Implicit Emotion Processing in Adults with Anorexia Nervosa; Implications for Social Perception on a Neural Level

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INTRODUCTION

- The behavioural literature in anorexia nervosa (AN) has suggested impairments in psychosocial functioning (Tchanturia et al 2012). Studies using Facial Expression Recognition Tasks (FERT) have reported poor recognition and slower identification of emotions in AN (Oldershaw et al 2011).
- This has led to model of social perception in AN by Zucker et al 2007 that relies heavily on the contribution of the amygdala, fusiform gyrus and superior temporal sulcus.
- Neuroimaging studies in AN focused on symptom provocation have reported disturbances in occipital, temporal and parietal regions among others.
- However the high prevalence of comorbid disorders in AN has remained a confounding factor and many studies suggest a prominent role for comorbidities instead of attributing this impairment to the pathology of AN.

The aim of this study is to: I) assess implicit emotion processing within the proposed neural model of social perception in AN, II) control for possible effects of comorbid disorders on emotion processing and III) to explore functional alterations in brain regions outside of the proposed model

METHODS

Participants

- 31 female participants currently with AN (Mean age =23, BMI = 16) and 31 age-matched HC females screened for psychiatric illness (Mean age =25, BMI =22)

Clinical Measures

- Participants completed the EDE-Q, HADS, OCI-R and R-SAS to assess levels of eating disorder symptomology, depression, anxiety, obsessive-compulsive symptoms and social anhedonia.

fMRI

- Images collected on a 1.5-T GE Signa HDx system with an 8-channel headcoil
- 180 whole-brain BOLD functional images were acquired using a T2*-weighted GE-EPI pulse sequence (TR =2000ms, TE =40ms, flip angle =70°, in-plane resolution 3.75x3.75mm, 25 axial slices of 5mm thickness parallel to AC-PC line)

fMRI analysis

- Data were pre-processed and analysed non-parametrically using XBAM v4.1 (http://brainmap.it; Fig. 1).

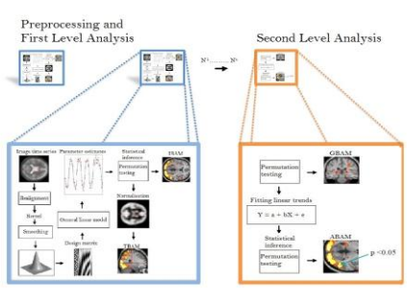

Fig. 1. Pipeline of XBAM fMRI data analysis.

IMPLICIT FACIAL EXPRESSION RECOGNITION TASK (I-FERT)

- A total of 10 different faces (5 male and 5 female) were used showing either a neutral expression, a prototypical happy or a morphed, mildly happy expression
- During each presentation participants were asked to specify the gender using a joystick (left, right), during the ISI participants viewed a fixation cross (Fig. 2)
- Both accuracy and reaction time were recorded for simple and complex trials.

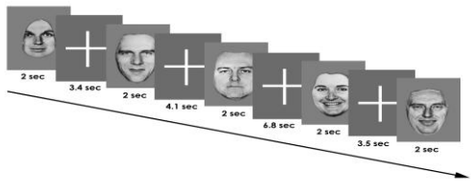

Fig. 2. Schematic of the I-FERT. All three facial expressions were presented a total of 20 times for 2 seconds during the task and the order in which they were presented did not vary between subjects.

RESULTS

Behavioural data

- There was no significant difference in gender judgment (accuracy).
- While the AN group was slower across all conditions, reaction times within the groups did not follow the same pattern. During the ambiguous morphed facial expression, the AN group showed no difference in reaction time from neutral faces while instead the HC group showed no difference from prototypical happy faces. Both groups did demonstrate a decrease in reaction time between neutral and prototypical happy facial expressions

Imaging data

- The ROI analyses revealed a group x task interaction, showing greater activation in the fusiform gyrus in AN for prototypical happy facial expressions.
- A whole-brain exploratory approach further extended this finding into the occipital lobe.

Table 1. Cluster properties showing a group x task interaction illustrating greater activation in AN compared to HC during prototypical happy faces.

Region	Size	Mass	Talairach Coordinates			Analysis	p
			X	Y	Z		
Right Fusiform Gyrus	13	0.13	36.1	-55.6	-18.2	ROI	.0059
Right Fusiform Gyrus	136	0.95	36.1	-70.4	12.2	Whole-brain	.0001
Extending into the Occipital Lobe							

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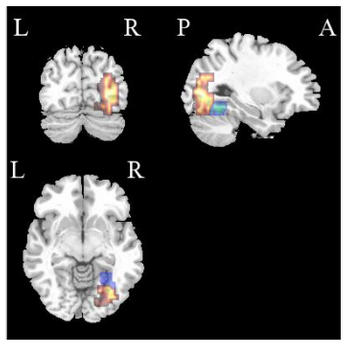

Fig. 3. Coronal, sagittal and axial views showing greater activation in AN in the right fusiform gyrus using an ROI approach (blue) and extending this finding using a whole-brain approach (red).

CONCLUSIONS

- Despite the significantly slower in reaction time in AN, there was no difference in accuracy. The pattern in reaction times per condition indicates that there was no attentional bias in AN away from happy facial expressions and suggests a possible difference in the perceived emotion during the morphed facial expressions between the two groups (i.e. AN perceive morphed images more as neutral and HC perceive them more as happy).
- The neuroimaging data supports the notion of a prominent role for the fusiform gyrus in social perception but finds no functional alterations in the other proposed regions. A whole-brain approach indicated that there is an overall disturbance during the processing of positive emotions in not just the proposed neural model but in visual regions in general.

As both groups demonstrate a decrease in reaction time to an increase in emotional intensity, it is unlikely that this increase in neural response is due to an increase in saliency. Instead, we suggest that this is a compensatory mechanism in AN and they simply require more resources (i.e. cerebral bloodflow) to facilitate a proper response equivalent to the HC.

LIMITATIONS

- As the current study only looked at positive emotions, it is important for future studies to address other emotions as well.
- PCA analysis of the clinical measures led to only one component reflecting a greater amount of general clinical symptoms, thereby eliminating the possibility of any correlational analyses.
- Differences in emotion processing based on task performance are not conclusive due to the nature of the task.

***References*:**

Zucker et al 2007. Anorexia Nervosa and Autism Spectrum Disorders: Guided Investigation of Social Cognitive Endophenotypes

Oldershaw et al 2011. The socio-emotional processing stream in Anorexia Nervosa.

Tchanturia et al 2012. Altered Social Hedonic Processing in Eating Disorders