

Topic: Social cognition

Social decision making.

Article Discussed

Rilling, J. K., & Sanfey, A. G. (2011). The Neuroscience of Social Decision-Making. *Annual Review of Psychology*, *62*(1), 23–48. https://doi.org/10.1146/annurev.psych.121208.131647

Brief Summary

The article from week 14 looked at “The Neuroscience of Social Decision-Making” and essentially summarized research and knowledge about the neural systems influencing social decision-making. The class discussed various themes and ideas, including the experiments discussed in the article, particular those related to game theory. Question 29 involving the prisoners’ dilemma, which was unanswered during class time, came up and students speculated about the answer. Transcranial magnetic stimulation was briefly explained and discussed. The class also discussed whether testosterone levels decrease empathy and communicated about social decision-making in non-human species.

Cognitive process neuroimaging analysis

Neurosynth term: “social cognition”.

Top 5 Pubmed Articles

1: Patin A, Hurlemann R. Social cognition. Handb Exp Pharmacol. 2015;228:271-303. doi: 10.1007/978-3-319-16522-6_10. Review. PubMed PMID: 25977087.

2: Green MF, Horan WP, Lee J. Social cognition in schizophrenia. Nat Rev Neurosci. 2015 Oct;16(10):620-31. doi: 10.1038/nrn4005. Epub 2015 Sep 16. Review. PubMed PMID: 26373471.

3: Keech B, Crowe S, Hocking DR. Intranasal oxytocin, social cognition and neurodevelopmental disorders: A meta-analysis. Psychoneuroendocrinology. 2018 Jan;87:9-19. doi: 10.1016/j.psyneuen.2017.09.022. Epub 2017 Oct 8. Review. PubMed PMID: 29032324.

4: Ebert A, Brüne M. Oxytocin and Social Cognition. Curr Top Behav Neurosci. 2018;35:375-388. doi: 10.1007/7854_2017_21. Review. PubMed PMID: 29019100.

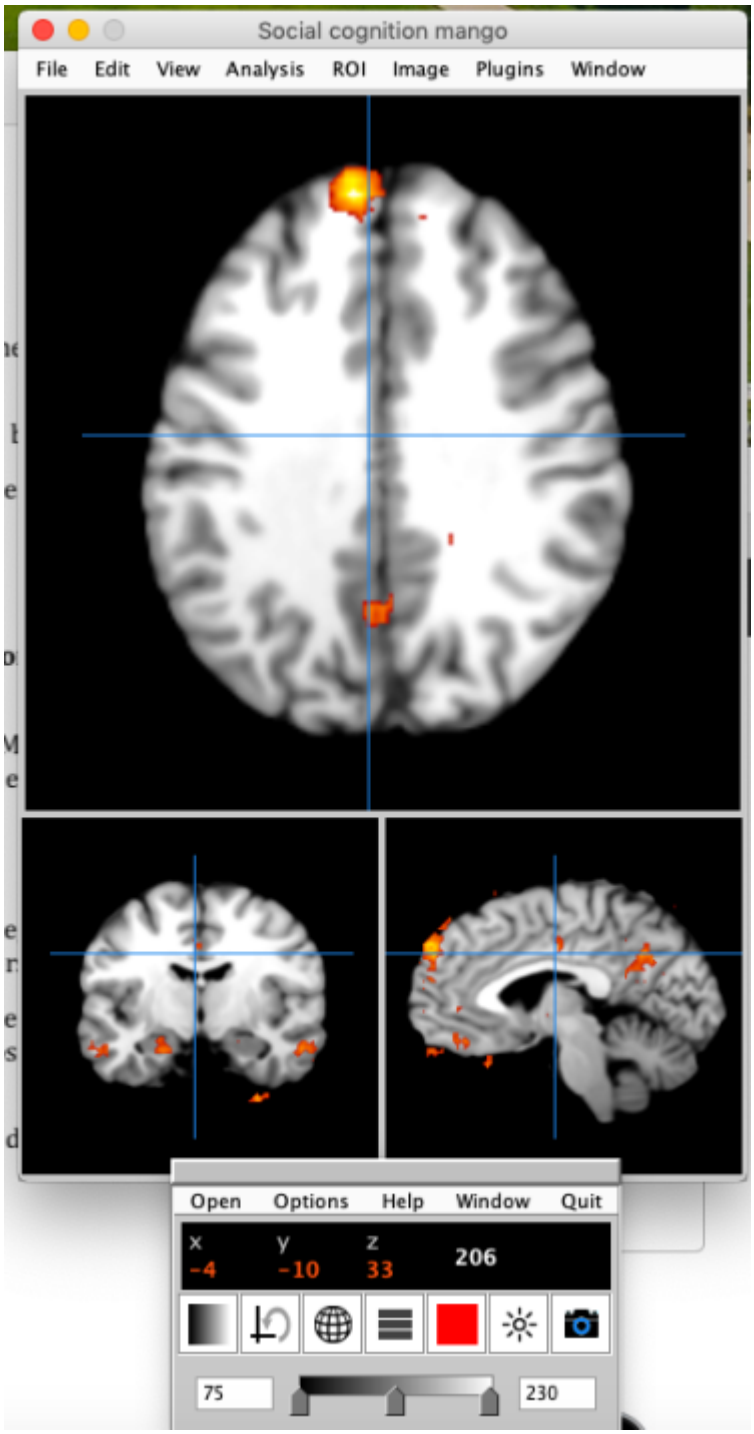
5: Happé F, Cook JL, Bird G. The Structure of Social Cognition: In(ter)dependence of Sociocognitive Processes. Annu Rev Psychol. 2017 Jan 3;68:243-267. doi: 10.1146/annurev-psych-010416-044046. Epub 2016 Sep 21. Review. PubMed PMID: 27687121.

Top 5 Neurosynth articles

Evidence of altered cortical and amygdala activation during social decision-making in schizophrenia.	**Baas D, Aleman A, Vink M, Ramsey NF, de Haan EH, Kahn RS**	**NeuroImage**	**0.314**

Social cognition and neural substrates of face perception: implications for neurodevelopmental and neuropsychiatric disorders.	**Lazar SM, Evans DW, Myers SM, Moreno-De Luca A, Moore GJ**	**Behavioural brain research**	**0.309**
Impaired neural processing of social attribution in anorexia nervosa.	**McAdams CJ, Krawczyk DC**	**Psychiatry research**	**0.306**
The selectivity and functional connectivity of the anterior temporal lobes.	**Simmons WK, Reddish M, Bellgowan PS, Martin A**	**Cerebral cortex (New York, N.Y. : 1991)**	**0.301**
Neural activity during emotion recognition after combined cognitive plus social cognitive training in schizophrenia.	**Hooker CI, Bruce L, Fisher M, Verosky SC, Miyakawa A, Vinogradov S**	**Schizophrenia research**	**0.293**

Neurosynth map for the term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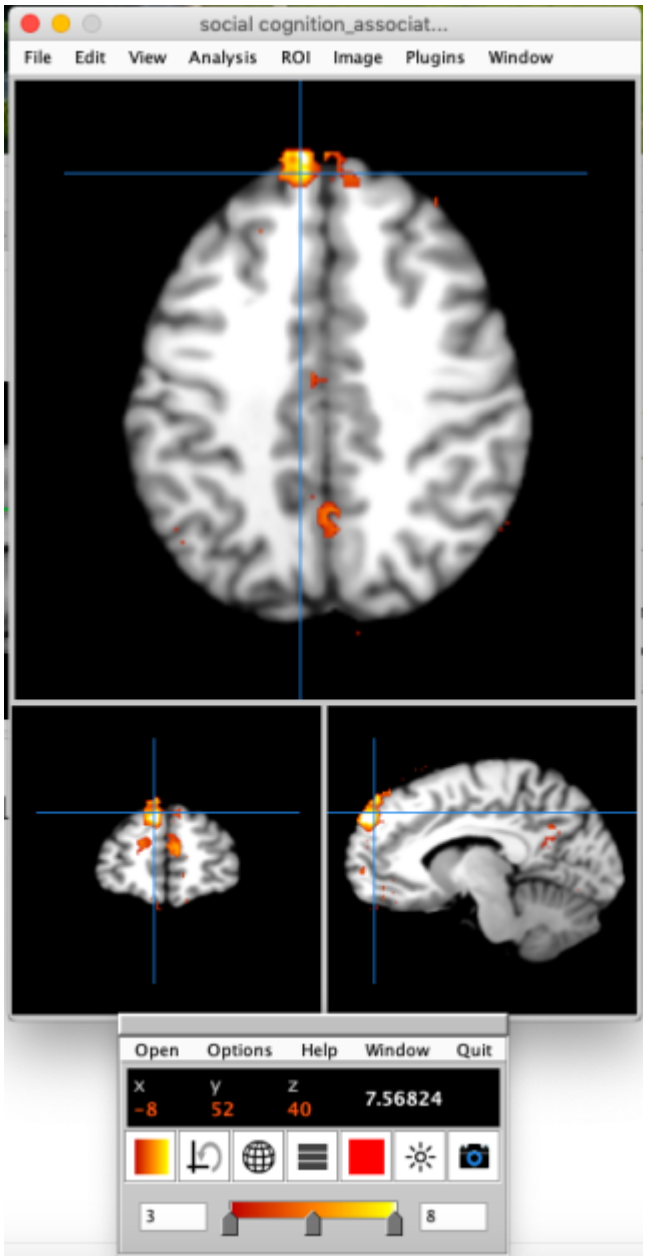
Brain region chosen for the term

Brain region: Dorsomedial prefrontal cortex



Other Neurosynth terms associated with this brain region

Name	z-score	Posterior prob.	Func. conn. (r)	Meta-analytic coact. (r)

medial prefrontal	9.54	0.81	0.51	0.48
medial	7.13	0.73	0.44	0.41
prefrontal	7.04	0.72	0.38	0.34
cortex mpfc	6.82	0.83	0.32	0.38
prefrontal cortex	6.39	0.7	0.34	0.32
mpfc	6.23	0.8	0.35	0.38
dorsomedial	5.5	0.8	0.26	0.38
social	5.08	0.7	0.34	0.3
emotional	4.73	0.68	0.17	0.14
dorsomedial prefrontal	4.65	0.8	0.26	

Questions posed by the class

Background vocabulary

Q: What is a social-emotional bias?

MileImport: An emotional bias is a distortion in cognition and decision-making due to emotional factors, which can be positive or negative dependent upon whatever emotion is invoked. There is also a magnitude of bias that is directly correlated to the magnitude of the emotion felt. There was not a lot of information regarding social-emotional bias, with the main resource on the phenomenon referring to social-emotional bias as emotional bias within the scope of social behaviors, often resulting in pro-social or anti-social behaviors.

Q: What is a somatic marker? (p. 33)

MobileSuper: Somatic markers are feelings in the body that are associated with emotions, such as the association of rapid heartbeat with anxiety or of nausea with disgust. According to the hypothesis, **somatic markers** strongly influence subsequent decision-making.
“Somatic Marker Hypothesis.”

Definitions of altruism and reciprocity

Q: What is altruism?

SodaOxford: Altruism is defined as the practice of unselfish concern for or devotion to the welfare of others. This is the opposite of egoism.

(“the definition of altruism,” n.d.)

CoolActive: Altruism is any behavior that is designed to increase another person’s welfare without providing a direct reward to the person performing the behavior. (“Understanding Altruism: Self and Other Concerns – Principles of Social Psychology – 1st International Edition,” n.d.)

Q: What exactly is altruistic punishment?

WelcomeSoda: According to the first website, “punishment is altruistic if it is costly for the punisher and if the punished person’s behavior changes such that others benefit.” This website particularly mentions that by this definition, motivation does not matter. If someone does not have selfless motivation, their act, or given punishment, can still be altruistic. The importance of motivation is highly debated in philosophy. In the scientific article, it is said that humans have a natural desire for order and altruistic punishment is usually for group survival. (Fowler, 2005)

Q: What are some examples of altruistic punishment?

IsotopeNirvana: Altruistic punishment is defined as the punishment of a transgressor by a third-party

that was not directly affected by the transgression. Some examples of this type of punishment would be the judicial process, arrests, and trials.(“Altruistic Punishment (SOCIAL PSYCHOLOGY) - IResearchNet,” n.d.)

Q: What is the difference between Altruism and Pro-social Behavior?

TwinNevada: Altruism is defined as behavior that benefits other organisms but has some costs. Altruism is often referred to as a behavior that is meant to benefit another person rather than oneself. On the other hand, prosocial behavior refers to acts intended to benefit others. These are acts that are positively valued by society. Prosocial behavior benefits others or has positive social consequences. (“New Page 1 - AP Psychology Community,” n.d.)

Q: What is reciprocal exchange?

PoloBravo: Reciprocal exchange in social psychology is a transfer of goods not involving the public market that is based on their social role in a group. It can involve 2 or more people. An example of this is the Kula Exchange, which takes place in the Trobriand Islands near Papua New Guinea. (“reciprocal exchange definition,” n.d.)

Q: Are there more studies on reciprocal altruism?

TelecomElegant: Although no study was conducted, the following article provides a great discussion regarding some of the misunderstandings they believe people have about reciprocal altruism. One interesting idea mentioned is how researchers fail to investigate kinship and reciprocity the same dependent on which is being studied. The authors note, “When testing for reciprocity, kinship is always controlled for (statistically or otherwise), while when testing for kinship, reciprocity is generally ignored.” (Schino & Aureli, 2010)

Q: In the article, they define altruism as doing something that benefits others at your own personal cost. I know there have been debates about whether true altruism exists. What are the more recent findings of whether it does exist or

not? If it does, what are some examples?

Although there have been no findings of 'true altruism,' there have been findings of reciprocal altruism and extreme altruism. Reciprocal altruism has been shown through FMRI studies to exist in the caudate nucleus and the orbitofrontal cortex (Rilling et al. 2002, 2004b). These studies were conducted on humans who engaged in the Prisoner's Dilemma and other related trust games.

The best article I found in relation to true altruism was called *Risking Your Life without a Second Thought: Intuitive Decision-Making and Extreme Altruism.* Extreme altruism was displayed by Carnegie Hero Medal Recipients (CHMRs), people who risked their lives to save others. Rand and Epstein collected data from published interviews of these recipients in the USA and Canada. They "extracted all quoted material spoken directly by the CHMR in which they described the decision-making process involved in their altruistic activity (i.e. *why* they did what they did)". Some examples include "Christine Marty, a 21 year college student, rescued a drowning 69-year-old trapped in a car during a flash flood, and stated "I'm thankful I was able to act and not think about it." Daryl Starnes, a 70-year-old man, climbed into a burning vehicle to rescue a 48-year-old woman trapped inside after a car accident, and stated "I just did what I felt like I needed to do. You don't think about someone making that big a deal out of it."" What they found was that the CHMR's reacted immediately to the situation indicating that their response was an intuitive response, not a deliberate response. After reading this, it makes me question if there is a definitional difference between extreme altruism and true altruism. To me, I believe they are the same and yes, it exists.

Game theory and altruism

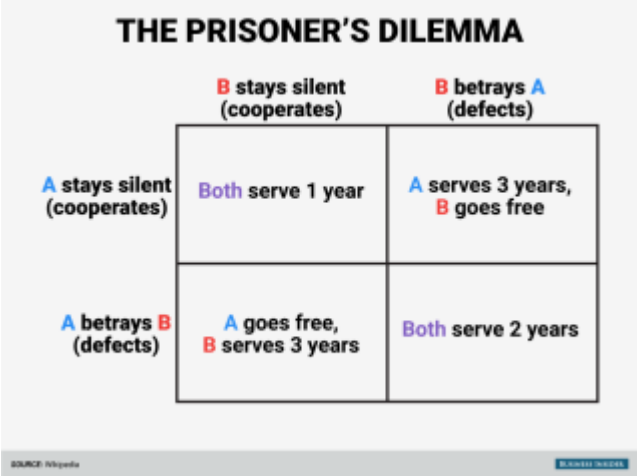
Q: Why are reciprocal altruism relationships said to be 'inherently unstable?

ShelfOpus: This article argues that "reciprocity is a basic mechanism facilitating cooperation, we can expect interaction that evolves around it to be complex, non-optimal, and resistant to change." The problem with reciprocal altruism is that is assumes that preferences stay the same and do not vary. Therefore, reciprocal mechanisms can exploit cooperators by those with whom they have coordinated on reciprocity. (Danielson, 2002)

Q: Can we clarify what game theory is again? How does it relate to the article

from this week?

RespondLlama: game theory offers insights into economic, political and social situations involving individuals who have different goals. It is assumed that the individuals in game theory are rational (individual makes decisions consistently in pursuit of own objectives) and intelligent. Game theory is related to utility scale which is how this article relates.



Game theory - prisoner's dilemma is an example. Shows how two individuals decisions/actions impact each other based on their goals. (Myerson, 2013)

Q: Can game theory be applied to every decision made?

ZeroCanary: no because not every decision requires difficult decision making. Some decisions are obvious and do not require the game theory approach. Example being if you are a vegetarian and are offered chicken for dinner, the decision takes no time at all to react negatively to the chicken.

Q: We played a game similar to the PD game in a large Intro to World Politics class. We played three rounds. If you both cooperated you received a B. If you both defected you got Cs. If one defected and one cooperated, the defector got an A and the cooperator got an F. By the last round, almost everyone defected. In the article it says about 50% defect. Why did more defect in my class? Could it be related to size, since the class was so large people were able to dehumanize their opponent more? Or do you think it was something else like

pressure from the professor or the type of people in the class etc.

. This was my question and my class. In the PD game, rewards depend on the interaction of players. A player is rewarded the most when they defect and the other player cooperates and has the worst payoff when they cooperate and the other defects. When both cooperate both players receive some reward, and when both defect both receive slightly less reward (Rilling & Santey, 2011). In class we played three rounds. If you both cooperated you received a B. If you both defected you got Cs. If one defected and one cooperated, the defector got an A and the cooperator got an F. This is congruent with the standard PD game.

In class, by the third round, almost everyone defected. At first, though, there was slightly more cooperation. This is consistent with findings that show that although cooperation is usually around 50% during the first round, trust often breaks down during the final rounds of a game. This is explained by arguing that early trust and cooperation is strategic, and that benefits disappear towards the end of interaction (Camerer, 2003).

Under many experimental conditions cooperation decreases over time, however, under certain conditions cooperation may remain high (Oskamp & Perlman, 1965). In one article about games used to teach International Relations, participants were given the option to vote people out of the game. Defectors were voted out and the remaining players all cooperated (Asal, 2005).

Other factors affecting cooperation in the PD game include socialization before and during the experiment (increasing cooperation) and the size of the university and classes where the subjects are from (larger sizes indicating less cooperation)(Oskamp & Perlman, 1965). Because the class was a large lecture course within a large university many of the students never socialized before the PD game. These factors likely all contributed to the low cooperation levels. During the second round of the game, participants were given a chance to socialize and levels of cooperation were slightly higher.

The framing of the game also likely influenced the results. Smaller psychology courses in which participants were aware of the theories behind the experiment resulted in higher levels of cooperation. Cooperation has also been shown to be higher when the norm of cooperation was stated as desirable, and when participants publicly disagreed with the competitive norm (Oskamp & Perlman, 1965). In our large International Studies course, we were learning about defection and how common and likely it is. Therefore, the competitive norm was reinforced, likely resulting in higher defection rates. Personality types are also shown to affect cooperation levels (Terhune, 1968). Perhaps certain types of personalities are more likely to take International Study courses.

So, there was likely a number of factors influencing the high defection rates in the International Studies course. Some of these most likely included that cooperation often decreases towards later trials, that defection did not involve many negative consequences, the lack of socialization of subjects, the large size of the class and university, the lack of knowledge of related psychological theories, the reinforcement of the competitive norm, and personality type.

Transcranial Magnetic Stimulation (TMS)

Q: Can someone explain how transcranial magnetic stimulation works?

PaintLevel: Transcranial magnetic stimulation (TMS) is a research tool that initiates current flow in the brain that can temporarily excite or inhibit focal brain regions by delivering an electric stimulus into a magnetic field created by a previously introduced magnetic coil. Stimulation to the motor cortex, for example, can result in a finger twitch. (Hallett, 2000)

Q: What is rTMS?

SincereZigzag:

- Repetitive transcranial magnetic stimulation
- Neuroimaging can only establish the association between task performance and a pattern of cortical activation. In contrast, by transiently disrupting the function of a targeted cortical region, rTMS allows one to test the causal link between activity in that region and task performance. This technique essentially creates a temporary, reversible “lesion”; this lesion need only be severe enough to produce observable decrements in performance.

(Kosslyn et al., 1999, p. 1)

Q: What parts of the brain are activated in social versus nonsocial rewards scenarios?

ExactTulip: “A common neural structure observed in studies involving social and non-social reinforcers is the human striatum – the input unit of the basal ganglia and a region that, due to its heterogeneity in terms of anatomical connectivity and involvement in distinct, but parallel processes (e.g., affective, cognitive, motor 1, 4), is in a prime position to influence learning and decision-making in a social context. Here we review ongoing research suggesting that signals in the human striatum are relevant to social information processing, including the processing of social factors that influence how we value experiences, learn from them, and make decisions (Bhanji & Delgado, 2014).”

-This article suggests that both social and non-social rewards are essentially derived from the same main

portions of the brain, with the striatum having the largest known influence. Due to the striatum having a large role in repetitive behavior, it is also known to have a large influence in contributing to conditions such as substance addiction, this indicates a correlation between the rewards people may receive from a substance and social rewards such as praise of recognition.

Sex hormones and empathy

Q: How can we naturally increase oxytocin (OT) levels in order to thereby increase empathy?

WindowComrade: Two of the easiest ways to increase oxytocin levels are to engage in positive conversation and physical contact. According to wikiHow, being more compassionate to those closest to you can increase oxytocin levels. Giving compliments, encouragement, and focusing on positive reinforcement are other ways of naturally increasing oxytocin levels. Any form of positive social interaction seems to be the most effective way of naturally increasing oxytocin levels. (“How to Naturally Increase Oxytocin Levels,” n.d.)

Q: Are men naturally less empathetic due to higher levels of testosterone?

PolarisUnique: “Led by scientists from Utrecht University, the researchers sought to build on previous studies in which women were found to outperform men on tasks designed to measure empathetic capabilities. During these studies, participants were subjected to the Reading the Mind in Eyes Tests (RMET), in which the emotions and motives of others must be determined simply by looking at a picture of their eyes.

Suspecting that testosterone may have been responsible for the inferior performance of males when conducting this test, the researchers set up a new experiment to measure how the hormone influences success rates, while tracking its effects on the brain.

Recruiting a group of 16 female volunteers, the study authors used functional magnetic resonance imaging (fMRI) to measure their brain activity as they performed the RMET. In doing so, they discovered that a brain region called the inferior frontal gyrus (IFG) became specifically activated whenever they were required to associate an emotion with an image, suggesting that it plays a primary role in empathizing with others_social.

Following this, half of the participants were orally administered a large dose of testosterone in order to

temporarily elevate their blood levels of the hormone by a factor of ten, while the other half received a placebo.

Upon repeating the RMET, those who had received testosterone took significantly longer to identify the emotions being expressed in the pictures than those who had received the placebo, indicating that the hormone did indeed impair their capacity for empathy.(“Testosterone Decreases The Ability To Feel Empathy By Interrupting Brain Networks,” n.d.)”

Cortical regions associated with social decision making

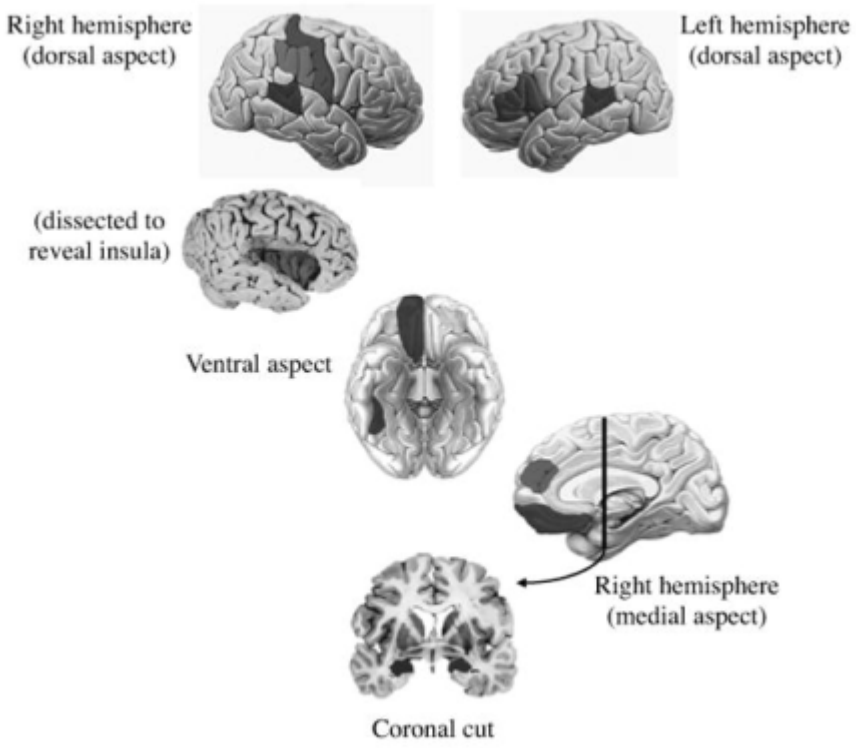
Q: Do people with psychosocial disorders have damage to their anterior insula?

SOCIALANVIL: In one research paper I found, they were examining borderline personality disorder and anger-related aggression. They were looking at how different neural systems work to control or not control BPD. This study was done in 33 women with BPD as well as healthy controls. The overall finding from the research was the discovery of a single, large network showing a significantly stronger increase in connectivity from baseline to the aggression phase in female patients with BPD compared to healthy women. This network consisted of regions in the anterior and posterior cingulate cortex, precuneus, dorsomedial prefrontal cortex, superior and middle temporal gyrus, hippocampus, insula, ventrolateral and dorsolateral prefrontal cortex, superior parietal lobe, thalamus, precentral and postcentral gyrus, caudate, pallidum, cerebellum, middle occipital lobe, lingual gyrus, calcarine sulcus, and fusiform gyrus. Therefore, from this research, I would likely answer yes to this question of whether or not people with psychosocial disorders have damage to their anterior insula. (Ueltzhöffer, Herpertz, Krauch, Schmahl, & Bertsch, 2019)

Q: Is the prefrontal cortex the only brain area that plays a role in social decision-making?

Optiontample: no

(Adolphs, 2009)



Facial expressions

Q: What facial characteristics are associated with trustworthiness?

RavioliJaguar: Facial expressions can be potent signs during social interactions. In this paper by Campelllone and Kring, they examine the facial expressions congruent and incongruent during Trust Game. In situations where smiling and laughter were noted, both players were noted to act more trusting while in situations where no emotions are angry facial expressions were present participants were less likely to trust. This study found that though both angry and happy emotions trigger the amygdala to process affective information and decision making, anger habituates the potential “threat” to safety causing the participants to trust less. (Campellone & Kring, 2013)

Altruism in non-human animals

Q: Are there examples of altruism in animals in which its not extended to relatives?

VideoSport: Yes. A number of species have been shown to commit acts of altruism to animals not related to them("Is Animal Altruism Real?," 2013). Humpback whales have saved seals from killer whales and rats will save unrelated rats who are trapped even if they lose food doing so. There are examples of Bonobos and apes helping unrelated others as well. Scientists believe this may be because high level cognition involving thoughts of morality is not what motivates altruism but rather emotional instincts related to empathy("Animal Altruism").

Q: According to the article, humans, to a greater extent than other animals, learn from others. Why is this the case?

DivideSegment: Humans have a large dependency on others for information. Humans have more advanced brains than animals, they intelligently learn as children from social information and situations. (Koenig & Sabbagh, 2013)

Q: The paper states that primates who share and have strong social associations have larger prefrontal cortices. Do pack animals (wolves/ dogs) also have this similarity, or is that something different?

AmbientBenefit: Basically, research from animals doesn't show so much that size impacts social associations but it does show that prefrontal cortices are involved in social motivation. The PFC is shown to work with other areas of the brain like the NAc (nucleus accumbens) and VTA (ventral tegmental area). The article mostly focuses on rodents, and states that "Lesions of regions within the rodent PFC have demonstrated its' importance in social functioning." The review shows a lot of studies that show that PFC is activated during mice social interaction, and it parallels this with disorders in humans and looks at similarities and differences. (Bicks, Koike, Akbarian, & Morishita, 2015)

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