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Standard Guide for Communication of Assessor and Panel Performance[1]

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1. Scope

1.1 This guide provides guidance to sensory panel leaders on how to deliver performance feedback to trained sensory assessors and panels. This guide is not intended to be used by individual assessors or anyone unfamiliar with the panel.

1.2 This guide covers recommended feedback given throughout assessor training, panel development, and ongoing assessor and panel monitoring.

1.3 This guide examines aspects of feedback including: types, when to provide, effective delivery, and alignment to performance expectations for assessors.

1.4 Descriptive, discrimination, and quality panels are within the scope of this guide.

1.5 This guide does not cover consumer panels (qualitative or quantitative).

1.6 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E253 Terminology Relating to Sensory Evaluation of Materials and Products

E456 Terminology Relating to Quality and Statistics

E3000 Guide for Measuring and Tracking Performance of Assessors on a Descriptive Sensory Panel

3. Terminology

3.1 *Definitions*—For definitions of terms relating to sensory analysis, see Terminology E253. For terms relating to statistics, see Terminology E456.

4. Significance and Use

4.1 The procedures recommended in this guide can be used by a panel leader to provide assessors and panels feedback: *(1)* on their data-based performance, *(2)* on any behavior changes that are needed to improve their performance, and *(3)* to motivate assessors to remain engaged with the panel tasks. The aim of all these types of feedback is to ensure the generation of repeatable and valid data.

4.2 This guide provides direction for how to achieve mutually beneficial feedback exchanges between assessors and panel leaders.

5. Introduction to Feedback

5.1 *What Is Feedback?*—Feedback is the process of informing a trained assessor of their performance to maintain or improve repeatability and validity of their responses. For a sensory assessor or panel, feedback can be the act of a panel leader sharing or informing assessors of their own results or those of the panel or both; it can be providing positive or negative reinforcement to change or correct behaviors; or it can be acting as a "cheerleader" to instill confidence and increase motivation.

5.2 *Reasons to Provide Feedback:*

5.2.1 *Performance*—Providing appropriate and timely feedback on an assessor's or panel's results contributes to stable performance, performance improvement, and delivery of reliable and robust results. It can help to make an assessor more skilled at giving the same response for the same task under the same conditions.

5.2.2 *Correcting Behaviors*—Feedback is a tool that can be used to address panel/assessor issues if behaviors or results are not as expected. For example, if the assessor has scored an

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

attribute much lower than the panel, resulting in a different sample rank order, then they will need feedback on how to correct and adjust their scoring. Feedback can also inform assessors of any corrective actions needed to address negative behaviors impacting the panel or highlight any positive impact they may have on the panel.

5.2.3 *Motivation*—Feedback should provide motivation for the panels/assessors to continue learning and developing their skills. It can help to increase panel/assessor credibility, confidence, and satisfaction, which can then impact the frequency, duration, and intensity of training.

5.3 *Impact of Feedback:*

5.3.1 Feedback can have both positive and negative effects on assessors. The choice for a panel leader to give feedback depends on the situation and the impact the feedback will have on the recipient. When delivered correctly, feedback can deliver many positive consequences such as:

5.3.1.1 More accurate, relative, and consistent results;

5.3.1.2 Psychological benefits such as an increase in assessor confidence and motivation; and

5.3.1.3 Reducing confusion, conflicts, and competition among assessors.

5.3.2 Negative consequences are also possible if feedback is given incorrectly, including:

5.3.2.1 Negative impact on results (for example, increased data variability);

5.3.2.2 Psychological effects that may create a negative environment for assessors (for example, impact on group dynamics, decrease in individual motivation) and increase panel turnover; and

5.3.2.3 Confusion for the assessor if too much, or inconsistent, feedback is given.

5.4 *How to Give Feedback:*

5.4.1 *Initiate*—The panel leader needs to think about how to initiate feedback with an assessor or panel. Feedback can be spontaneous, on a scheduled basis, one-on-one, or in a group depending on the type of feedback being given (see 5.8).

5.4.2 *Plan and Formulate*—If planning feedback in advance, the panel leader needs to think of the reasons for giving the feedback and outline the steps that need to be taken to deliver it. If the panel leader is giving individual feedback to an assessor, especially if giving spontaneous feedback, they need to consider their personalities, learning styles, or needs. Effective feedback involves dialog with assessors in a way that acknowledges good performance or identifies areas of improvement.

5.4.3 *Exchange*—Everyone has their own personality and will respond to feedback differently. It is important for the panel leader to adjust their communication style to fit the emotional needs of individual assessors at the time of the feedback. To have a successful feedback exchange with assessors or a panel, the panel leader needs to consider the following points:

5.4.3.1 Be respectful and honest. The panel leader needs to tell the assessor(s) how they are doing, where they are fantastic, and where they need help;

5.4.3.2 Assessors should be told that their feedback is a vital part in the success of the panel; and

5.4.3.3 When giving negative feedback related to performance issues:

(1) Determine from them where they think they need help and devise a plan to fix the issues,

(2) Be open-minded to out-of-the-box solutions,

(3) Give focused encouragement during the panel session if they make improvements in performance or behavior, and

(4) Give deadlines for performance to meet expectations.

5.4.4 *Document*—Ensure all feedback given and received is documented to support development of the assessor and also for corrective action (for example, dismissal of assessor from a panel) if needed in the future.

5.4.5 *Evaluate*—Use self-reflection to ensure your assessors understood the feedback and conduct a follow-up of discussed topics in feedback through observation or other discussions. Allow assessors to evaluate how feedback was given and express what worked and did not work as feedback was given.

5.5 *Setting Performance Expectations for Assessors:*

5.5.1 It is important to make assessors aware of the level of performance that is expected for the stage of development they are at and the role they are undertaking. Performance expectations can vary depending on if the assessor is new or experienced. The consequences of poor performance, for example, extra training sessions or even dismissal, need to be explained to assessors at the beginning of their training. For employee panels, it is important to make attendance expectations clear, how panel participation relates to their current role, and what level of performance they will need to maintain to remain on the panel.

5.5.2 To help assessors understand why their performance is monitored, the panel leader needs to clearly state the importance of quality data and the critical role the panel results play in business decisions.

5.6 *When to Give Feedback*—Assessors should be told that feedback can occur during training and monitoring activities. There are generally four occasions in which trained assessors require feedback: *(1)* training of new assessors, *(2)* project or product category training, *(3)* post-product assessment and data collection, and *(4)* panel monitoring and maintenance.

5.6.1 *Training of New Assessors:*

5.6.1.1 Newly recruited assessors with no previous experience will be learning many new skills and need slightly different feedback from that given to more experienced assessors. Regardless, if new assessors are trained in separate sessions with other new assessors before being added to a panel, or if they are added directly to an existing panel, they will need to be given information about the sensory evaluation methods they will be using, how they are progressing in developing their skills, and how well they are calibrating with other assessors. Assessors new to the panel should be made aware that it is expected that they will make mistakes and initially have a lower level of performance compared to more experienced assessors.

5.6.1.2 A training session should be given to assessors showing the types of performance diagnostics that will be given to them. Various tables and graphics should be prepared and explained to the panel. Assessors should also be told that performance feedback may also include behavioral aspects

such as how assessors interact with the group during discussion and how disagreements are handled.

5.6.2 *Project or Product Category Training*—In this training phase, the assessors will be gaining specific knowledge about products being evaluated in a specific project or within a product category. They will be expected to learn about specific attributes and references and learn how to calibrate with the panel as a whole. The final performance level of the assessors and panel will be used to validate that the panel is ready to move to the product evaluation and data collection phase of a project.

5.6.3 *Post-Product Assessment and Data Collection*—The type of sensory methodology (for example, discrimination versus descriptive tasks versus quality evaluations) used may dictate whether or not to give feedback after a product assessment or when a project is completed. Discrimination tests may not always require feedback and it can have a negative impact if the assessor consistently gets the test wrong. A descriptive panel will most likely benefit from feedback to help facilitate learning and skill improvement. The feedback given during this phase is more specific and relates to the assessor/panel performance results. It helps to continue the development of the assessors' skills and performance level.

5.6.4 *Panel Monitoring and Maintenance*—General feedback on panel performance is good for monitoring assessor performance over time and maintaining the panel's proficiency level between projects. Maintenance activities may include conducting specifically designed tests to evaluate panel/assessor performance; retraining on existing methods and products as deemed necessary; expanding/enhancing skills required for new methods, attributes, and products; dealing with panel attrition; and so forth.

5.7 *Individual Assessor Versus Group Feedback to the Panel as a Whole:*

5.7.1 Feedback is important for both individual assessors, who perform the task, and the panel as a whole, who produce the results used for decision making.

5.7.2 Individual feedback is used as a status check for the individual assessor and provides them with information about their own performance versus that of the panel. It may also be needed for difficult situations, for example, when the panel leader needs to draw attention to or correct an assessor's behavior. It can also be used to motivate an assessor if they have improved their performance or made a positive contribution to the panel.

5.7.3 Group feedback is given to the panel as a group. It can be used to highlight data performance issues, for example, presenting plots after a descriptive analysis/profiling project and discussing the attributes that have a lot of disagreement between assessors and what training or behavior changes will be needed to improve data quality. It can also be a form of motivation, for example, having a senior manager thank the panel for their contribution to a project.

5.8 *Types of Feedback:*

5.8.1 There are five main types of feedback that can be used with assessors and panels. Each type of feedback may be used for different tasks during the different phases of panel development and each has advantages and disadvantages.

5.8.1.1 *Correct Response*—Informs the assessor of the correct answer.

5.8.1.2 *Confirmation Feedback*—Informs the assessor whether a response was correct or incorrect. The correct response is not given to them.

5.8.1.3 *Immediate Feedback*[3] (within a session)—Information provided after the assessor gives their response; it is most beneficial when received during training. Immediate feedback can be given directly after the assessor gives a response (refer to Case Study 4, Appendix X4) or it can be given very soon after the assessor's response is entered during the same panel session. Immediate feedback can be used during training, but is not recommended during data collection as this can bias the test results.

5.8.1.4 *Delayed Feedback*—Often, it is not possible to give feedback immediately. The data may require analyzing, plots prepared, and feedback planned. Be aware that learning may be reduced, especially with longer gaps between the activity and the feedback.

5.8.2 Tables 1-3 summarize which type of performance feedback you can use during each type of panel and phase of panel development and also provide some examples.

6. Feedback During Descriptive Panel Training

6.1 Descriptive panels profile products by quantifying attribute intensities on rating scales. They are usually trained in specific profiling methods and familiarized with specific products or product categories. These panels should demonstrate good repeatability of results. Attrition is an issue for longstanding panels, requiring integration of new members on occasion. To maintain high-performing panels, training is an ongoing effort as is performance monitoring (with feedback).

6.2 *Feedback During Training of New Assessors:*

6.2.1 For brand new assessors without previous descriptive analysis experience, it is critical for them to understand that many of the skills needed to become a trained assessor on a descriptive panel are foreign to normal product usage patterns, but with training, they will learn to grasp the concepts and apply this new knowledge to the evaluation process. They should be encouraged to ask questions at each session and understand that they will make mistakes during this phase of development. In general, training should commence with simple tasks then proceed to more complicated work as the assessors learn. Continuous feedback on each new task is important to the learning process. Assessors should be made aware of the "correct" response, where applicable/relevant, and should re-experience test sample(s) so that they can align their perception to the expected response. The "correct" response can be determined by past panel work within the company, literature, or the current panel once it is more experienced.

6.2.2 Immediate feedback during initial training can help to ensure poor habits are corrected early. Examples of poor habits include not following protocol(s); not allowing adequate time

[3] Findlay, C. J., Castura, J. C., and Lesschaeve, I., "Feedback calibration: A training method for descriptive panels," *Food Quality and Preference*, Vol 18, No. 2, 2007, pp. 321-328, ISSN 0950-3293, https://doi.org/10.1016/j.foodqual.2006.02.007.

TABLE 1 Types of Feedback Given during Different Phases of a Descriptive Panel

Phase	Types of Appropriate Feedback	Examples
Training of new assessors	Confirmation response	Telling assessors that they had the incorrect response for a four-sample sweet ranking test.
	Correct response	Giving assessors the correct order of samples in a four-sample sweet ranking test.
	Immediate feedback (within a session)	Telling the assessor who got the sweet ranking test to go back and taste the samples in the sweet ranking test and to focus on how they ranked the less intense samples. Praising an assessor for accomplishing a new task (motivation). Requesting more explanation from an assessor when they are struggling with a new attribute or task. Asking assessors to talk one at a time during panel discussion (behavior change).
	Delayed feedback	Discussing any changes in scoring behaviors that might be needed after reviewing a plot of mean scores and standard deviation for each assessor versus the panel. Giving positive feedback on performance improvement for a difficult attribute when viewing the plot.
Project or product category training	Immediate feedback (within a session)	Confirming that an assessor has scored the intensity of an attribute close to the desired target or to the panel average. Asking assessor to adjust their scores if using the consensus method. Requesting an assessor to review and adjust their attribute scores during a group training session.
	Delayed feedback	Discussing any changes in scoring behaviors that might be needed after reviewing a plot of mean scores and standard deviation for each assessor versus the panel.
Post-product assessment and data collection	Delayed feedback	Praising good performance of specific assessors versus the panel when showing a plot of attribute mean scores and standard deviations to the panel. Highlighting attributes with poor performance that will need more training.
Panel monitoring and maintenance	Delayed feedback	Informing individual assessors of the attributes they are not performing well on during the one-year review of results from a two-year storage trial.

between samples; adopting misinterpretation or misuse of scale methods; habitual, non-discriminating use of scales; and misunderstanding and incorrect rating of specific attributes.

6.3 *Feedback During Project Training:*

6.3.1 During project training, two-way communication between the panel leader and assessors should be open and frequently encouraged. The panel may debate and discuss as they try to arrive at common understanding and potentially resolve differences for new sample sets or when learning new methods or attributes.

6.3.2 During training sessions, assessors commonly assess samples and references during group discussions. Various tools can be used to determine what feedback to give and supplement feedback. The following formats are commonly used:

6.3.2.1 Attribute discrimination (good versus poor discrimination attribute lists),

6.3.2.2 Graphical illustrations (including boxplots, mean and target ranges, interaction plots, and so forth),

6.3.2.3 Reports or presentations, or both (often providing a historical overview and depiction of performance over time),

6.3.2.4 Targets/references (panel leader provides qualitative or quantitative examples, or both),

6.3.2.5 Correct answer or agreement, and

6.3.2.6 Individual assessor rank compared to panel as a whole.

6.3.3 Feedback about assessor performance can occur after collecting individual raw scores from each assessor, either on paper or electronically. The panel leader can provide means, ranges, and other statistical analyses, including graphs, for the discussion with the panel. This process will allow for the assessors to see how they perform individually and, in comparison, with the rest of the panel.

6.3.4 Based on the mean and the range of scores obtained for each attribute, the panel can discuss why they agree or disagree with the average rating. The panel should re-experience the product, assessors should determine if they would like to adjust their scores, and the panel should come to agreement about whether the mean accurately reflects the product attribute under discussion. Continuous feedback from the panel leader is important to facilitating this cyclic process.

TABLE 2 Types of Feedback Given During Different Phases of a Discrimination Panel

Phase	Discrimination	Examples
Training of new assessors	Correct feedback	Assessor is told they answered a tetrad test incorrectly and shown the correct groupings.
	Confirmation feedback	Assessor is told they did not get a triangle test correct and is not told what the correct answer was.
	Immediate feedback (within a session)	Assessor is told they should reassess the triangle test samples and focus on the bitter taste in the samples.
Project or product category training	Correct feedback	Assessor is told they answered a triangle test incorrectly and shown the correct groupings.
	Immediate feedback	Panel leader praises an assessor for getting three triangle tests correct in the training session.
Post-product assessment and data collection	Correct feedback	Assessor is told they answered the tetrad test correctly.
Panel monitoring and maintenance	Delayed feedback	Assessors are shown a count of how many triangle tests they have participated in over the past month and given a gift voucher if they attended all ten tests.

TABLE 3 Types of Feedback Given during Different Phases of a Quality Panel

Phase	Quality	Examples
Training of new assessors	Correct feedback	Assessor is told they correctly identified the sample spiked with butyric acid.
	Confirmation feedback	Telling assessors that they had the incorrect response for a four-sample ranking test.
	Immediate feedback	Praising an assessor for accomplishing a new task (motivation).
Project or product category training	Correct feedback	Assessor is told they answered a triangle test incorrectly and shown the correct groupings.
	Immediate feedback	Panel leader praises an assessor for correctly identifying and recognizing the spiked samples in a training session.
Post-product assessment and data collection	Delayed feedback	Project leader shares business outcome from the panel evaluation.
Panel monitoring and maintenance	Immediate feedback	After a "true-to-type" monitoring test, assessors are told the correct descriptions and allowed to reassess the samples.
	Delayed feedback	Panel is informed of the attributes they need further training on after reviewing results of daily evaluations (see case study for more information).

6.3.5 *Individual Assessor Feedback*—Assessors should understand the importance of the data they give to the project and how that influences decisions. The panel leader should consider the assessors' background knowledge when sharing performance tables or graphs. Make sure they understand the terms (for example, mean and standard deviation) and how to read the graphs used to represent data. Panel leaders need to explain what the assessor should get from the information and how they can use it to improve their performance. Examples of good and poor quality performances should be pointed out and discussions with the assessor can identify and resolve issues in evaluating attributes of concern.

6.3.6 *Panel Feedback*—Panel performance results can be shared to both inform and motivate panels, though make sure to consider the background of the panel and project to determine if sharing such results is appropriate. An overview of satisfactory and unsatisfactory performances should precede sharing of specific results so that members of the panel can focus their attention where needed. Also, the level of expectations for performance should be described. Of particular interest to panel members are the following questions: *(1)* how did the panel do overall, *(2)* how can the panel improve, *(3)* how did the individual assessor do relative to the rest of the panel, and *(4)* where can individual assessor improvements be made.

6.4 *Feedback After Data Collection*—The same tools and type of feedback given to assessors and the panel during training (6.3) can also be used after data collection is complete. Giving this type of feedback is dependent on any effect that it may have on the project objectives and final results. For example, information shared after a one-off project may be different from that giving during an ongoing study such as a shelf-life study.

6.5 *Feedback During Panel Monitoring*—Panel maintenance involves preserving the performance level of the panel for continued use. Training exercises are designed to ensure the panel does not drift and that they maintain their ability to discriminate at the desired level of sensitivity needed to make business decisions. Activities may include conducting specifically designed tests to evaluate panel/assessor performance; retraining on existing methods and products; and expanding/enhancing skills required for new methods, attributes, and products.

6.5.1 *Individual Assessor Feedback:*

6.5.1.1 Similar feedback can be given as described in 6.3.5. If an assessor's performance deteriorates over time, it will be necessary to give them repeated feedback on the areas in which they need to improve and how to improve. Make sure to consider the information in 5.7 when having this type of discussion.

6.5.1.2 If performance does not improve, it may eventually become necessary to remove the assessor from the panel. If applicable, consult and involve Human Resources when planning to have this type of discussion with an assessor.

6.5.2 *Panel Feedback*—Similar feedback can be given to the panel as described in 6.3.6.

7. Feedback During Discrimination Testing

7.1 In a discrimination test, the assessor's task is to determine if the products that they are presented with are different from each other. There are many different discrimination tests available depending on the test objectives, product types, and resources available, but the feedback approach for screened and trained assessors is quite similar for all methods.

7.2 Discrimination panels are typically company employees or trained panels; these are assessors who continuously participate on this type of panel. Feedback plays an important role in motivating them to return for subsequent tests. The feedback for overall or unspecified discrimination tests (for example, same-different or triangle) differs slightly from that for attribute-specific discrimination tests (for example, directional paired comparison or two alternative forced choice) as described in 7.3.

7.3 *Feedback During Training of New Assessors:*

7.3.1 When training new assessors in any discrimination task, the main feedback objectives are to ensure that the assessor knows how to take part in the test and instill confidence in the assessors for subsequent real test situations. The products used for training are generally known to be different and the objective is to qualify the assessor for future testing situations for that discrimination method, for example, duo-trio or tetrad.

7.3.2 In attribute-specific discrimination tests, a further objective is added to the training: ensuring that the assessor understands and recognizes the attribute of interest. For example, if the two-alternative forced choice training test is to determine which of two beers is more bitter, the assessor shall be able to understand that they are looking for a difference in bitterness and not, say, carbonation or sourness, but also that they can detect and quantify the levels of bitterness in the beers to be able to recognize the difference in the samples presented. Training and feedback for attribute-specific discrimination tests, therefore, also include tests to help the assessor recognize and quantify the attribute of interest by gradually decreasing the level of difference in the attribute.

7.3.3 When training new assessors in discrimination tests, it can be very helpful to give immediate feedback to the assessor on their performance so that they may reassess the products, if possible, to confirm or correct their result. Replication of the training test(s) on different occasions, again with immediate feedback, can improve the assessor's ability in that discrimination method. For example, they may learn that they work better in a particular discrimination test if they make their decision based on their initial judgement or, alternatively, that they need to assess the samples a couple of times to confirm their answer.

7.4 *Feedback During Project Training:*

7.4.1 Immediate feedback to the assessor regarding their "correct response" is only recommended for training tests and not real test situations. There are several reasons for this. If the sensory facility is mainly conducting similarity tests and an assessor is only able to identify the odd sample correctly in a series of triangle tests around 33 % of the time, being given constant feedback that they were "incorrect" may lower motivation to be on the panel. If a sensory facility replicates all discrimination tests, immediate feedback after each replication can influence the results of the next replicate. Also, when working on a large project such as salt or sugar reduction, giving assessors immediate feedback about whether they were "correct" or not may well impact their performance in the next related tests by giving them clues as to the objective of the tests.

7.4.2 However, delayed feedback relating to project progress (without the specific detail about the project) can be very motivating to the assessors, as well as a simple "thank you for good attendance."

7.5 *Feedback During Panel Monitoring*—Discrimination assessors who test on a regular basis should receive feedback on their performance both as individuals and a group.

7.5.1 *Individual Assessor Feedback:*

7.5.1.1 Monitoring can be simply performed by recording each assessor's results over time and comparing to the panel's result: in fact, some software systems will offer this as standard. If the panel found a statistically significant difference between the products, each individual assessor's result is compared to this. The sensory science function can then set their own action standard for the performance monitoring such as: "if an assessor does not identify a difference in more than 40 % of tests when the panel as a whole has found a difference, validation tests (see Note 1) will be performed to check that the assessor still meets the requirements for the discrimination testing panel."

NOTE 1—A validation test is a test in which the result is already known and an assessor's performance can be compared directly to this.

7.5.1.2 Recording the results of all tests will also help identify those assessors who are able to detect consistently small differences or are particularly adept at taint detection, for example. However, this information is rarely used for feedback except to report and recognize attendance.

7.5.1.3 When validation tests are performed regularly, informing the assessors if they were "correct" in their sample choice can be very motivating for the assessors; however, be careful that the differences between the products do not become common knowledge or further validation study products will need to be sourced.

7.5.2 *Panel Feedback*—Group feedback for a discrimination panel usually consists of a summary of the number of tests conducted and a thank you from the panel leader or project leader for the assessors' contributions. If the panel takes part in any comparative testing with panels in other locations, sharing the overall outcome of these tests, for example, that the panel managed to identify the difference as a team, can also be interesting and aspirational for the assessors. After testing is

complete, assessors may be motivated by learning the objective of the test and how their work saved the company money, accomplished a specific objective, helped to launch a new product, and so forth. However, be careful that the information shared will not bias the assessors for future projects.

8. Sensory Quality Testing

8.1 Different types of sensory quality panels are used in industry including: quality assurance panels that support assessment of incoming ingredients and outgoing plant production; shelf-life panels to monitor quality of the product over time and under different storage conditions; panels dedicated to new product development initiatives, sourcing, and procurement; and other applications in which product quality is a concern.

8.2 Sensory quality panels are typically comprised of dedicated assessors very familiar with the products being tested. The assessors can be internal employees of the company or external assessors. Usual/routine evaluations often involve comparison to controls or retains. As opposed to descriptive panels that involve detailed profiling, the quality assurance (QA) sensory quality panels generally are tasked to rate overall match to a target or control in a very efficient, rapid manner to keep pace with production and ensure product sensory specifications are satisfied. As a result, quality panels often test a high volume of products on a daily basis and generally work more hours in a day assessing the sensory aspects of products. Performance expectations should be clearly communicated to the assessors when they start in their role as this makes marginal or poor performance more easily addressed.

8.3 Typical quality methods may be as simple as discrimination tests (for example, duo-trio or tetrad) and designating a sample as in or out of specification ("In/Out" or A-not-A) or more diagnostic such as the relative-to-reference (directional-degree-of-difference) scale, simple descriptive analysis, or more complex shelf-life determination or confirmation. Training and monitoring performance with feedback involves ensuring assessors are familiar with the control product(s) and the acceptable range of deviation, although some quality methods do not require the assessment of controls within the test itself or do not have the ability to keep controls stable. In these instances, assessors refer to a written sensory specification.

8.4 Training and monitoring should also ensure that assessors are capable of determining that the intended attributes or "on notes" are within the target intensity range and they are also capable of identifying any potential defects of "off notes" of each product. Therefore, where possible, it is good practice to present products containing both "on" and "off" notes to the quality assessors during training so that they can experience the full range of characteristics.

8.5 To help assessors understand desirable product attributes, product identification training and feedback can be given. In training, assessors are presented with a sample whose brand is not given and they shall correctly identify the brand. Assessor performance on brand identification should be tracked and compared against preset validation parameters (for example, 75 % identification of each brand).

8.6 Assessors should also be trained and provided feedback on specific off attributes that can occur in products they evaluate. Typically, this is done by adding a specific off attribute to the product and presenting it to the assessor either blind during normal assessment or in a training setting in which they are aware doctored samples are present. Both detection, which is the ability of the assessor to perceive an atypical aspect, and recognition, which is the ability of the assessor to identify correctly the off note, should be tracked and compared against preset validation parameters as with brand identification.

8.7 Feedback on assessor repeatability is also important. Some methods may already incorporate this type of data analysis, but others such as in/out should have repeated samples included and are analyzed with a qualitative approach. If an assessor is consistent in saying a sample is in or out of specification and their comments are the same between the two samples, they would be considered repeatable.

8.8 Individual assessor responses should also be examined for agreement with the broader panel response. Though certain methods such as difference from control and descriptive analysis easily allow for such analyses, qualitative methods may be used for agreement for methods such as in/out. For example, it is straightforward to examine if an assessor indicates samples are out of specification more often than the panel does on average. If assessors make comments on samples, these too can be compared qualitatively between a single assessor and the panel, and discrepancies can be given as feedback to individual assessors.

8.9 For all types of quality performance, it may be useful to compare assessor and panel performance in brand identification, attribute recognition, repeatability, and agreement across multiple production facilities to ensure the same assessor performance, product(s) characteristics, and quality levels are maintained at all locations.

8.10 *Feedback During New Assessor Training*—Communication regarding the method, product characteristics, ranges, and so forth during the training of a sensory quality panel is critical regardless of the type of panel (plant, corporate, or external). Assessors will require clear instruction on evaluation methodology and familiarization with the ingredients and finished products that are being evaluated, as well as the "on" and "off" notes. During the training, the assessors should also develop an understanding of their own abilities, for example, when they are anosmic to certain ingredient or product characteristics or they are especially sensitive to other aspects such as taints or "off-notes." The training should allow assessors to understand that everyone has different sensitivities and the role is as a group, all working together. This helps boost confidence and morale of the whole quality panel. As well as these physiological limitations, training should also include information about psychological errors; biases such as expectation, logical, and habitual errors are especially important for all quality assessors to understand so that they can help prevent issues.