

## Morphometric cortical correlates of pain catastrophizing behaviour in patients with chronic painful knee OA

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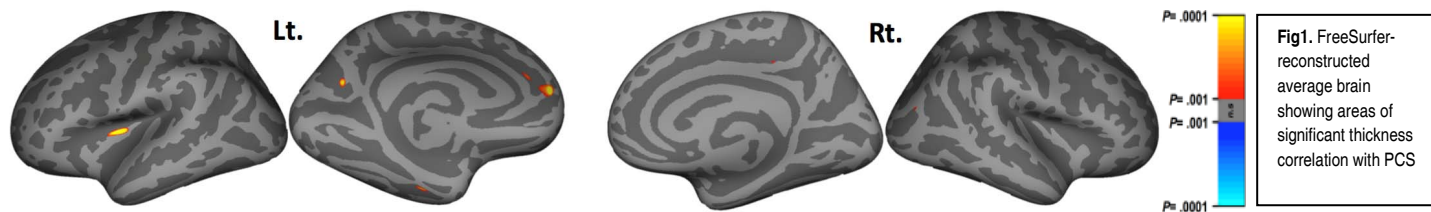
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**Target audience:** Clinical and preclinical Neuroscientists, Neuroradiologists

**Purpose:** Pain catastrophizing (PC) is defined as “an exaggerated negative mental set brought to bear during actual or anticipated painful experience”<sup>1</sup>. It has been consistently reported among studies of different clinical pain conditions<sup>2-5</sup> that PC is associated with more emotional distress and intensified pain experience. Furthermore the tendency to catastrophize may contribute to pain chronicity even upon curative treatment of the cause<sup>2, 3</sup>. While catastrophizing as a psychological predictor of pain experience has been extensively studied, little is known about its neural correlates. We hypothesised that individual tendency to PC may be associated with morphometric variations in emotional pain processing centres. To investigate the interrelation between PC and cortical thickness we undertook a research ethic committee approved MRI study in patients with chronic pain in knee osteoarthritis (OA).

**Methods:** 25 patients (45-80yrs, 14 males) with chronic pain due to knee OA but no other major medical or neuropsychiatric co-morbidities were included. All patients completed the Pain Catastrophizing Scale (PCS) which consists mainly of 13 statements regarding various thoughts and feelings while in pain. Ratings are made on 5-point scale ranging from 0 (not at all) to 4 (all the time) <sup>6</sup>. MRI was performed at 3Tesla MRI scanner (GE Discovery 750) using a 32-channel head coil including 1mm isotropic 3D T1 weighted scan. For cortical thickness measurements we used FreeSurfer software package Mac version 5.1 (www.surfer.nmr.mgh.harvard.edu). Qdec (FreeSurfer-application) was used to perform within group whole-brain surface based correlation analysis. Significance was set at  $p < 0.001$  (uncorrected) controlled for age and pain duration.

**Results:** Significant positive correlations were found between PC scores and cortical thickness mainly in the left hemisphere, namely PC was associated with thicker cortex in the Insula, medial superior frontal gyrus, precuneus, fusiform gyrus, and rostral anterior cingulate. Two small clusters of positive correlation were found in the right hemisphere in the posterior cingulate and inferior-parietal Fig1.



**Discussion:** This is to our best knowledge the first study to investigate the cortical thickness correlates of pain catastrophizing in OA. By controlling for pain duration, we aimed to disentangle brain changes that may predispose to reduced coping with chronic pain and morphometric changes that may be a consequence from on-going pain experience. The study provides preliminary evidence that mainly left hemispheric limbic and para-limbic areas involved in pain-related emotions and interoception may mediate emotional negative bias towards chronic pain. Controlling for pain duration reduces the likelihood that secondary or plastic brain changes may explain observed increases in cortical thickness. The positive correlation between PC and cortical thickness is well in line with the concept that PC reflects increased attention and emotional response to pain processing as shown in patients with fibromyalgia<sup>7</sup>. This would however need to be confirmed using longitudinal study design. The study is further limited by relatively small sample size, limitation to only two potential covariates, and the use of a liberal significance threshold of uncorrected  $p < 0.001$

**Conclusion:** This study suggests that focally increased cortical thickness in brain areas processing the emotional pain experience may underlie the pain catastrophizing tendency in some patients with chronic knee pain

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