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Resting-state functional magnetic resonance imaging studies in children with attention-deficit/ hyperactivity disorder: an ALE meta-analysis

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 July 2024 and was last updated on 28 July 2024.

INTRODUCTION

Review question / Objective The authors conducted a comprehensive meta-analysis of resting-state functional magnetic resonance imaging studies in children with attention deficit hyperactivity disorder (ADHD).

Condition being studied Attention deficit hyperactivity disorder (ADHD) is the most common neurodevelopmental disorder in children, with a global prevalence of approximately 5.2–7.2%. Although considered to be a childhood disease, it is reported that in most cases (approximately 65%), symptoms persist in adulthood. ADHD can result in poor educational performance, job unemployment, marital failure, crimes, and various mental illness, including personality disorder, selfharm, affective disorder, and drug abuse.

METHODS

Participant or population Attention deficit hyperactivity disorderchildren.

Intervention Not applicable.

Comparator Typical developingchild.

Study designs to be included Resting-state functional magnetic resonance imaging (fMRI) methods were used.

Eligibility criteria This systematic review and meta-analysis incorporated the subsequent studies: (1) Original fMRI studies using whole-brain seed-based (seed-seed or seed-voxel) resting-state functional connectivity to compare ADHD and healthy control (HC) groups were eligible for inclusion (other methods employing statistical approaches such as regional homogeneity and independent component analysis, were excluded because data can-not be integrated with seed-based data), (2) studies that have effectively confirmed the presence of ADHD symptoms based on DSM-III, DSM-III-R, DSM-IV, DSM-IV-TR, DSM-5 and ICD-10 criteria, including previous versions, (3) studies that employed the ALE

method for conducting the analysis and provided peak coordinates of brain regions using standardized Montreal Neurological Institute or Talairach coordinates after normalization, (4) studies that utilized between-group contrasts to examine differences, (5) studies that were formally published in peer-reviewed journals, (6) studies that included participants below the age of 18 years.2.2.2. Exclusion Criteria This systematic review and meta-analysis omitted the subsequent studies: (1) studies employing neuroimaging techniques other than R-fMRI, (2) studies that solely presented within-group comparisons, (3) could not identify standardresting state networks of interest in the whole sample, (4) studies that included children with ADHD in partial remission, as the similarity of neuronal correlates between individuals in partial remission and those with the complete syndrome has not been established, and (5) studies that examined the effects of medication without providing fMRI data at baseline or after a washout period, (6) had irretrievable peak RoI coordinates, (7) were based on a non-seed-based method, (8) ADHD-200 sample imaging database.

Information sources Databases were search (PubMed, The Cochrane Library, Web of Science, EBSCO (MEDLINE, APA PsycInfo Em, base ERIC), , Scopus, and ProQuest,) up until 24th January 2024. Reference lists of included studies will be scanned for further relevant literature. No restrictions will be placed on study design, sample size orlanguage.

Main outcome(s) Based on the perspective that ADHD is a disorder reflecting dysfunction of large-scale neuronal systems , we interpreted abnormally activated brain regions from our metaanalysis as dysfunctional nodes of largescale networks described in the current neuroscience literature.

Quality assessment / Risk of bias analysis No appropriate tool exists for assessing risk of bias in neuroimaging studies. However, due to results from ALE analyses being susceptible to dominance from individual large cohort studies, it may be necessary to conduct sensitivity analyses using the 'Jacknife' method or the 'leave one out' method.

Strategy of data synthesis Aggregate data will be used for quantitative coordinatebased ALE meta-analyses. Analyses will be performed in Brainmap GingerALE version 3.02 We will adhere to the ALE method (http://www.brainmap.org/ale/) of
Eickhoff et al. [1, 2] . A p value will be calculated for each voxel based on probabilities of attaining an ALE value which differed from that of the corresponding voxel on a nulldistribution map, In all analyses, the threshold was set at $p < 0.001$ uncorrected with an extent-threshold of 120 mm3.
[1] Eickhoff, S.B., et al. Human Brain Mapping, 2009. 30(9): p. 2907-2926.
[2] Eickhoff, S.B., et al. Neuroimage, 2012. 59(3): p.2349-2361.

Subgroup analysis If evidence allows, consideration may be given to the following subgroups: Stimulant naïve participants, Participants without comorbidities.

Sensitivity analysis We will also do a sensitivity analysis removing studies with fewer than 8 participants.In the present paper.

Country(ies) involved China.

Keywords Resting-state functional magnetic resonance imaging, attention-deficit/hyperactivity disorder.

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