Riding the Brain Waves:

Neuromarketing's Choppy, Uncharted Waters

By Michael Polster, Ph.D.

If feature articles in the *Wall Street Journal* and *Financial Times* are any indication, one might be tempted to conclude that neuromarketing is well on its way to becoming a standard implement in the market research toolkit. Neuromarketing aims to identify neural correlates of reactions to advertising and, ultimately, purchase decisions. Indeed, some organizations now tout "neurally-based insights," alleged to offer a window into subconscious processes that influence behavior.

The two most common methodologies used in neuromarketing are electroencephalography (EEG), which measures changes in brain waves, and functional Magnetic Resonance Imaging (fMRI), which creates images of the brain based on the flow of oxygen in the blood. Both techniques attempt to map parts of the brain used in processing a stimulus by comparing activity levels recorded in distinct regions when the stimulus is, and is not, present. As a rule, stimuli that trigger higher levels of activity in areas of the brain associated with positive emotion or memory are deemed more valuable by "neuromarketers" than stimuli that trigger lower (or no activity) in those regions.

Although there may be an intuitive appeal to the concept of using brain imaging techniques to expose customer motivations, a critical analysis suggests that the financial and intellectual yield of neuromarketing research remains entirely unsubstantiated. On the financial front, functional imaging equipment costs millions of dollars to purchase, and machine time rental is likely to be cost-prohibitive for all but the most zealous. EEG equipment is less expensive and more portable but still requires a significant investment. As for the *substance* of neuromarketing, there are few peer-reviewed papers published on the subject, and none of them demonstrates unequivocally that changes in brain function are associated with — much less able to predict — purchasing behavior. Books and cyberspace are filled with tantalizing anecdotes without offering physiological proof or clear commercial validation.

In the first published study demonstrating the power of neuromarketing, the now-famous "Pepsi Challenge" was recreated inside a functional MRI to measure blood flow through the brain under two conditions – initially, in a blind taste test, and then again, in a taste test when brand was identified. In the blinded test, half the respondents preferred Pepsi, and similar regions of the brain were activated by each beverage. By contrast, when the brands were identified, three-quarters of respondents preferred Coke, and additional areas of the brain associated with memory and emotion were activated by Coke, but not by Pepsi. It is fair to conclude from those findings that

brand is linked with neural activity in particular parts of the brain and that it also drives consumer preference. Neuromarketing proponents, however, have taken things further to suggest that brain function measurement can be used to predict the impact of previously unseen advertisements or other stimuli better than traditional techniques – presumably based on the premise that the brain can't lie but people can. For the moment, there are simply no data available to justify that extrapolation whereas there *is* an abundance of data demonstrating that established brand effects are actually captured quite well by direct questioning when the brand is visible. That phenomenon was famously illustrated by the "New Coke" debacle in which an iconic brand was abandoned (temporarily) on the basis of blind taste testing alone that focused on sensory responses rather than cognitive. Had brand been incorporated into the question, traditional research would have produced the right answer.

Setting aside the logical leap required to move from *a posteriori* to *a priori* analyses of neuronal activity, there is no compelling evidence that measurements of neuronal activity can predict behavior. A case in point is the highly-publicized example involving *New Scientist* magazine, in which tweaking a magazine cover based on the results of neuromarketing techniques supposedly led to increased sales. The finding received significant attention in the press, but here are just some of the ways in which it lacked scientific/methodological rigor. First, the report failed to indicate whether or not the cover that won based on physiological findings differed from the winning cover based on traditional metrics (e.g., preference), presumably an outcome needed to justify the investment in neuromarketing decision support. Second, there was no control group (e.g., sales data demonstrating that the most preferred option outperformed the least preferred option). Third, the cover ultimately selected had a different headline from the other two options, suggesting inherent bias in the material.

The dearth of prospective studies in the literature may be a consequence of the fact that pre-conscious processing and neuronal effects actually seem to be short-lived. The celebrated subliminal "hidden persuasion" of the early 60's, a forerunner of neuromarketing, failed to turn consumers into "Stepford Wives" of Madison Avenue because the measured effects lasted just seconds or minutes, not days or weeks. Similarly, recent reports of individual neurons firing in response to a picture of a famous person (e.g., the "Halle Berry" neuron) also suggest that those neurons are quite fickle, as evidenced by their failure to respond to the same person the next day. If the effects observed in neuromarketing research are anywhere near as fleeting, then their value to marketers is severely compromised.

Responding to the lack of peer-reviewed data, the Advertising Research Foundation (ARF) recently announced The NeuroStandards Collaboration to increase transparency and draw comparisons across neuromarketing methods in an effort to develop standards for research in the field. Although this initiative is a valuable first step in establishing whether or not the neuromarketing emperor is wearing any clothes, it does not yet include the type of primary research necessary to test fundamental tenets of neuromarketing. The true challenge for the discipline is to conduct a well-controlled experiment in which the inclusion of physiological data alters the decision that marketers would have made if traditional measurements of preference were used *and* to demonstrate that the new decision has a material effect on the desired consumer behavior (e.g., purchase). Until such data are available, it is possible only to infer or

hypothesize that greater neuronal excitation corresponds to improved brand performance in the marketplace.

Notably, however, one of the leading experts in neuroimaging is less than sanguine about the prospects of producing that type of data and, in fact, concludes that "fMRI is not and will never be a mind-reader" (Logothetis, *Nature*, 2008, p. 869). That conclusion is based on a variety of technical reasons relating to a mismatch between the functional organization of the brain and the methodologies used to measure its function. Specifically, most brain functions are widely distributed across non-linear networks that involve excitation and inhibition of millions of neurons, yet a simple linear subtraction methodology is used to measure changes in performance in response to critical stimuli. As a result, Logothetis considers fMRI to be "an excellent tool for formulating intelligent, data-based hypotheses, but only in certain special cases can it really be useful for unambiguously selecting one of them" (p. 870). It appears, therefore, that the basic claim made by proponents of neuromarketing – the ability to distinguish between ads or concepts based on neuroimaging data – is directly refuted by one of the developers of the technology.

The excitement around neuromarketing is presumably linked to our current infatuation with innovation of all kinds and to some extent a growing disillusionment with direct measurement. As a result, we are seeing a broad shift from an interrogational mode of research to an observational one. The industry has entered a period of self-doubt in which it is more prone than ever to challenge the validity and veracity of what people tell us, and the relevance or representativeness of those who do the telling. The ability to observe people instantly on the web is further reducing patience with the idea of engaging people as reporters of their own behavior and as interpreters of their own feelings and motivations.

Like all fads, this trend is likely to reverse itself, as marketers come to recognize that even when our customers appear (wittingly or not) to mislead us, they also continue to inform us in indispensable ways. Meanwhile, as an industry, we need to be just as disciplined in assessing "shiny new things" as we are self-critical in debunking the old worn ones. Although neuromarketing may someday represent a valuable market research tool, the complexities of interpreting the brain's response to marketing materials and the challenges associated with demonstrating a "neuro-half-life" long enough to impact future purchase decisions probably place that day decades in the future. Until then, market researchers in search of fresh insight are at risk of being seduced by a fledgling but costly idea that is not yet fully understood. Researchers and marketers may be better served continuing to innovate around skilled interpretation and validation of data collected using more traditional metrics.

About the Author: *Prior to joining **NA**XION, Michael Polster, Senior Vice President in the firm's Healthcare Practice, earned a Ph.D. from Cambridge University. While serving as a post-doctoral fellow at the University of Arizona, Michael conducted functional neuroimaging research on human memory that resulted in the first publication in Nature on the subject. His full CV, as well as an electronic version of this article, can be found at our website.*