

Title

The Effects of Cognitive Behavioral Therapy on White Matter in the Human Brain as Measured by Diffusion Tensor Magnetic Resonance Imaging

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Abstract

Psychotherapy may change our ways of thinking, feeling and behaving. It can also change our perception of pain. Using fMRI, we have previously documented that there are differences between the brains of healthy volunteers and chronic pain patients in both gray matter structure and neural function, and further that these differences are attenuated after as little as three months of cognitive behavioral therapy (CBT). The present study examines whether white matter also changes as a result of clinical intervention. It is our hypothesis that the observed structural and functional changes will correlate with corresponding changes in white matter, as measured by Diffusion Tensor Imaging (DTI). Specifically, we expect to see increased fractional anisotropy between areas of gray matter that show changes in cortical volume or functional activity after CBT. Our preliminary statistical analysis, which has focused on only a percentage of the white matter tracts that we plan to investigate and utilized only a portion of the statistical tools that we intend to apply, suggests a significant increase in fractional anisotropy in the right anterior cingulum bundle. We consider this to be an important finding because the fibers of the cingulum originate in the cingulate gyrus, a region that projects to the amygdala and insula, and is known to play an important role in both emotion and sensation of pain. These results suggest that CBT influences not only gray matter structure and function but may also influence white matter in the brains of patients with chronic musculoskeletal pain.