**Headline:** How Decision-Making Is Affected by Social Conformity

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**[Article Body:]**

The rapid growth of digital technologies in the last quarter-century has multiplied the number and types of possible influences on individual values and opinions. Has the digital era changed the level of social conformity in the population? And how can this be measured?

A [2023 meta-analysis of research on conformity](https://rips-irsp.com/articles/10.5334/irsp.874#introduction) suggests that the level of social conformity from January 2004 to December 2022 has remained the same, despite the explosion of social media. But more research is recommended to look at the exact factors involved.

How and why human beings make decisions has always been a topic of interest in science and fiction. In recent years, advanced technology has added another dimension: Scientists have devised methods to create images of how human decisions map onto specific regions of the brain.

Think of the brain of Shakespeare’s Hamlet undergoing an MRI as he recites his famous soliloquy, “To be, or not to be… .” Researchers can now see in real time which parts of the orbitofrontal region of the brain light up as Hamlet speaks or thinks his words.

The difficult part is how to interpret the results. Researchers can map the blips on the brain as they light up, but what does it mean? Devising experiments to tease out the factors that influence a particular decision is tricky. What kind of experimental situations will reveal the subjective emotions that produce the objective result?

**How Conformity Is Mapped in the Brain**

How and why people follow a perceived leader is an important question relevant for all areas of life, especially politics.

It’s known that the region of the brain called the orbitofrontal cortex, or OFC, is involved in decisions relating to value judgments and impulse control, but it’s not easy to design an experiment that maps the perception of social rank on an individual’s decision-making.

A [2012 study by an international team of scientists](https://pmc.ncbi.nlm.nih.gov/articles/PMC3315000/) considered this question and reported finding a direct relationship between the OFC volume and the tendency to change one’s values to align with those of others. The researchers suggested that the tendency to conform may have an “anatomical correlate” in the lower middle front region of the brain, just below the central cortex.

Using functional MRI, the researchers looked at the OFC gray matter volume of 28 adults who made a list of 20 pieces of music they wanted to buy online. The participants rated their choices in terms of desirability. The experimenters told participants that two expert music reviewers (invented by the researchers) had reviewed their music choices and, in some instances, suggested alternative songs that the experts preferred.

Participants were then asked to rate their list again, knowing the music reviewers’ preferences for other songs, which they were not familiar with. Participants also knew that if they participated, the study administrators would buy them a CD with 10 songs of their choice.

The researchers calculated a value for social influence based on the changes in the participants’ original choices and their choices after learning what the “experts” preferred. This value was directly correlated to the OFC volume. Interestingly, the researchers found more neural response in participants when the “experts” disagreed with a participant’s choice.

**How the Brain Maps Decision-Making**

Scientists describe the orbitofrontal cortex as a key area for mapping possible behaviors in a particular situation and as a hub for decision-making, especially about social behavior. The OFC’s specialized functions are to evaluate information about emotions, social relationships, and decision-making.

Although the OFC has been the subject of much neuroscience research, including its intricate connections to other brain areas, its exact mechanics are not well understood. As a 2023 research study put it, precisely how the OFC works “[remains elusive](https://www.nature.com/articles/s41467-023-38671-7).”

The pace of research on the OFC, however, indicates that this may be changing. The number of research papers on the OFC increased from [one per month in 1987 to more than 50 per month](https://pmc.ncbi.nlm.nih.gov/articles/PMC5541252/) by 2015, and in 2020, there were [714 research papers on this part of the brain](https://pmc.ncbi.nlm.nih.gov/articles/PMC9351730/).

Nineteenth-century OFC research was spurred by [the accident of a railway workman, Phineas Gage, in 1848](https://academic.oup.com/braincomms/article/3/3/fcab125/6296836). Gage’s brain was pierced by an iron rod and went through the orbitofrontal lobe, destroying part of it. He lived for 12 years after the injury as a medical curiosity, providing scientists and the public with evidence of changes in personality and behavior connected to a damaged orbitofrontal lobe.

In recent decades, further evidence of the OFC’s role in cognition has come from observations of humans and other primates who suffered brain injuries. Research has focused on how the OFC is involved, along with input from other areas of the brain, in making decisions about value judgments and integrating new knowledge with established memories.

In humans, nonhuman primates, and some other studied species, the OFC is considered crucial for learning how to adapt to new situations, which is necessary for survival. Its [abnormalities are thought to be important](https://academic.oup.com/braincomms/article/3/3/fcab125/6296836) in devising treatments for Alzheimer’s and Parkinson’s diseases.

**Mapping the Brain and Changing Information**

Advanced imaging technology can help assess how animals and human beings respond to changes in the world around them that challenge outcomes they have already learned to expect.

In a [2023 study](https://pmc.ncbi.nlm.nih.gov/articles/PMC10272188/), European researchers used functional MRI (fMRI) to look at the brain activity of human participants when they learned a particular stimulus-response activity and then had to relearn the reversal of the activity. The researchers mapped the interaction of the OFC and the part of the brain that processes sensory stimuli when an expected outcome changes. The experiment was designed to measure behavioral flexibility and map the area of the brain involved.

The sensory stimuli consisted of plastic pins that the dominant hand’s index fingertip felt in different configurations. Participants learned tactile patterns and then learned the reversal of these patterns.

The study found that the OFC interacted dynamically with the sensory cortex in the initial learning and in the relearning when the stimulus response was reversed. The mental computation required for flexible decision-making involves lateral OFC interacting with the sensory cortex. The research showed that the lateral OFC encoded deviations from the initially learned response and signaled the expected response to the sensory cortex.

The researchers commented that their findings have implications for the treatment of several mental illnesses—including schizophrenia, autism, and obsessive-compulsive disorder—that exhibit impaired ability for flexible decision-making. The results, they reported, are similar to those of studies of the lateral OFC in mice.

**OFC Damage: Research and Potential Treatment**

The wave of new research articles on the OFC has shown the orbitofrontal cortex to be what scientists termed a “cognitive map framework” of decision-making in social contexts. So many cognitive neuroscience functions and diseases have been attributed to OFC operations that a [2015 paper on the OFC](https://pubmed.ncbi.nlm.nih.gov/25919962/) is titled “What the Orbitofrontal Cortex Does Not Do,” and a 2021 review of OFC articles is titled “[The Magical Orbitofrontal Cortex](https://pmc.ncbi.nlm.nih.gov/articles/PMC9351730/).”

An important area of research is how the increasing knowledge about OFC functions may help treat people with damage to this brain region. This includes [mental illnesses, diseases like Alzheimer’s and Parkinson’s, and normal aging](https://pubmed.ncbi.nlm.nih.gov/34222873/). So far, loss of function caused by damage to the OFC has mostly helped researchers understand the important features of the OFC, rather than how to treat people suffering from this loss.

Some treatments, such as [selective lobotomies of specific brain areas in the OFC](https://www.cell.com/action/showPdf?pii=S0960-9822%2818%2930917-5) associated with mental illnesses, were not successful. Other treatments include pharmaceuticals that target particular functions and [magnetic stimulation of the right orbitofrontal cortex](https://www.sciencedirect.com/science/article/abs/pii/S0165178122004486?via%3Dihub), both of which have had some success with a selective group of patients.

Animal models are being used to study how the OFC works, although there are [both similarities in structure and discrepancies](https://pmc.ncbi.nlm.nih.gov/articles/PMC3549638/) with human models. In terms of similarities to humans, rats and mice exhibit social behavior that involves cooperation and empathy, and studies are looking at [neural mechanisms in rodents to understand autism spectrum disorder](https://www.frontiersin.org/journals/psychiatry/articles/10.3389/fpsyt.2023.1205199/full). Rodents have complex social behavior, as do nonhuman primates.

OFC research is continuing in both humans and animals, confirming prior conclusions about OFC functions and opening many more intriguing research areas. The regions of the brain involved in decision-making and status are becoming clearer. The social and emotional thinking behind these decisions, however, remains harder to pin down.