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Team studies the social origins of intelligence in the brain

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By studying the injuries and aptitudes of Vietnam War veterans who suffered penetrating head wounds during the war, scientists are tackling—and beginning to answer—longstanding questions about how the brain works.

The researchers found that brain regions that contribute to optimal social functioning also are vital to general intelligence and to emotional intelligence. This finding bolsters the view that general intelligence emerges from the emotional and social context of one's life.

"We are trying to understand the nature of general intelligence and to what extent our intellectual abilities are grounded in social cognitive abilities," said Aron Barbey, a University of Illinois professor of neuroscience, of psychology, and of speech and hearing science. Barbey (bar-BAY), an affiliate of the Beckman Institute and of the Institute for Genomic Biology at the U. of I., led the new study with an international team of collaborators.

Studies in social psychology indicate that human intellectual functions originate from the social context of everyday life, Barbey said.

"We depend at an early stage of our development on social relationships—those who love us care for us when we would otherwise be helpless," he said.

Social interdependence continues into adulthood and remains important

throughout the lifespan, Barbey said.

"Our friends and family tell us when we could make bad mistakes and sometimes rescue us when we do," he said. "And so the idea is that the ability to establish social relationships and to navigate the social world is not secondary to a more general cognitive capacity for intellectual function, but that it may be the other way around. Intelligence may originate from the central role of relationships in human life and therefore may be tied to social and emotional capacities."

The study involved 144 Vietnam veterans injured by shrapnel or bullets that penetrated the skull, damaging distinct brain tissues while leaving neighboring tissues intact. Using CT scans, the scientists painstakingly mapped the affected brain regions of each participant, then pooled the data to build a collective map of the brain.

The researchers used a battery of carefully designed tests to assess participants' intellectual, emotional and social capabilities. They then looked for patterns that tied damage to specific brain regions to deficits in the participants' ability to navigate the intellectual, emotional or social realms. Social problem solving in this analysis primarily involved conflict resolution with friends, family and peers at work.

As in their earlier studies of general intelligence and emotional intelligence, the researchers found that regions of the frontal cortex (at the front of the brain), the parietal cortex (further back near the top of the head) and the temporal lobes (on the sides of the head behind the ears) are all implicated in social problem solving. The regions that contributed to social functioning in the parietal and temporal lobes were located only in the brain's left hemisphere, while both left and right frontal lobes were involved.

The brain networks found to be important to social adeptness were not

identical to those that contribute to general intelligence or emotional intelligence, but there was significant overlap, Barbey said.

"The evidence suggests that there's an integrated information-processing architecture in the brain, that social problem solving depends upon mechanisms that are engaged for general intelligence and emotional intelligence," he said. "This is consistent with the idea that intelligence depends to a large extent on social and emotional abilities, and we should think about intelligence in an integrated fashion rather than making a clear distinction between cognition and emotion and social processing. This makes sense because our lives are fundamentally social—we direct most of our efforts to understanding others and resolving social conflict. And our study suggests that the architecture of intelligence in the brain may be fundamentally social, too."

The findings are reported in the journal *Brain*.

More information: *Brain*. DOI: 10.1093/brain/awu207

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