
**Sensory analysis — Methodology
— General guidance for conducting
hedonic tests with consumers in a
controlled area**

*Analyse sensorielle — Méthodologie — Lignes directrices générales
pour la réalisation d'épreuves hédoniques effectuées avec des
consommateurs dans un espace contrôlé*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://standards.iteh.ai/Foreword-Supplementary-information)

The committee responsible for this document is ISO/TC 34, *Food products*, Subcommittee SC 12, *Sensory analysis*.

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Sensory analysis — Methodology — General guidance for conducting hedonic tests with consumers in a controlled area

1 Scope

This International Standard describes approaches for measuring, within a controlled area, the degree to which consumers like or relatively like products.

It uses tests based on collecting consumers' responses to questions, generally on paper or via a keyboard or a touch screen. Tests of a behavioural nature (such as recording quantities consumed ad libitum by the consumers) do not fall within the scope of this International Standard.

The hedonic tests dealt with in this International Standard, can be used as a contribution to the following:

- comparing a product with competitor products;
- optimizing a product so that it obtains a high hedonic rating or is liked by a large number of consumers;
- helping to define a range of products to correspond to a particular consumer target population;
- helping to define a best-before date;
- assessing the impact of a product formulation change on the pleasure given by the product;
- studying the impact of sensory characteristics of a product on degree to which it is liked, independently of the product's extrinsic characteristics, such as brand, price, or advertising;
- studying the effect of a commercial or presentation variable, such as packaging.

The methods are effective for determining

- whether or not, a perceptible preference exists (difference in degree of liking), or
- whether or not, no perceptible preference (paired similarity test) exists.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4121, *Sensory analysis — Guidelines for the use of quantitative response scales*

ISO 5492, *Sensory analysis — Vocabulary*

ISO 5495, *Sensory analysis — Methodology — Paired comparison test*

ISO 8587, *Sensory analysis — Methodology — Ranking*

ISO 8589, *Sensory analysis — General guidance for the design of test rooms*

ISO 29842, *Sensory analysis — Methodology — Balanced incomplete block designs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5492 and the following apply.

3.1
access panel

sample database of potential respondents who declare that they will cooperate for future data collection if selected

[SOURCE: ISO 20252]

Note 1 to entry: Respondents can be drawn on a more or less regular basis.

3.2
closed-ended question

question requiring respondents to select from a predetermined list of possible answers

3.3
commissioning party

person, body, or service who commissions a third party to conduct a study

Note 1 to entry: The concept of commissioning party corresponds to that of purchaser or customer in quality control. It contrasts with that of the supplier, service provider, or laboratory

Note 2 to entry: Usually, the commissioning party and the service provider belong to different enterprises. Where they belong to two departments of the same enterprise, the respective responsibilities of the two departments shall be carefully differentiated and explicitly clarified in the study proposal

3.4
consumer respondent

person who uses a product

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Note 1 to entry: For the purposes of this International Standard, the meaning is restricted to a person who is neither an expert, an expert sensory assessor nor a selected assessor in conformity with ISO 5492.

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3.5
consumer sample

group of consumers recruited on the basis of criteria specified by the nature of the target population

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3.6
controlled area

location providing

- controlled preparation and presentation of the products,
- comfortable conditions for consuming the products and for questioning the consumers, and
- absence of communication (verbal and non-verbal) between the consumers, guaranteeing independent responses

3.7
hedonic perception

amount of pleasure given by the sensory properties of a product

3.8
hedonic test

test aimed at measuring the overall hedonic perception of a product by consumers

3.9
open-ended question

question that does not provide ready-made alternatives for respondents but asks them to answer in their own words

Note 1 to entry: It can concern each of the products presented to the consumers or only some of them (e.g. when the question asks why a particular product has appealed most, or least, to an consumer).

3.10**position bias**

bias related to the location of a product in a set of products being evaluated

3.11**product family**

group of products that can replace one another under normal conditions of consumption

Note 1 to entry: Product families may vary according to culture and consumption habits.

3.12**representativeness**

<of a sample> degree to which attributes of the sample agree with relevant attributes of the population from which it is drawn

3.13**sequential bias**

bias related to the temporal or sequential position of a product in a set of products being evaluated

3.14**session**

meeting of consumers working simultaneously according to the same protocol during a defined time period

Note 1 to entry: A session can be divided into several subsessions separated by a defined rest time. For example, a session lasting 1 h 30 min can be divided into two subsessions with a 10-min break between them.

3.15**target population**

population whose hedonic response to a product is to be evaluated

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4 Preliminary considerations

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4.1 Study proposal

The study proposal is drawn up by the service-providing laboratory based on the information (especially concerning the objective of the study and target population) given by the commissioning party, as a written document that binds the laboratory and the commissioning party contractually. It includes the following elements:

- the objective of the study;
- the products to be evaluated (and the procedures for their procurement, especially when the laboratory has to procure one or more products);
- the target population for the study;
- the size of the consumer sample (sample size) and the way it is to be recruited;
- any limitations on consumers' prior history of participation in consumer studies;
- any limitations on other products to be evaluated in the same testing session;
- the evaluation conditions;
- the type of interview (self-completion forms or interviewers);
- the questionnaire;
- the place of evaluation;

- the number of products to be evaluated per session in the proposed study, together with an indication of other products to be evaluated where the session comprises several product families (where these products are not known at the time of drawing up the proposal, the laboratory should be committed to communicate them as soon as the laboratory knows the nature of the products);
- the conditions of preparation specific to the products to be evaluated (if they are known at this stage);
- any instructions specific to the products to be evaluated (if they are known at this stage) together with any specific information to be given about the products or the test at the start of the session;
- the name of the statistical tests to be used for interpreting the results; the type of risks used and their tolerable values; the magnitude of the minimum difference to be detected in a difference of liking test or of the maximum tolerable difference in a similarity of liking test;
- any envisaged segmentation of the consumer population, based either on characteristics known before obtaining judgment data or from the responses obtained;
- the method of examining and summarizing open-ended questions;
- any recommendations the commissioning party wishes the laboratory to draft on the basis of the results;
- the dates envisaged for the tests and for submission of the report.

When any of the above elements are unknown at the time of the study proposal, the proposal includes for each element concerned the following statement: "This element will be specified by the commissioning party by... [specifying the stage of the study]."

NOTE If a specification already exists, the study proposal may make reference to it without repeating technical points described in an operational manner in the specification.

4.2 Specification of the target population

In order to specify the target population, it is necessary to answer the following questions. These questions shall be considered for each test to be performed because the consumer target group can be different from one test to the next, even for the same product.

- Has the product to be tested already been introduced on the market? If so, is it possible to distinguish between actual and potential consumers?
- Are the consumers of interest those who actually use the product, potential consumers who have not been using the product or both groups?
- Are results from specified subgroups to be examined and compared?
- Are the results of the total consumer sample to be analysed with a view identifying subgroups?
- Are differences between the results of individuals of interest?

4.3 Further specifications

Subsequent to specifying the target population, the following aspects shall be specified:

- place of test (see [Clause 7](#));
- expected precision of measurement (see [6.1](#));
- test method (see [Clause 9](#));
- product presentation plan for the test methods selected (see [10.2](#));
- specifications for the hypothesis to be tested (see [6.1](#));

For the hypothesis to be tested, the following aspects shall then be specified:

- the composition of the consumer sample (see [Clause 5](#));
- the size of the consumer sample (see [Clause 6](#)).

5 The consumer sample

5.1 General

A hedonic test aims to determine the acceptability of the products and/or to determine preferences among two or more products by the specified consumer population.

The composition of the consumer sample is decisive for any hedonic test as regards whether or not the result can answer the questions of interest to the commissioning party.

The consumers shall be volunteers, which does not imply that it is not permitted for them to receive expenses or a reward for participation.

It is essential to obtain spontaneous reactions.

Trained consumers shall be excluded from these tests since they are likely to differ systematically from the target population.

It is usually inadvisable to recruit a consumer sample from the personnel of a company manufacturing the products to be tested. The factors most likely to distort the results when an in-house consumer panel is used are

- a risk of the products to be tested being recognized,
- a tendency to judge in favour of the recognized products, and
- excessive familiarity with the products.

These factors carry a serious risk of the results not being representative for the target population of consumers.

Any criteria to be followed when selecting the consumers (e.g. whether or not they may be recruited from the staff of the manufacturing company or its competitors or from a particular socio-economic sector) shall be agreed with the client ordering the test irrespective of the recruiting method used.

5.2 Recruiting the consumers

5.2.1 General

WARNING The following shall be observed.

- **Confidentiality shall be observed and relevant legislation shall be complied with when creating and documenting files containing personal data.**
- **Legislation with respect to age restrictions shall be adhered to.**

Consumers can be recruited either on a task-specific basis (where consumers are freshly recruited for a particular study) or from an access panel (a list of potential consumers having known characteristics). Task-specific recruitment has often been considered a means of recruiting consumers who have not participated much in consumer studies, but this idea might have become erroneous with the multiplication of locations where hedonic tests are organized in a quasi-permanent manner.

5.2.2 Task-specific recruitment

Task-specific recruitment can be conducted in a public place, at a sales point, by telephone, by mail or electronic mail or by advertisement in a local newspaper or radio station, or by social network or other internet ways. In many cases, it is necessary to reach a prior agreement with the corporation or organization responsible for the area in which the recruitment occurs.

The manner of recruiting and the time of approaching the consumers (in particular when making contact at public places or by phone and when distributing information through the media) can have a strong effect on the composition of the consumer sample.

5.2.3 Recruitment from an access panel

For efficiency in recruiting, it is also possible to assemble an access panel in the form of a file of consumer descriptions. Prior to each test and subsequent to specifying the target group, a pre-selection can be made based on criteria recorded in the file.

A consumer description may include consumer data such as the following:

- identity details of the person concerned, contact data;
- age, gender;
- marital status, household composition;
- social situation, profession, income;
- possible health problems (e.g. on allergies, diabetes, vision impairments, etc.) relevant to the products to be tested;
- other information relevant to the products to be tested (e.g. eating or drinking habits, religious prohibitions, lifestyle, household equipment);
- information on the person's availability for participation in tests;
- information on previous participation(s) in consumer tests.

Every consumer description shall be updated at regular intervals.

Such a database allows an efficient dialogue between the commissioning party and the service provider insofar as it enables the latter to ensure, a priori, that the initial desires of the commissioning party regarding target consumers can be satisfied.

5.2.4 Frequency of employing the consumers

In comparison to task-specific recruitment, there is a greater risk of “consumer professionalizing” when recruiting from an existing pool of consumers.

It is important to avoid a training effect for the individual consumer in relation to the product group concerned. Therefore, the same consumers shall not be employed too often. As guidance, an interval of at least three months between individual tests on the same product is recommended.

The laboratory shall keep records of each consumer's frequency of participation in tests involving each product and each product family. The participation history of the consumers shall be included in the study report, possibly including information about the product families involved if requested by the commissioning party.

5.3 Assembling a consumer sample

5.3.1 Selection of consumers by means of recruitment questionnaires

When consumers are selected by means of a recruitment questionnaire relating to criteria stipulated for the composition of the consumer sample, it shall not be possible for the consumer to identify which criteria in the questionnaire are decisive for selection to participate in the test.

The following are examples of possible criteria:

- previous participation in testing the product group concerned;
- frequency of using the product ;
- the product brand usually used, product description, place of purchase, etc.;
- habits in the use or consumption of the product.

Other criteria, such as age, sex, social stratum, occupational group, or geographical location can be relevant. For reasons of practicability, classes should be specified for each of these criteria. For each class, a percentage should be stated by which this class is to be represented in the consumer sample.

For each consumer selected to take part in the test, the recruitment questionnaire shall be filled out completely.

The required recruitment details may be verified.

An example of a recruitment questionnaire is given in [Annex A](#).

The recruitment questionnaire shall be preserved, or information arising therefrom shall be stored to ensure the traceability of recruitment parameters of the study.

5.3.2 Representativeness of the consumer sample

Representativeness with respect to the target population is the foremost quality required of a sample. Defining this population generally results from a concerted action between the study-commissioning party who proposes a target population and the laboratory which evaluates the feasibility of implementing this proposal.

To select consumers who are representative of the target population, criteria such as the following shall be used:

- frequency of use or consumption of the product (this criterion is often considered fundamental on account of its supposed influence on the discriminating power of the study);
- age, gender, socio-economic status, occupation, geographical location;
- brand of product usually used or consumed;
- place of purchase of the product.

5.4 Sample segmentation

There are two ways in which the consumer sample can be segmented:

- a) Segmentation at the outset in order to obtain answers to questions such as the following:
 - 1) Do women respond in the same way as men?
 - 2) Are responses different for different age groups?
 - 3) Do responses depend on consumption habits?

In this case, each subgroup is analysed separately and the results are compared.

- b) Segmentation may be derived from the data collected if there is evidence (such as multimodality) of different subgroups.

In [Annex B](#), guidance is given as to how to deal with segmentation data.

6 Size of the consumer sample

6.1 Decisions of measurement

The numerical precision of any averages or estimates obtained from the results increases with sample size. However, increased precision of measurement does not in itself ensure the relevance and validity of conclusions reached. Appropriate choices of consumers and procedures are also essential.

[Annex D](#) contains some considerations on the influence of the consumer sample size on the precision of measurement.

Precision also depends on the variability of the consumers in their responses to a single product. The larger the dispersion, the larger the sample size shall be to achieve a given precision. Knowledge of this parameter comes from the experience of both the laboratory and the commissioning party.

The precision of the results depends also on the test procedure. For example, all other things being equal, the difference between two products is established more precisely if each consumer assesses both products rather than if they are judged by different consumers.

The required precision depends on the purpose of the test. With all other things being equal, it is influenced by the following:

- the smallest difference between two mean pleasure ratings that is considered large enough to be useful when the purpose is to demonstrate a difference (the smaller it is, the larger the sample size has to be);
- the greatest difference between two mean pleasure ratings that is considered small enough to be ignored, when the purpose is to demonstrate equivalence (the smaller it is, the larger the sample size has to be);
- the risk, α , that the commissioning party is willing to accept of mistakenly concluding that there is a difference (the smaller the risk, α , the larger the sample size has to be);
- the power, P , that the commissioning party desires for the test. ($P = 1 - \beta$, where β is the risk of mistakenly concluding that there is no difference); the larger the desired power, the larger the sample size has to be);
- the directionality of the intended statistical test. If the commissioning party is interested only in reassurance that product B is not inferior to product A, a directional test is appropriate and the power of the test is greater than if the conclusions that B is inferior to A or that B is superior to A would be of equal interest.

6.2 Determining the sample size

Determining the sample size is a critical step in the development of a test and demands the assistance of a statistician. [Annex E](#) gives expressions (accompanied by examples) which can be used for the calculations for either a difference test or a similarity test based on ratings. [Annex F](#) does the same for tests based on preferences.

In all cases, the size of a consumer sample conforming to this International Standard shall never be less than 60.

Where the laboratory does not have the information required by the methods described in [Annex E](#) or [Annex F](#), this International Standard fixes the minimum sample size at 100.

Where the laboratory uses the methods described in [Annex E](#) or [Annex F](#), the sample size is given by the calculation result. However, this number

- can be lowered to 100 when the calculated number of consumers is over 100, but the laboratory and/or the commissioning party does not have the means to question a larger number of consumers. If this occurs, the laboratory shall calculate the estimated power of the test for a number of consumers equal to 100 and obtain the agreement of the commissioning party that this lower power is acceptable, and
- shall be increased to 60 when the calculated number of consumers is below 60.

The values of 100 and 60 suppose that the commissioning party does not hope for conclusions segmented according to consumer characteristics such as age or gender. Where a segmentation is decided on prior to the test, the minimum number of consumers per segment is 60.

6.3 Working with subgroups

6.3.1 General

Subgroups of the consumer sample can be formed before collecting test data or by making use of test data. For any of the options listed below, statistical advice should be obtained at the design stage.

6.3.2 Separate tests using pre-formed consumer groups

The commissioning party may wish to study separate subgroups formed by taking account of consumer characteristics (such as gender or age), which are known before conducting the test. One option is to analyse their results independently. If this is done, each subgroup shall consist of at least 60 consumers.

6.3.3 Unified test using pre-formed consumer groups

The procedure in [6.3.2](#) is less efficient than balancing presentations over the whole consumer sample, followed by an integrated analysis of all the results that takes account of subgroup membership. The same degree of confidence will normally be achieved with fewer than 60 consumers in each subgroup. This style of analysis is at its most efficient when all subgroups are of the same, or of very similar, size.

6.3.4 Segmentation of the consumers

The membership of subgroups may be an outcome derived from the results of a test on a large consumer sample. The subgroups are then classes resulting from the evaluation of all the data on hand (measurement results and/or socio-demographic data). This segmentation serves to describe the consumer sample and can be used for developing new hypotheses. The number of groups formed, their characteristics, and their sizes all depend on the amount and nature of the results obtained.

6.4 Number of product samples and experimental design

The number of samples and the experimental design affect the size of the consumer sample. If a complete plan is used for product presentation, the number of consumers needed for the test is equal to the number of responses per product to be obtained. If an incomplete plan is used, the number of consumers must be larger.

6.5 Safety margin in recruitment

The number of responses actually obtained is usually smaller than the number of consumers recruited since some consumers selected for the sample might be absent and some who participate might not use the questionnaires correctly. To compensate for this, a safety margin should be included when calculating the number of consumers required.