SUPPLEMENTARY MOTOR AREA (SMA) DURING MOTOR ACTIVATION OF CATATONIC PATIENTS IN FUNCTIONAL MRT

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Introduction: Catatonic patients often show akinesia with an associated deficit of the internal initiation of movements. Internal initiation of movements is closely related with function of supplementary motor area (SMA). Thus we investigated postacute catatonic patients during motor activation with sequential finger opposition (SFO) in Functional MRT.

Methods: We investigated 10 catatonic patients diagnosed according to criteria by Lohr (1987) and Rosebush (1990) in a postacute state and compared them with 10 healthy controls. Motor activation was examined with SFO in both hands. Functional imaging was performed with SFO in both hands. Functional imaging was performed using a gradient echo-EPI pulse sequence with TR 1, 8 ms, TE 66 ms, Flip angle = 99 degree, FOV 23 cm, matrix 64 × 64 (interpolated to 128), voxel size 3.13 × 3.16 × 4 mm. Series of 60 sequential multislice images parallel to AC-PC line were obtained compromising for all slices. The first two images were not used for calculation to account for latencies of oxy/desoxyhemoglobine contrast changes. For visualisation Z-score maps were superimposed to corresponding anatomic images of identical resolution. Signal time courses of the different brain sites were generated. Pertinent clinical information as well as quantity and quality of SFO were registered.

Results: Healthy subjects showed a consistent activation pattern of contralateral M1, S1 and SMA as well as less frequentipsilateral M1 and S1. In contrast, no activation of SMA was revealed in 7 of 10 catatonic patients whereas the other 3 showed less activation of SMA than healthy controls. Moreovercatatonic patients did not show a similar consistent pattern of activation as healthy subjects.

Conclusion: Our results give preliminary evidencethat SMA may be functionally altered in catatonia.

FUNCTIONAL MAGNETIC RESONANCE IMAGING OF FRONTAL CORTICAL ACTIVATION IN A WORKING MEMORY TASK

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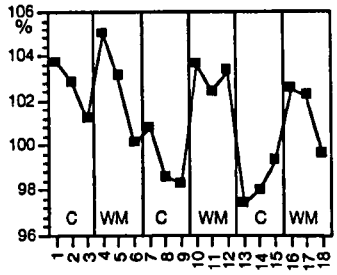
Functional magnetic resonance imaging was used in conjunction with a letter detection task for the study of frontal lobe functioning during working memory in 16 normal subjects. In the activation task, subjects responded by pressing a button whenever any presented letter was the same as the second last in the sequence. In the control condition, the subjects had to respond to a fixed letter. Hence, the activation condition and the control condition differed only subjectively, i.e., regarding the task demand, whereas the stimuli and the type and frequency of response were identical. The activation condition produced significant activation in the dorsolateral prefrontal cortex.



To conclude, the present paradigm led to the activation of prefrontal areas known to be involved in working memory functions. In contrast to experimental tasks previously used rather extensively to study the prefrontal cortex, the paradigm is characterized by its simplicity, interpretability, and its ties to known neurophysiology of the frontal cortex.

LEARNING STUDIES WITH FUNCTIONAL MRI

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The new technique of functional magnetic resonance imaging was used to study the effects of learning on cortical organization in humans. Because this method is entirely noninvasive it can be repeated with individual subjects as often as desired, and large populations of volunteer subjects with specific characteristics can be studied without requirement for personal medical benefit. The hypothesis addressed was that learning experiences produce long-term changes in brain areas activated during performance of the learned tasks.

Blood oxygenation level dependent (BOLD) contrast imaging of human brain function using Echo-Planar MRI (EPI) gives good freedom from motion artifact, high SNR/unit time, and adequate spatial resolution. Cortical areas show a signal change related to task-dependent activity, in images with a spatial resolution of 2.5 mm × 2.5 mm × 5 mm, obtained in 40 ms per image. Theoretical considerations suggest an ultimate spatial localization of cortical electrical activity to within about 2 mm by such techniques.

A study of signal changes in motor cortex M1 during the learning of a complex finger-tapping task showed an increase in activated area, compared with an untrained task, over a period of 3–5 weeks of training, well correlated with the learning curve for this task. This suggests that the trained task comes to be represented by a more extensive neural network in M1 than the untrained task, an instance of medium-term neural plasticity. The increase in area for the trained task was observable even eight weeks after cessation of training.

Longer term plasticity was studied using language reading tasks in a population of young healthy congenitally deaf subjects, compared with normally hearing subjects. Subjects read English sentences, controlled with nonsense strings of consonants, and viewed American Sign Language sentences presented using a video of a competent signer, controlled by means of nonsense signs. Significant differences and some striking similarities were found between the two groups, which have profoundly different language experiences.

The two studies suggest remarkable research potential for fMRI in longitudinal psychiatric studies.

RIGHT FRONTAL HYPOPERFUSION IN SCHIZOPHRENICS WHILE PERFORMING THE WISCONSIN CARD SORTING TEST — A FUNCTIONAL MRI STUDY

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Since the pioneering work of Ingvar and Franzen the concept of hypofrontality in schizophrenia has gained considerable attention. Especially when using cognitive challenges, this phenomenom could

repeatedly be demonstrated, mainly by PET and SPECT. Besides the use of radioactive tracers, a major disadvantage of these methods consists in the minor spatial resolution.

We used a functional MRI-approach to overcome this difficulty and investigated 15 chronic schizophrenic inpatients (diagnosed according DSM-III-R) and 30 age- and sex-matched controls. Four sequences of activation (Wisconsin Card Sort) and rest were measured with a clinical 1.5 T scanner (Philips Gyroscan ASC II). The individual correlation slices were matched to an overall correlation map and projected onto the matched anatomical slice after normation procedures. A priori defined anatomical regions in both groups were compared using the Wilcoxon rank-sign test. Schizophrenics showed a statistically significant decreased activation in the right mesial and lateral prefrontal cortex. There was a trend of an increased activation in the left medial temporal lobe in the schizophrenic patients.

It was possible using fMRI to demonstrate hypofrontality in schizophrenics. Methodological issues concerning the different brain imaging methods will be discussed.

AUDITORY HALLUCINATIONS IN SCHIZOPHRENIA ALTER CORTICAL RESPONSE TO EXTERNALLY PRESENTED SPEECH- AN fMRI STUDY

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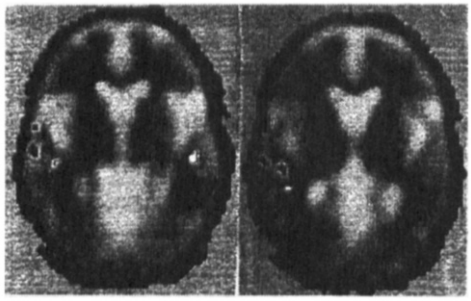
Functional MRI (fMRI) has been used to demonstrate that auditory hallucinations activate regions of auditory cortex that subserve perception of external speech (e.g. Brodmann's Areas 21, 22 and 42) [1]. We wished to test the hypothesis that schizophrenics experiencing auditory hallucinations, compared with those not experiencing them, exhibit reduced responsibility to external speech in cortical regions activated by auditory hallucinations.

Five schizophrenics experiencing ongoing auditory verbal hallucinations (mean age 31.5) and three schizophrenics with a history of hallucinations but not actively hallucinating (mean age 35.0), all right handed, were presented with alternating 40 s epochs of speech and blank tape through headphones whilst being scanned. Analysis of data, grouped and transformed into standardised space, revealed that activation in predominantly right-sided auditory association cortex (BA 22 and 42) was *less* in the hallucinating than non-hallucinating group.

Figure 1 shows *differences* in response to external speech between 5 hallucinating and 3 non-hallucinating schizophrenics (black pixels: hallucinator's response < non-hallucinator's; white pixels: hallucinator's response > non-hallucinator's). (Left of fig is right side of brain).

Auditory hallucinations appear to alter the pattern of auditory cortex activation in response to external speech. Regions of right-sided auditory association cortex (BA 22 and 42) previously reported to be active during the perception of auditory hallucinations may become "saturated" and hence less able to respond to external speech.



[1] Woodruff PWR, Brammer M et al., Lancet. 1995, 346, 1035.
[2] Bullmore E, Brammer M, et al., Mag. Res. Med.. (in press).

S88. Anhedonia: clinical features and mobility across different diagnoses

Chairmen: P Boyer, G Loas

MEASUREMENT OF ANHEDONIA: A REVIEW OF THE INSTRUMENTS

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The term "anhedonia" was coined by the French psychologist Théodule Ribot, in contrast to "analgesia", to denote a complete absence of pleasure. In 1970 a first attempt was made to operationalize the concept. Instruments developed to measure anhedonia are reviewed and their psychometric properties and conceptual framework discussed. Mostly they have been designed considering anhedonia to be a symptom either of schizophrenia or of depression. Some reliability data are available for most scales, but only some have been investigated as to validity. Of these the MMPI Anhedonia Scale was shown to be more sensitive to neurotic disturbance than to anhedonia. The Anhedonia (Interview) Scale correlated significantly with numerous MMPI scales, which questions its construct validity. The Scales for Physical and Social Anhedonia have been most extensively investigated. They were explicitly developed to measure a lifelong, characterological deficit in pleasure capacity, as it was assumed to exist in schizophrenia. Validation studies yield controversial results, which is partly to be explained by the different methods used. Moreover most studies did not use the revised versions of these scales.

The Pleasure Scale of Fawcett et al was designed to measure a state dependent pleasure capacity deficiency, considered to be specific of a subtype of depression. Its psychometric properties have been investigated by different authors and will be discussed. The distinction between life-long, characterological or trait-dependent and state-dependent seems rather forward. However, when one uses a measure to evaluate current anhedonia, the part played by the trait capacity to experience pleasure is not taken into account. This is a major methodological flaw which must be considered in developing new instruments. Recently developed instruments will be analysed in that vein.

ANHEDONIA IN CHRONIC SCHIZOPHRENIA: A SPECIFIC DIMENSION?

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Introduction: Anhedonia is a common characteristic of schizophrenia namely in the early stage of the disease. For Andreasen anhedonia is a component of the negative syndrome of schizophrenia; for Kirkpatrick and Buchanan anhedonia constitutes one of the main characteristics of the deficit syndrome. But anhedonia is also a common characteristic of depression. Moreover Harrow et al have recently shown that depression in chronic schizophrenia is partly