The social circuits that track how we like people and ideas

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Whether at the office, dorm, PTA meeting, or any other social setting, we all know intuitively who the popular people are – who is most liked – even if we can't always put our finger on why. That information is often critical to professional or social success as you navigate your social networks. Yet until now, scientists have not understood how our brains recognize these popular people. In new work, researchers say that we track people's popularity largely through the brain region involved in anticipating rewards.

"Being able to track other people's status in your group is incredibly important in survival terms," says Kevin Ochsner of Columbia University. "Knowing who is popular or likeable is critically important in times of need or distress, when you seek an alliance, or need help – whether physical or political – etc." While sociologists, psychologists, and anthropologists have long studied these group dynamics, neuroscientists have only begun to scratch the surface of how we think about people's social status.

That is all changing, though, Ochsner says with many areas of work bringing together social psychology and sociology with cognitive neuroscience to better understand how individual brain processes connect to group membership. As will be presented today at the annual meeting of the Cognitive Neuroscience Society (CNS) in Boston, researchers are now studying at the neural level everything from social popularity to how ideas successfully spread in groups.

Like me?

Someone attains social status in a group through either power – control over resources – or popularity – how well-liked they are. Past research on status has largely focused on power, but Ochsner and his colleagues wanted to specifically look at popularity, capitalizing on social network analysis techniques already available from sociology.

"Now that we have a simple way of defining for a given group who is popular, we can then ask how it is that the brain is representing what it means for someone to have this kind of liking-based status, or popularity, within the context of a group," Ochsner says.

In the new work, Ochsner's team recruited people from student organizations to come into the lab and rate how much they like each other. The researchers then used those ratings to mathematically determine who is most liked in each social network.

Then some weeks later, the researchers brought the same individuals back into the lab and had them lie in an fMRI scanner while showing them faces of people. The participants would determine if the faces were from people in their own organization or not; composite faces – not real people – were added as controls. The researchers wanted to see how areas of the participants' brain responded to viewing faces of those rated as popular within the group – increasing or decreasing specific brain activity based on popularity.

With each social network, the researchers found the same pattern of brain activity in individuals viewing the faces of popular people, identifying two critical systems in the brain: the system involved in emotional evaluation and reward (ventral striatum, amygdala, ventromedial prefrontal cortex) and the system involved in social cognition, or our ability to think about the feelings and intentions of

others (temporoparietal junction, precuneus, and dorsomedial prefrontal cortex). "We find that activity in these two networks scales up with the popularity of another individual, and that's kind of neat because it's consistent with two accounts of how we track the status of other individuals," Ochsner says.

The first account posits that, over time, we learn who is likeable by experiencing the rewarding effects of interacting with someone. Even if you personally do not like someone, you may know that person is likeable by others based on observing interactions with other group members. This would explain why the reward systems in the brain react to the sight of popular people – as we are anticipating the benefits of interacting with them. The other account is that we need to be able to think about the mental states, beliefs, and thoughts of other people – in particular those with high status – in order to form coalitions, ask for help, or otherwise work within the group.

"What we see is that even with brief presentations of faces – the faces are only on the screen for about a second – these systems are coming online," Ochsner says. Moreover, the emotional evaluation system controls the response of the social cognition system: "The emotional evaluation system really holds the key to unlocking the popularity of group members and tells the social cognition systems, 'hey this is a person with whom I can expect rewarding interactions', triggering the person to think about what the popular individual's thoughts, intentions, and feelings are."

They also found that the more popular someone is within a group, the more strongly these brain systems react to the sight of another popular person. This finding suggests that popular people are "exquisitely sensitive to how likeable other individuals are and that they can then tailor their behavior appropriately," Ochsner says.

Importantly, Ochsner points out that in the studies, they controlled for a number of factors, including attractiveness, trustworthiness, and idiosyncratic preferences of individuals, to ensure that the popularity measure held true for the individuals in the group on average. Also, they first independently located the brain systems involved, using tasks designed to identify reward learning and social cognition.

The work not only addresses the basic science question of how we track social popularity in the brain but also could eventually inform research on autism and other disorders that impair people's ability to judge social status. "You could also ask questions about how can you bring people from the periphery, the not-liked part of a group, into the liked part of a group," Ochsner says. And, he says, the work has enormous implications in the business world where the effectiveness of a hierarchical structure often comes down to who is most liked.

Like my ideas?

The very same brain regions involved in how we see other people's popularity also shape how well we communicate messages to others, recent research has found. Emily Falk of the University of Pennsylvania and colleagues have found that activity within the social cognition and emotional evaluation and reward systems can actually predict how effectively someone can sell their ideas to others and how well ideas spread.

"Neural activity within the brain of an initial idea recipient can tell us how successfully an idea will be re-transmitted," Falk says. "The brain activity in that initial person gives hints about how others, who never saw the original message, are likely to react to messages as they are transmitted from person to person, and also who are likely to be the best idea salespeople."

Falk will be presenting at the CNS meeting a growing body of work about not only the neural systems that make someone a good "idea salesperson" but also the role of someone's position within a social network in idea transmission.

In her lab's newest work, with lead author Matthew Brook O'Donnell, the team first used Facebook to map out people's status within their social networks. Then using fMRI imaging, they found that individuals with more opportunities for brokering information between different groups of people showed increased activity in brain regions that support thinking about the mental states of others. This brain activity could enable them to better respond to social cues when making recommendations to others.

"We know that social environments affect people in all kinds of ways, and Matt and I have become very interested in how social network position influences all kinds of basic processes in the brain," Falk says. The new work seeks to explain the variation found in the previous research in how good people were at being idea salespeople.

The work is giving insights into what makes ideas stick. For example, though the current results are correlational, it is possible that if the social cognition systems are most critical in spreading ideas, then people should invest more energy in thinking about what other people are thinking and feeling to get the best results.

"People may sometimes decide what to share based on their own preferences, but, ultimately, we are hardwired to be social, and those social circuits seem to forecast which ideas catch on," she says. "Likewise, people who show more activity in those circuits ultimately have more success in convincing others to get on board with their preferred ideas."

The explosion of new communications tools, such as social media, combined with new analytic tools is dramatically helping scientists understand how ideas spread, Falk says. "Ultimately, we are working on forecasting which ideas will go viral and what kind of people and messages can best make that happen. We hope that this kind of information can be used to create more effective public health campaigns that address major societal challenges such as obesity and cigarette smoking."

More information: Falk and Ochsner are presenting their work, along with Lisa F. Barrett and Dharshan Kumaran, in the symposium "The Neuroscience of Social Networks," Monday, April 7, 2014, at the CNS annual meeting in Boston. More than 1,500 scientists are attending the meeting in Boston, MA, from April 5-8, 2014.

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