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Crossmodal correspondences: Assessing shape symbolism for cheese

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ABSTRACT

Several recent studies have demonstrated the existence of robust crossmodal correspondences between food and beverage items and shapes varying on the angular-round continuum. To date, however, the majority of this research has involved relatively simple gustatory, oral-somatosensory, and/or olfactory stimuli. In the present study, therefore, we extended this research in order to investigate whether people also exhibit robust crossmodal correspondences between shapes and cheese. To this end, participants in Experiment 1 (conducted at a Gastronomy event) tasted three aged farmhouse cheeses (Keen's Cheddar, Tunworth, & Berkswell, from Neal's Yard Dairy, UK). Participants rated each cheese using a single response scale anchored at either end by a rounded and an angular shape. Significant differences in shape symbolism were observed across the three cheeses. In Experiments 2 (conducted with cheesemongers and cheese experts) and 3 (conducted with customers in a cheese store), participants separately rated the olfactory, gustatory, and oral-somatosensory attributes of different cheeses (Tunworth, Lancashire, and Stawley) on the angular-round continuum. The results revealed that participants' crossmodal correspondences were based primarily on the taste, rather than the smell or texture of the cheeses. Implications of these findings for the marketing of dairy products are discussed.

Practical applications: The results of the present study demonstrate that taste is the leading contributor to the systematic associations consumers have between the flavors of cheese and certain angular/sharp or organic/round shapes and speech sounds, with the same pattern of crossmodal correspondences being held across different tasting groups (non-experts, regular consumers, and cheesemongers/experts). These results provide insights regarding the abstract imagery that might best be associated with specific taste attributes in commercial cheeses. These results may also be used to not only develop abstract imagery for product packaging that can capture specific shape/sound symbolic properties, but also to develop descriptors that can provide a common ground on which to talk about cheeses, thereby improving communication between different panels of cheese tasters.

1. Introduction

The latest research has started to reveal the existence of a number of shape (and sound) symbolism effects (otherwise known as crossmodal correspondences) in the food and beverage sector (see Spence, 2011, 2012, for reviews). So, for example, it has been demonstrated that people preferentially match carbonated water with angular shapes and still water with rounded shapes (see Fig. 1 for examples of the kinds of shapes typically used in studies in this area; Spence & Gallace, 2011). Similarly, people also match dark chocolate with angular shapes and milk chocolate with rounded shapes. The angularity of the shape chosen in this case correlating with the variation in the cocoa (and hence bitterness) content of the chocolate being tasted (Ngo, Misra, & Spence, 2011). These recent findings build on anecdotal reports from marketers suggesting that consumers tend to match sweetness with round (rather than angular) shapes (e.g., Dichter, 1971). Additionally, we have recently demonstrated that when given a piece of mild supermarket Brie and a glass of cranberry juice, people place the Brie toward the rounded-shape end of the scale and the more acidic cranberry juice toward the angular-shape end of the scale (Gallace, Boschin, & Spence, 2011; Spence & Gallace, 2011). These results build on a much older literature highlighting the existence of robust crossmodal correspondences between shapes and speech sounds (e.g., see Köhler, 1929, 1947; Sapir, 1929, for early work, and Hinton et al., 1994; Robson, 2011, for more recent reviews).

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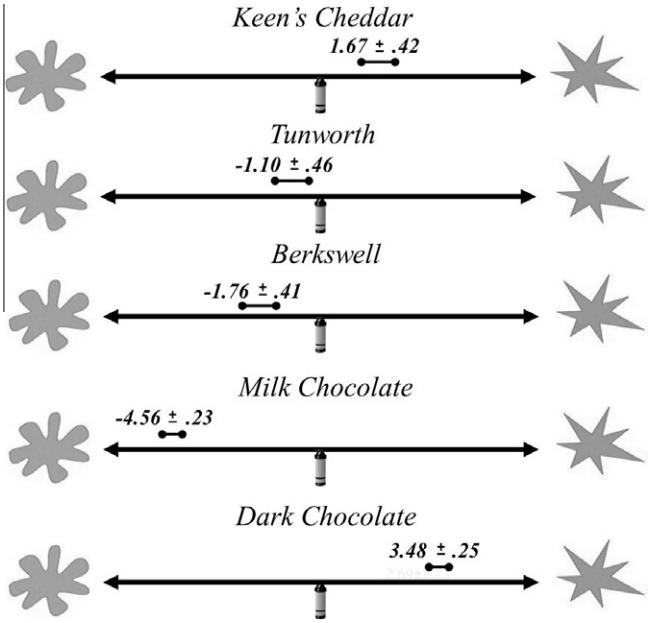

Fig. 1. The shape symbolism response scales used by participants in Experiment 1. The mean (± the standard error of the mean) of participants' responses is shown above the cheese and chocolate response scales.

In fact, researchers have even demonstrated that people can match the more complex 3-D shape of dessert containers to specific dessert types/flavors (see Overbeeke & Peters, 1991).

Taken together, these results therefore suggest the existence of a number of systematic crossmodal correspondences between the various olfactory, gustatory, and oral-somatosensory attributes of food and beverage items and the angularity of abstract shape stimuli (see Spence, 2012). In particular, carbonation, bitterness, sourness, and crispness/crunchiness all appear to be matched with more angular shapes (see also Cytowic & Wood, 1982; Harrison, 2001), while non-carbonated, sweet, and creamy foods all seem to be matched with more rounded shapes instead. However, that said, it is worth noting that none of the tastes/flavors, oral-somatosensory textures, and/or smells utilized in these previous studies were especially complex (with the possible exception of the Brie cheese). One might rather say that they were all fairly simple, if not unidimensional – at least when compared to the temporal evolution of sensations that one might expect to experience when savoring an aged cheese, say, or a well-aged glass of fine wine.[1] Therefore, in order to further research on the topic of shape symbolism, and in order to test the limits of the phenomenon of crossmodal correspondence as observed in the food and beverage sector, the research outlined here focused on aged cheese. We sought to discover whether similarly robust shape symbolism effects could be demonstrated with such a food. We further attempted to ascertain which specific attributes of the overall multisensory flavor Gestalt (associated with tasting/eating cheese) were critical to driving the crossmodal correspondences that we observed. Later, we discuss how such information might be useful in terms of the marketing/packaging of cheeses and other foods having a particular flavor profile (cf. Dichter, 1971; Spence, 2012; Spence & Piqueras-Fiszman, in press; Westerman et al., 2012, in press).

Anecdotal evidence from both chefs and synaesthetes suggests that shapes can reliably be linked to foods. The chef Paul Bertolli (e.g., Bertolli, 2003), for example, has talked about the different dishes on certain of his menus as having very different shapes, or angularity. Similarly, the synaesthete (MW) investigated by Cytowic first came to the medic's attention when he complained that the roast chicken he was preparing for dinner "had too many spikes" (see Cytowic, 1989). On what basis these foods were associated with certain shapes, whether it was their taste, smell, texture, or some unknown combination of these attributes that drove the crossmodal mapping, isn't clear from the descriptions provided by Cytowic and Bertolli. Elsewhere, Harrison (2001) describes another synaesthete (AJ) whose synaesthetic shapes were triggered by food-related olfactory cues rather than by tastes (i.e., by purely gustatory cues; see also Cytowic & Eagleman, 2009, Chapter 6). Taken together, then, the scattered literature from synaesthetes displaying florid signs of shape symbolism suggests that different attributes (components) of flavors/foods can drive shape symbolism effects. Whether similar crossmodal correspondences between shapes and the taste, smell, and/or oral-somatosensory attributes of foods are also present in neurologically normal individuals is something that has yet to be ascertained empirically. It should be noted that while basic tastes (i.e., sweet, salty, sour, and bitter), textures, and aromas are familiar and distinguishable attributes, most people are not aware that what they call 'taste' actually represents a mixture of gustatory stimulation together with retronasal olfaction. That is, most people do not realize that retronasal aroma contributes to the 'taste' (or more correctly, the flavor) of a food or beverage experienced in the mouth. Auvray and Spence (2008) have suggested that texture also contributes to peoples' flavor ratings. Separating these components in experience (e.g., separating pure taste from retronasal olfaction) can be extremely difficult outside of the laboratory. Thus, what the average consumer refers to as taste normally reflects a combination of retronasal olfactory and gustatory cues (not to mention possibly also trigeminal cues).

The closest that researchers have come to answering this question to date was in a study by Deroy and Valentin (2011). There, it was demonstrated that people reliably matched three different beers (Adelscott, 1664, and Bitburger) with different shape attributes, when given a range of 34 different 2D and 3D shapes to choose from. However, it would seem possible that the participants in this study may have been matching the bitterness of the beer or its oral-somatosensory properties to the shapes rather than necessarily any of the more complex flavor attributes of the stimuli, such as their smell (cf. Holt-Hansen, 1968, 1976).

It can be argued that aged cheeses (and presumably also mature wines) have flavor profiles that are at least as complex as those of beer. They can certainly involve a much richer and time-evolving palette of gustatory sensations and oral-somatosensory textures on the tongue, and smells in the nose. The word "sharp" is often used in everyday language (in English), to describe the taste of certain cheeses (Marks, 1991; Williams, 1976). Wines can also be described as "sharp" (though here the term is not used in an appreciative manner). Meanwhile, other shape descriptors, such as "rounded" are used in a more positive way to refer to the pleasing attributes of certain wines (Lehrer, 2009, pp. 140–141; Peynaud, 1987, pp. 168–171). The fact that such shape terms appear to come naturally to both normal consumers and experts/critics alike suggests that they might find it similarly easy to match cheeses (or wines) – at least cheeses (or wines) worth talking about – to angular (sharp) and rounded (smooth) shapes. The importance of investigating shapes as a potential new way of assessing or communicating the sensory attributes of foods is seen

[1] However, that said, the cheese (a cheap supermarket variety) was not particularly ripe, and, hence there was not a great deal of complexity or depth to the flavor. While it is obviously hard to give a precise definition to the term 'complexity', we use the term here to refer to a food or beverage whose gustatory, olfactory, and/or oral-somatosensory attributes vary markedly over the course of consumption. Cheese and wine seem to provide two representative examples of such complexity in the food and beverage sectors.