Viewing Happy and Sad Faces: an fMRI Study

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Introduction

☐Neuropsychological [1-3] and imaging [4] data suggest that facial expressions of fear, disgust & anger are processed by partially isolable neural systems (including the amygdala, ventral-anterior insula and ventral striatum, respectively)

☐By contrast, there are no reports to date of selective impairments in the recognition of two other pan-culturally recognized emotions: sadness & happiness

☐Further, relatively few imaging experiments have examined the neural correlates of happy & sad facial expression processing, and findings to date have been inconsistent [4]

☐We, therefore, examined the neural systems activated when viewing facial expressions of happiness & sadness relative to neutral facial expressions using fMRI

Hypotheses

☐- Neutral faces: Fusiform & occipital 'face' areas, possibly amygdala [5]

☐- Happy faces: Induce approach & shared happiness [6]. May activate midbrain, striatal & frontal dopamine systems involved in approach & reward

☐- Sad faces: Meta-analysis implicates medial prefrontal cortex (MPFC) [4]. Understanding sadness involves 'mindreading' [7], also implicating MPFC [8].

fMRI Experiment

☐Participants (n=15, 7 female, mean age 22 yrs) made gender decisions on facial expressions from Ekman & Friesen's Pictures of Facial Affect.

☐Neutral, Happy and Sad expressions of 8 individuals (4 female) selected, based on recognition rates.

☐Examples:

☐Faces blocked by expression (neutral, happy, sad). 16 sec blocks, 4 faces per block (3 sec duration, 1 sec ISI). 12 blocks per expression.

fMRI Methods

Acquistion

☐3T Bruker MR system, Gradient-echo EPI

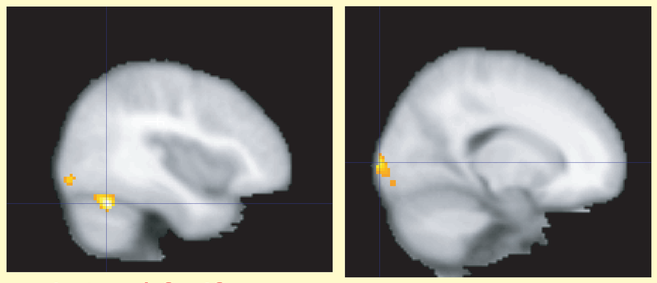
☐TR = 1.6s, 21 * 4mm slices, axial oblique

☐Preprocessing and Analysis in SPM 99

☐Random effects analysis, 8mm smoothing

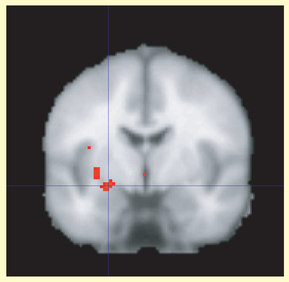
fMRI Results

Neutral expressions relative to fixation



Lateral fusiform

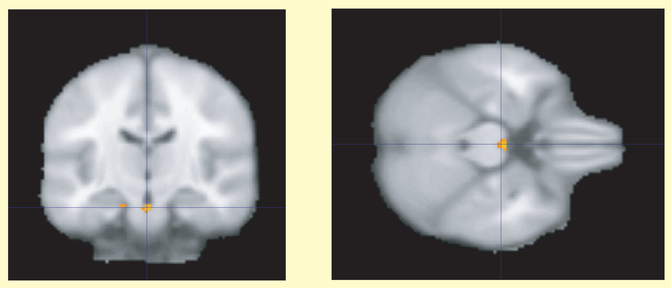
Occipital



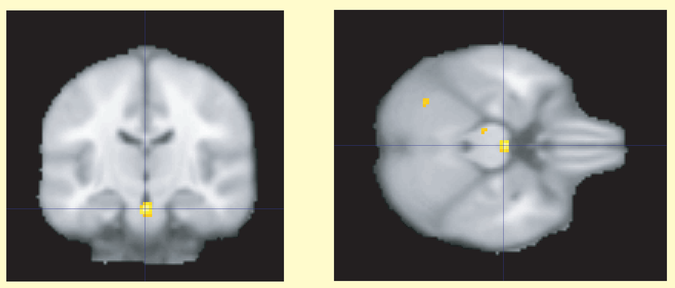
L amygdala

fMRI Results

Happy faces relative to neutral: midbrain

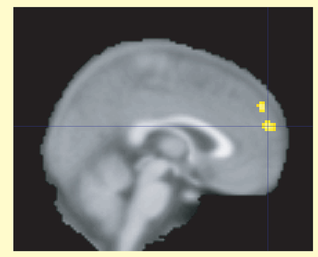


Happy faces relative to sad: midbrain

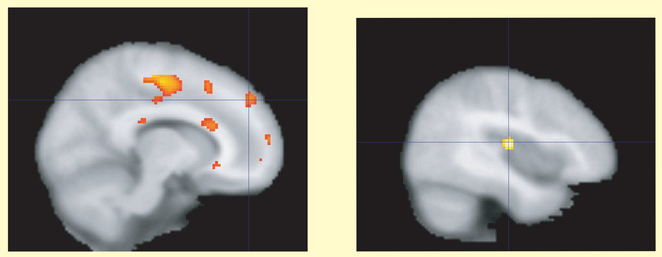


fMRI Results

☐Sad faces relative to neutral: Dorsal MPFC



Sad faces relative to Happy: DMPFC, R Insula



Conclusions

☐Viewing happy faces, relative to neutral and sad, activated midbrain, in region of VTA.

☐☐

☐Viewing sad faces, relative to neutral and happy, increased activity in dorsal MPFC. Relative to happy faces, viewing sad faces also activated R insula.

☐Lesion work will determine if these regions are critical for 'recognition' of happiness & sadness, or if activity related to signalling & affect inducing properties of these facial expressions.

☐Not mutually exclusive possibilites - shared affect may facilitate recognition [9].

References

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Acknowledgements

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