

### Discrimination testing when products have natural variability: Degree of Difference – with Control lot Variation (DoD-CV)

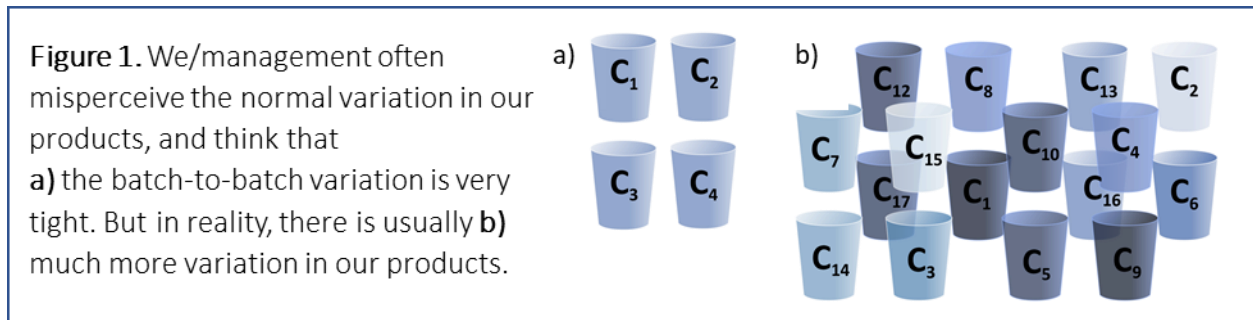
#### Situation

**“Will consumers notice if we make the [ingredient/supplier/equipment] change?”**

Operations and quality groups are all too familiar with the challenge of maintaining product attributes and profiles through the many changes that are a normal part of commercial production - ingredient, supplier, plant and manufacturing process changes are just but a few examples.

**“But WE don’t think it’s different, why are our sensory tests saying it’s different?”**

Adding to this challenge is making a product change when there is high batch-to-batch (BtB) variation (Figure 1). Regardless of what underlies this variation, not accounting for BtB variation when testing can easily lead to a false positive/negative result because the test has not taken into account a high batch to batch variation. At the business level, this could lead to lost opportunities in terms of cost savings or margin growth and/or an increase in risk when consumers detect a difference that was missed and that difference changes purchase or consumption behaviours.



**“How do we ensure that we take advantage of opportunities and that we do not miss any that exist? We need to do something differently!”**

#### Solution

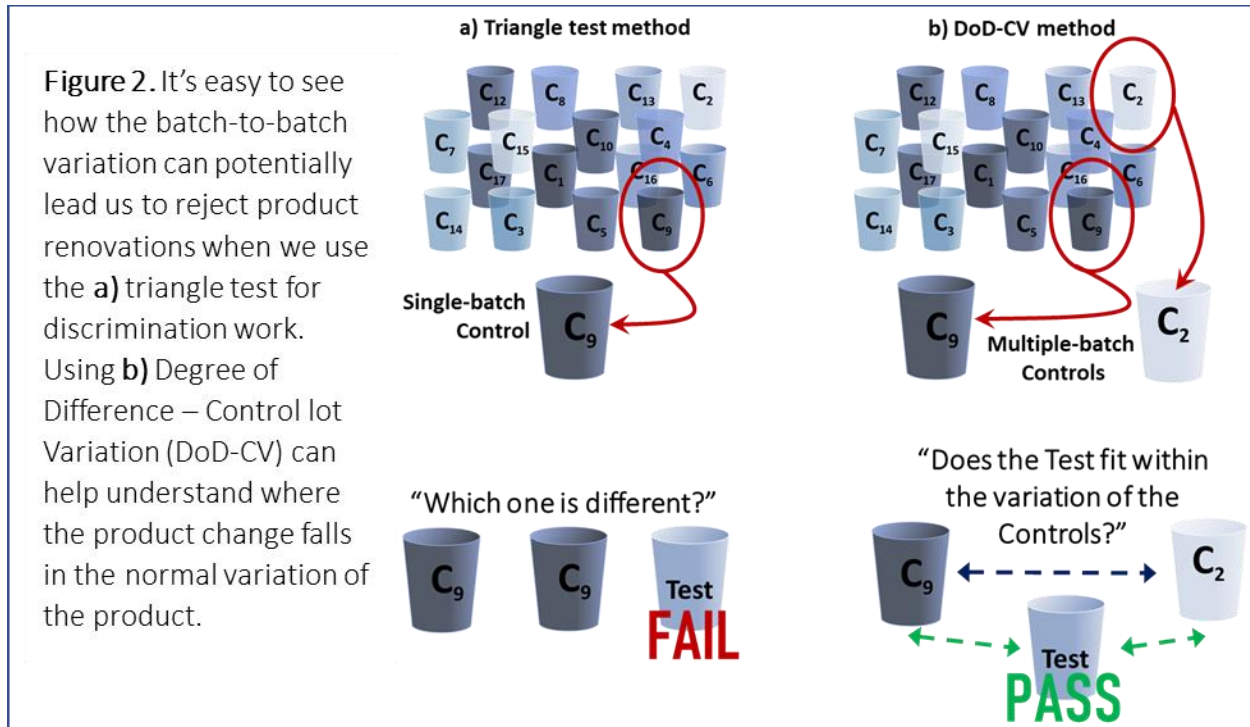
There are a number of discriminative sensory methods available, for example, descriptive analysis, tetrad test, triangle test, duo-trio, same-different, etc.); by failing to choose an appropriate method, the sensory professional responsible for “matching the current market product and the new product”, could face a situation where the discriminative test result show a significant difference while the new product is still within the acceptable quality assurance specifications.

When BtB variation is high, a degree of difference (DoD) test with control lot variation (DoD-CV) is a great option.

DoD-CV accounts for high variation by using the product’s own BtB variation as a baseline for assessing differences. Thus, rather than comparing a test product against a single control product, which may not represent the range of variation that exists, DoD-CV integrates and accounts for more of the differences that actually exist due to high variation.

## Deep-dive: Triangle test vs. DoD-CV

In a typical triangle test, a single-batch control would be pitted against the test product, BtB variation is not fully considered i.e. multiple batch controls are not included in the test. Figure 2 illustrates how use of a triangle test can lead to rejection of the proposed change because only one control is used. Conversely, DoD-CV integrates multiple batch controls, providing a better context for the test and integrating more of the product’s natural variation.



### Who?

**“Can’t you just get a few employees together to taste it and see what they say?”**

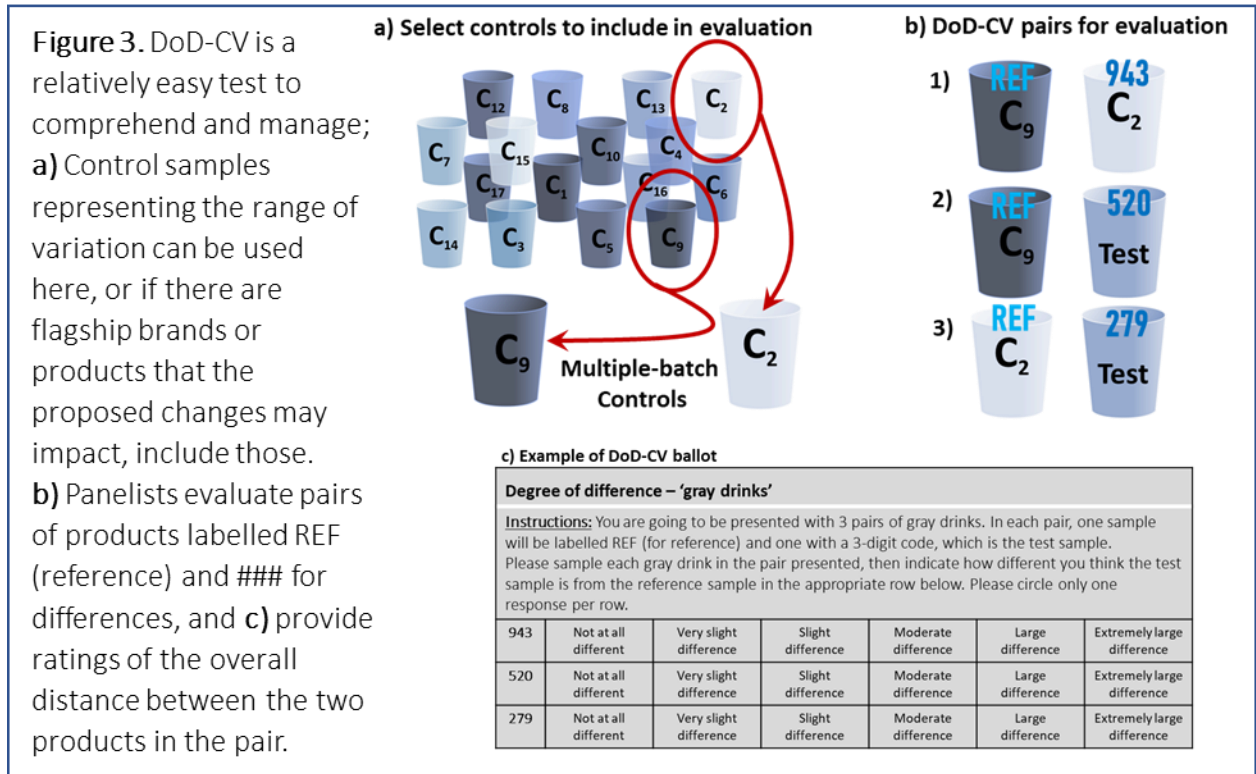
While both naïve and highly trained panellists can be used, use of trained panellists or at the very least naïve consumers that are screened for taste, aroma and texture acuity is strongly recommended. Any panelist used should be trained in the DoD-CV method and assessed for repeatability. The number of panellists used depends on the level of risk involved in making the business decision. For example, a decision on a flagship brand demands the use of more panellists, which would increase the power of the test, further increasing the test’s ability to better inform the decision.

### How?

The DoD-CV methodology is really quite simple, as indicated in Figure 3. Essentially, each respondent is presented with pairs of products where one identified as the ‘reference’ and the other as the ‘test’. The ‘test’ sample is evaluated against the ‘reference’ sample and ratings are provided in terms of how different the ‘test’ is from the ‘reference’ using a category or line scale with “not at all different” to “extremely different” as anchors.

The number of pairs included depends on the expected amount and source of BtB variation. At least 3 product pairs must be evaluated; control batch A vs. test, control batch B vs. test, and control batch A vs. control batch B.

Statistical analyses are then used to determine whether the distance (i.e. difference) between the controls and test product are greater than the distances between the controls. If the differences between test and controls are larger relative to those between the controls, the test product is deemed unacceptable.



## And...?

Another benefit of DoD-CV is that it can readily be expanded to integrate a number of metrics that are huge value-adds. For example, if there is a need to understand the nature of the difference, the ballot can simply be extended to include attribute intensity scales, provided the test is completed by a trained sensory panel. This means we can actually measure the overall differences and also identify exactly where those differences are.

**Contact ACCE directly for more information on using DoD-CV methodology in your discrimination testing program, or any other consumer and sensory testing need you may have: [info@ACCEIntl.com](mailto:info@ACCEIntl.com)**

### Further Reading

- Aust, L. B., Gacula, M. C., Jr., Beard, S. A., & Washam, R. W. II, (1985). *Degree of difference test method in sensory evaluation of heterogeneous product types*. *Journal of Food Science*, 50, 511–513.
- Pecore, S., Stoer, N., Hooge, S., Holschuh, N., Hulting, F., & Case, F. (2006). *Degree of difference testing: A new approach incorporating control lot variability*. *Food Quality and Preference*, 17(7–8), 552–555.
- Young, T.A., Pecore, S., Stoer, N., Hulting, F., & Holschuh, N., Case, F. (2008). *Incorporating test and control product variability in degree of difference tests*. *Food Quality and Preference*, 19, 734–736.