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Mapping the complex mind

by *Jessica McCann*

It's the kind of news story everyone loves. An average person happens upon an extreme situation—maybe a hit-and-run car accident or a bank robbery. In the midst of crisis, that person takes charge, makes split-second decisions, gives life-saving instructions to others.

What enables some people to lead, while others stand by like deer in the headlights?

Pierre Balthazard believes it's all in their heads. Balthazard is business professor at Arizona State University. He and a team of neuroscientists are studying the human brain to pinpoint the origin of leadership abilities.

Academics have studied leadership for decades. But leadership remains an area of relative mystery because so much of it is associated with cognitive and emotional response. A new multidisciplinary approach is called leadership neuroscience. It allows researchers to look at leadership in a new way.

"We are now at a place where we can look at the brain and it can tell us a lot about a person's behavior," says Balthazard, an associate professor of information systems in ASU's [W. P. Carey School of Business](#).

Neurologists have long used a noninvasive test called electroencephalography (EEG) to diagnose problems such as seizure disorders, headaches, and developmental delays. In the business community, psychometric analysis is used to assess personality types, leadership skills, or career suitability. One common instrument used is the Myers-Briggs Type Indicator®.

Balthazard's team uses both EEGs and psychometric analysis to map the brain's cognitive and emotional responses to a variety of leadership scenarios. When used in tandem, these tools reveal a great deal about the complexity of the human brain.

EEG uses electrodes placed on the scalp to measure and record ever-present electrical activity generated by neurons throughout the brain. Doctors typically evaluate EEG results by looking at the pattern of spikes and waves produced.

Advances in computer technology allow for expansion of traditional techniques. A quantitative EEG (qEEG) can provide a detailed statistical analysis in measuring those spikes and waves. Doctors can compare a patient's test results with results from other brain maps or data.

For Balthazard's research, individuals are wired for the EEG by Jeffrey Fannin, executive director of the [Center for Cognitive Enhancement](#) in Phoenix. While brain activity is being recorded, either Balthazard or David Waldman (also an ASU business professor) poses a series of questions from the psychological tests. Data from both tests are then turned over for quantitative analysis to [Applied Neuroscience, Inc.](#), in Tampa, Fla.

The ASU team analyzed about 50 brain maps during the first part of the study. The goal was to determine if any correlation exists between the psychological test results and the brain wave patterns.

"We are quite confident that there is a correlation," says Balthazard. "You can now give our research team a brain map of a person and, through analysis, we can tell you with high probability what that person's score would be on a psychometric scale for leadership."

The research is of particular interest to the military.

"We have to grow leaders very young, and we don't have the option of having bad leaders," said Col. Sean Hannah, director of the Army Center of Excellence for the Professional Military Ethic at the U.S. Military Academy.

"In the current environment, even young soldiers and young leaders are thrust into very complex situations," explains Hannah. "Young platoon leaders often must directly negotiate agreements with local populations. They're conducting decentralized operations where they

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are the senior decision-maker on the ground. They often don't have time to consult with higher level headquarters before they have to make very serious decisions."

Hannah's group worked with Balthazard's team for a little more than a year. They have brain mapped 70 individuals at West Point. Subjects range from new cadets with high potential to seasoned combat officers recently returned from service in the Middle East. Through analysis, the army aims to learn more about the human mind and the complexity of leadership.

Meanwhile, Balthazard's team continues expanding its body of work. To date, they have brain mapped almost 200 individuals. The diverse mix includes bankers, lawyers, university deans, global business executives, and military leaders. A database of 500 or more people would provide a large enough sampling to develop a satisfactory leader brain map model.

By using such a model, researchers can then chart individual development. If scientists know what the typical brain map of an effective leader looks like, for example, they can map an individual's brain before and after leadership training to see if brain functioning has improved.

A portion of the neuroscience leadership project is conducted jointly with the Army Center of Excellence for the Professional Military Ethic through grant funding from the U.S. Military Academy. For more information, contact Pierre Balthazard, Ph.D., W.P. Carey School of Business, 602.543.6228. Send e-mail to Pierre.Balthazard@asu.edu



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