SENSORY AND CONSUMER RESEARCH UPDATE

What's new? Recent highlights in sensory research.

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Mental imagery as an olfactory training strategy

An extremely important component of descriptive analysis is training panellists to achieve consistent results. The effectiveness of mental imagery as a training strategy has been shown in several areas such as sport and music. In this study, researchers from the University of Bordeaux in France assessed if olfactory mental imagery could be a tool for training the olfactory capacities of panellists.

Novices, undergraduate enology students (intermediates) and wine experts were asked to repeatedly imagine the visual images or smells of odorant sources presented in picture form. Olfactory abilities, odour sensitivity and identification performance were compared before and after mental training to check the differential effects of the two types of sensory training. They demonstrated that, like repeated objective odorant stimulations, repeated imagination of odours was able to enhance olfactory performance in objective perception. Both odour detection and identification abilities were improved. However, according to the results: (1) the effect was odorant specific; and (2) the impact of training on identification was restricted to wine experts.

The authors identified practical applications and suggested olfactory mental imagery as an excellent tool for training the olfactory capacities of panellists. This technique could be extended to perfumers, flavourists and tasting panellists with a view to improving product quality control, without material stimulus such as chemical supports. Given the variable results achieved, an unbiased conclusion would state this may be a useful addition to traditional training.

Tempere S *et al.*, (2014). "Learning Odors: The Impact of Visual and Olfactory Mental Imagery Training on Odor Perception." *Journal of Sensory Studies* 29 page 435-449

A spoonful of sugar helps the medicine go down

We learn by experience that adding sugar to coffee makes it sweeter, and for some people increases pleasantness. This strategy has implications for the pharmaceutical industry, especially for drugs that are administered in liquid form oral dose, such as many paediatric drugs. Julie Mennella and colleagues from Monell Chemical Senses Center in Philadelphia, USA, used a group of children and adults to determine whether adding sucrose to a number of bitter compounds, including caffeine, would reduce their bitterness, increase pleasantness or both.

The results showed that sucrose suppressed bitterness to different extents for each particular bitter compound, but for some bitter agents the effect of sucrose was marked; for instance, it substantially lowered bitterness ratings for caffeine. One important aspect this type of research highlights is the large individual variation in experiences – three children and two adults could not complete testing because they were nauseated after the tasting. Yet for other people, sucrose was an unequivocally effective masker of bitter taste. This is an obvious case of a strategy working effectively for some people, and less effectively for others. As the authors note, "Given the numerous and varied components of involved in the mediation of bitter taste and the age-related changes in bitter perception, the task ahead of us is challenging but remains an important public health priority that has the potential for major impacts on the health of our children."

Mennella J *et al.*, (2015) "A spoonful of sugar helps the medicine go down. Bitter masking by sucrose among children and adults." *Chemical Senses* 40 page 17-25

Bad breath and olfactory dysfunction

Halitosis, also called bad breath, is a symptom in which a conspicuously offensive and unpleasant odour is present in the exhaled breath. Volatile sulphur compounds are usually involved, often as a result of bacteria or infection in the oral cavity or upper respiratory tract. This study investigated whether people who had chronically bad breath also had impaired sense of smell. To keep it brief, those subjects who had bad breath also had a poor sense of smell. We suppose the bad sense of smell is an evolutionary advantage.

Altundag A, *et al.*, (2015). "The evaluation of olfactory function in individuals with chronic halitosis." *Chemical Senses* 40 page 47-51

Taste with our eyes

We taste and eat with our eyes – a five-year-old knows this but as sensory scientists we want to see some proof and some experimental results. A recent review by Capaldi from the Arizona State University, USA, gives an insight into the power of visual cues and the associated science behind the effect, ranging from the colour of food and portion size, to shape.

Did you know that simply arranging food on our plates in a neat way (rather than a messy way) can increase food consumption? The sight of food can already start a physiological response, which prepares you for the food that you are about to eat and increases your appetite. All these are physiological processes in response to a visual cue of certain foods. Blood insulin increases just by looking and smelling food, without actually eating the food. The body knows what to expect and prepares itself for what is about to happen.

Serving larger portions will increase intake. The amount of food we consume is informed by how much we think we have eaten based on visual cues. For example, by just looking at the number of left over bones of the chicken wings you consumed, you may decide it is time to stop eating. However, when these cues are distorted by providing bigger plates, or removing the leftover bones from our plates, we lose track of what we consumed and start to consume more.

Another important visual cue is colour. The colour of food has long been a subject of research. You might have experienced eating food which has been stripped from its colour. For example, colourless cola. Often it is very difficult to correctly identify the flavour of the food, without the colour cue being present. Colour intensity can increase perceived flavour intensity. For example, dark-coloured milk chocolate is perceived as more chocolatey than the same chocolate with a lighter colour. Colours that match the flavour (eg. red for cherry flavour) can increase perceived flavour intensity and overall acceptability of food.

However, the way particular cues influence our taste perception and food intake depends on our experience. This experience is closely related to our food environment. For people who have never eaten dark chocolate, a "dark-chocolate" colour cue would have little influence on how this chocolate is perceived. For future research it is therefore important to investigate the influence of visual cues in cross cultural studies. This is especially of importance when Australian products are shipped to overseas markets such as China.

Wadhera D, Capaldi-Phillips E. (2014). "A review of visual cues associated with food on food acceptance and consumption." *Eating behaviors*, 15, page 132-143

Seeing is not eating

In many countries, a meal usually consists of a number of different foods served on one plate. The liking of these separate foods differ – for example, a combination of a well-liked lasagne and a moderate-liked salad. It is possible that the hedonic value of one food affects the liking of other food within a meal. Attractive foods may increase the liking of other foods (i.e., assimilation), or decrease the liking of other food (ie., contrast). Imagine you take a sip of a moderate-liked juice after drinking a delicious juice. The moderate-liked juice will be more disliked after the delicious juice than when presented alone; a well-studied example of contrast effect. Contrast and assimilation effects were previously studied in comparing foods of the same kind, but not for different foods within a meal.

Researchers of the Montclair State University together with Natick Soldier Research in the USA studied how a side dish affected the liking of the main food-item: chicken tender. The well-liked side dishes consisted of potato chips and macaroni and cheese, and the disliked side dishes consisted of lima beans and beets. Sixty-four participants viewed two photographs with plates that consisted chicken tender served with either the well-liked or disliked side dishes. The whole meal was judged as more attractive with the well-liked side dishes and less attractive with the disliked side dishes. However, the tender alone was equally liked. After that, the researchers let the same participants consume the chicken tender with either the well-liked or disliked side dishes. Unlike the first experiment, the tender was more liked in combination with the disliked beans and beets, and less liked in combination with the well-liked potato chips and macaroni and cheese.

It appears that eating a meal, rather than just viewing it, results in different effects on hedonic judgements of foods within a meal. Adding well-liked foods to a meal may lead to a greater overall visual attractiveness, whereas actually tasting the food may increase the hedonic contrast of the well-liked and less-liked foods.

Jimenez A *et al.*, (2015). "Seeing a meal is not eating it: Hedonic context effects differ for visually presented and actually eaten foods." *Food Quality and Preference* 41 page 96–102

Mathematical modelling and olive oil

In order to combat the growing trend of adulterated or falsely labelled olive oils, researchers in Madrid, Spain, have developed a method through which differences between extra virgin olive oil (EVOO), virgin olive oil (VOO), ordinary virgin olive oil (OVOO), and 'lampante' olive oil (LOO, natural olive oil not fit for consumption) can be detected. To do so, they used the combination of a sensory panel and the measurement of six chemical parameters of 220 olive oil samples, and then applied nonlinear mathematical modelling known as artificial neural networks (ANNs), which allow for the discovery of "nonlinear trends that exist between variables."

The sensory panel were asked to evaluate the olive oils based on attributes considered desirable (green, ripe and bitter) and related to defects (earthy, vinegar-like and muddy). They were also asked to grade the oils as EVOO or other.

Six chemical parameters were also measured in each oil; free fatty acid content (FFA, related to the acidity of the oils), peroxide value (PV, a measure of oxidation), two UV absorption parameters (K232 and K268), 1,2-diacylglycerol (DAG) content (a component found in a range of 1-3 per cent in virgin olive oils), and pyropheophytin content (PPP, a degradation product of chlorophyll which is found in olive oils that have undergone thermal or age related degradation).

ANNs were then used to link the results from both the chemical analyses and sensory evaluation, and through the identification of various relationships, were able to correctly classify (on average) 96 per cent of olive oils. The researchers did note that while the ANNs used have been successful in other food- and chemistry-related scenarios, the particular modelling may not be as successful when looking at samples different to those used in this study.

Cancilla JC *et al.*, (2014). "Linking Chemical Parameters to Sensory Panel Results through Neural Networks to Distinguish Olive Oil Quality." *Journal of Agricultural and Food Chemistry* 62: 10661-10665.

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