Why We're So Nice: We're Wired to Cooperate

By NATALIE ANGIER

What feels as good as chocolate on the tongue or money in the bank but won't make you fat or risk a subpoena from the Securities and Exchange Commission?

Hard as it may be to believe in these days of infectious greed and sabers unsheathed, scientists have discovered that the small, brave act of cooperating with another person, of choosing trust over cynicism, generosity over selfishness, makes the brain light up with quiet joy.

Studying neural activity in young women who were playing a classic laboratory game called the Prisoner's Dilemma, in which participants can select from a number of greedy or cooperative strategies as they pursue financial gain, researchers found that when the women chose mutualism over "me-ism," the mental circuitry normally associated with reward-seeking behavior swelled to life.

And the longer the women engaged in a cooperative strategy, the more strongly flowed the blood to the pathways of pleasure.

The researchers, performing their work at Emory University in Atlanta, used magnetic resonance imaging to take what might be called portraits of the brain on hugs.

"The results were really surprising to us," said Dr. Gregory S. Berns, a psychiatrist and an author on the new report, which appears in the current issue of the journal Neuron. "We went in expecting the opposite."

The researchers had thought that the biggest response would occur in cases where one person cooperated and the other defected, when the cooperator might feel that she was being treated unjustly.

Instead, the brightest signals arose in cooperative alliances and in those neighborhoods of the brain already known to respond to desserts, pictures of pretty faces, money, cocaine and any number of licit or illicit delights.

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"It's reassuring," Dr. Berns said. "In some ways, it says that we're wired to cooperate with each other."

The study is among the first to use M.R.I. technology to examine social interactions in real time, as opposed to taking brain images while subjects stared at static pictures or thought-prescribed thoughts.

It is also a novel approach to exploring an ancient conundrum, why are humans so, well, nice? Why are they willing to cooperate with people whom they barely know and to do good deeds and to play fair a surprisingly high percentage of the time?

Scientists have no trouble explaining the evolution of competitive behavior. But the depth and breadth of human altruism, the willingness to forgo immediate personal gain for the long-term common good, far exceeds behaviors seen even in other large-brained highly social species like chimpanzees and dolphins, and it has as such been difficult to understand.

"I've pointed out to my students how impressive it is that you can take a group of young men and women of prime reproductive age, have them come into a classroom, sit down and be perfectly comfortable and civil to each other," said Dr. Peter J. Richerson, a professor of environmental science and policy at the University of California at Davis and an influential theorist in the field of cultural evolution. "If you put 50 male and 50 female chimpanzees that don't know each other into a lecture hall, it would be a social explosion."

Dr. Ernst Fehr of the University of Zurich and colleagues recently presented findings on the importance of punishment in maintaining cooperative behavior among humans and the willingness of people to punish those who commit crimes or violate norms, even when the chastisers take risks and gain nothing themselves while serving as ad hoc police.

In her survey of the management of so-called commons in small-scale communities where villagers have the right, for example, to graze livestock on commonly held land, Dr. Elinor Ostrom of Indiana University found that all communities have some form of monitoring to gird against cheating or using more than a fair share of the resource.

In laboratory games that mimic small-scale commons, Dr. Richerson said, 20 to 30 percent have to be coerced by a threat of punishment to cooperate.

Fear alone is not highly likely to inspire cooperative behavior to the degree observed among humans. If research like Dr. Fehr's shows the stick side of the equation, the newest findings present the neural carrot — people cooperate because it feels good to do it.

In the new findings, the researchers studied 36 women from 20 to 60 years old, many of them students at Emory and inspired to participate by the promise of monetary rewards. The scientists chose an all-female sample because so few brain-imaging studies have looked at only women. Most have been limited to men or to a mixture of men and women.

But there is a vast body of non- imaging data that rely on using the Prisoner's

Dilemma.

"It's a simple and elegant model for reciprocity," said Dr. James K. Rilling, an author on the Neuron paper who is at Princeton. "It's been referred to as the E. coli of social psychology."

From past results, the researchers said, one can assume that neuro- imaging studies of men playing the game would be similar to their new findings with women.

The basic structure of the trial had two women meet each other briefly ahead of time. One was placed in the scanner while the other remained outside the scanning room. The two interacted by computer, playing about 20 rounds of the game. In every round, each player pressed a button to indicate whether she would "cooperate" or "defect." Her answer would be shown on-screen to the other player.

The monetary awards were apportioned after each round. If one player defected and the other cooperated, the defector earned $3 and the cooperator nothing. If both chose to cooperate, each earned $2. If both opted to defect, each earned $1.

Hence, mutual cooperation from start to finish was a far more profitable strategy, at $40 a woman, than complete mutual defection, which gave each $20.

The risk that a woman took each time she became greedy for a little bit more was that the cooperative strategy would fall apart and that both would emerge the poorer.

In some cases, both women were allowed to pursue any strategy that they chose. In other cases, the non- scanned woman would be a "confederate" with the researchers, instructed, unbeknown to the scanned subject, to defect after three consecutive rounds of cooperation, the better to keep things less rarefied and pretty and more lifelike and gritty.

In still other experiments, the woman in the scanner played a computer and knew that her partner was a machine. In other tests, women played a computer but thought that it was a human.

The researchers found that as a rule the freely strategizing women cooperated. Even occasional episodes of defection, whether from free strategizers or confederates, were not necessarily fatal to an alliance.

"The social bond could be reattained easily if the defector chose to cooperate in the next couple of rounds," another author of the report, Dr. Clinton D. Kilts, said, "although the one who had originally been `betrayed' might be wary from then on."

As a result of the episodic defections, the average per-experiment take for the participants was in the $30's. "Some pairs, though, got locked into mutual defection," Dr. Rilling said.

Analyzing the scans, the researchers found that in rounds of cooperation, two broad areas of the brain were activated, both rich in neurons able to respond to dopamine, the brain chemical famed for its role in addictive behaviors.

One is the anteroventral striatum in the middle of the brain right above the spinal cord. Experiments with rats have shown that when electrodes are placed in the striatum, the animals will repeatedly press a bar to stimulate the electrodes, apparently receiving such pleasurable feedback that they will starve to death rather than stop pressing the bar.

Another region activated during cooperation was the orbitofrontal cortex in the region right above the eyes. In addition to being part of the reward-processing system, Dr. Rilling said, it is also involved in impulse control.

"Every round, you're confronted with the possibility of getting an extra dollar by defecting," he said. "The choice to cooperate requires impulse control."

Significantly, the reward circuitry of the women was considerably less responsive when they knew that they were playing against a computer. The thought of a human bond, but not mere monetary gain, was the source of contentment on display.

In concert with the imaging results, the women, when asked afterward for summaries of how they felt during the games, often described feeling good when they cooperated and expressed positive feelings of camaraderie toward their playing partners.

Assuming that the urge to cooperate is to some extent innate among humans and reinforced by the brain's feel-good circuitry, the question of why it arose remains unclear. Anthropologists have speculated that it took teamwork for humanity's ancestors to hunt large game or gather difficult plant foods or rear difficult children. So the capacity to cooperate conferred a survival advantage on our forebears.

Yet as with any other trait, the willingness to abide by the golden rule and to be a good citizen and not cheat and steal from one's neighbors is not uniformly distributed.

"If we put some C.E.O.'s in here, I'd like to see how they respond," Dr. Kilts said. "Maybe they wouldn't find a positive social interaction rewarding at all."

A Prisoner's Dilemma indeed.

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