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Static vs. dynamic liking in chewing gum: A new approach using a background task and a natural setting

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ABSTRACT

Chewing gum is a particular product, consumed during long periods of time and usually while doing something else. Therefore, traditional hedonic tests might not provide sufficient information. The aim of the present work was to compare the liking scores resulting from asking consumers whether they liked the product only once (static liking, SL) to those obtained when asking repeatedly during consumption (dynamic liking, DL). For this purpose, three different mint chewing gums were evaluated by two groups of 50 consumers. In both cases, consumers evaluated the samples at home using an Internet application specifically designed for the experiment. In the SL, consumers were prompted to rate their liking only after 5 min of chewing. During this time, consumers were presented with a series of curious facts (“Did you know...?”) which they would read from the screen as a background task. For the DL, consumers were asked to rate the samples every 45 s during a period of 10 min while performing the same background task, having a maximum of 10 s to answer.

Comparing the results obtained by both techniques at the same moment of consumption (5 min), ratings were found to be significantly higher with the SL for all samples. This could indicate that, when asked once, consumers gave their overall liking score and not their liking at precisely 5 min. Nonetheless, at that moment, the sample ranking was the same for both methods. Moreover, DL showed that when taking into account preference throughout consumption time, a significant product ranking inversion could be found, revealing that preference was time dependent and also that this change was different among products.

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1. Introduction

Conventional sensory methods, such as quantitative descriptive analysis or other forms of profiling, implicitly regard the sensory properties under investigation as a static phenomenon (Dijksterhuis & Piggott, 2000). Nonetheless, it is well-known that the perception of flavor is not a single event but a dynamic process (Piggott, 1994) where every step must be considered to fully understand it. For this purpose, many sensory techniques have been developed attempting to describe the sensations generated by food taking into consideration its dynamic aspect. Time-Intensity (T-I) technique (Lee III & Pangborn, 1986; Neilson, 1957), Dual Attribute Time-Intensity (Duizer, Bloom, & Findlay, 1997), Progressive Profiling (Jack, Piggott, & Paterson, 1994), Temporal Dominance of Sensations (TDS) (Pineau et al., 2009) and Sequential

Profile (Methven et al., 2010) showed the importance of the temporal dimension in sensory evaluation.

Therefore, if perception changes as a function of time, it might also be expected that hedonic responses would modify during consumption. The first work to investigate temporal liking was done by Lee and Pangborn (1986): they proved that liking changed along time, and that these changes could be measured using the T-I methodology. Later, Taylor and Pangborn (1990) measured the degree of liking of chocolate milk continuously along a consumption period of 80 s, finding that hedonic responses showed systematic changes during tasting, and that these changes were product dependent. At this point, it was suspected that changes in the hedonic response could be a mere reflection of the variation of the intensity of different attributes. Veldhuizen, Wuister, and Kroeze (2006) worked with orange juice lemonades and found that intensity and pleasantness responses did not occur simultaneously; the intensity response happened before the pleasantness response and

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also had a different duration time. Therefore, time-hedonic curves were different from the time-intensity curves, showing the importance of the dynamic hedonic evaluation. More recently, [Sudre, Pineau, Loret, and Martin \(2012\)](#) proposed two new methods for measuring the dynamics of liking during a one bite consumption event. Their aim was to find the specific moments at which preference changed during the one bite of wheat flakes, in order to relate this change in preference to the variation in the perceived attributes. In the first proposed method, they recorded liking at four specific times of the mastication period. In the second method, consumers recorded any change in their liking by clicking on a button corresponding to a level of the same 7-category scale. In this way, the temporal dimension was included, not as a continuous phenomenon but at 30 s intervals of consumption time. Their results proved the importance of tracking liking over time, and that this could be done at short intervals rather than in a continuous manner as proposed by the time-hedonic curves. In addition, they indicated that this type of study is highly product dependent, and that tasting conditions should be closer to natural settings as opposed to laboratory conditions.

In all of the aforementioned studies, consumers were repeatedly asked about their preference throughout consumption time of the product, but it is to be noted that this time was in all cases shorter than 2 min (a sip, a bite, a mouthful). However, for chewing gum a different approach is needed, since it is designed to have different rates of release of sweetness and aroma. Moreover, taste is supposed to last for long periods of time ([Lenzi et al., 2012](#); [Song, Knutsen, Broderick, & Seielstad, 2010](#)). Some research can be found on evaluation of taste, texture and aroma in chewing gum by Time-Intensity methods ([McGowan & Lee, 2006](#)) or on flavor release by dual Time-Intensity ([Duizer et al., 1997](#)); but there are few published references on how to study the preference of this product. [Delarue and Loescher \(2004\)](#) stated that with chewing gum, it might be confusing for consumers to be asked how much they like or dislike a sample several times in a row. According to them, using Time-Intensity to assess hedonic response creates an unnatural environment and the measurements are likely to be subject to response bias. So, they evaluated preference only at three different chosen moments of consumption (1, 5 and 30 min). Nonetheless, in their methodology, consumers were grouped and each group gave their preference at one time. So, since consumers were not asked about their preference at different moments of consumption, liking along time was not really obtained.

The test done by [Delarue and Loescher \(2004\)](#) clearly showed that chewing gum is consumed during long periods of time, and that long tests can be problematic: they can easily become boring, and boredom might lead to bias and probably low preference ratings. In addition, consumers usually chew gum while doing something else. For example, in a survey with 8930 university students, 41% reported that they chewed gum while revising to reduce stress ([Princeton Review & Wrigley, 2005](#)). With this in mind, we proposed a background reading task during the tasting. We believe that being relatively entertained while performing the tasting could distract consumers from the fact that the same question is being asked repeatedly along time. In this way, a dynamic hedonic response can be obtained, diminishing the influence of boredom in the task and making the test more similar to situations in which chewing gum is usually consumed.

Furthermore, [Delarue and Loescher \(2004\)](#) showed that an inconvenience of performing long preference tests was that subjects had to go to the sensory laboratory many times. Another improvement proposed in the present work was that the test was done in in-home conditions with the help of a web application. Therefore, consumers would be in a more natural environment, and the information obtained might be closer to real consuming conditions. Using this tool, the test becomes cheaper and more effi-

cient since the number of consumers performing the test is independent from the facilities of the sensory lab.

The aim of the present work was to compare the information obtained on chewing gum preference by means of a static (consumers evaluated their liking only once) and a dynamic liking (they were asked about their liking several times during product consumption) methodologies; both done in in-home conditions and while performing a background task.

2. Materials and methods

2.1. Samples

Three different commercial Argentinean chewing gums (hereon CH-1, CH-2, CH-3) were used for this study. The three were mint flavoured, not sugar coated and sugar free. They were all intended for the same market segment: young consumers (16–30 years old) of medium/upper class, and the price per unit of chewing gum was of around AR\$ 0.85.

2.2. Consumers

A total of 100 mint chewing gum consumers participated in the experiment. Consumers were recruited among students and staff of the Universidad Católica Argentina (Buenos Aires) based on their frequency of consumption of mint chewing gum. The whole population was homogeneous, consisting of 50% females and 50% males, ages ranging from 19 to 32 years old. Of this population, 55% consumed mint chewing gum at least 2–3 times a week and 38% consumed 2–3 times a month.

This population was randomly divided into 2 groups of 50 consumers. Each one tested the chewing gums under one or the other of the two protocols described in Section 2.3.

2.3. Testing protocols

Both testing protocols were carried out at consumers' homes, and while performing a background task. Those interested in participating were prompted to go to the Sensory Laboratory at the Universidad Católica Argentina, where they were given a sealed envelope containing all three samples in their original wrappings and the instructions needed to access their online session. At the same time, they were explained that the test could be done at any moment of the day needing a computer or a tablet with Internet service. Moreover, they were explained that the test should be carried out three days in a row, taking one gum per day at approximately the same moment of the day. All data was acquired by TimeSens online software (www.timesens.com). The way to carry out the test was explained at the beginning of the tasting (example for dynamic liking protocol in [Fig. 1a](#)) and the sample to be tested was instructed by the brand ([Fig. 1b](#)). Having branded samples is usually not recommended since it can be a source of bias for consumers. This could be avoided by re-wrapping samples in neutral papers. Since in the present work the focus was placed on the sensory techniques to be used and with both techniques chewing gums were presented in the same way the wrappings were kept. Moreover, in this particular case, samples were recognizable even without the wrappings. The order of presentation of samples was balanced and randomized among consumers.

The background task in both cases consisted on reading a series of curious facts ("Did you know...?", [Fig. 1d](#)) which changed frequently along consumption time. The main aim of this background task was to entertain consumers along the tasting period and to distract them in order to avoid boredom and even "over analysis" of the samples, trying to approach them to a more realistic

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