Neural bases of social deficits in ADHD: a systematic review. Does the Theory of Mind matter?

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Review question

What are neural bases underlying Theory of Mind deficits in chidren and adolescents with ADHD?

Searches

Search for relevant studies was restricted from: January 1970 until date, when final search took place.

Following databases were searched: Scopus, PubMed, Web of Knowledge. Search terms include words related to research question e.g. neuroimaging, Theory of Mind, ADHD. In order to facilitate our search, we used MeSH terms in case of PubMed to obtain relevant studies. We restricted our search on English articles only.

Types of study to be included

We included studies, which were published in peer-reviewed journals and empirically examined relationship between either brain structure or function in relation to Theory of Mind in children and adolescents with ADHD diagnosed by widely recognised diagnostic criteria of DSM and ICD. We also included studies, in which there was comparison group consisted of healthy subjects.

We excluded studies, which reported comorbidity of ADHD with Autism spectrum disorder, were not published in peer-reviewed journals, examined adult population, were reviews articles, examined neural activity by irrelevant measure (Electroencephalography (EEG)) did not reported either directly or indirectly ADHD diagnostic system.

Condition or domain being studied

The neural bases underlying Theory of Mind deficits in Attention Deficit Hyperactivity Disorder.

Participants/population

Inclusion: children and adolescents with ADHD (as diagnosed using recognised diagnostic criteria).

Exclusion: Adults (18 > years).

Intervention(s), exposure(s)

Neuronal correlates concerning mentalization deficits in ADHD will be assessed via neuroimaging methods, that allows to detect either abnormal brain structure (e.g. Magnetic resonance imaging (MRI), Computed Tomography (CT)) or activity (e.g. functional magnetic resonance imaging (fMRI)) in relation to deficits of Theory of Mind ability. We also analysed data from studies, which used non-invasive methods influencing brain activity (e.g. Continuous Theta Burst Stimulation (cTBS)) if related to relevant ADHD population and Theory of Mind.

Theory of mind ability, will be assessed by tasks, measuring an attribution of mental states (e.g. beliefs, feelings). Examples of these tests include: The Reading the Mind in the Eyes test or Sally-Anne task.

Comparator(s)/control

Healthy controls (i.e. absence of neurodevelopmental disorder).

Main outcome(s)

Main outcome is the identification of neural locations associated with deficits of Theory of Mind ability in ADHD. This outcome will be measured by neuroimaging techniques such as fMRI or MRI.

* Measures of effect

With respect to our study aims, timing was not relevant.

Additional outcome(s)

Secondary outcome is the identification of neural bases of Theory of Mind deficits in particular task (e.g. The Reading the Mind in the Eyes test).

* Measures of effect

With respect to our study aims, timing was not relevant.

Data extraction (selection and coding)

Abstracts of studies obtained by our search syntaxes and studies from additional sources, were reviewed by first author in order to select studies, which would meet our inclusion criteria. The same procedure was repeated by co-author in order to decrease the chance of selection bias. If ambiguity accrued, then discussion took place until consensus was reached. The degree of agreement between authors was assessed by both percentage of agreement as well as by Cohen's Kappa (CK). For CK there were 95% confidence intervals calculated. The CK was calculated in R program - irr package.

The full texts were then reviewed by the first author and assessed for eligibility. Process of study selection is depicted in PRISMA flow diagram.

After the eligibility assessing, the following information has been extracted: socio-demographic information such as number of participants, country of recrutation, age. Additionally, there were obtained information relevant to our quality measures criteria (see Risk of bias (quality) assessment). Furthermore, information regarding anatomical and/or functional neural correlates of Theory of Mind/mentalization were extracted. In addition, relevant information regarding Theory of Mind task were gathered. Lastly, information concerning methodology of neuroimaging procedures used were obtained. Acquired data were processed and stored in Microsoft Excel spreadsheet.

Risk of bias (quality) assessment

Studies will be assessed, during data extraction for following quality measures criteria: sample size (prospective power analysis reported), Signal detection supporting strategies (in orbitofrontal region of brain) attention control in ADHD group (e.g. eye tracking used), cognitive ability assessment. Additionally, The Newcastle-Ottawa Scale will also be used for study quality assessment.

Strategy for data synthesis

Because we have decided to include studies with different neuroimaging methodology, it is likely, that data would not be homogenous sufficiently to conduct quantitative synthesis. Thus, the narrative synthesis concerning neural underpinnings of Theory of Mind deficits in children and adolescents with ADHD will take place in our study. In another words, it will be explored, which functional/anatomical neural correlates are associated with decreased Theory of Mind ability in children and adolescents with ADHD.

The functional/anatomical correlates most frequently associated with Theory of Mind deficits in children and adolescents with ADHD, will be interpreted primary by the first author. Interpretation of the results will take in account specific neural and behavioral alterations inherently related to ADHD symptomatology. Additionally, interpretation of the results regarding relationship between abnormalities in neural function/structure and performance in Theory of Mind, will take in account results from the quality assessment. Minimum number of studies, from which data can be extracted is set to one.

Analysis of subgroups or subsets
If possible, subgroup analysis concerning neural abnormalities of Theory of Mind will be conducted: firstly for sub-types of ADHD and secondly for for particular Theory of Mind ability (e.g. false belief reasoning).

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Type and method of review
Narrative synthesis, Systematic review

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25 December 2019

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Palacky University

Conflicts of interest
None known

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English

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Czech Republic

Stage of review
Review Ongoing

Subject index terms status
Subject indexing assigned by CRD

Subject index terms
Attention Deficit Disorder with Hyperactivity; Humans; Neuropsychological Tests; Theory of Mind

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06 April 2020

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21 August 2019

Stage of review at time of this submission

Stage	Started	Completed
Preliminary searches	Yes	No
Piloting of the study selection process	Yes	No
Formal screening of search results against eligibility criteria	Yes	No
Data extraction	Yes	No
Risk of bias (quality) assessment	Yes	No
Data analysis	No	No

The record owner confirms that the information they have supplied for this submission is accurate and complete and they understand that deliberate provision of inaccurate information or omission of data may be construed as scientific misconduct.

The record owner confirms that they will update the status of the review when it is completed and will add publication details in due course.

Versions

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