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Cognitive trajectories following electroconvulsive therapy in adolescents with major depressive disorder: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Preliminary searches.

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 23 November 2025 and was last updated on 23 November 2025.

INTRODUCTION

Review question / Objective Electroconvulsive therapy (ECT) is an effective treatment for adolescents with severe or treatment-resistant major depressive disorder (MDD). However, concerns regarding its potential adverse effects on developing brains, particularly cognitive impairment, remain a major barrier to its utilization. While evidence in adults suggests cognitive deficits are often transient, the cognitive trajectory in adolescents remains under-investigated.

Therefore, this study aims to:

Evaluate the overall cognitive function changes in adolescents with MDD following ECT compared to baseline.

Determine the time-dependent effects by analyzing short-term and long-term cognitive outcomes separately.

Perform subgroup analyses to dissect the impact on specific cognitive domains, including memory (verbal, visual, spatial, working memory), executive function, attention, and processing speed, to identify potential trade-offs between cognitive side effects and symptom-related cognitive recovery.

Condition being studied Cognitive function in adolescents diagnosed with Major Depressive Disorder (MDD) undergoing ECT.

METHODS

Participant or population Adolescents (age ≤ 19 years or as defined by study authors) diagnosed with Major Depressive Disorder (MDD) according to DSM (IV, 5) or ICD (10, 11) criteria.

Intervention Electroconvulsive therapy (ECT), regardless of electrode placement (unilateral/bilateral) or pulse width.

Comparator Pre-treatment baseline cognitive scores.

Study designs to be included Randomized controlled trials (RCTs), quasi-experimental studies, and observational cohort studies (prospective or retrospective) that provide pre- and post-ECT cognitive assessment data.

Eligibility criteria Adolescents (age ≤ 19 years or as defined by study authors) diagnosed with Major Depressive Disorder (MDD) according to DSM (IV, 5) or ICD (10, 11) criteria.

Information sources PubMed, The Cochrane Library, Web of Science, Embase, SCOPUS, PsycINFO.

Main outcome(s) Global Cognitive Function: Assessed by standardized scales such as the Montreal Cognitive Assessment (MoCA), Mini-Mental State Examination (MMSE), or composite scores from comprehensive batteries (e.g., MCCB, CANTAB).
Timing: Short-term and Long-term.

Additional outcome(s) Specific Cognitive Domains:
Memory: Verbal memory, visual/spatial memory, working memory (e.g., specific subtests of MCCB/CANTAB).
Executive Function: Reasoning, planning, cognitive flexibility.
Attention and Processing Speed.
Subjective Cognitive Function.

Data management Two independent reviewers will screen titles/abstracts and full texts. Disagreements will be resolved by a third reviewer.

Quality assessment / Risk of bias analysis RCTs: Cochrane Risk of Bias Tool (RoB 2.0).
Non-randomized studies: Joanna Briggs Institute (JBI) Critical Appraisal Checklist or ROBINS-I tool.

Strategy of data synthesis
Statistical analysis will be performed using RevMan.
Effect Measure: Standardized Mean Difference (SMD) with 95% Confidence Intervals (CIs) will be used due to the use of different cognitive scales across studies.
Model: A random-effects model will be applied to account for clinical and methodological diversity.
Heterogeneity: Assessed using the I^2 statistic and Chi-square test.
Subgroup Analysis: Conducted based on (1) Time points (Short-term vs. Long-term); (2) Specific cognitive domains (Memory vs. Executive Function vs. Attention).

Subgroup analysis We will specifically analyze the status of each component of short-term memory.

Sensitivity analysis Performed to test the robustness of results (e.g., excluding studies with high risk of bias or those combining ECT with specific cognitive-enhancing drugs like ketamine).

Language restriction English、Chinese.

Country(ies) involved China.

Keywords Electroconvulsive therapy, Adolescent major depressive disorder, Cognitive.

Contributions of each author
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Author 3 - Su Hong.
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