Unravelling sweetness perception: implicit and explicit response to sweet aromas

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INTRODUCTION:

Research suggests that liking and food choice are dependent of different factors such as the food properties, consumers' characteristics, and context of consumption. In the present research, we have conducted a study to determine the neurological response to sugar and sweet taste, and its correlation with the explicit response. We hypothesized that using natural aromas (e.g.: vanillin) in the reformulation of products could generate a similar response than sugar, increasing the acceptance and the adherence of consumers to new product developments with a significant decrease in added sugar.

METHODS:

1. Developing suitable stimuli with selected odorants for EEG techniques (2 odors & 3 marshmallows)
2. Determining implicit response
3. Consumer-led adaptation of GEOS lexicon for measuring explicit response
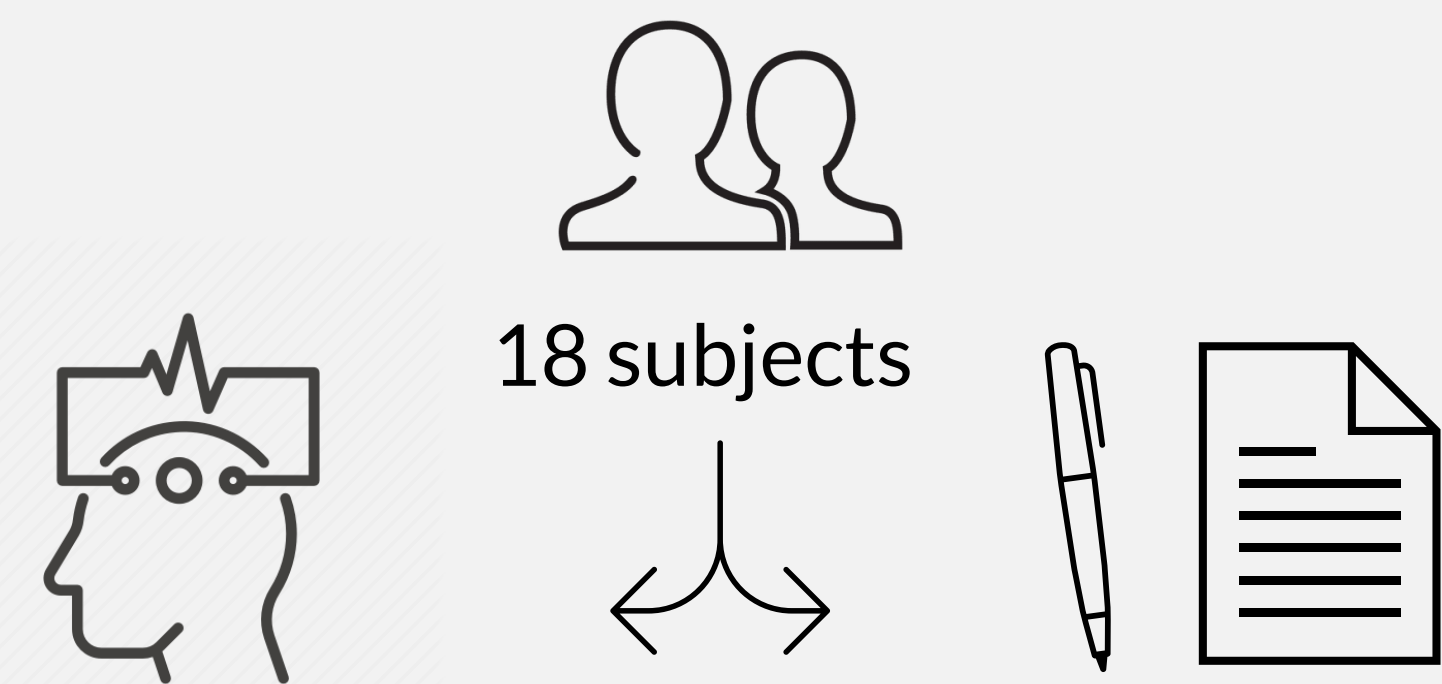
18 subjects

Implicit response   Explicit response

RESULTS:

o Up to date, no significant differences were identified in the analyses of the recorded EEGs between samples nor between subjects.

o The explicit response showed no differences between gustatory samples. The reduction of 50% in sugar content, together with the addition of vanillin, did not significantly affected acceptance of the samples. Differences were found between sweet odor (vanillin) and DMS.

The use of natural 'sweet' aromas such as vanillin have showed to be useful to diminish the negative effect of sugar reduction on acceptance, maintaining consumers standards.

Table 1. Mean scores and p-values for liking and 6 emotion categories across the 5 samples. Different letters within the row indicate a different post-hoc group by Tukey's HSD (p < 0.05).

Category	Sample					p-value
	Vanillin	DMS	M Vanilla	M Sugar	M Spicy	
Liking	7.462 [a]	4.308 [b]	6.154 [ab]	6.077 [ab]	4.462 [b]	< 0.05*
'Joyful'	9.954 [a]	4.431 [b]	6.692 [ab]	6.077 [ab]	4.262 [b]	< 0.05*
'Passionate'	9.192 [a]	3.446 [b]	4.592 [b]	5.008 [ab]	3.108 [b]	< 0.05*
'Disgusted'	1.308 [c]	8.815 [a]	2.685 [bc]	3.085 [bc]	6.900 [ab]	< 0.001***
'Hungry/thirsty'	6.769 [a]	2.662 [a]	4.200 [a]	3.869 [a]	4.762 [a]	0.170
'Melancholic'	6.085 [a]	3.477 [a]	3.073 [a]	2.885 [a]	2.823 [a]	0.145
'Relaxed/calm'	8.792 [a]	2.931 [b]	5.446 [ab]	5.838 [ab]	2.338 [b]	< 0.001***
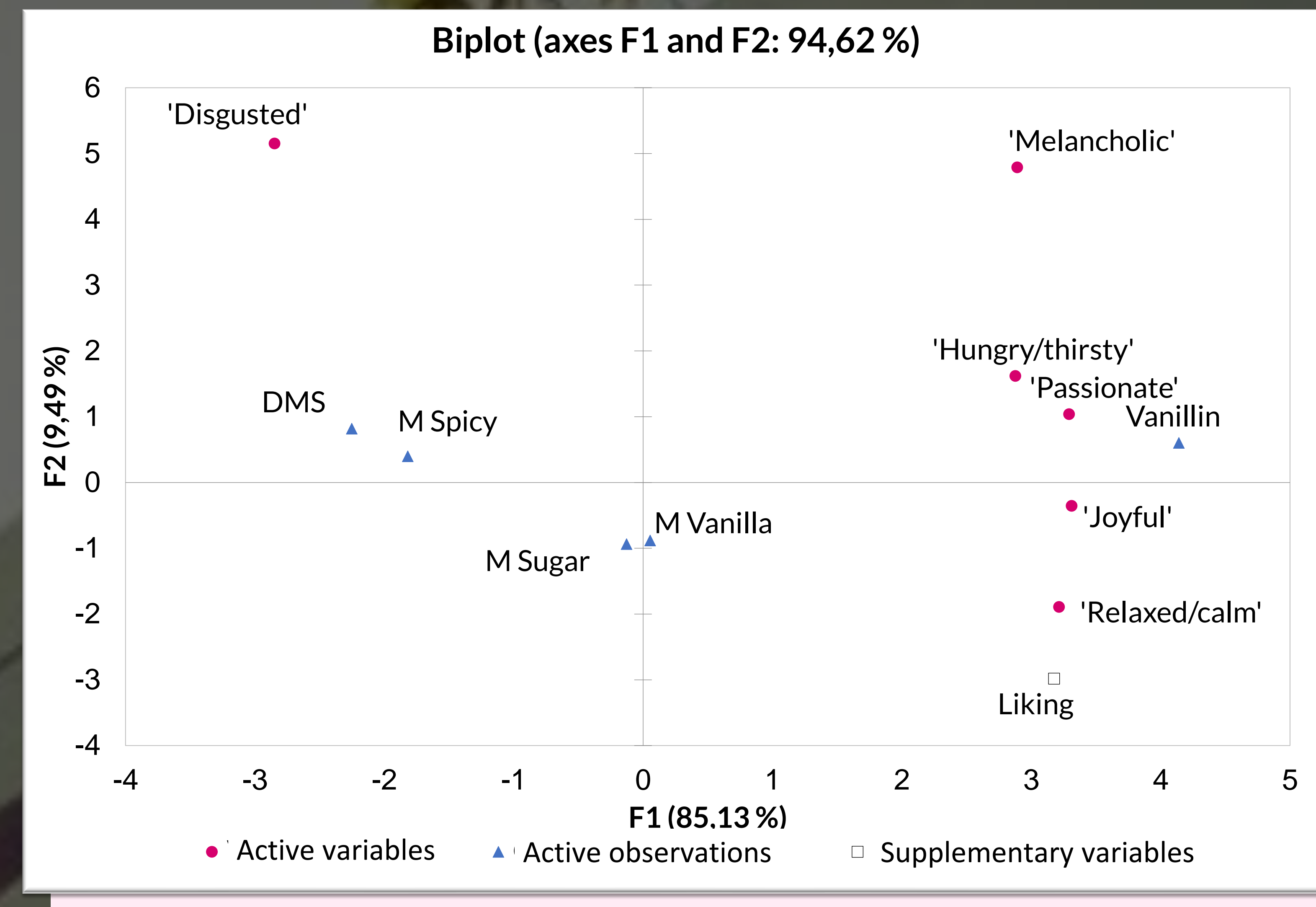
Fig 1. Principal component analysis of the explicit response for all samples.

The utility of EEG recording for odor & taste stimuli is yet to be determined. Further research is needed to understand the correlation between EEG and emotional explicit responses regarding food stimuli.

Table 2. Samples used for implicit and explicit measurements.

Olfactory (O) & Gustatory (G) stimuli
Vanillin (O)
DMS (O)
Sugar marshmallow (G)
Vanillin marshmallow with low sugar (G)
Spicy marshmallow (G)

Fig 2. Emotional categories in Spanish used for the explicit response.

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