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## Short Communication

# Improvement of an emotional lexicon for the evaluation of beers

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## ABSTRACT

Emotional response has been the subject of many studies during the last years. Many studies have shown the importance of using consumers to generate emotional lexicons. Chaya et al. (2015) developed a consumer defined (CD) lexicon to assess emotional response elicited by beer products. Shortly after, van Zyl and Meiselman (2015) presented a procedure to ensure that emotional lists were fully composed by emotions. The present research was developed to improve and test the lexicon developed by Chaya et al. (2015) following the approach proposed by van Zyl and Meiselman (2015). The proposed procedure allowed an easy filtering of terms for the study of emotional response. As a consequence, the test was shorter, clearer, and easier to understand and to complete by consumers. The improved emotional lexicon of beer favoured 1) the efficiency of the research in terms of discrimination among samples, 2) the simplicity of use by the consumers.

## 1. Introduction

The study of consumer emotional response elicited by food products has increased during the last years. Many methods have been developed to study emotions evoked by food and beverages. EsSense Profile™ (King & Meiselman, 2010) was the first emotional lexicon developed to measure emotions related to food products consumption and illustrated a methodological advance in consumer testing. Although this emotional lexicon was recommended to determine the emotions elicited by food products, authors also recommended to adapt this lexicon to the food category. Since EsSense Profile™ was published, several methods to measure emotional response have been developed and improved. For example, Ng, Chaya, and Hort (2013) highlighted in their study the importance of a consumer defined lexicon as compared with EsSense Profile™. The authors showed that a consumer defined lexicon was a list of positive and negative emotions more specific to the product category than the EsSense Profile™. Spinelli, Masi, Dinnella, Zoboli, and Monteleone (2014) used a list of full sentences for the study of cacao and hazelnuts spreads, instead of a list of specific emotional terms. This method, called EmoSemio, resulted in reduced ambiguity and improved understanding by the consumers.

Regarding the study of emotional response to beer products, different authors have used diverse lexicons and methods to analyse the emotions elicited by beers. Chaya et al. (2015) developed, using consumers' focus groups methodology, the first published beer specific

lexicon for the Spanish population and grouped a lexicon of 44 single terms into 12 emotional categories. Using the same approach, Eaton (2015) established an English version for British beer consumers. Ng et al. (2013) had previously developed an emotional lexicon for black currant squashes using direct-one-to-one interviews with individual consumers. The focus groups methodology proved to be more efficient than the method developed by Ng et al. (2013), but the effort needed to generate consumer defined lexicons was still considerable. Silva et al. (2016) also developed consumer led lexicons for beer Dutch and Portuguese consumers by means of focus groups. Cardello et al. (2016) and Jaeger et al. (2017) successfully applied a variant of the 12-point emotion circumplex method of Yik, Russell, and Steiger (2011) in an attempt to reduce the time/effort to capture emotions related to beer.

In addition to the works mentioned above, other authors have developed consumer defined emotional lexicons for specific product categories, such as chocolate spreads (Spinelli et al., 2014), coffee (Bhumiratana, Adhikari, & Chambers, 2014), and wine (Danner et al., 2016; Silva et al., 2016). Van Zyl (2016) provides a detailed list of lexicons applied in beverages in tables 19.3a to 19.3d.

In general, emotional lexicons are difficult to generate, they have to be understandable and clear to consumers, and relevant to the product category (Gmuer, Guth, Runte, & Siegrist, 2015). One of the clues is to ensure that the terms generated by the consumers are true feelings. Van Zyl & Meiselman (2015) proposed some basic rules for a procedure for the development of consumer defined emotion lists. The authors

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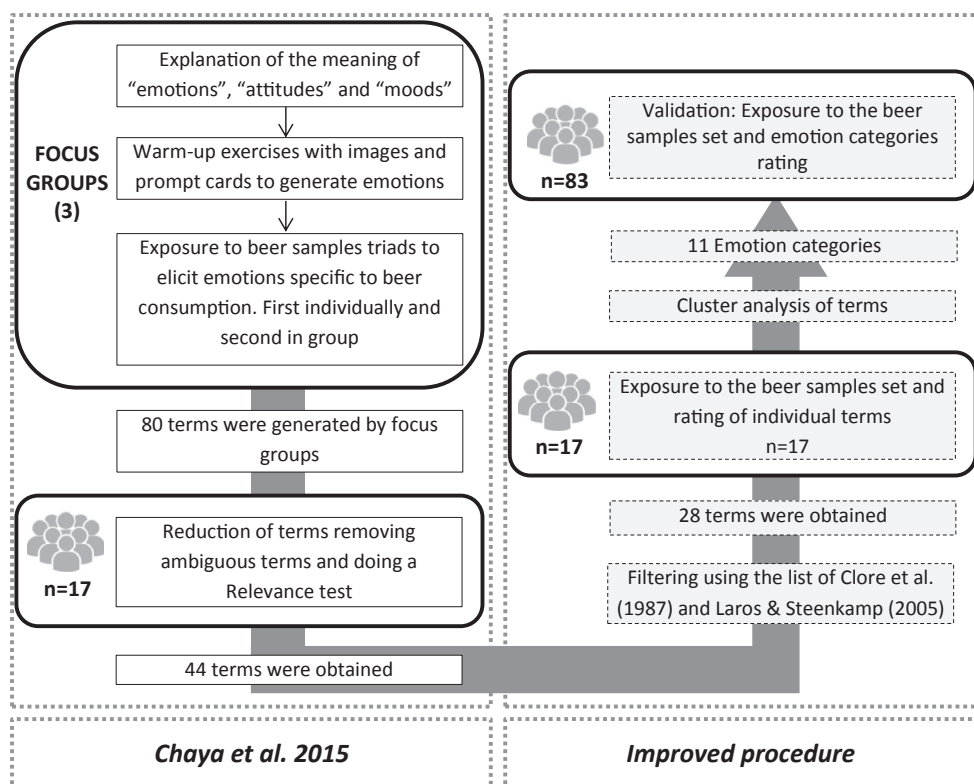


Fig. 1. Step by step approach for developing the beer consumer defined lexicon.

proposed checking that the terms generated by the consumers are found on the lists of Laros and Steenkamp (2005) and Clore, Ortony, and Foss (1987). However, to date no references can be found using the procedure proposed by van Zyl and Meiselman (2015) as a guide to ensure the suitability of the emotional terms generated by consumers.

This study aimed to improve and test the Spanish consumer beer lexicon developed by Chaya et al. (2015), following the procedure proposed by van Zyl and Meiselman (2015).

## 2. Materials and methods

### 2.1. Improvement of the emotional lexicon

This research is based on a previous study presented by Chaya et al. (2015). The approach is summarised in Fig. 1.

#### 2.1.1. Samples

For the present study, samples and sample preparation were the same as reported in Chaya et al. (2015) (Table 1). Two samples were 'control' commercial beer samples, one of which was a commercial non-alcoholic beer. The other eight samples were based upon the control samples and were each manipulated in a single sensory property. Several sensory properties were chosen to represent key characteristic properties of beer (e.g. bitterness, hoppiness, etc.) whilst others reflected off-flavours and/or hypothesised drivers of emotional response (e.g. isoamyl acetate, dimethyl sulphide (DMS)). The commercial beers were modified using ethanol (Merck Chemicals Ltd, UK), dextrose (Myprotein, UK), specific flavour capsules (Cara Technology, UK), or controlled decarbonation. All 10 samples had been evaluated by the University of Nottingham's trained expert beer panel who had rated each sample for the 8 sensory properties of interest (data not shown). The assessments revealed significant differences between the spiked and control samples, indicating that the samples differed in their sensory properties. From these results, it was anticipated that subjects in subsequent studies would perceive the differences in relevant sensory

**Table 1**  
Samples and treatments used.

Sample	Treatment
1 Control	Commercial lager
2 Hoppy	0.75 mg kettle hop extract (AROXA™)/litre commercial lager
3 Light struck	0.3 µg 3-methyl-2-butene-1-thiol (AROXA™)/litre commercial lager
4 Isoamyl acetate	10.5 mg isoamyl acetate (AROXA™)/litre commercial lager
5 DMS	0.9 mg dimethyl sulphide (AROXA™)/litre commercial lager
6 Bitter	25 mg iso-α-acids (AROXA™)/litre commercial lager
7 Sweet	25 g dextrose/litre commercial lager
8 Low CO <sub>2</sub>	Commercial lager decarbonated to ~1.6 units
9 Non-alcohol control	Commercial non-alcohol lager
10 High alcohol	96% ethanol added to commercial non-alcohol lager (8% ABV)

properties across samples. Samples were prepared by adding the relevant materials to samples and 10 ml decanted into transparent closed screw cap universal containers 2–4 h before assessment by consumers. This was with the exception of the Low CO<sub>2</sub> samples which was decarbonated by leaving open and refrigerated ( $4 \pm 1$  C) for 3 h before re-sealing. Low CO<sub>2</sub> samples were then decanted just prior to consumer assessment. Products were presented blind (labelled with three-digit random codes) at  $4 \pm 1$  C. Unsalted crackers (Carrefour, Spain) and mineral water (Fuente Liviana, Spain) were provided as palate cleansers.

#### 2.1.2. Procedure to improve the lexicon and terms grouping

The initial list of the emotional terms generated by the focus groups in Chaya et al. (2015) (Table 2) was checked and verified following the method of van Zyl and Meiselman (2015). It was compared with the emotional lists published by Clore et al. (1987) and Laros and

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