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Optimisation of the partial napping approach for the successful capturing of mouthfeel differentiation between brandy products

Leanie Louw [a,b], Sulette Oelofse [b], Tormod Naes [c,d], Marius Lambrechts [a,b], Pierre van Rensburg [a,b], Hélène Nieuwoudt [a,*]

[a] Institute for Wine Biotechnology, Department of Viticulture and Oenology, Stellenbosch University, Private Bag X1, 7602 Matieland (Stellenbosch), South Africa
[b] Distell Ltd, PO Box 184, Stellenbosch 7599, South Africa
[c] Nofima Mat, Oslovegen 1, 1430 Ås, Norway
[d] University of Copenhagen, Denmark

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ABSTRACT

Partial napping has been validated as a suitable sensory profiling method for brandy evaluation. However, it was found that, compared to conventional profiling, very little useful information could be extracted on brandy mouthfeel when it was evaluated as part of overall in-mouth perceptions. This study aimed to optimise the partial napping method to improve information output on the mouthfeel of brandies. Panellists' proficiency in visual, aroma and in-mouth evaluation of brandies were scrutinised after which three partial napping protocols were tested to identify the most effective solution for the successful capturing of mouthfeel differences between brandies. The results showed that panellists were equally efficient in aroma and in-mouth evaluations, but that in-mouth perception (defined as retronasal flavour, basic taste and mouthfeel) was not a useful construct as it did not contribute to the product configuration that could be obtained with visual and colour assessments alone. Instructing panellists to ignore retronasal flavour delivered more useful results. Using dark glasses and nose-clips to eliminate visual, aroma and retronasal flavour perceptions were not necessary to obtain a reliable and interpretable representation of the mouthfeel differences between brandies. Clear glasses and written instructions were sufficient to generate useful mouthfeel information under conditions more representative of the consumer product experience.

1. Introduction

Brandy is a distilled spirit made from fermented grapes; in fact, the word 'brandy' is derived from the Dutch word 'brandewijn' meaning 'burnt wine' (Toerien, 2008). Brandy flavour is influenced during the entire production process. Some flavour compounds present in brandy originate from the inherent aromatic chemical composition of the grapes while others are formed during alcoholic fermentation and it is these compounds that are concentrated during distillation. The extraction of flavour molecules from wood during maturation and finally the evolution of all the above mentioned compounds during ageing further contribute to the final flavour of brandy (Louw & Lambrechts, 2012).

The origin of aroma compounds in brandy can be divided into two categories: those that are formed during base wine production and concentrated during distillation, and those that are extracted or formed during wood maturation. The former, largely consistent of esters, higher alcohols and volatile fatty acids, impacts on the fruity and floral odours. The wood derived aroma compounds, mostly oak lactones, phenolic aldehydes and furanic aldehydes, are generally associated with spicy, woody, sweet-associated and nutty sensory notes (Louw & Lambrechts, 2012). Brandy mouthfeel develops during wood maturation as low molecular weight and hydrolysable tannins are extracted from the oak, and these compounds impact on smoothness, burning, astringency, bitterness and body (Caldeira, Anjos, Portal, Belchior, & Canas, 2010; Caldeira, Mateus, & Belchior, 2006; Canas, Caldeira, & Belchior, 2009). As brandy matures, its body and flavour complexity increases while astringency and alcohol burn decrease. Wood maturation can also affect brandy colour. Typical brandy colour hues include straw-yellow, golden, topaz and greenish (Canas et al., 2009).

Partial napping is a structured version of the projective mapping procedure where panellists are required to perform the projective mapping task based on only one sensory modality (Pfeiffer &

* Corresponding author. Tel.: +27 808 2748.
E-mail address: hhn@sun.ac.za (H. Nieuwoudt).

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Gilbert, 2008). The idea was suggested as a means to bypass any loss of information caused by panellists being forced to transfer multi-dimensional sensory perceptions onto a two-dimensional sheet of paper (Pagès, 2005). This concept was later presented under the name of partial napping (Pfeiffer, 2008), as a middle ground between the intuitive napping approach and the analytical conventional profiling approach. It has initially been applied in step-wise manner by instructing panellists to focus on several separate modalities after which the data are used to construct a consensus map based on all the modalities (Dehlholm, Brockhoff, Meinert, Aaslung, & Bredie, 2012; Louw et al., 2013; Pfeiffer, 2008). However, it can also be applied as a restrictive method where panellists are forced to focus on a specific modality and to disregard other modalities completely (Giacalone, Ribeiro, & Frøst, 2013; Grygorczyk, Lesschaeve, Corredig, & Duizer, 2013). In such a case no data would be generated on the excluded modalities.

In the first feasibility study of the application of partial napping to brandy evaluation, partial napping has been validated as a reliable and robust screening tool for large sample sets (Louw et al., 2013). The reported limitations of partial napping were that (1) it generates a lot of data, compared to global projective mapping, that has to be processed by analyst and (2) differences in mouthfeel were not extracted as successfully as with conventional profiling. It was shown that colour, aroma and retronasal flavour were the dominant differentiating factor between brandies in the mind of the panellists (Louw et al., 2013). Other researchers have suggested that nosing is sufficient to capture the most important sensory characteristics of brandy and whisky due to strong correlations observed between orthonasal and retronasal odour perception (Jack, 2003; Peña Y Lilo et al., 2005).

However, mouthfeel potentially plays a role in consumer acceptability of spirit products. In fact, references to mouthfeel characteristics is often used to describe spirit products in brand communication; terms such as full-bodied, mellow, soft, round, silky and smooth are used across all spirit categories. These types of descriptors are partly subjective and therefore difficult to define and quantify with conventional descriptive profiling. In such cases, rapid sensory profiling methods can be more informative (Albert, Valera, Salvador, Hough, & Fiszman, 2011). Partial napping has been reported to be especially useful for market exploration and product ideation studies and for developing new vocabularies, especially in studies that require a certain degree of focus e.g., on product texture (Dehlholm et al., 2012).

Partial napping can be of particular value to uncover information on discrimination between products in terms of attributes that are important but not easily explained or quantified (Dehlholm et al., 2012).

The outcome of mouthfeel evaluation with partial napping is likely to be affected by the way in which the task is structured. It has been suggested that panellists do not use the same perceptual approach to sample evaluation when they are required to treat different aspects of flavour (taste and retronasal odour) as one concept compared to when they are tasked to evaluate different in-mouth sensations individually (Auvray & Spence, 2008). Although an assessment of the overall "in-mouth" experience is representative of the way in which consumers interact with brandy, more information might be obtained regarding differentiation on taste and mouthfeel if the partial napping task is restricted to these sensations alone (i.e., retronasal odours are excluded).

The principal aim of this study is to optimise the partial napping procedure for brandy evaluation to facilitate more effective capturing of differentiation on mouthfeel. To obtain this goal, the partial napping data from our previous work (Louw et al., 2013) will be scrutinised to determine the panellists' proficiency in the three sensory evaluation modes: visual, orthonasal aroma and in-mouth sensations (consisting of basic taste, mouthfeel and retronasal flavour perception) from which areas for optimisation will be identified. Based on the information gathered, three partial napping protocols will be tested to identify a more effective solution for capturing mouthfeel differences between brandy samples.

2. Materials and methods

This study was conducted in two phases. The first phase, referring to all work done on Sample Set 1 (Table 1), is an extension on the work published in Louw et al. (2013) and the methodology for this phase is thoroughly described in said publication. This phase involved additional, explorative, data analyses on the data from Louw et al. (2013) to gain an understanding of the sensory panellists proficiency in evaluating brandy based on three sensory modalities, using the Napping® method. The second phase, referring to all work on Sample Set 2 (Table 1), was executed 2 years after the first phase in response to the outcomes from the first phase. This second phase tested three different partial napping protocols where the perception of colour and odour were excluded in a step-wise manner by using first clear glasses (all sensory modalities perceivable), then dark glasses (visual perception excluded) and dark glasses with nose clips (visual and odour perception excluded) in order to identify the best approach for successful elicitation of brandy mouthfeel during partial napping.

2.1. Products

Two sets of South African brandy samples were presented in this experiment (Table 1). Sample set 1 was also evaluated in Louw et al. (2013). Sample Set 2 consisted of ten brandies unrelated to those in Sample Set 1. In order to assess the accuracy of the results from each sensory modality, each set contained two duplicate samples. The duplicated samples were specifically chosen to present an average profile for the category, based on a bench top evaluation. In Sample Set 1, B6 was presented twice. In Sample Set 2, C9 was presented twice. The samples were selected to represent a wide range of styles that has been aged for between 3 and 10 years. The samples represented two of the three South African brandy styles, namely blended brandies and potstill brandies. These styles differ in terms of alcohol content; blended brandies contain 43% ABV (alcohol by volume) and potstill brandies 38% ABV. Furthermore, potstill brandies must be 100% pot distilled. Blended brandies are required to contain at least 30% pot distilled distillate, while the remainder may be column distilled, resulting in a less flavourful profile (South African Department of Agriculture, 1989). Blended brandies are sold at a lower price point than potstill brandies. The samples were stored at room temperature in their original packaging. The sample preparation and serving practices were done according to standard sensory practices as described in our previous work (Louw et al., 2013).

Table 1
List of brandies evaluated.

Set 1	South African brandy style	Set 2	South African brandy style
B1	Blended	C1	Potstill
B2	Blended	C2	Blended
B3	Potstill	C3	Potstill
B4	Blended	C4	Potstill
B5	Blended	C5	Blended
B6[a]	Blended	C6	Potstill
B6R[a]	Blended	C7	Potstill
B7	Potstill	C8	Blended
B8	Potstill	C9[b]	Blended
B9	Blended	C9R[b]	Blended

[a] B6 and B6R are duplicates of the same brand.
[b] C9 and C9R are duplicates of the same brand.