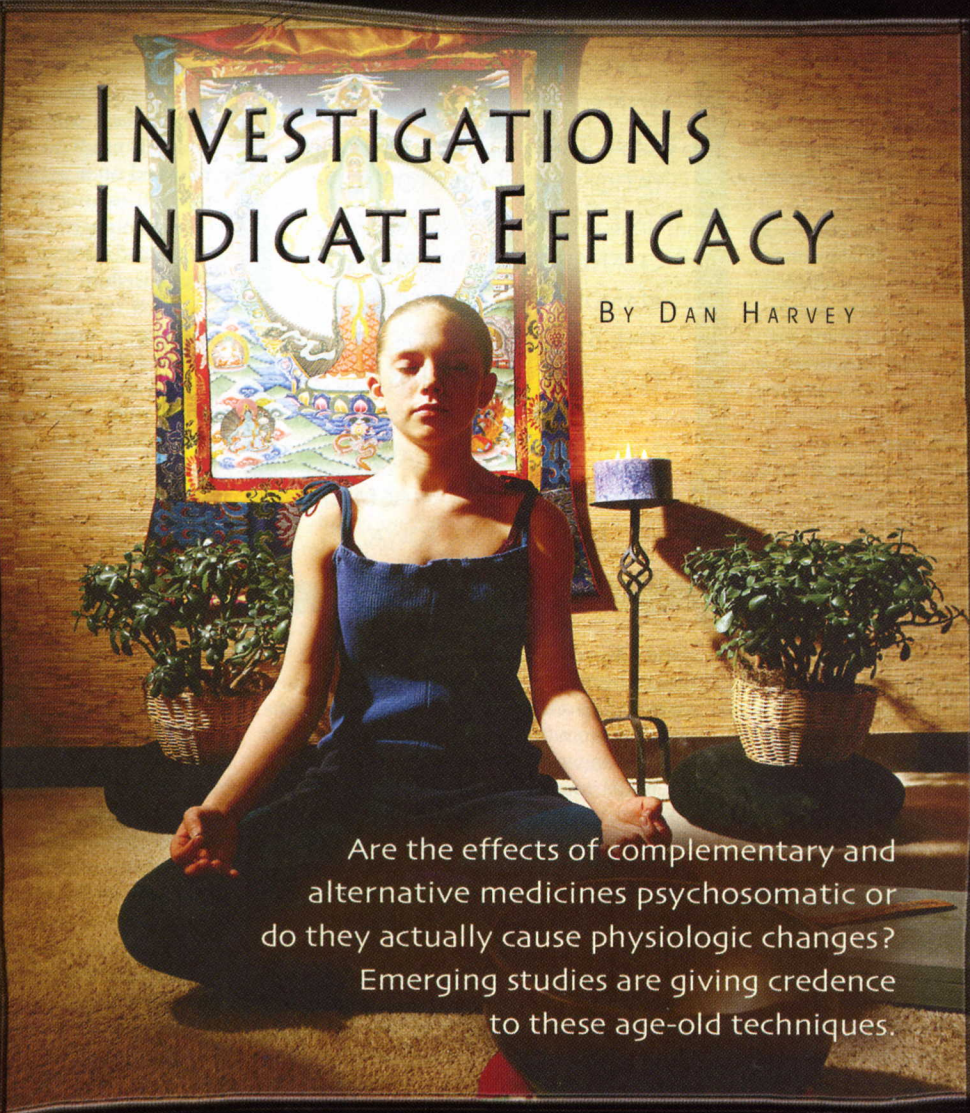


IMAGING *Complementary* AND *Alternative* MEDICINE



INVESTIGATIONS INDICATE EFFICACY

BY DAN HARVEY

Are the effects of complementary and alternative medicines psychosomatic or do they actually cause physiologic changes? Emerging studies are giving credence to these age-old techniques.

*W*e live in an era that witnesses remarkable scientific and technological achievements on a regular basis. One common concern is that science will demystify the mystical and debunk the spiritual. However, sometimes the opposite is the case.

Recently, complementary and alternative medicine (CAM) techniques have been subjected to scientific scrutiny. Ancient traditions such as transcendental meditation (TM), yoga, and acupuncture have not only attracted new adherents, but objective researchers have placed these practices under the laboratory micro-

scope, so to speak, and found data that validate their benefits.

"What we are now seeing through science are two things," says Alarik Arenander, PhD, director of the Brain Research Institute—part of the Institute of Science, Technology and Public Policy at Maharishi University of Management in Fairfield, Iowa. "There are great technological advancements in neuroimaging, and at the same time, there is a great resurgence of interest in these fundamental states of the brain associated with meditation and other CAM modalities."

It's not uncommon anymore to find seemingly disparate acronyms such as TM and CAM sharing lead paragraphs with fMRI and PET in mainstream press and scientific journals. For instance, both Reuters and *New Scientist* magazine recently reported how MRI and PET studies reveal that certain areas of the brain light up constantly in Buddhists, indicating positive states of mind maintained beyond the meditative state.

According to these recent reports, researchers at the University of Wisconsin at Madison and the University of California San Francisco Medical Center have demonstrated how parts of the brain—the left prefrontal lobes, an area linked to emotions and disposition, and the amygdala, an area linked to fear—are affected by Buddhists' spiritual practices. At the same time, yoga and acupuncture are being combined with Western medical treatment throughout the country to provide more effective treatment of chronic illnesses.

Not only are scientists and physicians interested in this direction of research, but so are major institutes of funding such as the National Institutes of Health (NIH). Still, it's a whole new frontier of research that has only recently opened, and many researchers embark on the quest without a map.

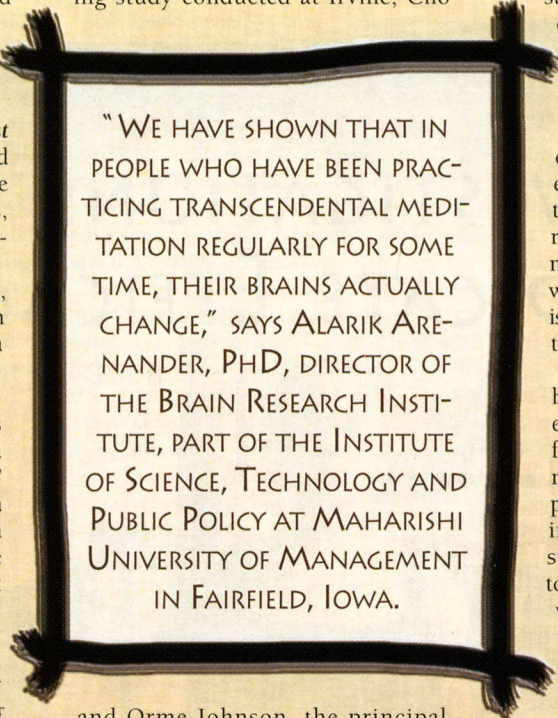
"Right now, it's like the wild, wild west," says Arenander, who has been involved in research concerned with mechanisms of brain-state change during meditation as well as applying TM to the treatment of traumatic brain injury patients and to children with attention deficit hyperactivity disorder. "Some researchers are just placing anyone in a magnet, taking pictures, and then publishing. But, the work doesn't connect anything, and few of these techniques have any scientific work published. There are no rules, and it is not systematic. Everyone just has their covered wagon and is heading across the prairie. That's why we've requested NIH grants. We must establish some basics before we can do comparative studies; otherwise, it is mayhem."

MEDITATION AND PAIN REACTION

Two researchers who have methodically pioneered the research and systematically scouted the terrain are David Orme-Johnson,

PhD, adjunct faculty of the Center for Natural Medicine and Prevention at Maharishi University of Management, and Zang Hee Cho, PhD, professor of radiological sciences and of psychiatry and human behavior at the Functional Brain Imaging Laboratory at the University of California at Irvine.

These two researchers, already experienced in studies on CAM—specifically acupuncture and TM—recently entered into a collaboration: a pilot study involving the functional neuroimaging of acute stress responses in TM practitioners. In the ongoing study conducted at Irvine, Cho



"WE HAVE SHOWN THAT IN PEOPLE WHO HAVE BEEN PRACTICING TRANSCENDENTAL MEDITATION REGULARLY FOR SOME TIME, THEIR BRAINS ACTUALLY CHANGE," SAYS ALARIK ARENANDER, PHD, DIRECTOR OF THE BRAIN RESEARCH INSTITUTE, PART OF THE INSTITUTE OF SCIENCE, TECHNOLOGY AND PUBLIC POLICY AT MAHARISHI UNIVERSITY OF MANAGEMENT IN FAIRFIELD, IOWA.

and Orme-Johnson, the principal researchers, are employing functional magnetic resonance imaging (fMRI) to compare TM practitioners' reactions to pain with controls inexperienced in meditation. After the initial imaging, the nonmeditating controls learn TM and are then imaged again after four months of TM practice. The objective is to explore the brain mechanisms that may mediate the reported beneficial effects of the TM program on stress and the heart's response to it.

"We wanted to make a cross-sectional comparison of long-term meditators and people interested in learning TM," explains Orme-Johnson, "to find out what was going on in both the heart and the brain. So, we measured heart rate as well as the brain's response to pain."

Both Orme-Johnson and Cho have done similar research separately. While at the University of Texas in El Paso, Orme-Johnson conducted a study, also involving TM practitioners, that measured stress response to noise and revealed that meditators recovered faster from stress—something the current study appears to collaborate. "There was greater autonomic stability in the autonomic

nervous system in the meditators compared with control," he recalls.

Cho had studied acupuncture in relation to the body's response to pain—specifically acupuncture stimulation's effects on brain functioning. Appropriately, Cho, who invented PET, employed the scanning technique in his research to measure changes in brain metabolism. The technology revealed activation or deactivation in areas of the brain through the stimulation of certain acupuncture points, or acupoints. As a result, he concluded that acupuncture, by stimulating brain regulating mechanisms, or homeostatic mechanisms, could be used to treat various diseases.

Cho became involved in this direction of research because of personal experience. In the early 1990s, he went on a rock climbing trip, and afterward experienced soreness excruciating enough to seek medical attention. Because he returned on a weekend, immediate regular medical treatment wasn't available, so his wife encouraged him to see an acupuncturist instead. Despite Cho's skepticism about the procedure, his wife talked him into it.

As it turned out, the procedure eased his pain almost immediately. Because he entered the procedure as a skeptic, he was forced to conclude that its benefits were more than psychosomatic. His curiosity provoked, Cho launched a scientific investigation. Using PET and fMRI, he studied the effects of acupuncture on pain to determine whether or not an acupoint would induce brain activation.

Cho designed a study that involved subjects placing their fingers in hot water (hot enough to cause pain, but not hot enough to cause tissue damage). The subjects were imaged twice. First, the pain was measured and the cortical activation was imaged. Next, the subjects were given acupuncture, then placed their fingers in the hot water a second time, and were imaged again to see the changes in the cortical area of pain perception. In the second set of images, any evidence of pain processing disappeared. Essentially, the subjects weren't receiving a pain signal. This finding led Cho to hypothesize that acupuncture probably produces an endogenous opiate that blocks the ascending pain signal in the spinal chord, and he became convinced that PET validated the effectiveness of acupuncture. "I believe acupuncture is a neural effect more than anything else," he says.

Later, he delivered a presentation on his work at Maharishi University. Faculty researchers were fascinated and wanted to use similar methodology to study TM, which led to the current collaboration.

HEATED REACTIONS

Entering the study, Cho and Orme-Johnson speculated that the brain response to stress in long-term TM practitioners would be less

