



Pushing the Buy Button *by Potay Parapiboon*

"Do you prefer Pepsi or Coke?" used to be the big question when we were growing up: as kids, we fought for our favorite brand, claiming that Pepsi was too sweet or Coke was too sparkling. Many of us, including myself, grew tired of this never-ending debate: "They taste the same, who cares?"

Doctor Samuel McClure at the Baylor College of Medicine cares. In October 2004, McClure and fellow neurobiologists performed a blind-taste test, investigating how the brains of 67 subjects responded to Pepsi and Coke. Observing subjects' brains using functional Magnetic Resonance Imaging (fMRI), the researchers found that the two soft drinks lit up the brain's reward system, and the subjects were split in half as to which drink they preferred. But when the subjects heard the names of the brands in advance, the drinks activated other parts of the brain--ones that control the sense of self (the ventral putamen and the medial prefrontal cortex). Three out of four said they preferred Coke.

Damon Tomlin, another Baylor neurobiologist, believes that what causes this difference between the two chemically similar drinks is marketing. Coke has long promoted its brand through public events. The first corporate sponsor to lend its name to the modern Olympic Games (in 1928), it initiated the red-and-white version of Santa Claus to promote its sales during the Great Depression and even gave free cola to U.S. soldiers during World War II.

First published in *Neuron*, McClure's study was a forerunner in exploring how cultural schemes penetrate human brains, shape personal preferences, and influence behaviors. It stirred debates among neurobiologists, marketers, and those who were afraid that fMRI technology would enable businesses to discover and push the so-called "buy button" in the human brain.

Finding the Buy Button: What is Neuromarketing?

Neuromarketing is an emerging field that applies medical technologies such as the fMRI to scan the brains of test subjects as they consume particular products or look at advertisements. Neuromarketers aim to discover what kinds of stimuli trigger neural responses. Information from neuromarketing research is used to provide deeper insight into the human brain for marketing purposes, to make more effective advertising, or to improve brand loyalty campaigns.

The introduction of the fMRI in the 1980s enabled scientists to observe the human brain at work. When we perform a particular task or receive a stimulus, certain regions of our brain are activated. Different levels of activity or magnitudes of blood oxygenation have distinct magnetic properties. The fMRI utilizes these differences in magnetic response to show us exactly which parts of the brain are functioning; this data can then be compared to baseline levels to determine the induced activation. The technique is called BOLD (Blood Oxygen Level Dependent) fMRI and has been used most frequently in cognitive neuroscience research.

The fMRI apparatus is a large, donut-shaped magnet that detects changes in electromagnetic fields within the ring. In a typical experiment, a subject lies inside the donut, does nothing for thirty seconds, performs a task, and then rests for another thirty seconds. Researchers operating the fMRI compare the signal during the task to the signal when the subject is at rest. Regions with strong signals are often responsible for processing that particular task.

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"The fMRI really opens the black box [of the brain]," says Joy Hirsch, the director of the Functional Magnetic Resonance Imaging Research Center at Columbia University. Initially, it was only used for spotting injuries or malfunctions in patients suffering from psychiatric disorders. Recently, however, researchers have found previously unforeseen applications such as neuromarketing. Some large companies have taken the use of the fMRI a step further, establishing their own pilot fMRI studies for neuromarketing research.

fMRI in Full Force: Recent Studies

The prominent carmaker Daimler-Chrysler discovered that reward centers in male subjects' brains responded more distinctly to sportier models. Interestingly, in this study, the images of cars also activated the region in the brain that recognizes faces, perhaps explaining why some people like identifying themselves with their cars. Meanwhile, Lieberman Research Worldwide, a marketing firm in Los Angeles, is working with Caltech neurobiologist Steven Quartz to provide neuromarketing services to Hollywood studios. In one study, Quartz analyzed the fMRI brain images of the audiences as they viewed movie trailers to see which ones created the most brain buzz. He discovered that the orbitofrontal cortex (a part of the prefrontal cortex) was associated with liking or anticipation.

In 2001, BrightHouse, a marketing consultant company, established the Neurostrategies Group, which aimed to "unlock the consumer mind." Conducting experiments with neuroscientists at Emory University, the group has already provided services to the Metropolitan Museum of Art in New York, Home Depot, Hitachi, and Georgia-Pacific. According to Justine Meaux, the company's director of research, BrightHouse's Neurostrategies Group helps businesses apply neuroscience in marketing, brain development, and product innovation.

Jordan Grafman, who heads the Cognitive Neuroscience Section of the National Institute of Neurological Disorders & Stroke, argues that marketers benefit from understanding consumers' brains. He suggests in Forbes Magazine that "there may be a certain combination of pitches that companies can use to appeal to the amygdala and prefrontal cortex."

Is Neuromarketing Ethically Acceptable?

Neuromarketing, unsurprisingly, has many critics. Most of them view efforts to understand consumer behavior through fMRI studies as an attempt to manipulate consumers. One active consumer watchdog group, Commercial Alert, highlights a potentially significant ethical problem associated with neuromarketing. The group worries that certain diseases, such as obesity, type 2 diabetes, alcoholism, eating disorders, and smoking-related illnesses, will become more prevalent if producers of junk food, alcohol, and tobacco use the fMRI as a weapon to lure consumers, especially children. In light of current examples of youth targeting from alcohol advertisements during the Super Bowl to complimentary toys at fast food restaurants, groups like Commercial Alert worry that greater insight into the brain's response will only make such appeals more effective.

The ongoing debate about neuromarketing is not centered upon the topic of public health alone. Neuromarketing, like human cloning or embryonic stem

In December 2003, Commercial Alert and prominent psychology experts sent a letter to Emory University President James Wagner, requesting that Emory stop conducting neuromarketing experiments. They declared that "it is hard to see how Emory's neuromarketing research meets the ethical standards for experimentation on human subjects." In the letter, the group stated that the University was founded by the Methodist Church in 1836 upon a core of ethical and religious values for the improvement of human well-being. The Commercial Alert group accused Emory University of rejecting its own declaration by applying medical knowledge and technology to manipulate people for non-medical purposes.

Stanford neurobiologist Donald Kennedy, former head of the Food & Drug Administration and current editor-in-chief of Science magazine, is also concerned about the ethics of brain research studies, and has urged researchers to collect brain data more carefully. In 2003, he told the Society for Neuroscience, "Far more than our genomes, our brains are us, marking out the special character of our personal capacities, emotions, and convictions...As to my brainome, I don't want anyone to know it for any purpose whatsoever."

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Can Neuromarketing Really be So Powerful?

While neuroscientists, marketers, and consumer watchdogs debate whether or not the fMRI should be allowed for marketing, some scientists regard neuromarketing as nothing more than obsession with linking subregions in the brain with personal preference.

"One limitation of fMRI today is that most neuromarketing studies are based on small numbers of patients whose results are averaged," claims Joan Hamilton, a prominent columnist of the Business Week. Because there have been no large-scale neuromarketing studies, she doubts the effectiveness of marketing strategies that companies could make: "there might not be enough of a data repository on how most normal brains behave to say what any individual scan means."

In addition to the lack of extensive research, the limitation of the fMRI machine itself makes some neuroscientists think that neuromarketing is not as powerful as one might expect. Despite stating that the fMRI can open the "black box" of the brain, Hirsh admits that the fMRI "falls short when we want to ask about more detailed brain processes. We're not learning that much about how neurons are doing local computing."

According to Richard Robinson, a science writer of the Public Library of Science, the caveat about fMRI that some neuroimagers stress is that a voxel, the basic unit of computed tomography represented as a pixel, has far from the resolution required to image a neuron. There are an estimated 100 billion neurons in the brain, so at best, an fMRI is signaling blood flow changes of tens of thousands of neurons. While resolution will improve over time, it seems unlikely that the fMRI will detect the activity of individual neurons; thus, its ability to dissect the exact structure of thought is congenitally limited.

What Will the Role of Neuromarketing be in the Future?

With marketers eager to edge out their competition, and critics concerned about advertising's affect on the nation's health, the debate on neuromarketing is unlikely to end soon. And although the conclusion of this debate may remain elusive, the recent research signals an increasing role of neuromarketing in consumers' lives in the near future. Perhaps, in your kids' generation, the debate between Coke and Pepsi may be outdated. Your kids might simply respond, "I don't know, ask the fMRI."

Potay Parapiboon is a sophomore interested in Economics and Psychology. In addition to science writing, she enjoys playing the piano, swimming, and painting.

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