



1 *Response to visual cues via eye tracking.*



2 *ECG and GSR measurement probes.*

PHYSIOLOGY – MONITORING HUMAN RESPONSES TO ODOR EXPOSURE

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Odors can elicit specific responses in humans, often at a subconscious level. Humans respond to olfactory cues in different ways depending on sensitivity to specific odorants, hedonic rating and past experiences. Each of these aspects can play an important role in consumers' product preferences and acceptance, which are essential factors for a food product today. An odor compound is perceived when it reaches the olfactory epithelium, either via the orthonasal pathway, i.e. when actively smelling, or retronasally, e.g. when consuming food. Depending on odor acceptance, the body can react very differently from one odor to the next.

For example, certain odors can produce a calming response whereas others can elicit stress. The physiological response of a subject to an odor or odorant can be monitored instrumentally via a variety of biofeedback parameters. Furthermore, visual methods like eye tracking can provide additional information on consumers' attraction to a product. As such, physiological and behavioral assessments are a useful tool to complement chemical analyses of a sample to ascertain specific responses of consumers to a product.



Expertise

The Department of Sensory Analytics at Fraunhofer IVV has in-depth knowledge of the physiological and psychological principles of human odor and taste perception. We offer a wide range of instrumental methods and human sensory techniques for characterizing a large variety of odors and odorants. To make these analyses complete, physiological testing methodologies have been added to our analytical repertoire.

Physiological test parameters

A variety of physiological parameters can provide an insight into the (involuntary) response of a person to a particular odorant or odor profile, e.g. of a specific product. We monitor the following parameters for our routine physiological tests:

- Heart rate and amplitude via electrocardiogram (ECG) measurements, which provides a measure of the degree of relaxation of a subject, as well as arousal in response to a stimulus, e.g. an olfactory or visual cue
- Respiratory rate and amplitude by detecting small pressure changes at the nares of a subject via a nasal cannula, which allows the response of an odor to be monitored, e.g. in relation to acceptance or aversion

- Skin conductance via galvanic skin response (GSR) measurements, which characterizes the degree of stress elicited on a subject, e.g. in relation to exposure to an unpleasant (increase in stress) or pleasant (calming effect) odor
- Eye tracking using a state-of-the-art eye tracker, which is used to evaluate the interest of a subject to a specific target in comparison to other objects

The benefits to you

- We have broad experience in sensory analysis
- Our team has in-depth knowledge of the physiological and psychological principles of human odor and taste perception
- You have access to a group that possesses in-depth expertise in sensory testing and comprehensive chemical-analytical techniques
- Our laboratory facilities are equipped with state-of-the-art analytical instrumentation
- We have skills in developing novel methods and specialized test procedures, individually adapted to your specific needs
- Our team works inter-departmentally within Fraunhofer IVV as well as with different institutes throughout the extensive Fraunhofer network, offering an excellent source of inter-disciplinary expertise. This is reinforced by our close ties with universities and companies

What we offer

We offer a wide range of services to suit most odor-related issues and are equally available for consultation on customized solutions. Our expertise includes:

- **Human sensory** evaluation of food odors and taste, and packaging odors
- Assessing the **physiological and behavioral response** of consumers to odors or specific odorants using standard parameters and **mimic analysis**
- Combined instrumental and sensory analysis of odor-active compounds in foods and packaging using gas chromatography (**GC**) with flame ionization detection (**GC-FID**), olfactometry (**GC-O**), mass spectrometry (**GC-MS**), or a combination of these (**GC-MS/O** and **2D-GC-MS/O**)
- Simultaneous *in vivo* monitoring of odorants in real-time via proton-transfer-reaction mass spectrometry (**PTR-MS**)
- Customized consumer studies using audio and/or video immersion with masked odor presentation

1 *Monitoring physiological parameters during odorant stimulation.*

2 *Eye tracking and mimic analysis.*