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# An fMRI study of the relationship between neuroticism and neural responses to infant emotional faces

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## Introduction

- Infant facial expressions provide an important cue to elicit emotional and behavioral responses from a caregiver.
- Recent studies revealed personality traits are stable predictors of maternal behavior. However, little is known about the influence of female personality traits on discriminating infant facial expressions.
- It has been reported that lower levels of neuroticism are associated with better cognitive function later in life. We predicted that neuroticism would correlate with neural activations to infant emotional stimuli.
- The purpose of the present study was to investigate neuroticism-related differences in nulliparous females' neural response to infant emotional faces using fMRI.

## Methods

### 【Participants】

55 healthy, right-handed nulliparous females (mean age = 20.2 years, age range = 20–21 years）with no childcare experience.

### 【Personality assessment】

Neuroticism was measured before the fMRI experiment with the Maudsley Personality Inventory (MPI).

### 【fMRI acquisition】

3T MRI (MAGNETOM Skyra, Siemens)
SPM 8 (Wellcome Department of Imaging Neuroscience, London, UK)

### 【Region-of-Interest (ROI) analysis】

We performed region of interest (ROI) analyses for the dorsal anterior cingulate cortex (dACC), the fusiform gyrus, and the nucleus accumbens using the MarsBaR software (Brett et al., 2002). Each ROI was anatomically defined and derived from Individual Brain Atlases using the SPM software (IBA SPM) (Alemán-Gómez et al., 2006) implemented in the WFU PickAtlas (Wake Forest University, Winston-Salem, NC) (Maldjian et al., 2003, 2004).

### 【Stimuli and tasks】

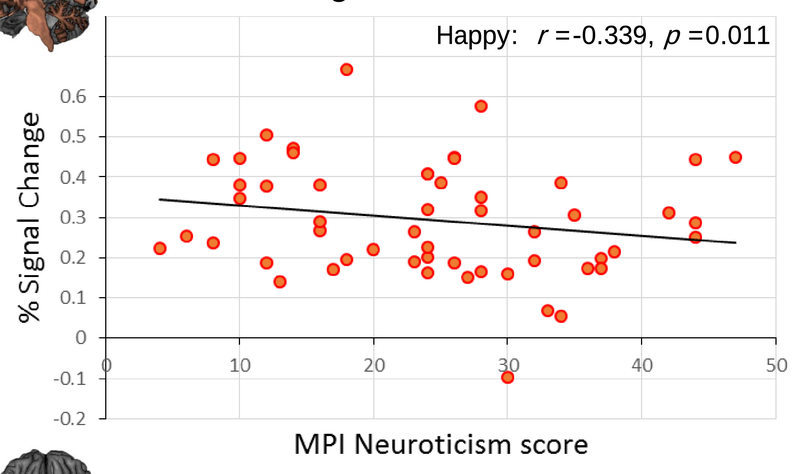

Participants were presented with 72 photographs of unknown four infant faces expressing three kinds of emotions (happy, neutral, and sad) in randomized counter-balanced order, and they were asked to rate each face on an 8-point scale of happy to sad to assess the perceived affect level during the scan.

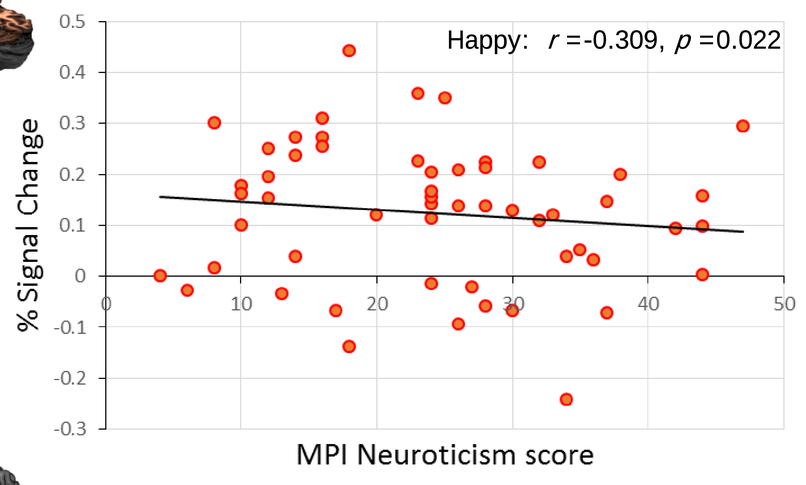
Happy　Neutral　Sad

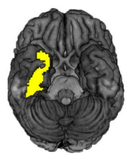
Examples of infant facial expressions used as stimuli

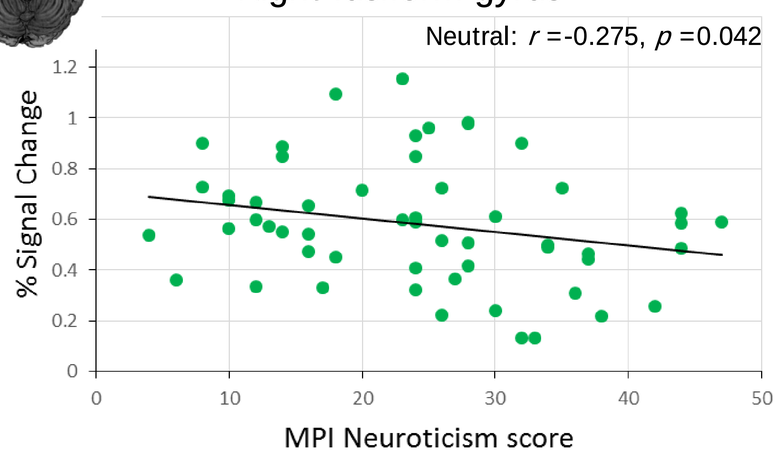
## Results

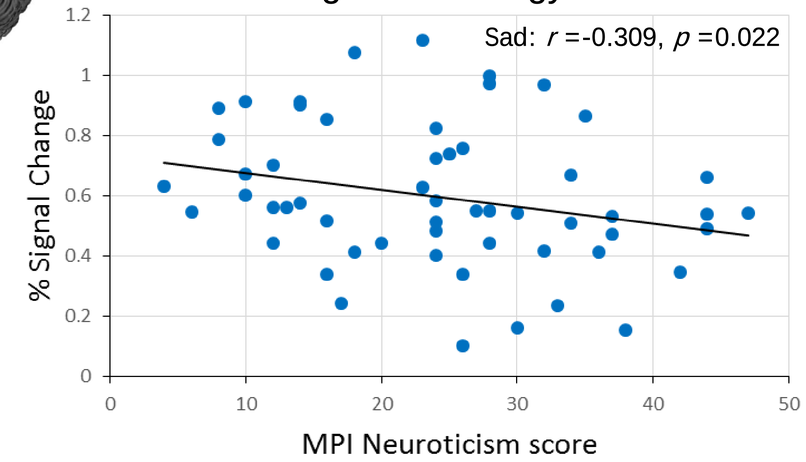
- The mean score (SD) of the 55 subjects on the neuroticism scores : 24.16 (10.91).
- We carried out correlation analyses of the relationships between the neuroticism scores and the activity of the dACC, the fusiform gyrus, and the nucleus accumbens .
- Neuroticism score negatively correlated with the activities of the right dorsal anterior cingulate cortex (dACC) and the left nucleus accumbens while the subjects viewed happy faces. The score also negatively correlated with the activity of the right fusiform gyrus while viewing neutral faces, and with that of the left fusiform gyrus while viewing sad faces.






## Discussion and Conclusions

- The results demonstrated that nulliparous women with lower neuroticism showed increased activation in the dACC and the nucleus accumbens, which are thought to participate in the brain reward system, suggesting that they consider an infant happy face to be a reword.
- Nulliparous women with higher neuroticism exhibited reduced activation in the fusiform gyrus while viewing neutral or sad infant faces probably because it is difficult for them to rate infant ambiguous or negative facial expressions.
- Our findings indicate that in the nulliparous women, the neuroticism scores are well correlated with the activity of the right dACC, left nucleus accumbens, and right fusiform gyrus contingent upon the type of emotion expressed in infant stimuli.

## Acknowledgments

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