

Test-retest reliability of an integrated attentional-emotional task

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Introduction

Functional MRI (fMRI) is now frequently used to assess how brain activity patterns change with development, progression of neuropsychiatric disorders, pharmacological treatments, and cognitive interventions. In order to interpret changes in imaging signals with targeted interventions, it is necessary to establish the long-term test-retest reliability of blood oxygenation level dependent (BOLD) signals. The aim of the present study was to determine which brain regions elicited highly reliable activation to attentional and emotional stimuli between two fMRI scanning sessions performed by the same subjects over 3 sessions spaced approximately four months apart.

Methods

59 subjects healthy subjects were recruited for the initial scan, 39 participated in the second-visit scan, and 31 subjects participated in the third-visit scan. All subjects were physically and neurologically healthy, and women had a negative urine pregnancy test. After providing written informed consent, all subjects participated in two fMRI sessions on a 4.0 T Varian Unity INOVA whole-body MRI/MRS system while performing an integrated attentional-emotional visual oddball task, termed the Continuous Performance Task with Emotional and Neutral Distracters (CPT-END). Visual cues consisted of 70% simple colored squares, 10% simple colored circles, 10% emotionally neutral pictures, and 10% emotionally unpleasant pictures. fMRI analysis included motion correction, smoothing, normalization, conversion to percent signal change, and event-related modeling for correct responses to circles, emotional pictures, and neutral pictures in AFNI (<http://afni.nimh.nih.gov/>). Test re-test reliability was assessed using intraclass correlation (ICC) which assesses within-subject reliability.

Results

There were no significant differences on any performance measure (e.g. accuracy, response times) on the CPT-END task between the three scanning sessions. A number of brain regions were reliably ($ICC(2,1) > 0.5$) activated between scan sessions in response to the three events of interest. While attentional stimuli (circles) reliably activated the precuneus and middle temporal gyrus, distractor images (emotional & neutral pictures) elicited a wider network of activation including the middle frontal gyrus, precuneus, and lingual gyrus.

Conclusions

In conclusion, this study suggests that the BOLD signal effects for the CPT-END related to the dissociation of attentional and emotional functions in the prefrontal and parietal cortices show high test-retest reliability over a period of eight months.