

Brain activation patterns and brain volume changes associated with explicit retrieval of unpleasant and neutral words in patients with obsessive compulsive disorder

Shin-Eui Park¹, Gwang-Won Kim², Jong-Chul Yang³, Gyung-Ho Jeong⁴, Heoung-Keun Kang², and Gwang-Woo Jeong^{1,2}

¹Interdisciplinary Program of Biomedical Engineering, Chonnam National University, Gwang Ju, Korea, Republic of, ²Radiology, Chonnam National University Medical School, Gwang Ju, Korea, Republic of, ³psychiatry, Chonbuk national University medical school, ⁴Radiology, Chonbuk national University Medical school

Purpose

Obsessive compulsive disorder (OCD) is an anxiety disorder characterized by intrusive thoughts that produce uneasiness, apprehension, fear, or worry, by repetitive behaviors aimed at reducing the associated anxiety, or by a combination of such obsessions and compulsions. The purpose of this study was to compare the differential of brain activation patterns and brain volume changes associated with the explicit retrieval of unpleasant and neutral words during conceptual processing between the healthy controls and patients with OCD by using a 3 Tesla function magnetic resonance imaging (fMRI)

Subjects and Methods

A total of 14 patients with obsessive compulsive disorder (mean age = 29.0±12.26 years) and 14 healthy controls (mean age = 32.9±6.17 years) who had no history of neurological or psychiatric illness underwent the functional MRI on a 3.0 Tesla Magnetom Verio MR Scanner (Siemens Medical Solutions, Germany). The stimulation paradigm consisted of 5 times rest condition, 2 times encoding of two-syllable words and 2 times explicit retrieval of previously learned words, each lasted for 14, 18, and 18 seconds, respectively. All subjects were performed twice stimulation paradigm consisting of unpleasant and neutral words, respectively. Six different words were presented for 3 seconds each in the encoding and retrieval task. In the retrieval task, different and same words used in the encoding task were presented. The brain activation maps and volume changes were analyzed by SPM8 program.

Results and Discussion

The predominant activation areas observed in patients with OCD during explicit retrieval task with neutral words included the middle and inferior frontal gyri, superior temporal gyrus, inferior parietal gyrus and calcarine gyrus ($p < 0.005$). In explicit retrieval task with unpleasant words, patients with OCD showed significantly increased activities in the superior, middle and inferior frontal gyri, superior and inferior temporal gyri, fusiform gyrus, superior parietal gyrus, calcarine gyrus, superior and middle occipital gyri ($p < 0.005$), (refer to Fig.1 and Table 1). The patients showed higher number of activation areas during the explicit retrieval of unpleasant words over neutral. Patients with OCD showed significantly reduced volumes in the calcarine gyrus, middle frontal gyrus and fusiform gyrus (figure 2).

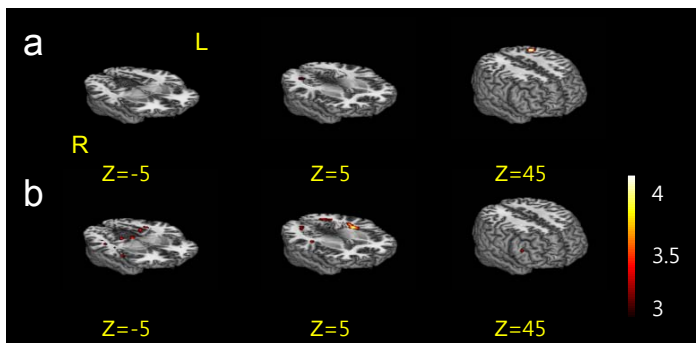


Figure 1. Differential brain activation patterns associated with neutral words(a) and unpleasant words (b) in patients with OCD over healthy controls: two sample t-test($p < 0.005$).

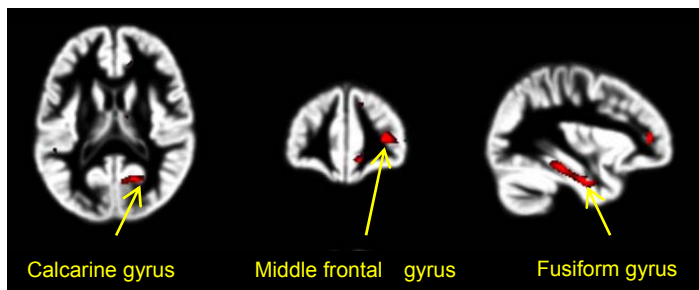


Figure 2. Brain areas showing significant volume reduction in patients with OCD over the healthy controls ($p < 0.005$).

Conclusion

Our findings indicate that there are neurofunctional and neuroanatomical dissociation between patients with OCD and healthy controls in explicit memory retrieval with unpleasant and neutral word.

Reference

1. Elman et al., *Neuroimage* 2011 May 1 ;56(1) : 345-353
2. Kim MS et al., *J Psychiatr Res* 2006 sep ; 40(6) : 541-549

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Table 1. Differential brain activities (maximum t-value) associated with unpleasant word and neutral words. compared with obsessive compulsive disorders and healthy controls using the two sample t-test ($p < 0.005$)

Anatomical areas	Abbr.	BA*	MNI coordinate			t-value	R/L
			x	y	z		
Neutral word							
Middle frontal gyrus	MFG	45	-44	40	26	3.06	L
Inferior frontal gyrus	IFG	44	38	10	30	2.83	R
Superior temporal gyrus	STG	22	-54	-26	8	2.84	L
Inferior parietal gyrus	IPG	40	-52	-46	56	2.93	L
Calcarine gyrus	CcG	19	24	-74	12	3.28	R
Unpleasant word							
Superior frontal gyrus	SFG	8	-18	28	62	3.02	L
Middle frontal gyrus	MFG	11	-28	42	-8	2.85	L
Inferior frontal gyrus	IFG	45	54	32	18	3.19	R
Superior temporal gyrus	STG	38	-36	8	-26	4.25	L
Inferior temporal gyrus	ITG	37	40	-54	-4	3.29	R
Fusiform gyrus	FuG	37	-40	-50	-12	3.56	L
Superior parietal gyrus	SPG	40	38	-58	64	2.80	R
Superior Occipital gyrus	SOG	-	-18	-82	12	3.72	L
Middle Occipital gyrus	MOG	19	-28	-78	2	3.27	L
Calcarine gyrus	CcG	19	22	-78	14	3.17	R

*BA indicates Brodmann's area.