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Sensory analysis — Methodology — Magnitude estimation method

Analyse sensorielle — Méthodologie — Méthode d'estimation de la grandeur

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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).

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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 11056:1999), which has been technically revised. It also incorporates the amendments ISO 11056:1999/Amd.1:2013 and ISO 11056:1999/Amd.2:2015. The main changes compared with the previous edition concern the statistical treatment of the examples in Annex B:

— the Assessor factor is considered as fixed factor or as random factor (in the previous edition, the Assessor factor was always considered as a fixed factor);

— the R commands used to process the examples and to obtain the different tables are given explicitly (in the previous edition, only the tables of results were given);

— the numerical examples have been preserved without any modification to allow the user to understand the evolution in the processing of the tables;

— a new example has been added as B.2.

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.

Introduction

Magnitude estimation is a psychophysical scaling technique where assessors assign numerical values to the estimated magnitude of an attribute. The only constraint placed upon the assessor is that the values assigned should conform to a ratio principle, i.e. if the attribute appears to be twice as strong in sample B in comparison with sample A, the value assigned to sample B has to be twice that assigned to sample A. Attributes such as intensity, pleasantness or acceptability may be assessed using magnitude estimation.

Magnitude estimation method is often considered as being less susceptible to "end-effects" than the methods which employ an experimenter-defined continuous or discontinuous response scale. These "end-effects" occur when the assessors are unfamiliar with the extent of the sensations elicited by the products. Then assessors can assign one of the initial samples to a category which is too close to one of the ends of the scale. Consequently, they then find themselves short of graduations and are obliged to classify samples perceived as being different into the same category. This should not occur with magnitude estimation since, in theory, there are an infinite number of categories.

Allowing each assessor to start the process at any numerical value, i.e. to use their own scale, gives rise to a particularly important "assessor" effect. However, there are various ways of solving this problem:

— the analysis of variance (ANOVA) allows the "assessor" effect and the interactions to be taken into account;

— the assessors can be forced to a common scale by use of a reference sample to which a value has been assigned;

— the data supplied by each assessor can be reduced to a common scale by applying one rescaling methods.

It is up to the experimenter to choose the most appropriate approach based on the circumstances.

Magnitude estimation is the privileged method to determine the Steven's equation psychophysical power function. It can also be used to solve concrete problems.

NOTE The magnitude estimation method is not the most efficient technique for determining small differences between stimuli or for conducting assessments in the vicinity of a detection threshold.

EXAMPLE 1 A company produces a moderately successful beverage, but recent products which are sweeter, produced by a competitor, have made inroads into their shares of the market. It is decided to increase the sweetness level by one third in an attempt to recapture some of the market loss. In formulating the new product, knowing the power function of the sweetener will provide an estimation of the amount of sweetener necessary to reach the one third increase in sweetness level.

EXAMPLE 2 In the formulation of the new diet beverage, the intensity of the desired sweetness is known, but it is not yet decided whether to use aspartame or sucrose as a sweetener. Knowing the power functions of each substance, the iso sweetness lines can be plotted to determine the concentrations of each sweetener necessary for the desired sweetness level. This information coupled with cost/volume information can help inform the decision about which sweetener is more cost effective.

The calculations in Annex B were performed using R functions. Access to R packages is free. This information is given for the convenience of users of this document and does not constitute an endorsement or recommendation by ISO of the exclusive use of R packages. Other software may be used to perform the calculations required by this document.

The files are in the ME folder under the USB DISK H (format Text (separator: tabulation)).

The results can sometimes vary due to rounding errors, depending on the software used.