



American College of Neuropsychopharmacology

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NEW RESEARCH ON COMBAT VETERAN TWINS UNLOCKS BRAIN MYSTERIES OF PTSD

Landmark study clarifies origin of underlying brain abnormalities

NASHVILLE, TN (December 9, 2008) – A decade-long study among identical twins with and without combat experience has provided new information on brain abnormalities found in people with Post-Traumatic Stress Disorder (PTSD). The study is the first to identify the origin of changes in the brain related to PTSD among combat veterans, and researchers say it represents a major step forward in determining whether such changes are acquired from the traumatic experience alone or whether the individuals also have an underlying physical predisposition to the disorder.

The findings were presented at the annual meeting of the American College of Neuropsychopharmacology (ACNP). Scientists presented highlights of more than 10 years of data obtained in 130 twin pairs on the origin of brain abnormalities in PTSD, and how combat stress may compromise brain structure and function.

“This project is offering new evidence on how brain structure and function change with PTSD and revealing vulnerability factors that increase one’s likelihood of developing PTSD following a traumatic event,” explained Roger K. Pitman, MD, professor of psychiatry at Harvard Medical School and ACNP member. He added that the findings could translate to PTSD in many other settings and eventually help screen for people who are most vulnerable for the disorder, as well as point to brain areas that are potentially targeted by different treatments.

Pitman’s work explored two competing theories: does PTSD develop because of preexisting brain vulnerabilities or does trauma lead to these abnormalities. Some researchers had hypothesized that if PTSD results from exposure to a traumatic event, then the brain abnormalities found in people with PTSD must be acquired as a result of the event. Others believed that individuals born with biological abnormalities – also known as vulnerability factors – were more susceptible to developing PTSD after exposure to a traumatic event. Until this study, Pitman explained, almost all psychobiological studies on PTSD had been cross-sectional (i.e., they observed subjects at only a single point in time), and correlational (i.e., they examined the probability of a risk factor being associated with a disease), which often falls short of being able identify what actually causes the disease in most people.

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Pitman's innovative use of identical twins allowed his group to investigate whether structural brain abnormalities were found in the veterans with PTSD and whether they were more likely to be genetically determined or acquired because of combat experiences. "Our strategy was to take the best surrogate example of what the brain of a combat veteran with PTSD would be like if not exposed to the traumatic event. The closest approximation would be the brain of their identical twin," explained Pitman. The study sample is unique – identical twins, nearly all in the military during the Vietnam War, but with one twin exposed to combat and the other not.

The researchers tested the following hypothesis: if biological abnormalities found in PTSD are 100 percent genetically determined, then they should be present in both twins because identical twins share the same genes. That is to say, any genetic brain abnormality present in a combat veteran with PTSD should also be shared by his twin brother, even though the latter was never exposed to combat. In contrast, if the abnormality was acquired due to the traumatic event, it should not be present in the brain of the non-exposed twin.

The first brain abnormality the project investigated was diminished volume of an area of the brain known as the hippocampus, a structure critically involved in memory and regulation of stress responses. Previously it had been assumed that the traumatic event causes reductions in the size of the hippocampus, resulting in PTSD. However, Pitman's results revealed that diminished hippocampal volume was shared by the identical twins of the PTSD veterans, even though the former had not been exposed to combat. These findings support the conclusion that reduced volume of this part of the brain is a factor that can increase vulnerability to PTSD in response to trauma, but does not result from exposure to the trauma itself.

In contrast, this project identified another brain abnormality that appears to be acquired by those experiencing traumatic events and subsequent PTSD. Previous work has shown that the ventromedial prefrontal cortex (vmPFC), a brain area often associated with decision-making, is less active in people with PTSD. In a structural imaging study with MRI, Pitman's team found an area of the vmPFC that was smaller in the combat veterans with PTSD but not in their combat-unexposed twins, suggesting that combat stress had damaged brain tissue in this area.

"These findings will have practical implications for determining treatment approaches to PTSD," said Pitman. "Traditional therapeutic methods are more successful in addressing an acquired abnormality, rather than one caused by a predisposition from birth. Our research may spur additional or alternative therapies that will be effective for those who are predisposed to PTSD."

ACNP, founded in 1961, is a professional organization of more than 700 leading scientists, including four Nobel Laureates. The mission of ACNP is to further research and education in neuropsychopharmacology and related fields in the following ways: promoting the interaction of a broad range of scientific disciplines of brain and behavior in order to advance the understanding of prevention and treatment of disease of the nervous system including psychiatric, neurological, behavioral and addictive disorders; encouraging scientists to enter research careers in fields related to these disorders and their treatment; and ensuring the dissemination of relevant scientific advances.