The unhealthy ego: What can neuroscience tell us about our 'self'?

October 28 2010

With Election Day right around the corner, political egos are on full display. One might even think that possessing a "big ego" is a prerequisite for success in politics, or in any position of leadership. High achievers–CEO's, top athletes, rock stars, prominent surgeons, or scientists–often seem to be well endowed in ego.

But when does a "healthy ego" cross the line into unhealthy territory? Where is the line between confident, positive self-image and grandiose self-importance, which might signal a personality disorder or other psychiatric illness? More fundamentally, what do we mean by ego, from a neural perspective? Is there a brain circuit or neurotransmitter system underlying ego that is different in some people, giving them too much or too little?

What is Ego?

What ego is depends largely on who you ask. Philosophical and psychological definitions abound. Popularly, ego is generally understood as one's sense of self-identity or how we view ourselves. It may encompass self-confidence, self-esteem, pride, and self-worth, and is therefore influenced by many factors, including genes, early upbringing, and stress.

The popular concept of ego is a far cry from what Sigmund Freud elaborated at the turn of the 19th century in his seminal work on

psychoanalytical theory. Freud distinguished between primary (id) and secondary (ego) cognitive systems and proposed that the id, or unconscious, was characterized by a free exchange of neural energy and more primitive or animistic thinking. It was the job of the ego, the conscious mind, to minimize that free energy, to "bind" it and thereby regulate the impulses of the unconscious. It was Freud's attempt to "link the workings of the unconscious mind to behavior," says Joseph T. Coyle, M.D., chair of psychiatry and neuroscience at Harvard School of Medicine/McLean Hospital and a Dana Alliance for Brain Initiatives member.

Ego constructs continue to be used in some psychoanalytical therapies, but beyond that, the term seems to be falling out of favor in modern psychiatry. ("Ego is so last century," quips Coyle.) Dana Alliance member Jerome Kagan, Ph.D., professor emeritus of psychology at Harvard, says: "Ego is a terrible word. In Freudian theory, ego has a meaning–not a very precise one, but a meaning. But you can't take the word ego out of Freudian theory and apply it in non-Freudian ways. It just doesn't work."

According to psychiatrist John M. Oldham, M.D., chief of staff at Baylor College of Medicine's Menninger Clinic and President-elect of the American Psychiatric Association (APA), terms like sense of self or self-identity are more common today. The new diagnostic criteria for personality disorders being developed for the revised APA Diagnostic and Statistical Manual of Psychiatric Disorders (DSM-5) will reflect this newer language, he says.

Where's the Ego in Neuroscience?

If ego is loosely defined in psychiatric circles, a neural definition is virtually nonexistent. "Ego doesn't exist in the brain," says Kagan. What does exist, he explains, is a brain circuit that controls the intrusiveness of

feelings of self-doubt and anxiety, which can modulate self-confidence. But, Kagan says, "We are nowhere near naming the brain circuit that might mediate the feeling of 'God, I feel great; I can conquer the world.' I believe it's possible to do, but no one knows that chemistry or that anatomy."

Dana Alliance member Joseph LeDoux, Ph.D., a neurobiologist at New York University, has argued that psychological constructs such as ego are not incompatible with modern neuroscience; scientists just need to come up with better ways of thinking about the self and its relation to the brain. "For many people, the brain and the self are quite different," he writes in The Synaptic Self, where he made the opposite case. For LeDoux, it's a truism that our personality—who we are in totality—is represented in the brain as a complex pattern of synaptic connectivity, because synapses underlie everything the brain does. "We are our synapses," he says.

Researchers are increasingly applying the tools of modern neuroscience to try to understand how the brain represents self and other aspects of ego as popularly defined—they just don't call it ego. Brain-imaging studies have used self-reference experiments to investigate the neurobiology of self. For example, asking a subject to make a judgment about a statement, such as "I am a good friend" versus a statement that is self-neutral, such as "water is necessary for life." Others have looked at brain pathology in people with disorders of self. These studies have fairly consistently linked self-referential mental activity to the medial prefrontal cortex, a subregion of the frontal lobe where higher-order cognitive functions are processed.

The medial prefrontal cortex is the locus of the brain's "default mode" network, where metabolic activity is highest when the brain is not actively engaged in a task. During task performance, default mode activity decreases. Washington University neuroimaging pioneer and

Dana Alliance member Marcus E. Raichle, M.D., first reported the default mode and has argued that default-state activity may hold clues to the neurobiology of self (Gusnard, 2001).

Could Raichle's default mode state be Freud's ego? Robin Carhart-Harris and Karl Friston of Imperial College London explored that question in a recent article in Brain (Carhart-Harris, 2010), where they proposed that the Freudian ideas of primary and secondary cognitive processes (corresponding to the id and the ego, respectively) "fit comfortably with modern notions of functional brain architecture, at both a computational and neurophysiological level." Acknowledging the "ambitious" nature of that thesis, the authors reviewed a large body of evidence to support it. Freud's theory that ego represses id is consistent, they argued, both with the default mode's characteristic ebb and flow of neuronal activity in opposition to neuronal firing in other brain areas and with theories about the hierarchy of brain systems (e.g., the cortical "thinking" brain is higher-order and therefore regulates the subcortical "primitive" brain).

The Disordered Self

Clues about the neurobiological underpinnings of self can also be seen in psychopathology. "There are a whole range of disorders in which self-identity is affected, in the sense of 'who am I?' and 'how am I distinguished from those around me and things occurring around me?," says Coyle.

The delusions of schizophrenia, for example, have been described as a loss of ego boundaries. Patients may interpret neutral events as being self-referential or may be unable to distinguish what's happening "in here" from "out there," as in the case of auditory hallucinations. These disruptions are thought to be linked to structural changes seen in the brains of people with schizophrenia, including smaller cortical neurons that have fewer connections than normal (van der Meer, 2010).

In frontotemporal dementia (FTD), a key feature is loss of self-awareness or self-identity, sometimes to the point of a complete shift in personality (Sturm, 2008). Imaging studies have revealed severe abnormalities in frontal regions among FTD patients with the most dramatic changes, further supporting the frontal lobe's role in mediating self (Butcher, 2001).

Narcissistic Personality Disorder is characterized by grandiose self-importance and such extreme preoccupation with self that "you lose the capacity to see things through other people's eyes," says Oldham. In contrast, people with Borderline Personality Disorder characteristically lack a strong sense of identity and sometimes get intrusively close to other people, "as if they're putting on the costume of somebody else's personality," he says. In autism, the representation of self may appear to be wholly absent or greatly exaggerated, to the extent that others are under-recognized (Lombardo, 2010)

The manic phase of bipolar disorder is often marked by grandiosity, which represents "the extreme of what we would call egocentricity, a logarithmic multiplication of extreme narcissism." says Oldham. Depression, conversely, often goes hand in hand with extremely low self-esteem.

All personality traits exist on a continuum, Oldham points out, with extremes at either end that sometimes cross the line into psychopathological behavior. The key determinants of whether that line has been crossed are the degree of disruption on interpersonal relations and daily activities. Who goes over the line and who doesn't involves a complex interplay of genetic factors—comprising up to 50 percent of the risk—and environmental triggers, mostly related to stress. Beyond that, there are many more questions than answers.

"We're just beginning to understand this," says Kagan. "There are no

firm facts yet. We have some hints, but at this point everything is up for grabs."

More information: References:

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(3) For a review, see: van der Meer L, Costafreda S, David AS. Self-reflection and the brain: a theoretical review and meta-analysis of neuroimaging studies with implications for schizophrenia. Neuroscience and Biobehavioral Review 2010:34(6):935-40.

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(6) See for example: Lombardo MV and Baron-Cohen S. Unraveling the paradox of the autistic self. WIREs Cognitive Science 2010;1(3):393-403

Provided by DANA Foundation