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Letter to the Editors

Facial emotion perception and fusiform gyrus volume in first episode schizophrenia

Dear Editors,

There is evidence that individuals with first episode (FE) schizophrenia are impaired in facial emotion perception (Edwards et al., 2001). While the mechanisms underlying impaired performance on face emotion perception tasks are still unknown, increasing attention has been given to the Fusiform Gyrus (FG). The FG has primarily been implicated in face perception, a building block to emotion perception (Kanwisher et al., 1997), however new evidence suggests that the FG plays an additional role in emotion processing among non-clinical control participants (Wang et al., 2005), and individuals with depression (Surguladze et al., 2005) and schizophrenia (Gur et al., 2002). Likewise, structural studies indicate an association between decreased FG volumes and face perception among individuals with FE schizophrenia (Lee et al., 2002). However, the association between FG volume and emotion perception in FE schizophrenia has not been examined.

We recruited two groups of participants into this pilot study: individuals with first episode schizophrenia and non-clinical controls. The individuals with schizophrenia were included if they met DSM-IV criteria for schizophrenia or schizophreniform disorder, had a total lifetime exposure to antipsychotic medication of 16 weeks or less, had duration of illness less than 5 years, and were free of neurological injury. Non-clinical control participants were included if they had no history of a DSM-IV axis I disorder, no first-degree relative with a psychotic disorder, and no history of brain damage.

The clinical participants (13 males, 10 females) had a mean age of 22.7 years (SD=5.3), were primarily Caucasian (61.9%), right-handed (90.9%), and had a diagnosis of schizophrenia (78.3%). The 21 non-clinical controls (11 males, 10 females) had a mean age of 24.62 years (SD=4.44), and were also primarily Caucasian (68.4%) and right-handed (94.7%). The two groups did not significantly differ on any of the demographic variables (all p values $>.20$).

We administered the Face Emotion Discrimination Task (FEDT; Kerr and Neale, 1993) to assess emotion perception. The FEDT consists of 30 pairs of pictures of faces expressing basic emotions. The participant must determine whether the two faces are expressing the same or different emotions.

Images were obtained in the Department of Radiology at Duke University with a General Electric Signa Advantage MR System operating at 1.5 T. Three MRI sequences were conducted. First, a scout sequence was run to aid in slice positioning. The second sequence resulted in T_1-weighted-spoiled gradient-recalled images (1.5 mm axial slices ($n=124$); repetition time, 12.3 ms; echo time, 5.4 ms; flip angle, 20° field of view, 24 cm; matrix, 256×256; acquisition time, 9:18). The third sequence, which acquired PD- and T_2-weighted images, was an axial double-echo fast spin echo (FSE) multiplanar sequence with flow compensation (slice thickness, 3 mm ($n=60$); repetition time, 4000 ms; echo times, 15 and 105 ms; flip angle, 90° field of view, 24 cm; matrix, 256×256; acquisition time, 8:32).

We used Mutual Information Registration (MIRIT; Maes et al., 1997) for registration of participants' images to the probabilistic brain atlas, which is part of the automatic brain segmentation procedures (EMS; Van Leemput et al., 1999). An image segmentation program was then used to classify each voxel as gray matter, white matter, or CSF. IRIS 2003, image analysis software developed

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Table 1
Descriptive statistics for FEDT and FG

	Schizophrenia ($n=23$)	Controls ($n=21$)
	Mean SD	Mean SD
FEDT score	24.25 (4.63)	27.05 (1.47)*,[a]
ICV	1355.21 (127.98)	1393.68 (130.37)
Fusiform gyrus absolute volumes		
Right gray	6.77 (1.16)	6.77 (1.39)
Left gray	6.51 (1.29)	6.75 (1.47)
Fusiform gyrus relative volumes (% ICV)		
Right gray	0.499 (0.07)	0.488 (0.10)
Left gray	0.478 (0.07)	0.484 (0.09)

* $p<0.05$ level.
[a] Based on *N*s of 20 (schizophrenia) and 17 (non-clinical controls).

at UNC-Chapel Hill by Guido Gerig, Ph. D., was used for segmentation and volume measurements. Participants' MRI images were segmented to target left and right FG volumes, as well as bilateral FG volume. Gray and white matter volumes within the FG were also measured.

The FG was anatomically defined based on criteria established by Lee et al. (2002). Reliability was established by segmenting the FG in five images that were repeated three times to constitute a series of 15 images. The rater was blind to case number and group. Reliability was in the acceptable range (ICC=.98 [left FG], .91 [right FG]).

Our results showed that individuals with FE schizophrenia are impaired in facial emotion discrimination abilities as compared to non-clinical controls ($F(1,35)=5.73$, $p=.02$, Table 1). The group difference remained significant when controlling for age, gender and socioeconomic status ($F(1,30)=6.79$, $p=.01$). However, individuals with first episode schizophrenia did not differ from non-clinical controls in gray FG volume either in its proportion ($F(1,42)=0.02$, $p=.90$) or controlling for intracranial volume (ICV) ($F(1,41)=0.01$, $p=.90$). The association between gray FG volume and FEDT was not significant ($p>.50$) for either individuals with FE schizophrenia (left: $r=.09$, $p=.68$; right: $r=.21$; $p=.34$) or non-clinical controls (left: $r=.007$; $p=.97$; right: $r=.01$; $p=.93$).

The findings indicate that individuals with FE schizophrenia are impaired in facial emotion perception. Therefore, deficits in face emotion perception in schizophrenia do not seem to be a consequence of illness chronicity or long-term antipsychotic medication use. However, persons with FE schizophrenia did not demonstrate significant volume differences in the FG compared to non-clinical controls. Differences in the anatomical protocol may have contributed to inconsistent findings between this study and the study of Lee et al. (2002). Lee et al. used slightly different imaging parameters (e.g., T_2-weighted images vs. T_1-weighted images), which may have contributed to a degree of volume discrepancy. Given that the FG presents difficulty during structural imaging due to its ventral location in the brain, this underscores the need to employ a universal protocol and consistent imaging parameters across studies.

FG volume was not associated with emotion perception performance. It is possible that neural activation, rather than volume, is a more meaningful way of assessing the role of the FG in emotion perception. In addition, other neural structures, such as superior temporal sulcus, which has been associated with processing the changeable aspects of faces (Haxby et al., 2000), and the amygdalae, may be more integral to emotion perception (Adolphs, 2002).

These preliminary findings need to be interpreted within the limitations of the study, namely small sample sizes and focusing on a single social cognitive domain and neural structure.

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