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Sensory analysis: A scientific approach to perceived effects

Evaluation of a product based on its physical and chemical characteristics, on visual impressions and even on results of rheological and instrumental studies, is clearly of interest as this information allows us, among other things, to determine its intrinsic qualities, something that is of great help to its designer.

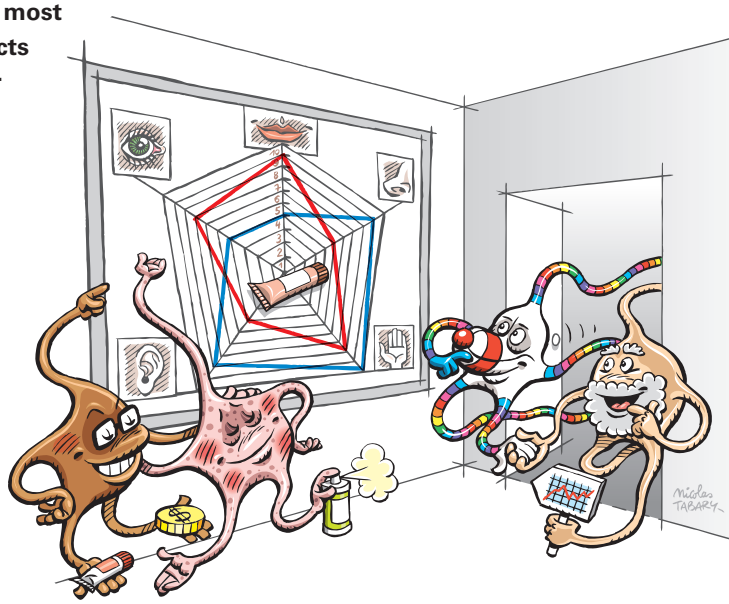
Practical experience shows, however, that this information proves ineffective when tackling the consumer's own assessment of the product. To evaluate its quality, in the absence of analytical means, the consumer has only his or her senses which translate into impressions, not always objectively.

At this stage the senses are involved in different ways: sight, taste, smell, touch, hearing, stirring emotions that are more or less deeply buried.

Sensory analysis allows us to identify, measure, analyse and interpret the product's organoleptic properties as they are perceived by the senses, in an ordered and structured way. It is therefore a reliable and independent measuring tool which meets scientific standards and allows us to induce, measure, analyse and interpret sensory perceptions.

The aim of these methods is therefore to improve, classify or describe the sensory properties of everyday consumer products in the most rigorous and objective way. We do this with the aid of subjects organised in sample groups, allowing us to define their preferences objectively, to predict what motivates their choice and to verify the products' organoleptic qualities.

These evaluations are therefore an integral part of an overall quality procedure aimed, for example, at improving formulas or creating new products.



Is there a scientific justification for sensory evaluation?

If we consider more specifically the case of cosmetology, it is clear that as well as altering or causing a new skin reaction, a cosmetic product very much involves visual and olfactory sensations in a significant and factual way. Indeed, it is only after assessing the product visually and appreciating its scent that the consumer will touch it, triggering a considerable number of stimuli in the brain that will then be analysed.

As regards tactile perception, it is through a complex structure linking numerous nerve fibres, sensitive neuroreceptors with specific functions (mechanoreceptors, thermoreceptors and nociceptors) and specialised molecules (neurotransmitters) that information can be transmitted to the cerebral cortex via electric currents conveyed by three successive neurones, inducing the 'skin feeling'. So the skin represents an important source of information for the central nervous system, and vice versa. The significant progress made in the field of neuroscience, and more specifically in that of sensory perception, means that it is entirely justifiable to credit such methods of sensory evaluation, even if there remain some more blurred, subjective areas.

What is the methodological approach?

There are now a number of international standards and rules governing the use of sensory analysis, both its definition and its modus operandi. The general principle is set out in ISO standard 5492 which defines sensory analysis as 'the examination of the organoleptic properties of a product by the sensory organs'. The techniques of sensory analysis are based on measuring sessions during which the participants are given products and asked to describe and evaluate them according to a series of precise and predetermined sensory criteria (descriptors). There are generally held to be three types of sensory analysis methods:

- Hedonic testing, an analytical approach that uses 'naive' consumers with the aim of producing an objective evaluation of the tested product, focusing on the 'pleasure' aspect and on the testers' personal feelings (ISO 11136): ranking test, (ISO 8587), hedonic notation test, acceptability test, etc.

- Discrimination testing, easy to operate and to interpret, based on simple questionnaires requiring compulsory responses from the testers: the triangle test (ISO 4120), but also the A/Not-A test (ISO 8588) or the duo-trio or p-over-n tests.

- Descriptive testing, more complex to handle, requiring a panel of experts who must go through all the documentary resources available to decide upon a list of terms that they will then refine using statistical methods.

The goal is to end up with a 'sensory profile' of the product, represented in the form of a prism synthesising all the information but analysing each of the descriptors according to their intensity. In all cases, the operating conditions are chosen to ensure the reliability and quality of the results.

Is it better to use trained experts or 'naive' consumers?

The decision whether to use trained or 'naive' judges is directly linked to the aim being pursued and the methodology. For analysis tests such as discrimination and descriptive testing, it is necessary to have trained experts, chosen on the basis of their sensory acuity for certain categories of products to be tested.
The judges should have appropriate and ongoing training that will allow them to ignore their personal preferences and their own hedonic reactions. By contrast, naive consumers taking part in a test are asked to perceive the product in its entirety, even if their attention is sometimes directed towards specific aspects. The reactions of 'naive' judges are immediate and expressed in terms of 'like' or 'don't like' according to pre-established criteria. To this end, they should first be trained in the techniques of descriptive analysis (for example, ASTM E 1490-03).

What role does statistical processing play in sensory analysis?

Statistical processing has a crucial role to play in sensory evaluation. This is due to the fact that, in all sensory data, there are major causes of variations: variability between and within judges, variability between and within products. Untangling these variabilities involves the collection of large amounts of data and its analysis according to an analytical protocol defined in advance of the study.
The types of statistical problems encountered can be highly varied, giving rise to simple protocols as needed for hedonic tests or to much more complex protocols such as discrimination testing where the paradigm is the famous triangle test proposed by Pagès. The analytical methods we use should be defined case by case, depending on the objective (for instance, principal component analysis to explain correlations between descriptive variables, ascending hierarchical classification to identify groups of products, preference mapping to identify consumer affinities).

Sensory analysis is therefore an attractive approach because – as long as the protocol is well-constructed and conducted rigorously by competent, objective judges – it permits the collection and objective analysis of the sensations felt by the user or future user of any given product. The different kinds of protocols that can be adapted for use allow sensory analysis to respond to the many questions likely to arise from the launch of new products or changes to products already on the market. Methods such as preference mapping (relationship between sensory data and consumers' preferences) are commonly used in the fields of market research and R&D. These multidimensional methods can be used to explore and understand the structure and tendencies of consumer preferences, to link consumer preference information to other data and to predict the behavior of consumers in terms of products acceptance. Attractive as it is, however, sensory analysis cannot answer all our questions and should be regarded as an useful and effective method contributing to an overall understanding of products, in association with other tools such as clinical and instrumental investigations.

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EVIC romania
15, Constantin Bosianu Street - 040505 - Bucharest - Romania
Tel: +40 21 335 70 90 - Fax: +40 21 335 70 91
E-mail: evicromania@evic.ro
Website: www.evic.ro