Capturing consumer perception of vegetable freshness in a simulated real-life taste situation

Fiorella Sinesio*, Anna Saba, Marina Peparaio, Eleonora Saggia Civitelli, Flavio Paoletti, Elisabetta Moneta*

CREA-Council for Agricultural Research and Economics, Research Centre for Food and Nutrition, Via Ardeatina, 546, I-00178 Rome, Italy

A B S T R A C T

Consumer testing in re-created purchase or consumption contexts may produce results with a higher external validity than laboratory testing and be a valid alternative to consumer testing in real-life contexts. Hence, the present study evaluates the utility of a novel immersive approach in sensory consumer testing. An immersive multisensory room was designed to reproduce consumption conditions close to real life, with large wall screen projections, audio and olfactory stimuli and furniture consistent with the video scenario. Overall liking and perceived freshness of two vegetable products (salad tomato and wild rocket) at different storage time were evaluated by a group of volunteers, regular consumers of the products. Evaluations were performed both in a immersive environment setting - the scenario was the dining room of a holiday farm overlooking a patio and the countryside - and in a traditional sensory lab setting, as a control. The magnitude of liking was higher when evaluations were performed in the immersive environment setting than in the traditional lab setting. However, the discrimination efficacy for freshness and liking of stored and un-stored vegetables was reduced in the immersive environment with respect to the control lab. Additional research, aimed at exploring other products and other consumption or purchase immersive scenarios, will further clarify whether these findings are product-dependent or determined by the contingent immersive situation.

1. Introduction

The dynamics of consumers' food preferences and motives underlying choices are influenced by a multitude of interacting factors, the study of which requires investigation of all elements affecting the food experience: the product itself (intrinsic/extrinsic properties), person–related factors (cultural, psychological, physiological, emotional) and the specific context in which the choice is made, e.g. temporal (meal time), social and physical surroundings (Köster, 2009). Although consumer research has shown that eating situations influence consumer responses to foods and beverages, hedonic tests traditionally take place in isolated sensory booths devoid of environmental contextual cues. This latter setting does not correspond to natural conditions of product consumption, and does not consider the influence of important components related to the emotional-perceptive sphere of the individual. In real-life contexts, indeed, the choice of a certain food product over another, as well its perceived quality, is driven also by the specific eating situation, and therefore it is subjected to contextual influences, such as how the product is prepared and, served, place and time of consumption, conviviality (Cardello, 1995; King, Weber, Meiselman, &

Lv, 2004; Machín, Giménez, Vidal, & Ares, 2014). These conditions provide a continuous flow of information and cues, such as visual, auditory, tactile and olfactory contextual stimuli, acting on the consumers' emotional state, expectations, perceptions, and hedonic appreciation of the products.

Previous research on situational contexts indicate that eating behaviour is influenced by a combination of variables interacting and integrating with each other in a non-independent way to create the consumption context (Sester et al., 2013). In addition, several authors have demonstrated how the tasting place and its atmosphere can affect food acceptance and eating behaviour (De Graaf et al., 2005; King et al., 2004; King, Meiselman, Hottenstein, Work, & Cronk, 2007; Meiselman, Johnson, Reeve, & Crouch, 2000; Weber, King, & Meiselman, 2004). Other authors, exploring the situational nature of food choices, have identified a conceptual framework of eating/drinking occasions that is characterised by several dimensions such as the food/drink itself, the location and time of eating occasion, the social setting, activities in which consumers are involved, their mental processes (emotions, moods) and physical state (e.g. loss of appetite), and the recurrence of those experiences (Bisogni et al., 2007).

Among the many contextual factors impacting on liking and food-related behaviour, other studies highlighted the importance of social influences, i.e. the presence of/interaction with other people during food consumption versus eating alone (Cruwys, Bevelander, & Hermans, 2015; King et al., 2004). In addition, physical stimuli from the surrounding environment such as visual cues (Quartier, Vanrie, & Van Cleempoel, 2014; Stroebele & De Castro, 2004), sound (Kantono et al., 2016; Schifferstein, Talke, & Oudshoorn, 2011; Wansink & van Ittersum, 2012), odour (Stroebele & De Castro, 2004), together with other extrinsic cues like packaging (Gutjar et al., 2015; Piqueras-Fiszman, Velasco, & Spence, 2012), type of food serving containers (Libotte, Siegrist, & Bucher, 2014; Wan, Woods, Seoul, Butcher, & Spence, 2015), may affect preferences.

Other authors have conducted experiments in a real situation, in order to reproduce the social, psychological and emotional state (Edwards, Hartwell, & Brown, 2013; Porcherot, Petit, Giboreau, Gaudreau, & Cayeux, 2015). However, this approach may be difficult to implement, because of the complexity of real-life situations and the lack of controlled conditions. In light of the above considerations a better balance between research carried out under controlled laboratory conditions and contextual settings is recommended, to gain more insights into the complex phenomenon of food choices, and yield results with higher external validity (Meiselman, 2013). Therefore, the use of immersive approaches simulating physical purchase and consumption contexts in real-life, are highly desirable (Jaeger, Hort, et al., 2017).

1.1. Context simulation approaches

Several approaches have been used for simulating consumption/purchase situations in studies exploring the effect of contextual variables in consumer testing.

1.1.1. Imagined context

A common approach for evoking consumption/purchase contexts is to use a written scenario describing a situation that consumers are asked to imagine. This approach does not require a modification of the physical environment as for immersive techniques. These scenarios stimulate consumers to imagine a typical consumption/purchase situation while evaluating the product and a description of the imagined consumption context is given. The scenario evokes a common context, but the details are strictly individual, being derived by consumers' personal experiences. Written and pictorial scenarios have been employed by several authors when measuring consumers' hedonics (Hein, Hamid, Jaeger, & Delahunty, 2010, 2012; Jaeger, Fiszman, et al., 2017; Lusk, Hamid, Delahunty, & Jaeger, 2015), acceptance and intention to purchase (de Andrade et al., 2016; Hersleth, Monteleone, Segtnan, & Næs, 2015), rejection for consumption or purchase (Giménez, Gagliardi, & Ares, 2015), sensory product characterization (Jaeger, Fiszman, et al., 2017) and associative emotional responses (Piqueras-Fiszman & Jaeger, 2014a, 2014b, 2014c).

Such methods are easy-of-use and inexpensive, since they lead to the creation of a situational and temporal condition in consumers' mind, without requiring a modification of the physical surroundings. These methods enable participants to adapt the evoked contexts to their own personal situations. Indeed, consumers may be asked to imagine a specific situation, or to recall to memory their typical consumption/purchase situation, or the situation in which they consumed /bought the product last time (Jaeger, Fiszman, et al. 2017). However, recalling a specific situation might detract attention away from the products to be tasted, or it might be hard to keep the evoked context in mind throughout the testing session and, at the same time, focus on the analytical task. Another limitation of this technique is the lack of sights, sounds and smells associated with the context of consumption, which may be more engaging for participants, and the absence of interactions with the physical and social environment.

1.1.2. Physical immersion

The physical environment of the eating situation is virtually re-created in laboratory, under controlled conditions. Some authors have included a few contextual features, such as the furniture (Dalenberg et al., 2014), or changed the microenvironment relative to how the food is served, such as the table's setting (García-Segovia, Harrington, & Seo, 2015), or the combination with other foods (Jimenez et al., 2015), as well as the visual arrangement of the food on the dish (Michel, Velasco, Fraemohs, & Spence, 2015).

More immersive approaches have been used by other authors. For example, Sester et al. (2013) set up a bar-like environment to study contextual influences on drink choices, This environment had furniture specially designed and a wall used as a screen for video-clips projection combined with music. Different furniture and video-clips were projected on the wall to change the level of warmth of the ambience. More recently, Bangcuyo et al. (2015) recreated a virtual coffeehouse by video footage depicting typical sights and sounds displayed onto a video wall composed of high-definition LCD screens. Such virtual coffeehouse setting improved consumers engaged in the testing, and resulted to be more discriminating and predictive of coffee liking than data collected in traditional sensory booths.

1.1.3. Immersive Virtual Reality (IVR)

The emergent and potentially valuable way to improve the feeling of being present in a real situation is the use of immersive technologies, such as the 3D Immersive Virtual Reality system that can virtually re-create specific purchase or eating environments (Jaeger & Porcherot, 2017). These techniques can stimulate more realistic consumer behaviour and therefore represent new opportunities for research in consumer testing. However, also for these techniques more research work is necessary to delineate advantages and difficulties of using virtual reality in consumer testing of food products.

1.2. Aims

Context simulation through the use of immersive techniques in consumer testing has many potential applications in food industry. Further exploration of existing techniques or the development of deeper immersive methods are therefore necessary to understand the added value of such techniques with respect to the evaluation in the traditional testing booths. In this perspective, we created an immersive ambience with video projection (multiple wall), respecting the proportion and three dimensionality of real visual cues combined with material cues in the room and other stimuli other than visual (sound, odour, ventilation). The immersive room simulated a real consumption scenario in a countryside setting (like restaurant, holiday farm, agri-tourism) by means of visual, audio, olfactory stimuli. Socialization and eating conditions approximating the reality were part of the immersive method. The proximity to the production site is associated by consumers to freshness of fruits and vegetables, therefore a rural location is the experimental setting that confirms this assumption. (Péneau, Linke, Escher, & Nuessli, 2009; Saba et al., under revision).

The choice of a holyday farm with local products for the immersive setting was motivated as it is a farm that makes direct sales of its products, it makes small scale processing (jams, preserves, cheeses, oil, wine), and food service, mainly using its own and local products. Therefore, in this place the consumers expect to buy and eat seasonal, fresh, and local vegetables.

The general objective of this research was therefore to investigate the capability of this immersive method in simulating a real consumption setting providing meaningful contextual information, and shaping consumers' hedonic answers and perceived freshness of some vegetable products. Tomatoes and wild rocket were chosen for the experimentation. To this purpose, specific objectives were defined to test:

a) the hypothesis that, by bringing consumers into an immersive