Functional Differences in Mental Rotation between Men and Transsexual Patients before and during Hormone Therapy Studied with fMRI at 3 T

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Introduction: Inconsistent data have been reported on neuropsychological abnormalities in transsexual patients and on the effects of a cross-sex hormone therapy on cognitive functions. Some studies point to neuropsychological alterations/abnormalities in untreated transsexual patients, suggesting differences in underlying neurobiological processes (1,2). The aim of the present study was to investigate visual spatial competence in male-to-female transsexual (MFTS) patients before and during hormone therapy.

Methods: This study included 11 MFTS patients before hormone therapy, 11 MFTS patients during cross-sex hormone therapy of at least six months (HT) and 11 male controls without gender identity disorder (GID), age 36.3 ± 9.8 years (mean ± stdev). Functional imaging was performed applying a blocked mental rotation paradigm with proven sexual dimorphism, projecting the classical three-dimensional objects from the standard mental rotation test (3) onto a screen at the rear of the scanner tunnel. fMRI data were acquired at 3 T (Gyroscan Intera 3.0T. Philips, Best, NL) with a whole head EPI sequence (single shot EPI, 36 slices parallel to the AC-PC line, isotropic voxels of 3.6 mm edge length, TR/TE 3000/50 ms). In addition, immediately before fMRT examination sex steroid hormone levels in the serum were determined in all participants. After the fMRI scan, the performance of mental rotation was assessed outside the scanner (3). Analysis of fMRI data was done with SPM5 (Wellcome Department of Cognitive Neurology, London).

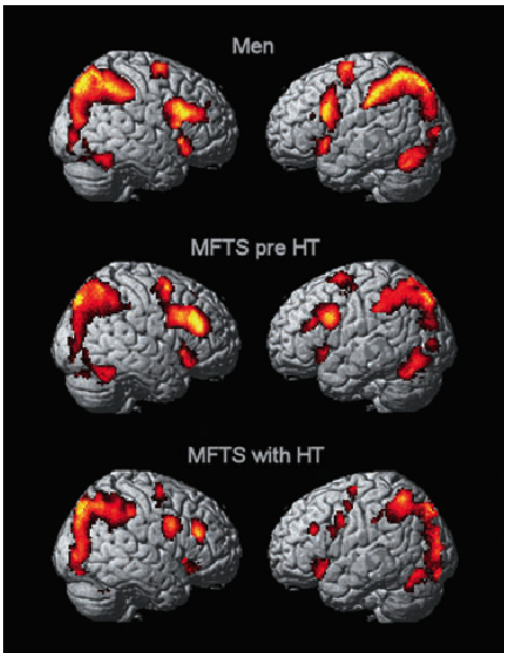

Fig. 1 Activated areas during mental rotation in men, MFTS pre HT, MFTS with HT, random-effects analysis, P < .005, corrected, cluster ≥ 20 voxels (rendered on the surface of the template used by SPM5).

Results: All three investigated groups showed typical activation patterns for the mental rotation task in fronto parietal areas (Fig. 1). However, there were significant differences between groups within this network. Men without GID had significantly stronger activations in the left parietal cortex (BA 40) (Fig. 2), a key region for mental rotation processes, while both groups of transsexual patients showed stronger activations in fronto-temporal areas.

Discussion: The present study gives clues that there are differences in the activation pattern for mental rotation between MFTS patients and male controls already before a hormone therapy, and that these differences remain stable during hormonal treatment. An increase of the differences during hormone therapy could not be found. Possible causes for the functional differences between MFTS patients and controls may be different strategies to cope with the mental rotation task as well as altered neurobiological processes (4).

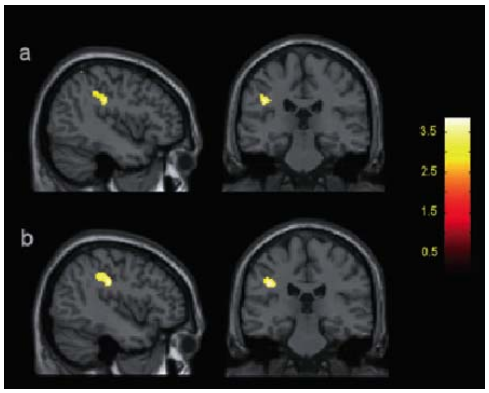

Fig. 2 Comparison of mental rotation between: a) men vs. MFTS pre HT, b) men vs. MFTS with HT, random effects analysis, P < .005, uncorrected, cluster ≤ 20 voxels (Projection on the T1w template used by SPM5).

References: (1) Cohen-Kettenis PT et al., Psychoneuroendocrinology 1998; 23:631-641 (2) van Goozen SH et al., Behav Neurosci 2002; 28:906-915 (3) Peters M et al., Brain Cogn 1995; 28:39-58 (4) Schoening S et al., J Sex Med 2009; in press