WORKING MEMORY IN MAJOR DEPRESSION – AN FMRI-STUDY AT 3 T

H. Kugel[1], S. Schöning[2,3], K. Lipina[2,3], A. Engelien[2,3], A. Behnken[2], S. Schäfer[2,3], H. Schiffbauer[1], I. Brote[1], B. Baune[2], V. Arolt[2], W. Heindel[1], and C. Konrad[2]

[1]Dept. of Clinical Radiology, University of Muenster, Muenster, NRW, Germany, [2]Dept. of Psychiatry and Psychotherapy, University of Muenster, Muenster, NRW, Germany, [3]Research Group 4, Interdisciplinary Center for Clinical Research (IZKF), University of Muenster, Muenster, NRW, Germany

Introduction: While impairments of neurocognitive functions have been frequently reported in patients with major depressive disorder (1), not much is known about the contribution of working memory to these deficits. As part of a larger project we investigated the performance of the working memory and its correlating neurobiological representation in functional MR imaging in patients with unipolar major depression and in a matched control group.

Methods: At present 13 unipolar depressive patients and 13 healthy control volunteers have been included in the study and examined with fMRI at 3 T (Gyroscan Intera 3.0T, Philips, NL). An n-back paradigm was applied with images presented with an MR compatible projection system on a screen at the rear of the scanner ("Presentation" software, Neurobehavioral Systems, Albany, Ca, USA; beamer system, Covilex, Magdeburg, GER). Subjects had to decide whether an item was or was not presented n presentations earlyer and respond by pressing a button. The study was designed in a block design, with the conditions rest (21 s), visual instruction (3 s), and activation (36 s), total duration 6 min. Each activation block contained 12 stimuli.
In addition to T1w anatomical data functional data were acquired with a multi slice single shot EPI sequence covering the whole head (36 slices with isotropic voxels of 3.6 mm edge length, TR = 3 s, TE = 38 ms). Data analysis was performed using SPM2 (Wellcome Dept. Cogn. Neurol, London, UK) with a 2nd level random-effects analysis.

Results: The number of correct responses decreased with increasing load on the working memory. It was lower in patients than in healthy volunteers. Both groups activated a network of prefrontal and parietal areas. The activations of the network increased from the 0-back task to the 2-back task and were more pronounced in patients (Fig. 1) than in healthy volunteers (Fig. 2).

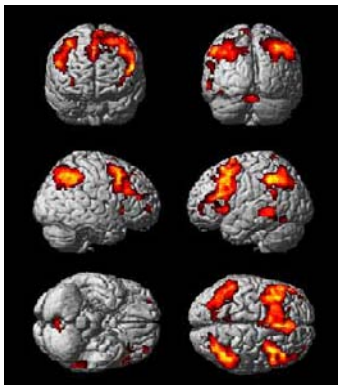

Fig. 1: Parametric analysis of the n-back paradigm in 13 depressed patients (p uncorrected <0.001, k=20)

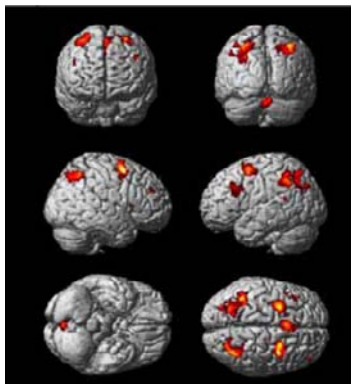

Fig. 2: Parametric analysis of the n-back paradigm in 13 healthy controls (p uncorrected <0.001, k=20)

Discussion: In accordance with comparable studies in both groups functions of working memory were localized in a fronto-parietal network. The stronger activation of this network in patients in spite of lower memory performance confirms that to maintain their working memory function patients with depression need a higher activation of the underlying neuronal network (2). Our results point out that dysfunctional activation and cognitive impairment include working memory functions in patients with major depression.

References: (1) Zakzanis et al., Neuropsychiatry Neuropsychol Behav Neurol 11, 111-119 (1998) (2) Harvey et al., Neuroimage 26, 860-869 (2005)