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Evaluation of the validity of temporal sensory evaluation methods carried out by consumers on controlled stimuli delivered by a gustometer

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Context and Objective

Temporal sensory evaluation is increasingly used with consumers. However, very few studies have investigated the validity and the reliability of the methods used. Thus, this study aimed to fill in the gap by comparing the conclusions drawn from data collected using three temporal sensory evaluation methods with consumers on time model solutions delivered using a gustometer.

Material and Methods

Panel : 149 consumers participated in this study, they were randomly assigned to TDS [1], TCATA [2] and AEF Panel [3].

Stimuli : Different stimuli were delivered to the consumers using a gustometer Burghart GU002 [4]. This device allowed to control at each moment of the "tasting" what the consumer has in the mouth. In this study 3 tastes and 2 aromas were selected (Salty, Sweet, Acid, Lemon and Basil).

Experimental procedure: The consumers participated in individual sessions of one hour. They were familiarized with the gustometer, two warm-up stimuli (water, during 20 then 30 s) were delivered (Fig.1).



Figure 1: Familiarization with the gustometer introduced by an explanatory video

Then four simple stimuli were presented to them in order to test their recognition abilities while continuing to accustom. They were then asked to write in a text box what they perceived, using their own words. The four stimuli consisted in single solutions (one flavour or taste among the five). One stimulus was presented twice (Fig.2).

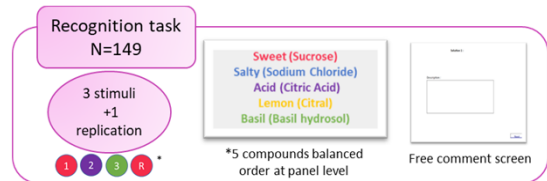


Figure 2: Example of presentation order of simple compounds and free comment screen

Each panel had to use a different temporal sensory evaluation method to characterize 18 complex stimuli varying in compositions, temporal sequences and concentrations. For TDS, the consumers had to click from a list of descriptors the sensations they perceived as dominant. For TCATA, the consumers had to check/uncheck from a list of descriptors the sensations they perceived/no longer perceived throughout the tasting. For the AEF panel, the evaluations were done retrospectively to the tasting, the consumers had to focus on the perceived sensations and try to memorize the order and intensity of those sensations. The consumers' responses were collected using TimeSens® V2 software [5].

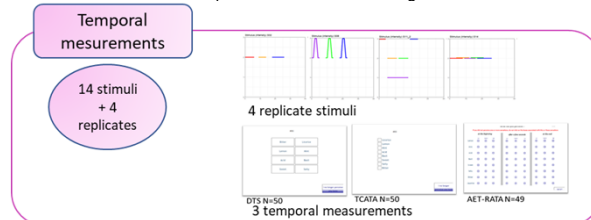


Figure 3: Graphic representation of the 4 repeated stimuli and evaluation screen for the 3 methods

Results

Ability of consumers to identify tastes and aromas:

In the recognition phase 65% of consumers were able to identify more than 50% of the compounds, the attributes used to describe the stimuli were represented as word clouds (Fig. 4).



| Exact term | 87% | 78% | 63% | 45% | 10% |
|-------------|-----|-----|-----|-----|-----|
| Family term | | | | 64% | 54% |

Figure 4: Word cloud of the words used to describe the stimuli and percentages of recognition

Evaluations of multi-compound stimuli with TDS, TCATA and AEF-RATA

Only the evaluation on four stimuli are presented (Fig.5a) and their replication (Fig.5b). These figures show that whatever the method, the results observed at panel level are consistent with the stimuli when there is no simultaneous delivery of compounds. They also show that despite the simultaneous delivery of compounds, the shapes of the TDS and TCATA curves are very similar except for the heights of the citation rates, which are higher in TCATA.

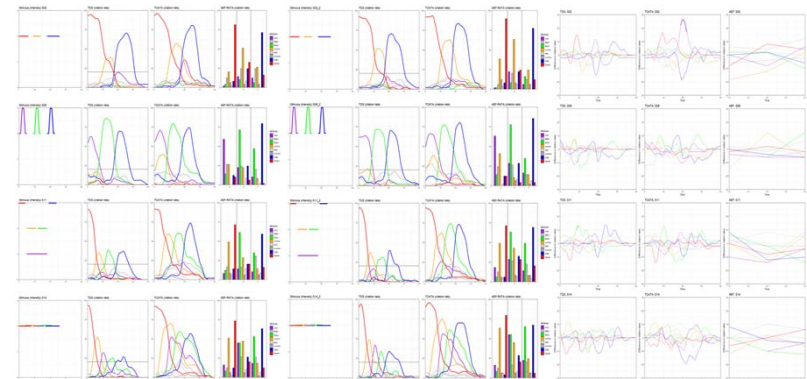


Figure 5a: Evaluations of stimuli From left to right: evolution of concentration of compounds in the stimuli over time, TDS curves, TCATA curves and AEF barplots.
 Figure 5b: Evaluations of replicates
 Figure 6: Differences in citation rates between the replicated stimuli

Conclusion

This study shows that using the gustometer enables to study the validity and the reliability of the measurements based on controlled stimuli.

TDS, TCATA and AEF present face validity. However, at the panel level, citation rates are not related to concentrations. Very few significant differences are observed between replicated stimuli, denoting a fairly good reliability. These results confirm that consumers are able to perceive and report temporal changes in stimuli, but only in a qualitative way.

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