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Opinion Article

Function of Neural Circuits in Empathic Brain

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DESCRIPTION

Neuroscientists have started to explain the neurobiological foundations of empathy. According to functional neuroimaging studies, imaging emotional experiences from our own and someone else's perspectives produces identical psychophysiological reactions and brain stimulation patterns.

The process of empathic discomfort, also known as emotional suffering, may have a role in the development of prosocial behaviour. Furthermore, the expression of suffering sends a vital signal to others, motivating actions such as care for a distressed individual. Pain's affective experience signals an adverse condition and prompts activity such as ending or reducing exposure to the source that caused the aversive state in the first place.

As a result, researchers frequently employ the perception and experience of pain as a helpful and ecologically realistic way to examine the sense of empathy.

The majority of empathy research has focused on pain empathy and how different factors influence its experience and behavioural displays. Various functional neuroimaging investigations have revealed that similar brain areas are active during personal pain experiences and when attending to the pain of others. The Anterior Insula (AIC), anterior mid and dorsal Anterior Cingulate Cortex (ACC), and Periaqueductal Grey (PAG) are among these areas. Participants were scanned during one Functional Magnetic Resonance Imaging (fMRI) experiment while feeling a moderately painful pinprick stimulus to the fingertips and another while watching another person's hand endure identical stimulation. Increased activity in the right dorsal ACC was observed in both situations. Another fMRI study with healthy volunteers found that the dorsal ACC, the AIC, the cerebellum, and the brain stem were active both when the subjects were exposed to a painful stimuli and when they witnessed another person being exposed to the same stimulus. Only the actual feeling of pain, however, activated the somatosensory cortex and a more ventral part of the ACC.

Additionally, these results are supported by two other fMRI studies. Participants were scanned while getting painful thermal stimulation (self-pain condition) or watching short videos of others undergoing painful stimulation in a study (other pain condition).

The researchers used connection studies to find areas whose activity correlated with ACC and AI activity during self or other pain, either over time (intra-individual connectivity) or between persons (inter-individual connectivity) (inter-individual connectivity). When comparing self-pain to other pain, both connectivity studies indicated clusters in the midbrain and periaqueductal grey with increased connectivity to the AI. Using both forms of research, the dorsal medial prefrontal cortex was revealed to have greater connection to the ACC and AI during other pain than during self-pain. Regions in the superior temporal sulcus, posterior cingulate, and precuneus became more connected to ACC during other pain than during self-pain, according to intra-individual connectivity analyses. These and other findings reveal that different brain networks are linked to ACC and AI in reaction to personal pain experiences and observing other individuals in distress.

CONCLUSION

Because of its role in prosocial conduct and moral development, empathy is an important human ability. Empathic deficits, particularly affective empathy, are regarded to play a key role in psychopathic personality. Empathetic abilities have typically been investigated using behavioural methods in the social and behavioural sciences, but recent neuroscience research has begun to provide light on the brain basis of empathic processing in connection to psychopathy.

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