Abstracts of Papers on Empathy

Cultural influences on neural basis of intergroup empathy.

Bobby K Cheon, Dong-Mi Im, Tokiko Harada, Ji-Sook Kim, Vani A Mathur, Jason M Scimeca, Todd B Parrish, Hyun Wook Park, Joan Y Chiao (2011)
NeuroImage 57 (2) p. 642-650

Cultures vary in the extent to which people prefer social hierarchical or egalitarian relations between individuals and groups. Here we examined the effect of cultural variation in preference for social hierarchy on the neural basis of intergroup empathy. Using cross-cultural neuroimaging, we measured neural responses while Korean and American participants observed scenes of racial ingroup and outgroup members in emotional pain. Compared to Caucasian-American participants, Korean participants reported experiencing greater empathy and elicited stronger activity in the left temporo-parietal junction (L-TPJ), a region previously associated with mental state inference, for ingroup compared to outgroup members. Furthermore, preferential reactivity within this region to the pain of ingroup relative to outgroup members was associated with greater preference for social hierarchy and ingroup biases in empathy. Together, these results suggest that cultural variation in preference for social hierarchy leads to cultural variation in ingroup-preferences in empathy, due to increased engagement of brain regions associated with representing and inferring the mental states of others.

Empathy: A Social Cognitive Neuroscience Approach

Lian T Rameson, Matthew D Lieberman (2009)
Social and Personality Psychology Compass 3 (1) p. 94-110

There has been recent widespread interest in the neural underpinnings of the experience of empathy. In this review, we take a social cognitive neuroscience approach to understanding the existing literature on the neuroscience of empathy. A growing body of work suggests that we come to understand and share in the experiences of others by commonly recruiting the same neural structures both during our own experience and while observing others undergoing the same experience. This literature supports a simulation theory of empathy, which proposes that we understand the thoughts and feelings of others by using our own mind as a model. In contrast, theory of mind research suggests that medial prefrontal regions are critical for understanding the minds of others. In this review, we offer ideas about how to integrate these two perspectives, point out unresolved issues in the literature, and suggest avenues for future research.

An integrated view of empathy: psychology, philosophy, and neuroscience.

Hisashi Nakao, Shoji Itakura (2009)
Integrative psychological behavioral science 43 (1) p. 42-52

In this paper, we will examine and untangle a conflict mainly between a developmental psychologist, Martin Hoffman and a social psychologist, Daniel Batson. According to Hoffman, empathic distress, a vicarious feeling through empathy, is transformed into an altruistic motivation. Batson and others on the other hand, criticize Hoffman, claiming that empathic altruism has no relation with empathic distress. We will point out some problems with Batson's position by referring to the results of fMRI experiments that suggest empathic distress and empathic altruism share a common basis, and defend Hoffman's argument. This will also offer new insights into the evolution of empathy.

The neurodevelopment of empathy in humans.

Decety, J. (2010). Developmental Neuroscience, 32(4), 257-267.

Empathy, which implies a shared interpersonal experience, is implicated in many aspects of social cognition, notably prosocial behavior, morality and the regulation of aggression. The purpose of this paper is to critically examine the current knowledge in developmental and affective neuroscience with an emphasis on the perception of pain in others. It will be argued that human empathy involves several components: affective arousal, emotion understanding and emotion regulation, each with different developmental trajectories. These components are implemented by a complex network of distributed, often recursively connected, interacting neural regions including the superior temporal sulcus, insula, medial and orbitofrontal cortices, amygdala and anterior cingulate cortex, as well as autonomic and neuroendocrine processes implicated in social behaviors and emotional states. Decomposing the construct of empathy into subcomponents that operate in conjunction in the healthy brain and examining their developmental trajectory provides added value to our current approaches to understanding human development. It can also benefit our understanding of both typical and atypical development.

The neural bases of empathic accuracy.

Zaki, J., Weber, J., Bolger, N., & Ochsner, K. (2009). Proceedings of the National Academy of Sciences, 106(27), 11382-11387.

Theories of empathy suggest that an accurate understanding of another's emotions should depend on affective, motor, and/or higher cognitive brain regions, but until recently no experimental method has been available to directly test these possibilities. Here, we present a functional imaging paradigm that allowed us to address this issue. We found that empathically accurate, as compared with inaccurate, judgments depended on (i) structures within the human mirror neuron system thought to be involved in shared sensorimotor representations, and (ii) regions implicated in mental state attribution, the superior temporal sulcus and medial prefrontal cortex. These data demostrate that activity in these 2 sets of brain regions tracks with the accuracy of attributions made about another's internal emotional state. Taken together, these results provide both an experimental approach and theoretical insights for studying empathy and its dysfunction.

Neural basis of extraordinary empathy and altruistic motivation.

Mathur, V. A., Harada, T., Lipke, T., & Chiao, J. Y. (2010). NeuroImage, 51(4), 1468-1475.

A central evolutionary challenge for social groups is uniting a heterogeneous set of individuals towards common goals. One means by which social groups form and endure is by endowing group members with extraordinary prosocial proclivities, such as ingroup love, towards other group members. Here we examined the neural basis of extraordinary empathy and altruistic motivation in African-American and Caucasian-American individuals using functional magnetic resonance imaging. Our results indicate that empathy for ingroup members is neurally distinct from empathy for humankind, more generally. People showed greater response within anterior cingulate cortex and bilateral insula when observing the suffering of others, but African-American individuals additionally recruit medial prefrontal cortex when observing the suffering of members of their own social group. Moreover, neural activity within medial prefrontal cortex in response to pain expressed by ingroup relative to outgroup members predicted greater empathy and altruistic motivation for one's ingroup, suggesting that neurocognitive processes associated with self identity underlie extraordinary empathy and altruistic motivation for members of one's own social group. Taken together, our findings reveal distinct neural mechanisms of empathy and altruistic motivation in an intergroup context and may serve as a foundation for future research investigating the neural bases of intergroup prosociality, more broadly construed.

A social-neuroscience perspective on empathy.

Decety, J., & Jackson, P. L. (2006). Current Directions in Psychological Science, 15(2), 54-58.

In recent years, abundant evidence from behavioral and cognitive studies and functional-imaging experiments has indicated that individuals come to understand the emotional and affective states

expressed by others with the help of the neural architecture that produces such states in themselves. Such a mechanism gives rise to shared representations, which constitutes one important aspect of empathy, although not the sole one. We suggest that other components, including people's ability to monitor and regulate cognitive and emotional processes to prevent confusion between self and other, are equally necessary parts of a functional model of empathy. We discuss data from recent functional-imaging studies in support of such a model and highlight the role of specific brain regions, notably the insula, the anterior cingulate cortex, and the right temporo-parietal region. Because this model assumes that empathy relies on dissociable information-processing mechanisms, it predicts a variety of structural or functional dysfunctions, depending on which mechanism is disrupted.

Neural correlates of feeling sympathy.

Jean Decety, Thierry Chaminade (2003)
Neuropsychologia 41 (2) p. 127-38

Positron emission tomography (PET) was used to investigate the neural correlates of feeling sympathy for someone else (i.e. the affinity, association, or relationship between persons wherein whatever affects one similarly affects the other). While undergoing PET scans, subjects were presented with a series of video-clips showing individuals (who were semi-professional stage actors) telling sad and neutral stories, as if they had personally experienced them. These stories were told with either congruent or incongruent motor expression of emotion (MEE). At the end of each movie, subjects were asked to rate the mood of the communicator and also how likable they found that person. Watching sad stories versus neutral stories was associated with increased activity in emotion processing-related structures, as well as in a set of cortical areas that belong to a "shared representation" network, including the right inferior parietal cortex. Motor expression of emotion, regardless of the narrative content of the stories, resulted in a specific regional cerebral blood flow (rCBF) increase in the left inferior frontal gyrus. The condition of mismatch between the narrative content of the stories and the motor expression of emotion elicited a significant skin conductance response and strong rCBF increase in the ventromedial prefrontal cortex and superior frontal gyrus which are involved in dealing with social conflict. Taken together, these results are consistent with a model of feeling sympathy that relies on both the shared representation and the affective networks. Interestingly, this network was not activated when subjects watched inappropriate social behavior.

Social neuroscience approaches to interpersonal sensitivity.

Jean Decety, C Daniel Batson (2007)
Social neuroscience 2 (3-4) p. 151-7

Interpersonal sensitivity refers to our ability to perceive and respond with care to the internal states (e.g., cognitive, affective, motivational) of another, understand the antecedents of those states, and predict the subsequent events that will result. This special issue brings together new research findings from empirical studies, including work with adults and children, genetics, functional neuroimaging, individual differences, and behavioral measures, which examine how we process and respond to information about our fellow individuals. By combining biological and psychological approaches, social neuroscience sheds new light on the complex and multi-faceted phenomenon of interpersonal sensitivity, including empathy. One should, however, be aware of the challenges and limits of such an approach.

The compassionate brain: humans detect intensity of pain from another's face.

Miiamaaria V Saarela, Yevhen Hlushchuk, Amanda C De C Williams, Martin Schürmann, Eija Kalso, Riitta Hari (2007)
Cerebral cortex (New York, N.Y. : 1991) 17 (1) p. 230-7

Understanding another person's experience draws on "mirroring systems," brain circuitries shared by the subject's own actions/feelings and by similar states observed in others. Lately, also the experience of pain has been shown to activate partly the same brain areas in the subjects' own and in the observer's brain. Recent studies show remarkable overlap between brain areas activated when a subject undergoes painful sensory stimulation and when he/she observes others suffering from pain. Using functional magnetic resonance imaging, we show that not only the presence of pain but also the intensity of the observed pain is encoded in the observer's brain-as occurs during the observer's own pain experience. When subjects observed pain from the faces of chronic pain patients, activations in bilateral anterior insula (AI), left anterior cingulate cortex, and left inferior parietal lobe in the observer's brain correlated with their estimates of the intensity of observed pain. Furthermore, the strengths of activation in the left AI and left inferior frontal gyrus during observation of intensified pain correlated with subjects' self-rated empathy. These findings imply that the intersubjective representation of pain in the human brain is more detailed than has been previously thought.

Putting the altruism back into altruism: the evolution of empathy.

Frans B M de Waal (2008)
Annual review of psychology 59 p. 279-300

Evolutionary theory postulates that altruistic behavior evolved for the return-benefits it bears the performer. For return-benefits to play a motivational role, however, they need to be experienced by the organism. Motivational analyses should restrict themselves, therefore, to the altruistic

impulse and its knowable consequences. Empathy is an ideal candidate mechanism to underlie so-called directed altruism, i.e., altruism in response to anothers's pain, need, or distress. Evidence is accumulating that this mechanism is phylogenetically ancient, probably as old as mammals and birds. Perception of the emotional state of another automatically activates shared representations causing a matching emotional state in the observer. With increasing cognition, state-matching evolved into more complex forms, including concern for the other and perspective-taking. Empathy-induced altruism derives its strength from the emotional stake it offers the self in the other's welfare. The dynamics of the empathy mechanism agree with predictions from kin selection and reciprocal altruism theory.

The neural substrate of human empathy: effects of perspective-taking and cognitive appraisal.

Lamm, C., Batson, C. D., & Decety, J. (2007). Journal of Cognitive Neuroscience, 19(1), 42-58.

Whether observation of distress in others leads to empathic concern and altruistic motivation, or to personal distress and egoistic motivation, seems to depend upon the capacity for self-other differentiation and cognitive appraisal. In this experiment, behavioral measures and event-related functional magnetic resonance imaging were used to investigate the effects of perspective-taking and cognitive appraisal while participants observed the facial expression of pain resulting from medical treatment. Video clips showing the faces of patients were presented either with the instruction to imagine the feelings of the patient ("imagine other") or to imagine oneself to be in the patient's situation ("imagine self"). Cognitive appraisal was manipulated by providing information that the medical treatment had or had not been successful. Behavioral measures demonstrated that perspective-taking and treatment effectiveness instructions affected participants' affective responses to the observed pain. Hemodynamic changes were detected in the insular cortices, anterior medial cingulate cortex (aMCC), amygdala, and in visual areas including the fusiform gyrus. Graded responses related to the perspective-taking instructions were observed in middle insula, aMCC, medial and lateral premotor areas, and selectively in left and right parietal cortices. Treatment effectiveness resulted in signal changes in the perigenual anterior cingulate cortex, in the ventromedial orbito-frontal cortex, in the right lateral middle frontal gyrus, and in the cerebellum. These findings support the view that humans' responses to the pain of others can be modulated by cognitive and motivational processes, which influence whether observing a conspecific in need of help will result in empathic concern, an important instigator for helping behavior.

Neural correlates of admiration and compassion.

Mary Helen Immordino-Yang, Andrea McColl, Hanna Damasio, Antonio Damasio (2009)

Proceedings of the National Academy of Sciences of the United States of America 106 (19) p. 8021-6

In an fMRI experiment, participants were exposed to narratives based on true stories designed to evoke admiration and compassion in 4 distinct categories: admiration for virtue (AV), admiration for skill (AS), compassion for social/psychological pain (CSP), and compassion for physical pain (CPP). The goal was to test hypotheses about recruitment of homeostatic, somatosensory, and consciousness-related neural systems during the processing of pain-related (compassion) and non-pain-related (admiration) social emotions along 2 dimensions: emotions about other peoples' social/psychological conditions (AV, CSP) and emotions about others' physical conditions (AS, CPP). Consistent with theoretical accounts, the experience of all 4 emotions engaged brain regions involved in interoceptive representation and homeostatic regulation, including anterior insula, anterior cingulate, hypothalamus, and mesencephalon. However, the study also revealed a previously undescribed pattern within the posteromedial cortices (the ensemble of precuneus, posterior cingulate cortex, and retrosplenial region), an intriguing territory currently known for its involvement in the default mode of brain operation and in self-related/consciousness processes: emotions pertaining to social/psychological and physical situations engaged different networks aligned, respectively, with interoceptive and exteroceptive neural systems. Finally, within the anterior insula, activity correlated with AV and CSP peaked later and was more sustained than that associated with CPP. Our findings contribute insights on the functions of the posteromedial cortices and on the recruitment of the anterior insula in social emotions concerned with physical versus psychological pain.

On the neural networks of empathy: A principal component analysis of an fMRI study.

Jason S Nomi, Dag Scherfeld, Skara Friederichs, Ralf Schäfer, Matthias Franz, Hans-Jörg Wittsack, Nina P Azari, John Missimer, Rüdiger J Seitz (2008)
Behavioral and brain functions : BBF 4 p. 41