vocabulary was the method's cardinal point. The use or not of the free-choice vocabulary made up a substantial methodological difference compared to, how the 'conventional descriptive profile' (CP) was and still is, applied in laboratories. Flash Profiling was introduced later by Dairou and Sieffermann (2002) as a rapid approach based on Free-choice profiling (Williams & Langron, 1984), leaving out the training sessions and implementing rank ordering of samples. Instead, assessors received an introduction to the samples and were told to generate their own vocabulary free-of-choice, based on their own sensory perception and to cover the sensory variations in the samples. After generating relevant attributes, they were allowed to see other assessors' vocabularies and to add or substitute attributes in their own list.

Dairou and Sieffermann (2002) compared a single sorting with a conventional descriptive profile (CP) and found configurational relations between the methods and, to a lesser extent, between vocabularies but suggested a study with more similar products. This was done on two product sets by Delarue and Sieffermann (2004), who drew similar conclusions. Later, Blancher et al. (2007) compared a CP with the FP and FMS and concluded that the FP was configurationally closer to the CP than FMS. However, the sorting was a single sorting.

Projective Mapping was introduced to the field of food sensory evaluation by Risvik et al. (1994). In Projective Mapping, assessors were introduced to the method, but had no further training. They were supplied with a A4 paper sheet and the sample set and were instructed to place samples perceived as similar close to each other and samples perceived to be more different further apart. Risvik et al., (1994) introduced Projective Mapping, recording the sample space using A4 paper sheets with unstructured line scales with trained assessors, but performed it later on A3 paper sheets with structured line scales on consumers, coupling the evaluation to a CP on trained assessors (Risvik, McEwan, & Rodbotten, 1997). King, Cliff, and Hall (1998) experimented with Projective Mapping using 60 cm × 60 cm paper sheets (also used later by Kennedy and Heymann (2009) and Nestrud and Lawless (2010)) on untrained assessors and using both unstructured and structured hedonic line scales.

Similar to Projective Mapping, Pagès later introduced Napping. The basic ideas of Napping and Projective Mapping were similar as they were both having similar assessor instructions and that the raw data were based on Euclidean product distances. Although, important methodological differences were found in the Napping concept, e.g. the framework of data collection had to be rectangular, data were not to be scaled and data analysis had to be done using Multiple Factor Analysis (Escofier & Pagès, 1994; Pagès, Asselin, Morlat, & Robichet, 1987). The framework consisted of a 60 cm × 40 cm paper sheet, which is approximately A2 size. Although stated otherwise in other publications, Napping and Projective Mapping are not the same, and Napping should be seen as a special restricted and defined case of Projective Mapping. Napping was normally coupled with the Ultra Flash Profiling (UFP) (Pagès, 2003) to collect subjects' semantic responses, so called in order to draw conceptual parallels to the free choice and rapid features of vocabulary used in the FP. Perrin et al. (2008) showed that the UFP is a good descriptive supplement to Napping, though it provides less descriptive information than that derived from a CP. As Napping is in continuous development, one of the latest variations is the Sorted Napping (Pagès, Cadoret, & Lê, 2010) in which Napping is combined with a sorting procedure instead of the UFP. This study will examine the original Napping attached to the UFP. Pagès mentioned in his original paper that it might be a good idea to perform a Napping restricted to one sensory modality. Even though this Napping on modalities has been implemented in some sensory laboratories, its performance has not previously been documented. Hence, we introduced this approach as the 'Partial Napping' (PN) as opposite to the non-restricted 'Global Napping' (GN). Here, we perform PNs on appearance, taste and mouthfeel and a GN.

The aim of this paper is to compare different rapid descriptive methods with each other and with a consensus profiling method based on the Quantitative Descriptive Analysis (Stone et al., 1974). Different features are compared: their configurational output, their semantic output, their reliability and their practical differences. Furthermore, applicability is studied among several sensory panels. A new approach that applies parametric bootstrapping allows ellipses of confidence to be displayed for single block evaluation designs, e.g. Napping data.

2. Materials and methods

2.1. Samples

Nine different types of commercially available liver pâté were bought in local Danish supermarkets. Products and brands were selected in cooperation with one manufacturer so that major varieties within the Danish product range were covered. Samples were different variations of liver pâté produced by three different manufacturers and were all from a similar production date. Packaging sizes varied between 200 and 500 g. Table 1 shows the product information available on the package. The pâtés span the overall branded differences in texture (coarsely chopped or not), fat content (5–25 g/100 g) and bacon content (with or without). The product numbers will be used throughout for identification of the pâtés.

For sensory evaluation, samples were prepared by cutting the surfaces and crust so that each sample would be of similar size (5 cm × 3 cm × 1 cm). The samples were stored at 2 °C and were served temperate to 15 °C in transparent PET containers, blind-labelled and with three-digit codes.

2.2. Methodology

2.2.1. Experiment overview

This study compared a number of different descriptive sensory evaluation methods both within and between sensory panels. The experimental set-up consisted of two different professional sensory panels, each of which performed a CP, FMS, a GN followed by a UFP and three PNs followed by UFPs. Furthermore, Panel A performed an FP. Panel B did not consist of enough assessors to perform an independent FP. Fig. 1 shows the overall experimental set-up. All evaluations were performed on the same products and within the same period of time. Evaluations took place in a standardised sensory environment (ISO 8589, 2007) and followed good sensory practice (Lawless & Heymann, 2010). Randomised complete block designs were assigned to the CPs and the FP, while randomised complete designs were assigned to the FMSs and the nappings.

2.2.2. Panels

Assessors from two professional sensory panels participated in this study. Panel A consisted of expert assessors, while Panel B consisted of specialised expert assessors (ISO 5492, 2008). Panel A was a panel attached to a university environment (University of Copenhagen), and assessors were mainly university students. It was a broad panel in the sense that the assessors were used to performing sensory analysis on a diverse product range. Panel B was a panel at the Danish Meat Research Institute, which supports the meat industry. For this reason, their daily work on sensory analysis was focused on meat products, and they possessed prior specific