
**Sensory analysis — Methodology —
Sequential analysis**

Analyse sensorielle — Méthodologie — Analyse séquentielle

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 12, *Sensory analysis*.

This second edition cancels and replaces the first edition (ISO 16820:2004), of which it constitutes a minor revision. Information on using the Thurstonian δ approach and a citation for a new Reference [Z] has been added in 5.1.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Sensory analysis — Methodology — Sequential analysis

1 Scope

This document specifies a procedure for statistically analysing data from forced-choice sensory discrimination tests, such as the triangle, duo-trio, 3-AFC, 2-AFC, in which after every trial of the discrimination test the decision can be made to stop testing and declare a difference, to stop testing and declare no difference, or to continue testing.

The sequential method often allows for a decision to be made after fewer trials of the discrimination test than would be required by conventional approaches that use predetermined numbers of assessments.

The method is effective for:

- a) determining that either:
 - 1) a perceptible difference results; or
 - 2) a perceptible difference does not result when, for example, a change is made in ingredients, processing, packaging, handling or storage;
- b) selecting, training and monitoring assessors.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5492, *Sensory analysis — Vocabulary*

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3 Terms, definitions and symbols

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1.1

alpha-risk

α -risk

probability of concluding that a perceptible difference exists when one does not

Note 1 to entry: This is also known as Type I error, significance level or false positive rate.

3.1.2

beta-risk

β -risk

probability of concluding that no perceptible difference exists when one does

Note 1 to entry: This is also known as Type II error or false negative rate.

3.1.3 sensitivity

general term used to summarize the performance characteristics of the test

Note 1 to entry: In statistical terms, the sensitivity of the test is defined by the values of α , β and p_d .

3.2 Symbols

- p_0 probability of a correct response when no perceptible difference exists
- p_d proportion of assessments in which a perceptible difference is detected between the two products
- p_1 probability of a correct response when a perceptible difference does exist

4 Principle

The type of discrimination test (triangle, duo-trio, etc.) is chosen. The sensitivity of the test is defined by selecting values for α , β and p_d .

The boundaries of the decision regions are computed based on α , β , p_0 and p_1 . After every trial of the discrimination test, the total number of correct responses [for the panel, see [Clause 1 a](#)), or per assessor, see [Clause 1 b](#))] is compared to the decision boundaries to determine:

- if testing can be stopped and a difference can be declared;
- if testing can be stopped and no difference can be declared;
- if testing should continue.

5 Procedure

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5.1 Construct a graph, as in [Figure A.1](#), which illustrates the boundaries of the decision regions based on α , β , p_0 and p_1 , as follows.

- a) α and β are chosen based on the risks the researcher is willing to take of obtaining a false positive or a false-negative result, respectively. α is the probability of declaring that a difference exists when the true probability of a correct response is p_0 . β is the probability of failing to declare that a difference exists when the true probability of a correct response is p_1 ($p_1 > p_0$).
- b) p_0 is the probability of a correct response when no perceptible difference exists (i.e. the probability of a correct guess). The value of p_0 depends on the discrimination test being used:
 - 1) for the triangle and the 3-AFC tests, $p_0 = 1/3$;
 - 2) for the duo-trio and the 2-AFC tests, $p_0 = 1/2$.
- c) p_1 is the probability of a correct response when a perceptible difference does exist. The value of p_1 depends on p_d :

- 1) for the triangle and 3-AFC tests, $p_1 = p_d + \left(\frac{1-p_d}{3}\right)$;
- 2) for the duo-trio and 2-AFC tests, $p_1 = p_d + \left(\frac{1-p_d}{2}\right)$;
- 3) researchers who use the Thurstonian δ approach to measure the magnitude of the sensory difference between two products can use the conversion tables (from δ to p_d and from p_d to δ)