

Neuroimaging distinction between neurological and psychiatric disorders

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Background

It is unclear to what extent the traditional distinction between neurological and psychiatric disorders reflects biological differences.

Aims

To examine neuroimaging evidence for the distinction between neurological and psychiatric disorders.

Method

We performed an activation likelihood estimation meta-analysis on voxel-based morphometry studies reporting decreased grey matter in 14 neurological and 10 psychiatric disorders, and compared the regional and network-level alterations for these two classes of disease. In addition, we estimated neuroanatomical heterogeneity within and between the two classes.

Results

Basal ganglia, insula, sensorimotor and temporal cortex showed greater impairment in neurological disorders;

whereas cingulate, medial frontal, superior frontal and occipital cortex showed greater impairment in psychiatric disorders. The two classes of disorders affected distinct functional networks. Similarity within classes was higher than between classes; furthermore, similarity within class was higher for neurological than psychiatric disorders.

Conclusions

From a neuroimaging perspective, neurological and psychiatric disorders represent two distinct classes of disorders.

Declaration of interest

None.

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The ICD-10,¹ arguably the dominant classification system in use in medicine, makes a distinction between neurological and psychiatric disorders. This distinction is based on nosological criteria, such as aetiological or syndromatic similarities, but also reflects historical² or social factors.³ It has important implications for clinical practice, since the remit of services frequently mirror the boundaries between groups of disorders, which might determine the type of treatment individual patients receive.^{4,5} Over the past few years, however, the distinction between psychiatric and neurological disorders has been called into question on the basis of the latest scientific data.⁶ It has been long known that neurological disorders can present with affective or psychotic symptoms traditionally thought to be specific to psychiatric disorders,^{7,8} and that psychiatric disorders present motor symptoms more frequently seen in a neurology clinic.⁹ More recently, brain imaging has provided an *in vivo* window into the human brain, and has revealed that both neurological and psychiatric disorders are associated with neuroanatomical and neurofunctional alterations.^{10–12} This dynamic and efficient perspective on regional changes in brain disorders can complement the histopathological information provided by neuropathological studies.¹³ This approach has challenged the simplistic view of neurological disorders as ‘organic’ and psychiatric disorders as ‘functional’. In addition to neuroscientific evidence, genetic studies have also begun to reveal the genetic underpinnings of neurological and psychiatric disorders. Allelic variants, copy number variants, epistatic effects and gene-environment interactions appear to play a critical role in both classes of disorders,^{14–16} suggesting the presence of comparable aetiological mechanisms. In a recent, thought-provoking article, White and colleagues¹⁷ suggested that the traditional distinction between disorders of the mind and disorders of the brain is a fundamental misconception, and called for a ‘radical rethinking’

in which psychiatric disorders should be reclassified as disorders of the central nervous system. The merging of these two categories, the authors argued, would be a logical decision given that both neurological and psychiatric disorders are rooted in the brain and are associated with a combination of both sensorimotor and psychological symptoms. However, concerns have been raised about the actual benefits patients would receive from the merging of both fields.^{17,18}

We acknowledge that the distinction between the fields of psychiatry and neurology involves multiple factors, ranging from social and historical to biological, and that any new classification should ultimately reflect an improvement in clinical outcomes. However, it is imperative that this debate is informed by scientific evidence including the biology underpinning the two classes of disorders. In this context, we investigated whether neurological and psychiatric disorders have distinct neuroimaging correlates that arguably could reflect distinct neuropathologies. In particular, we examined whether the two classes of disorders affected different sets of regions, whether these regions were localised in different functional networks and whether neuroanatomical variability within each class of disorders is smaller than between classes. Our investigation was based on a meta-analysis of 168 published studies that used structural magnetic resonance imaging (sMRI) to investigate neuroanatomy in a total of 4227 patients and 4504 healthy controls.

Method

The present meta-analysis was informed by the guidelines provided by the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) Statement (<http://www.prisma-statement.org/>); PRISMA flow diagrams illustrating the

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brain conducts vision The regions of the brain involved in space perception sleep memory learning and language are also considered The final chapter is devoted to discrete centers of the brain responsible for mental functions This monograph will be a useful source of knowledge for neurologists psychiatrists psychologists physiologists neurosurgeons and others interested in the human brain and its behavior Autism Spectrum Disorders David Amaral, Daniel Geschwind, Geraldine Dawson, 2011-05-01 Autism is an emerging area of basic and clinical research and has only recently been recognized as a major topic in biomedical research Approximately 1 in 150 children are diagnosed as autistic so it is also an intense growth area in behavioral and educational treatments Financial resources have begun to be raised for more comprehensive research and an increasing number of scientists are becoming involved in autism research In many respects autism has become a model for conducting translational research on a psychiatric disorder This text provides a comprehensive summary of all current knowledge related to the behavioral experiential and biomedical features of the autism spectrum disorders including major behavioral and cognitive syndromology common co morbid conditions neuropathology neuroimmunology and other neurological correlates such as seizures allergy and immunology gastroenterology infectious disease and epidemiology Edited by three leading researchers this volume contains over 80 chapters and nine shorter commentaries by thought leaders in the field making the book a virtual who's who of autism research This carefully developed book is a comprehensive and authoritative reference for what we know in this area as well as a guidepost for the next several years in all areas of autism research

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