Substantial pain management research is aimed at minimizing the pain felt by cancer patients. However, much basic knowledge about areas of the brain involved in the processing of pain is lacking. Recent PET studies have indicated four major areas of the brain are involved in the perception of pain. The present studies used fMRI to map brain areas that were activated in response to a painful stimulus, and to examine the modulation of the volumes of the activated areas by non-pharmacological intervention. Eight normal subjects were examined, with the painful stimulus applied to the finger with a pressure algometer. There were three runs per subject. First, the subjects were instructed to imagine the non-weighted algometer as painful. In the second and third runs the weighted stimulus was applied concurrent with auditory cues that had the subject either focus on the pain ("toward state") or distract themselves from the pain ("away state"). Activation maps were generated using cross-correlation analysis. The maps for the eight subjects were analyzed using a 3D ANOVA to generate mean control, toward, away, and difference maps, and volumes of connected activated voxels were computed using 3D cluster analysis. Primary activations were in the anterior cingulate cortex and insular cortex, although other areas of activation were also significant. The *total* volume of activation increased by 51% in the "toward" state compared to the "away" state. Such studies show the utility of fMRI for mapping the poorly characterized cortical representation of pain and its modulation by non-pharmacological interventions.