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Changes in connectivity between 'higher order' perceptual areas in apraxia after stroke

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Introduction:
Limb apraxia, a disorder of skilled action not consequent on primary motor or sensory deficits, has traditionally been defined according to errors patients make on neuropsychological tasks. Recent lesion symptom mapping studies suggest extrastriate visual areas may be important in mediating them. This would suggest that perceptual deficits may account for some subtypes of apraxia. In this study we investigated the possibility of diaschisis affecting perceptual areas in the brain following left hemisphere stroke; and whether this related to patients'apraxia deficits.
Methods:
We conducted a visual-perceptual localizer task involving 29 patients with left hemisphere stroke, comparing their performance to that of 17 age-matched healthy volunteers. Employing a standard block-design localizer task, participants were tasked with observing static colour photographs depicting familiar tools, headless bodies, non-tool objects, and scrambled versions of these stimuli (Valyear and Culham, 2010). Simultaneously, they engaged in a 1-back task. To pinpoint brain regions selectively engaged in tool-related visual processing, we conducted one-sample t-tests ($p<0.05$, FWE corrected) in each subject, seeking areas exhibiting heightened activation for tools in comparison to headless bodies, non-tool objects, and scrambled stimuli. Subsequently, we identified body-selective regions by contrasting activity for bodies against tools, non-tool objects, and scrambled stimuli. Psychophysical interactions were carried out to identify areas of diaschisis between these in patients, comparing them to healthy volunteers.
Results & Conclusion:
Our analyses consistently identified heightened activity for tools compared to other stimuli and bodies compared to other stimuli, respectively. These included pMTG (LOC) region and an anterior region along the IPS for tools and the extrastriate body area (EBA), known to selectively respond to human bodies and body parts when compared to objects and other control stimuli (Downing et al., 2001). The LOC region was consistently positioned laterally, ventrally, and anteriorly to EBA, in line with findings by Valyear and Culham (2010). There was no significant change in activation in any of these regions between healthy controls.
However, PPI analyses to unravel areas of functional disconnection ('diaschisis') identified that the left IPS showed increased connectivity with Left LOC in patients versus controls in the tools contrast; conversely, the left LOC and EBA regions appeared disconnected in the bodies'task. The study did not involve many patients and therefore we could not identify a reliable effect of praxis errors on these specific functional disconnections.

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