Neural Substrates of Posttraumatic Stress Disorder: Functional Magnetic Resonance Imaging Study Using Negative Priming Task

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Abstract: associated with emotional problems. Recently, however, the impact of PTSD on cognitive processes has interested a growing number of researchers. The current study is aimed at investigating the cognitive aspects of PTSD at both behavioral and neurological levels.

Methods We recruited individuals with PTSD who survived the DAEGU subway explosion in 2003 as well as non-PTSD individuals as a control group. To evaluate the inhibitory processes and the neural mechanisms, we had these individuals perform the negative priming task simultaneously with functional MRI scanning.

participants PTSD group: DAEGU subway explosion right-handed survivors 13(male 8, female 5) with a mean age of 26.0 years (range=23-30). Control group: right-handed male 10 and female 7 with a mean age 26.8 years (range=23-33) task Shematic the visuospatial primng paradigm.

Trials were perfomed in pairs (S1 and S2). If the position of the distractor(X) in S1 was in the same position than that of the target in S2, the trial was neutral. When the target was in the same position in S1 and S2, the trial was facilitatory (positive pirme). The durations of S1, S2 and the interstimulus interval(ISI) are as indicated in milliseconds(ms).

A Signa 1.5T Tesla imaging device (Siemens Medical Systems, Iselin, New Jersey, USA) with a three-axis gradient head coil was used. TR 1500ms, TE 60ms, flip angle 90o, number of slices 18 without gap, slice thickness 6.0mm, matrix size 64]64, field of view 240]240mm, in plane resolution 3.75]3.75 Gradient-echo functional images were collcted in the same plane [AC-PC (anterior commissure - posterior ommissure) line, TR 500ms, TE12ms, matrix size 256]256]

Results Behaviorally, the negative priming effect was intact in the control group but was not evident in the PTSD group. In the imaging results, only the PTSD group showed the negative priming effect (i.e., increased activation of the negative priming condition as opposed to the neutral condition) in the dorsolateral prefrontal cortex, anterior cingulated cortex, and inferior temporal gyrus. The PTSD group also showed increased activity for the positive priming condition as opposed to the neutral condition in the claustrum. These results confirm and extend the previous findings that the integrity of the ACC is compromised in the trauma survivors due to disrupted white matter tract..

Behavior results Response time (msec) and accuracy(deviation in the parentheses, in the neutral positive, and negative conditions of PTSD and control group.

Imaging results Local maxima in the activated regions by the PTSD group for the positive versus neutral conditions and the negative vursus neutral conditions. The specific coordinates are presented in the MNI space; k represents the cluster size of activated voxels, and BA represents Brodmann area. The activated regions were determined with a threshold of p¡0.001(uncorrected for multiple comparisons) and a cluster size of at least 10 voxels.

Conclusions The current results suggest that deteriorated performance of the PTSD group may be due to the functional problem as well as the structural abnormalities.