The Institute for Perception

For more technical reports from The Institute for Perception or for information about our short courses, please visit www.ifpress.com or email us at mail@ifpress.com

Reprinted from IFPress (2007) 10(4)2,3

Category Learning and Feedback in Panel Training

Michael B. Casale and Daniel M. Ennis

Background: Responses from many procedures used in market, survey, and sensory research are categorical. Familiar examples include rating category responses on rating scales to measure sensory intensity or liking as words, symbols, or numbers on a scale. Other examples are choices made among alternatives in difference or preference tests. Descriptive analysis can also be viewed as a special type of categorical response procedure in which a group of trained panelists provide categorical data on sensory intensity. Descriptive analysis can be a useful tool for consumer products companies to assist in quality assurance, product development and, in concert with methods such as Landscape Segmentation Analysis®[1], predict consumer liking. However, the information one eventually derives from any kind of trained panel is only as good as the effectiveness of the training procedures one uses.

Training a panel for a given product attribute often involves using a reference in order to orient participants and ultimately generate consistent responses among participants[2]. In addition, other factors such as feedback, rewards, and motivation are considered. Although the importance of feedback in panel training is often appreciated, it is important to consider the form or presentation of feedback. It may be useful to examine these issues regarding feedback in panel training based on research from experimental psychology and cognitive neuroscience. This research may prove useful in training individuals for participation on panels.

A-not A versus A-B Tasks: One aspect related to the issue of feedback administration in panel training is the choice of the training paradigm. Suppose that you are trying to train participants to correctly choose between your product and your rival's product. One option is to give them a series of different types of products, including your own, and tell them whether or not they are correct in their assessment. Another option is to present a series of products that are either your product or your rival's product exclusively. The former is a type of task that would be referred to as an A-not A task and the latter as an A-B task. This is an important distinction, as recent investigations suggest that learning performance differs for the two tasks[3]. That is, individuals trained with the A-B paradigm demonstrate overall better learning of the A category than those individuals trained in the A-not A learning paradigm. Based on these results, using an A-B training paradigm should be more efficacious than using an A-not A paradigm in training panels.

Given the choice to use the A-B training paradigm, the next consideration is to make a choice regarding feedback presentation. Recent research has demonstrated that feedback differentially affects performance in the A-B and A-not A tasks. Specifically, training in the absence of trial-by-trial feedback severely impairs performance in the A-B task relative to training with trial-by-trial feedback. This is not true, however, in the A-not A task, where training performance remains constant with or without the presence of trial-by-trial feedback. Since the A-not A task may lead to lower performance than the A-B paradigm with feedback, an optimal training paradigm may involve training individuals using an A-B paradigm where trial-by-trial feedback is presented following each response.

Scenario: Your company produces and markets a carbonated cola product in your main plant and at five other plant locations. Your company competes against one main rival. At each plant there is a dedicated panel that evaluates each day's production. One of the tasks of this panel is to ensure that the product is typical of your cola product and distinguishable from your rival. In one of the tests conducted by this panel, each panelist reports whether each test product is one of two alternatives, your product or that of your rival. A series of products are presented in a blind sequential monadic format. Your main plant has the capability to provide immediate computer-aided feedback. As none of the other five plants have this capability, panelists located at each plant were initially trained to distinguish between your product and your rival at your main plant with Computer feedback. After the panel has been trained and is in operation, the panel leaders at each plant adopt different approaches to providing feedback. Some of them provide feedback verbally after every trial, others wait until the end of a testing session to inform panelists about their daily performance. Except for your main plant, recent tests have shown an alarmingly low rate of correct categorizations for your product in some plants and higher rates in others. These results are shown in Figure 1. You do not know if this is due to differences among the plants indicating a need for production corrective action, a difference in the acuity of the panelists from plant to plant, or differences in training procedures adopted by the panel leaders. One of the projects that you conduct at your main plant is to evaluate the effect of the time lag between the panelist's response and feedback on the performance of trained panelists. To conduct this research you divide your panel into three groups, each one differing in the length of time separating the panelists' response and computer-generated feedback.

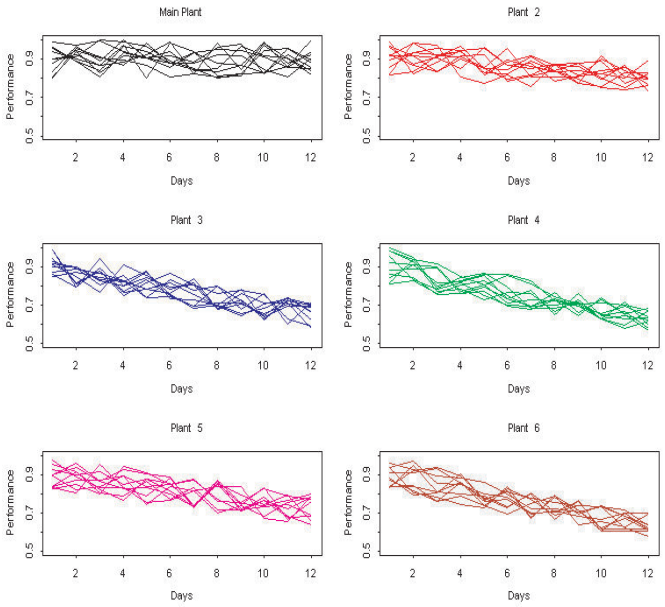

Figure 1. Performance in the A-B task by ten panelists at each of six plants over twelve days of testing. Plants 3, 4, and 6 show greatest decline in performance.

Feedback: Providing corrective feedback in order to enhance learning is certainly not a new idea. One can just re ect on personal experiences and intuitively reason that in certain contexts, learning without some form of feedback would be extremely difficult, if not impossible. Take for example the simple task of long division. No child is able to perform long division without corrective training. If mistakes are made, feedback is required in order for the child to learn how to correctly perform long division. It is hard to imagine a child being able to correct their own mistakes in this situation. Although this is an instance where feedback is critical for learning, there are many other instances where corrective feedback is not necessarily required for learning, such as learning how to eat (as opposed to eating etiquette.) Nevertheless, feedback has been shown to facilitate learning even in situations where it is not required. Given the apparently important role feedback can play in a variety of situations, it is not surprising to find a large body of work investigating the role of feedback in learning. Despite the fact that much of this literature does not directly deal with consumer product testing paradigms, the results appear to provide a plausible framework for developing methods to provide feedback in training panels.

In a recent study on the use of feedback in descriptive panel training, a new method, called the Feedback Calibration Method (FCM)[4], was compared to traditional descriptive panel training techniques. FCM differs from traditional techniques by delivering computer-based feedback. In this study, a 'Trained' group received traditional training methods that involved a summary report following each of the tasks. FCM delivered feedback immediately following every five attribute responses made by the participant. The feedback came in the form of line scales for each attribute. The line scale displayed the participant's response as well as an ellipse corresponding to 90% confidence intervals for the target response. The results of the study indicate that training time for descriptive panels can be significantly reduced by using the FCM versus traditional training paradigms. In separate studies that directly relate to the use of feedback in descriptive panel training, the effect of feedback on categorization learning was evaluated[3,5]. Generally speaking, these results indicated that feedback was necessary in order for learning to occur in certain category learning situations, but not others. Specifically, learning to categorize objects that can be separated with a relatively simple, verbalizable rule (e.g., 'all red things in A, all blue things in B') is not impaired by the removal of feedback, whereas removing feedback impairs the learning of relatively more complex category rules. Other research has been aimed at investigating the idea that varying the timing of feedback administration could affect learning in certain category learning scenarios. With respect to descriptive panel training, there is a need for more research on what type of learning is required for any given product dimension and further, if feedback is necessary.

Timing of the Feedback in the Scenario: Figure 2 shows the effect of feedback delay on the probability of correctly identifying your brand over a period of twelve days of testing with the three subsets of your panel at your main plant. Note that as feedback delay increased, the probability of correctly categorizing your product declined. The highest level of delay led to significantly greater reduction in performance compared to no delay. Although each plant panel was originally trained in your central facility, you realize that the effect of delayed feedback following daily routine testing at some of the plants may have had an effect on performance. Following a review of the procedures for the A-B task used at each plant, you optimize and standardize feedback timing at each plant with a consequent improvement in the consistency and reliability of panel performance across the company's production plants.

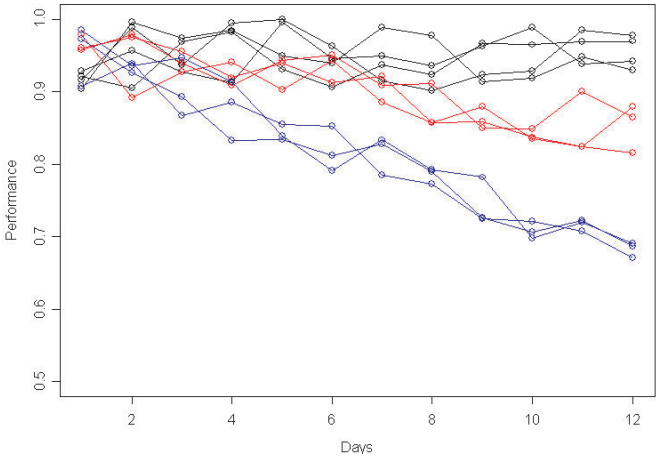

Figure 2. The effect of delayed feedback on panel performance at the main plant. Black lines refer to subjects with no delay, red with moderate delay, and blue with extreme delay.

Conclusion: Training panels for product testing usually involves category learning and the use of that learning to provide reliable estimates of product testing performance in discrimination tests or descriptive analysis. It is important that these categories are learned at a consistent and optimum level if the panel is to be useful in providing product development guidance. One factor that may affect performance is feedback, and the extent to which it does depends on the task. In cases where feedback is useful, the timing of the feedback may be critical to ensure that panelists maintain a high level of reliability and consistency.

References

[1] Ennis, D. M. (2001) Drivers of Liking® for multiple segments. *Ifpress*, 4(1) 2-3.

[2] Meilgaard, M., Civille, G. V., & Carr, B. T. (1999). *Sensory Evaluation Techniques* (pp. 133-160). Ann Arbor: CRC Press.

[3] Casale, M. B. & Ashby, F. G. The role of perceptual learning in categorization. Submitted.

[4] Findlay, C. J., Castura, J. C., Schlich, P., & Lesschaeve, I. (2006). Use of feedback calibration to reduce the training time for wine panels. *Food Quality and Preference, 17,* 266-276.

[5] Ashby, F. G. & Casale, M. B. (2002). The cognitive neuroscience of implicit category learning. In L. Jiménez (Ed.), *Attention and implicit learning*. (pp. 109-141)Amsterdam & Philadelphia: John Benjamins Publishing Company.