Quality Assurance with Difference from Control Testing

Difference testing is one of the most popular sensory testing methods. It is often the first sensory method used in newly developed sensory programs. Difference testing, as the name implies, helps determine if a difference exists between test and control samples as is the case of a widely-used method, Difference from Control. Sensory researcher Elvira Costell affirms in her article, *A comparison of sensory methods in quality control* that, "difference from control methods and descriptive methods, are the most sound sensory tests for quality control purposes" (2002).

Difference from Control (DFC) is an adaptation of the Degree of Difference test, which was developed to deal with batch to batch variations. DFC is a discrimination sensory testing method that presents panelists with an identified control sample, followed by one or more test samples. They are asked to evaluate the marked control and the test sample, then scale how different they perceive the sample to be from the control. The category scale will range from "Not Different" to "Extremely Different".

One key difference between DFC and other discrimination methods is that DFC actually measures the perceived difference, rather than simply stating whether or not a difference exists, which is the case with Same-Different, A-not-A, Triangle, Tetrad, and Duo-Trio test types. DFC also recognizes that variation will occur between batches, and in some products a wide variation is still deemed acceptable by consumers. This range may be so large that an acceptable batch might not pass a triangle or duo-trio test, making DFC a more appropriate test for these products (Yantis, 2012).

How is DFC used?

Ensuring consistency across batches and production locations is crucial in any manufacturing process. Failure to establish a well-designed quality assurance program could lead to undesirable mishaps and financial losses. These could result in consumer complaints, or worse, a contaminated product. DFC is most commonly used as a quality control/assurance practice and is a great option for products that have inevitable variability. This could include products such as meats or baked goods (Meilgaard et al, 2007).

Because DFC only requires a minimum of two samples – the control and a test sample – it's also an option for products that are highly fatiguing where multiple test evaluations are not practical. This could include alcoholic beverages or spicy foods.

Training Panelists

Before testing can begin, panelists need to be screened to ensure that they are discriminators, meaning that they are able to effectively detect a true difference. It is important to remember that discrimination testing is done with samples that have a confusable difference and should be reflected in the sample preparations. They also need to be trained on how to properly use the scale, as well as how to identify a variety of product differences (Muñoz et al, 1992).

All panelists are also educated on how the test functions. It's important that panelists are aware that one of the samples is the control, and the other is a test sample that may or may not be different. If the sample is the same as the control, this is called a blind control and is used to measure panel variance (Yantis, 2012).

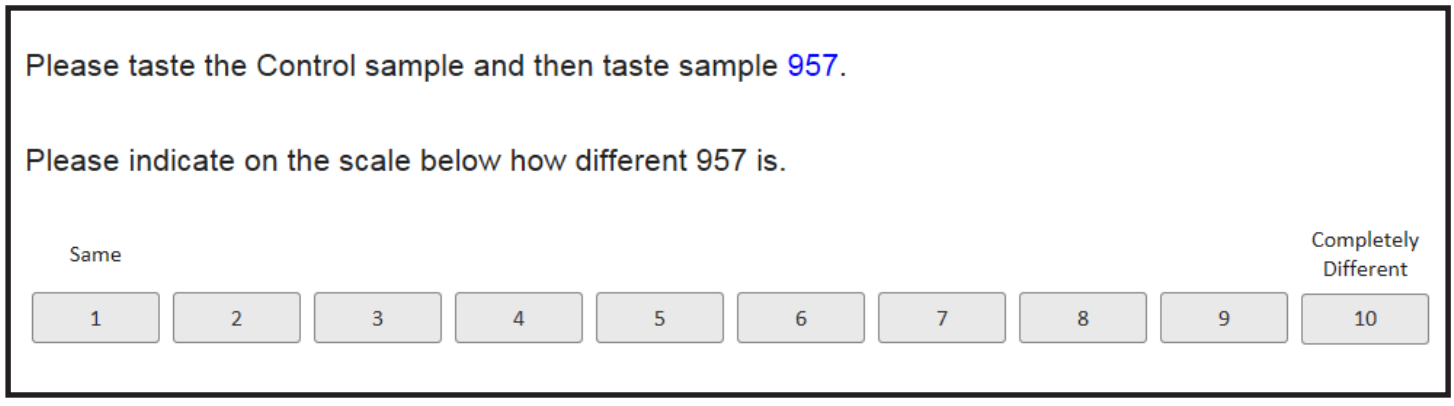
Another component of training includes intentionally spiking products with faults that are most likely to occur in a specific product. For example, a cookie manufacturer may intentionally spike a test sample with twice as much sugar, use almond extract instead of vanilla, or exclude an ingredient in order to test and train panelists on their ability to identify a range of possible faults. Consistent and immediate feedback in training is crucial. A thorough training process allows for a smaller, more highly calibrated panel (Findlay et al, 2007).

Test Setup

The panelists are presented with a control sample and one test sample at a time. The text instructs them on how they should complete the question. The question instruction text is important, as it ensures the panelist fully understands the task at hand. An example instruction text may read:
"In front of you are two samples. A control sample, labeled "Control", and test sample 421. Please taste the control sample followed by sample 421. Overall, how different is sample 421 from the control."

Establishing a gold standard "zone"

Establishing a gold standard "zone" for a product is an important component in DFC, as the control will set the standard in which your test samples will be evaluated. This can be accomplished in various ways. It may include using historical product data, analysis by a professional sensory expert, consumer acceptance testing, or by using descriptive analysis with a trained sensory panel. ASTM documentation recommends that the reference represents the middle of the quality or acceptance range (Yantis, 1992). Regardless of how a gold standard "zone" is established, it's vital that you thoroughly understand your own product and the standard to which your test samples will be compared.



A 10-point Difference From Control scale

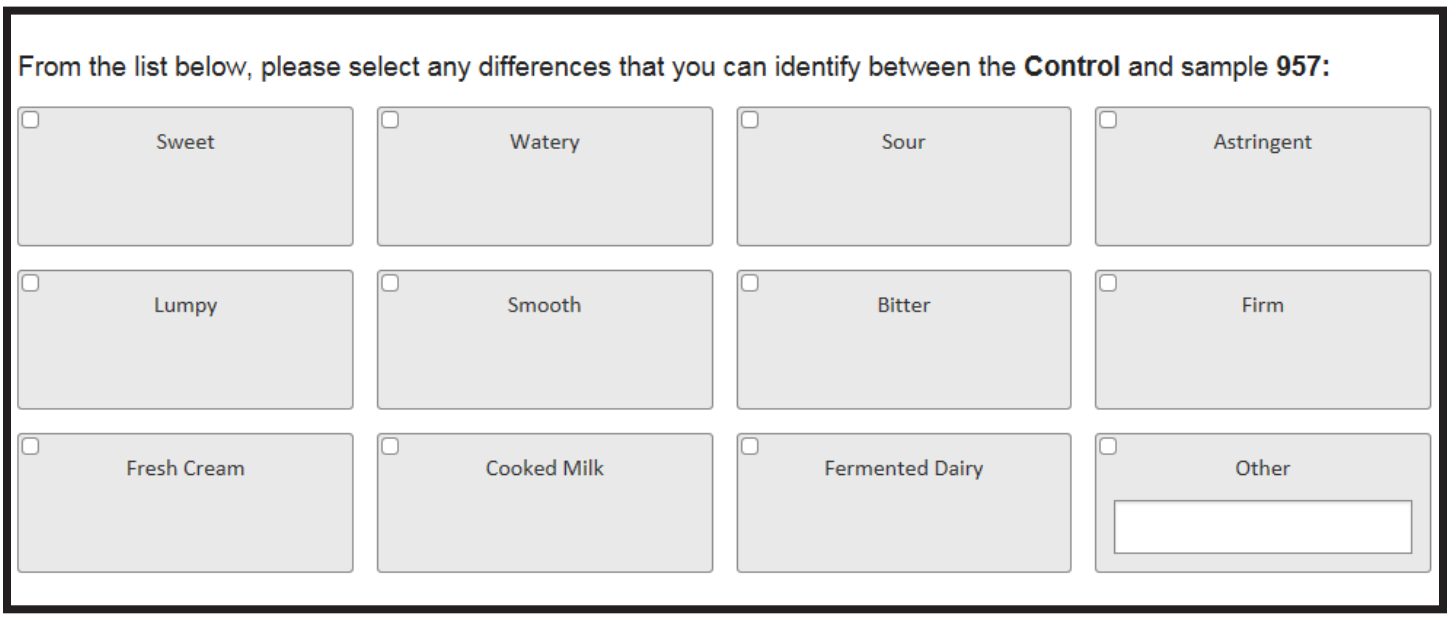
Considerations

One noted drawback to the standard administration of this method is that its classical use only measures the degree of the difference from the control and not what is actually causing the difference, which is necessary information in order to rectify a quality control issue (Muñoz et al, 1992). It's one thing to know that your product is not meeting your quality control standard, but the more important piece of the puzzle is understanding what is causing it to fail.

For this reason, some sensory professionals may decide to include a follow-up question in an attempt to gather more information as to what could be causing the perceived difference. This may include a follow-up Check-All-That-Apply question (as seen below), or line scale question. By including a follow-up question, the manufacturer can improve the odds of identifying, and subsequently fixing, the fault.

Deciding when a sample is different

It must be decided at which point on the scale a product sample is considered to be too different from the control and should be rejected. As mentioned, many products tested with DFC may have some level of difference from the control, therefore it's important to establish at what point it is so different that it should not go to market. Equivalence is the basis of the standard and while a difference may be present, it does not necessarily mean that a change in consumer acceptance will occur.



Conclusion

Quality control and assurance is an integral function of any consumer-facing product company. Sensory quality testing using Difference from Control is an option that has successful in helping the manufacturing process for a variety of food, beverage, and non-food products.

For more information and details on how DFC can be used to improve existing quality practices, or to develop a brand-new sensory quality program, contact Compusense at sales@compusense.com.

References

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