

# Mri in psychiatry essay

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Abstract Functional Magnetic Resonance Imaging differs from conventional Magnetic Resonance Imaging in that it is concerned with studies of metabolism rather than anatomy alone. Functional Magnetic Resonance Imaging tracks changes in blood oxygenation, cerebral blood flow, and the development of certain mobile metabolites which are suitable for spectroscopic analyses. Functional Magnetic Resonance Imaging in all these 3 modes has research applications in schizophrenia, bipolar disorders, and in the dementia consequences of Alzheimer's as well. There are no clinical applications which have been developed at this time.

The unusual and claustrophobic surroundings of equipment, the extreme sensitivities to head movements, and the absence of any internationally standardized protocols, hamper the use of the technology in clinical settings. However, it is possible that the technique will evolve towards some use in early detection of psychiatric conditions, and of structural damage to specific areas of the human brain. Introduction Though functional Magnetic Resonance Imaging (MRI) is yet to achieve the status of regular use in clinical psychiatry settings, there are a number of indications that the technique has potentials to help in objective and early diagnosis, as well as in management (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). Extraordinary spatial resolution makes MRI extremely versatile in studying all aspects of the working and living brain. The anatomy of the brain can be examined in-vivo to an extent of detail which was impossible before the advent of this imaging technique. Functional MRI (fMRI) addresses functional aspects of the brain. Blood Oxygen Level Dependant (BOLD) fMRI has time resolution of 100

milliseconds over a distance of 1 millimeter (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated).

These levels of resolution exceed the capabilities of other available imaging techniques at this time. fMRI resolution is adequate to record transient cognitive events. Perfusion fMRI measures cerebral blood flow in tightly specified regions of the brain (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated); fMRI can also be adapted to record the movement of water molecules, while a combination of MRI with spectroscopy can measure certain metabolites non-invasively (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). Spectroscopy with fMRI allows sequential readings over time during a single scanning session. fMRI is non-invasive, and can be performed repeatedly as no dye injection is involved (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). fMRI also has inevitable disadvantages (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). Conventional MRI machines cannot be used without modifications. Secondly, the system is highly sensitive to head movements; magnetic devices inside the body are contra-indicated, and the environment inside a unit provokes unnatural reactions if not outright claustrophobia.

Finally, spectroscopy with fMRI does not help to track neuro-transmitters because they are not mobile (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). A general criticism of fMRI is the multiplicity of protocols (The Future Role of functional MRI in Medical Applications, 2006). There is no standard procedure which is universally accepted.

Teams of researchers at various centers have developed working methods of their own. This will probably delay the clinical application of fMRI. The purpose of this document is to review selected Internet publications and sites related to the use of fMRI in the detection and management of schizophrenia, bipolar disorders, and Alzheimer's disease. The objective is to assess the utility of the technology in the detection and management of these conditions.

Descriptions of Schizophrenia, Bipolar Disorder, and

Alzheimer's Schizophrenia is a major group of psychiatric conditions, marked by unusual behavior towards other people, distortions in the workings of minds, and delusions (Kaplan, and Sadock, 1996). There are 5 types of schizophrenia: disorganized thinking and childish behavior marks the first type. Another involves extremes of hyper-activity or inhibition accompanied by withdrawal. Grandiose hallucinations with aggression and extreme views of religion are marks of the third type. The residual phase of a psychotic disorder can result in a fourth type of schizophrenia, while a final type includes undifferentiated cases of this mental condition.

Schizophrenia is a chronic condition of unknown etiology, which may have stages of premonition and residues before and after the active phase (Kaplan, and Sadock, 1996). About 2 million Americans suffer from schizophrenia and about 2 million new cases are discovered each year (Kaplan, and Sadock, 1996). Prevalence is relatively high in urban and industrialized areas. Bipolar disorders are collectively grouped as a sub-set of mood disorders in psychiatry (Kaplan, and Sadock, 1996). Bipolar

disorders are marked by extreme swings of mood from utter dejection to extreme elation. Such disorders tend to enter phases of remission, but may recur periodically as well. Bipolar disorders are characterized by severity: some types may include full manic and mixed episodes, as well as severe depression. Some form of alcohol abuse, either by the patient or by his or her family, is often associated with bipolar disorders (Kaplan, and Sadock, 1996).

Though Alzheimer's may lead to depression and dementia, this malfunction of the brain is not necessarily a psychiatric condition (Kaplan, and Sadock, 1996). Nihilism may precede Alzheimer's, at which stage the condition can respond to psychiatric medicines. Alzheimer's is a progressive mental condition, which affects over 5 million Americans, most of who are over 65 years old. Memory is a major casualty of Alzheimer's, though patients also lose abilities to reason, communicate, and to carry out essential daily activities on their own. There is no cure as yet for the disease, though some new treatments hold promises of relief for patients and their families. Technical Roles of MRI in These Conditions Schizophrenia is postulated to occur when genetic and environmental conditions overlap (Rapoport, Addington, Frangou, and Psych, 2005). It is also widely suspected that early indications may be available before full morbidity sets in.

Earlier investigations were limited to post-mortem investigations of affected brains. MRI makes it possible to study the development of this condition in the central nervous system of living individuals. Small sample sizes and

heterogeneous populations have vitiated attempts to draw generalized conclusions from empirical work.

However, there have been recent efforts to collate MRI studies of normal brain development in children and adolescents, which can be useful in diagnosing early onset schizophrenia (Rapoport, Addington, Frangou, and Psych, 2005). Methodological issues related to imaging protocols have also added to the controversies of using MRI in schizophrenia diagnosis and management. Nevertheless, expansion of the lateral ventricles, and loss of grey and white matter are fairly distinct MRI findings of brains of people affected by schizophrenia (Rapoport, Addington, Frangou, and Psych, 2005).

Meta reviews also establish that the volume of the hippocampus decreases in this medical condition. fMRI has been combined with spectroscopy to establish that metabolites which are involved in cell membrane construction are affected in schizophrenia (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). This is an important indication of the structural damage to certain regions of the brain which eventually lead to this clinical condition. Biochemical methods can combine usefully with fMRI for the early detection of schizophrenia. There is a growing tendency to use fMRI in order to rule out schizophrenia when new cases of psychosis are presented (Woolley and McGuire, 2005). There is growing acceptance amongst patient communities as well, with people requesting prescriptions for scans to confirm that 'all is well'. MRI can be used to compare images of the brain in the extreme as well as the remission phases of bipolar disorders. Comparisons of micro-structures in each of these states may yield insights in

to the nature of the disease and how it can be best managed (Lagopoulos, Ivanovski, and Malhi, 2007).

Since bipolar disorders relate to moods, initial studies assumed that the condition must be related to the thalamus, and other outer portions of the brain. MRI has made it possible to gain a better understanding of the condition by studying all parts of the organ in various phases of psychiatric conditions (Lagopoulos, Ivanovski, and Malhi, 2007). Specifically, MRI has enabled the study of working memory deficits in mood disorders, while earlier imaging methods and diagnostic technologies ignored cognitive aspects of mood disorders. MRI has established the differential working of the bipolar disorder affected brain, when compared with normal ones, even when extremes of mania or depression do not prevail (Lagopoulos, Ivanovski, and Malhi, 2007). This proves that the intervals of remission at the clinical level are deceptive. Neuro-imaging has also established through measurements of cerebral blood flow and of the glucose metabolism rate that the frontal lobe of the brain is often under-developed in patients with bipolar disorders (Lagopoulos, Ivanovski, and Malhi, 2007). fMRI can be used for spectroscopic analysis of metabolites in various phases of bipolar disorders (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated).

This has established that new cell building is affected in bipolar disorders compared to the activity in normal subjects. Further, cell membrane building block levels vary between manic and depressive phases and during remission as well. fMRI also combines well with spectroscopic analyses of

metabolites to study the development of dementia following Alzheimer's (Functional Magnetic Resonance Imaging (fMRI) for the Psychiatrist, not dated). This kind of spectroscopy with fMRI can distinguish between normal ageing and dementia as a result of Alzheimer's. fMRI is much more expensive than other imaging methods (Woolley and McGuire, 2005). Clinicians need to keep this in mind when prescribing the fMRI technique over other methods. There may be many cases in which the absence of temporal resolution and lesser spatial resolution make no difference to clinical decisions. However, safety from ionizing radiation and the possibilities of false negatives may rule in favor of fMRI.

Sequential fMRI sessions over a period of time may help in prognosis and in monitoring individual case responses to management as well (Woolley and McGuire, 2005). fMRI can also encourage the more widespread use of professional psychiatric help. Stigma attached to psychiatric conditions such as schizophrenia makes people hesitant to seek help (Woolley and McGuire, 2005). fMRI is an objective and private means to acceptance of the condition, and helps build resolve to deal with it. Case Studies and Results Imaging has established that large cavum septum pellucidum, cortical atrophy, and ventriculomegaly are more common in schizophrenic individuals than in normal people, but the exact relationships of these abnormalities with schizophrenia have not been established (Woolley and McGuire, 2005). It is likely that disturbances in the normal development of the brain are responsible for the appearance of this psychiatric condition. However, clinical applications are not possible without statistically valid evidence in support. Mean brain activation has been studied in 5 males suffering from



schizophrenia, by comparing their MRIs with images of 7 comparison subjects during a task involving attribution of mental state (Russell et al.

2000). The left inferior frontal gyrus of affected patients showed metabolic differences with respect to blood oxygenation. This case provides supporting evidence for the hypothesis that schizophrenia is directly associated with dysfunctions in the parts of the brain responsible for socio-emotional tasks.

This corroborates the notion that social disabilities are features of schizophrenia (Russell et al. 2000). MRIs of 10 bipolar disorder patients in phases of remission have been compared with similar images of controls (Lagopoulos, Ivanovski, and Malhi, 2007). Dysfunctions have been found in the cortex of the frontal parts of brains, which can be correlated with working memory deficits in bipolar disorder patients. Such imaging changes can be discerned even when patients are not in extreme states of mania or depression. This gives MRI additional values in the management of bipolar disorders because the pathologies can be detected even when patients appear superficially to be normal.

Comparisons of brain images of controls and bipolar disorder patients show differing areas of heightened blood oxygenation during working memory functions (Lagopoulos, Ivanovski, and Malhi, 2007).. Activation foci are seen in the fusiform gyrus, the ventrolateral prefrontal cortex, the lingual gyrus, and in parts of the frontal gyrus of normal individuals, whereas similar activation is found in the middle temporal gyrus, the inferior frontal gyrus, and the middle occipital gyrus, of patients with bipolar disorders. These stated differences have been noted during the encode phase of working

memory operations, but similar differences are also seen during delay and response conditions. It is possible to correlate clinical observations with brain images during comparisons of working memory functions of patients and controls.

ConclusionsfMRI has the potential to reduce the divide between psychiatry and other branches of medicine which rely increasingly on objective measures of states of physical health (Woolley and McGuire, 2005).

Subjectivity limits the acceptance of psychiatric counsel of all types. Cost is another inhibiting factor for the spread of fMRI in clinical psychiatry (Woolley and McGuire, 2005). Other imaging techniques, while offering no temporal and lesser spatial resolution may provide all the help that a clinician can use in chronic and recurrent psychiatric conditions. The environment of fMRI equipment and its extreme sensitivity to head movements does not bode well for the widespread clinical applications of the technology in psychiatry.

However, standardization of imaging protocols may lead to some advances in early detection of schizophrenia, bipolar disorders, and the dementia consequences of Alzheimer's disease. The technology also has applications for differential and confirmed diagnoses, monitoring responses to therapeutic approaches, and for better understandings of underlying etiologies. References Kaplan, H, and Sadock, B, 1996, Handbook of Clinical Psychiatry, Lippincott Williams & Wilkins Lagopoulos, J, Ivanovski, B, and Malhi, G, 2007, An event-related functional MRI study of working memory in euthymic bipolar disorder, Journal of Psychiatry & Neuroscience, 32 (3): 174-184, retrieved June 2007 from [http://www. pubmedcentral](http://www.pubmedcentral).

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