Neural Processing of Emotional Information is Negatively Biased in Dysphoria

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Introduction

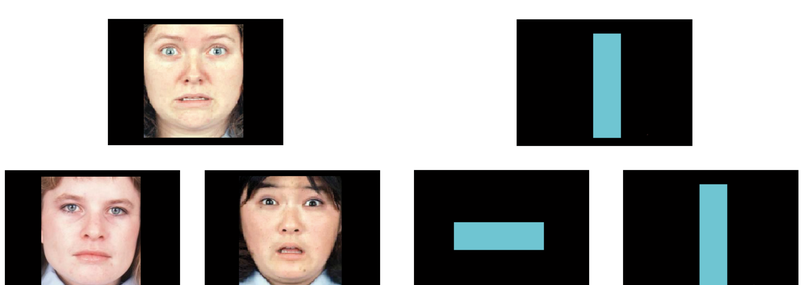
- Depression is associated with abnormal neural responses to emotional information processing.
- Neuroimaging studies of depressed patients have consistently reported amygdala hyperactivity in response to negative emotional stimuli[1].
- However, it is unclear whether this hyperactivity is also apparent as a function of dysphoria.

Hypotheses

- Dysphoric participants will have an overactive amygdala in response to fearful stimuli.
- Previous studies have reported a reciprocal pattern between the amygdala and orbitofrontal cortex when processing emotional information[2].
- Hence, we also hypothesised that there will be an increased activation in the OFC in dysphoric participants to happy than fearful faces.

Methods

- 24 dysphoric participants (Beck Depression Inventory, BDI > 10) and 24 matched healthy controls (BDI < 5).
- Participated in a faces – shapes matching task.
- Alternate blocks of fear, happy and control.



References

1. Siegle *et al* (2007). Biological Psychiatry, 61, 198 - 209.

2. Wright *et al* (2008). NeuroImage, 39, 894 - 902.

Imaging Analysis

- Block design with 3 explanatory variables modelled: fear, happy and control.
- *A priori* regions:rostral anterior cingulate (rAC), dorsal AC (dAC), anterior cingulate (ACC), ventral striatum (VS), amygdala, lateral orbitofrontal cortex, hippocampus, parietal cortex, visual cortex insula, midbrain and thalamus.
- Significance defined at $p < 0.05$ FDR small volume corrected (SVCs) using 10mm diameter sphere centred on the *a priori* regions.

Demographics

Variables	Dysphorics	Controls	Significance
Age	26 (5.6)	24 (4.4)	> 0.1
Gender	13F, 11M	13F, 11M	> 0.1
BDI	19 (10)	0.3 (1.0)	< 0.001
HAM-D	12.5 (6.4)	0.1 (0.9)	< 0.001
NART (IQ)	117.9 (3.8)	1117.8 (5.3)	> 0.1

Table 1: Demographics and baseline depression severity scores for both dysphorics and controls. Mean with standard deviation n parentheses.

Imaging Results

Dysphorics *vs* Controls

Brain Regions	Peak voxels	Z value	P value
Fear > Happy			
R Amygdala	24, -8, -18	3.75	0.020
R Fusiform Gyrus	24,-36, -16	3.70	0.023
Happy > Fear			
Lateral Orbitofrontal Cortex	-26, 46, -8	3.91	0.012

Table 2: Peak voxels of brain regions significantly increased in dysphorics vs controls with their corresponding z and p values

Acknowledgements

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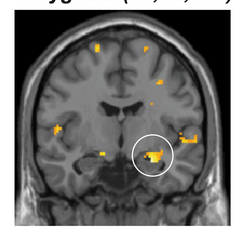
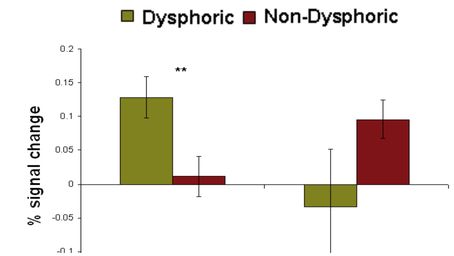
Imaging Results *(continued)*

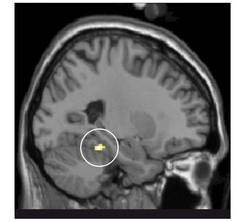
Dysphoric *vs* Controls : Fear > Happy

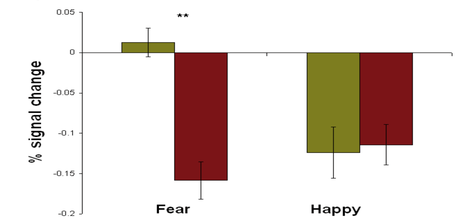
Amygdala (24, -8, -18)





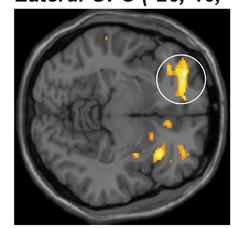
Right Fusiform Gyrus (24, -36, -16)

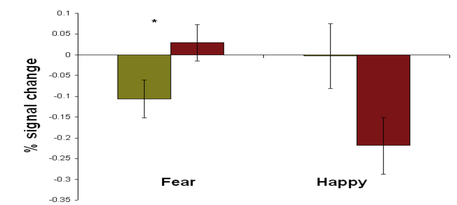




Dysphoric *vs* Controls : Happy > Fear

Lateral OFC (-26, 46, -8)





Summary

- Dysphoric participants had greater activation to fearful than happy faces in the amygdala and fusiform gyrus compared to controls.
- In contrast, dysphoric participants had greater activation in the lateral OFC to happy than fearful faces when compared to controls.
- This pattern of neural activity is believed to contribute to biases in processing negative stimuli in depression.