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Title:	Comparing amygdala connectivity between monkeys, apes, and humans using diffusion tensor imaging
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Objective: The amygdala is a group of separate but functionally related nuclei involved in perceiving and responding to emotional stimuli. Accordingly, it makes white matter connections with a wide range of brain areas, including areas of sensory cortex, brainstem, hypothalamus, and prefrontal cortex. In humans, orbitofrontal input to the amygdala may provide top-down inhibition of emotional reactions. The objective of this study was to investigate possible human specializations for emotion regulation by comparing amygdala connectivity between humans, chimpanzees, bonobos, gorillas and macaques, using diffusion tensor imaging (DTI).
Methods: In vivo human and chimpanzee scans were acquired using EPI protocols. Post-mortem bonobo, chimpanzee, gorilla and macaque scans were acquired using a spin-echo technique. In all subjects, the FSL DTI software package was used to generate color maps illustrating the principal diffusion direction and perform probabilistic tractography on white matter connections from the entire amygdala. In addition, probabilistic cytoarchitectonic maps (Amunts et al., 2005) were used to identify the laterobasal, centromedial, and superficial groups in human subjects, and connections from these areas were tracked individually. In human subjects, a group analysis was performed to determine the amount of overlap across subjects at different probability threshold values.
Results: The human group analysis revealed voxels with consistently high probability of connectivity with the amygdala, including the stria terminalis, amygdalofugal pathway, and connections to orbitofrontal cortex. The laterobasal group was found to have strong connections with sensory areas, including cortex of the ventral visual stream, while the centromedial group connected heavily with the brainstem and hypothalamus. Non-human primate tractography results were compared with these human results to reveal both similarities and differences.
Conclusions: DTI probabilistic tractography of amygdala connectivity yielded results consistent with published experimental tract-tracing studies in nonhuman primates, and suggests that comparative DTI studies can be used to identify evolutionary modifications of this system.

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