Review protocol: A Meta-Review on average cognitive features of children with ADHD and/or dyslexia

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) and developmental dyslexia are two of the most common neurodevelopmental disorders, both of which pose significant cognitive difficulties that tend to persist throughout a person's lifetime (Willcutt et al., 2012; Ramus et al., 2018). Traditionally, both conditions have been understood in categorical terms. Diagnostic criteria are used to draw clear-cut boundaries between affected and unaffected individuals (American Psychiatric Association, 2013). However, a growing body of evidence now supports a more dimensional perspective.

This view suggests that symptoms of ADHD and dyslexia can be seen as existing at the lower end of a developmental continuum that runs through the general population (Sonuga-Barke et al., 2010; Coghill & Sonuga-Barke, 2012). Such a perspective allows for a less rigid interpretation, one that acknowledges both the variability within diagnostic groups and the presence of subclinical symptoms that may still have an impact on everyday life.

Cognitive abilities such as inhibitory control, working memory, attention, and processing speed have received great attention in research on both disorders, since these functions are central not only to learning but also to functioning in daily contexts (Martinussen et al., 2005; Boets et al., 2011).

In the case of ADHD, executive function deficits, especially in inhibitory control and working memory, are typically considered primary (Willcutt et al., 2005; Lipszyc & Schachar, 2010). While that certainly holds true, dyslexia is more specifically associated with difficulties in phonological processing, naming speed, and memory-related skills, all of which affect reading accuracy and fluency (Swanson et al., 2009; Snowling, 2013).

Meta-analyses are essential in quantifying these cognitive deficits, offering robust evidence drawn from large and diverse samples (Frazier et al., 2004; Peng & Fuchs, 2016). Yet, most of the existing studies rely on comparisons between clinical and non-clinical groups. They rarely adopt a dimensional scoring approach that

considers symptom severity as a continuous variable (Pennington, 2006; Willcutt et al., 2012). In addition, much of the current literature tends to focus on treatment outcomes, prevalence rates, or neurobiological findings, rather than systematically contrasting cognitive characteristics through a dimensional lens (Barkley, 2015; Ramus et al., 2018).

The Present Meta-Review

This meta-review is part of a broader project that aims to explore whether the average cognitive characteristics observed in children identified with neurodevelopmental conditions reflect, or are compatible with, a dimensional account of such conditions. To do this, the current review focuses on identifying all previously published meta-analyses that examine the cognitive characteristics of ADHD and dyslexia from a dimensional standpoint. It's well established that children with neurodevelopmental disorders often show cognitive deficits, not just in one isolated domain, as some "core deficit" hypotheses have suggested, but across multiple areas of functioning (Willcutt et al., 2005; Pennington, 2006). While this idea of a "multi-deficit" profile isn't a necessary condition for a dimensional model, it certainly aligns more naturally with it.

The core idea is that these conditions represent the lower end of continuous developmental traits found throughout the general population. So rather than each disorder being tied to a single specific impairment, they appear to involve a range of cognitive challenges that correlate to varying degrees across individuals. Some earlier studies have used this framework to investigate whether the average performance of children with a neurodevelopmental diagnosis matches what would be expected if we extrapolated downward from the general population (e.g., Carretti et al., 2022; Mammarella et al., 2021). The present meta-review builds on that approach by drawing from previously published meta-analyses.

For that reason, this review focuses specifically on meta-analyses that compare individuals with ADHD or dyslexia to healthy control groups in relation to core cognitive skills such as inhibitory control, working memory, attention, and processing speed. It does not include studies that center on prevalence, diagnostic criteria, or treatment response.

By taking a dimensional perspective, we hope to generate a clearer, more holistic understanding of how cognitive functioning varies in ADHD and dyslexia. This approach also helps move beyond rigid diagnostic boundaries and captures the real-life variation seen in symptoms and functioning. Ultimately, we aim for this review to offer insights that could guide future research and clinical practice—leading to more tailored, effective interventions for children across the spectrum of neurodevelopmental traits.

Methods

Search Strategy

We will run a broad search across four major databases: PubMed, PsycINFO, Scopus, and Web of Science, to identify all relevant meta-analyses that compared average cognitive performance in individuals with ADHD or developmental dyslexia against neurotypical controls.

We are particularly interested in cognitive functions like working memory, executive functioning, and phonological abilities. No publication date limits will be applied. The following search string has been refined over several rounds to strike a balance between coverage and specificity, and it combines terms for the disorders with those for methodology and cognitive traits:

("meta-analysis" OR "meta analy" OR "systematic review")*
AND
("executive function" OR "cognitive function*" OR "working memory" OR "processing speed" OR "speed of processing" OR "phonological processing" OR "meta-phonolog*" OR "meta phonol*" OR "coherent dot motion" OR "rapid automatized naming" OR "RAN" OR "attentional" OR "attention abil*" OR "visual crowding" OR "neurocognitive" OR "neuropsychological" OR "Wechsler" OR "WISC*" OR "WAIS")*
AND
("ADHD" OR "Attention-Deficit" OR "Attention Deficit*" OR "dyslexia" OR "reading dis*")*
AND NOT

("intervention" OR "train*" OR "rehabilitat*" OR "therapy" OR "treatment")*

Screening Procedure

All the results will be imported into Zotero or a similar platform, to help us manage references, remove duplicates, and keep the workflow organized. The screening process has two main steps, following the PRISMA flowchart:

Step 1: Title and Abstract Screening

We will start by scanning titles and abstracts. If a study clearly is not relevant, for instance, if it focuses on non-cognitive outcomes, unrelated conditions, or isn't a meta-analysis, it will be excluded at this stage.

Step 2: Full-Text Screening

The remaining studies will then be reviewed in full to see whether they met our criteria. We will attach the PDFs directly to Zotero entries where available, which makes it easy to highlight, take notes, and track our decisions. We will also use personalized tags and folders to mark inclusion or exclusion throughout the process.

Inclusion Criteria

A study will be included if it met all of the following:

- It was a meta-analysis or systematic review.
- It focused on either ADHD or dyslexia (analyzed separately).
- It meta-analyses at least one cognitive domain (e.g., working memory, attention, processing speed, inhibitory control).
- It compared outcomes to a healthy (neurotypical) control group or, if it adopts a dimensional approach, it correlates the outcome to a measure of the clinical trait of interest on a sample of general popultaion.

Exclusion Criteria

We exclude studies if they:

- Focus only on prevalence, diagnostic criteria, or behavioral symptoms, without addressing cognitive traits;

- Look at intervention or treatment effects (e.g., medication, behavioral therapy);
- Compare clinical groups to other clinical or non-healthy groups (e.g., ADHD with comorbidities).
- Did not include a neurotypical control group (if a categorical approach is adopted).

Data Extraction and Organization

A systematic data extraction process will be utilized to ensure consistency across all the eligible included studies. Main data will be collected for each meta-analysis, including publication details, the type of disorder examined, cognitive traits assessed, effect sizes, and methodological features such as sample size, age range, and number of primary studies. To facilitate clarity and comparability, a standardized coding scheme will be developed before data extraction begin.

Below is a data dictionary with the list of extracted (coded) variables, their definitions, and expected value types:

Variable Name	**Description**	**Value Type**
ID_article	Unique identifier for the article	Integer
Authors	Full list of the article authors' names	Text
Year	Year of publication	Integer
Title	Title of the article	Text
Journal	Journal where the article was published	Text
Target_disorder	Which disorder (trait) is studied (ADHD or Dyslexia/reading)	Category
Dimensional_approach	Whether the study adopts a dimensional (not taxonic) approach (Yes/No)	Boolean
Trait_measured	Cognitive trait analyzed (e.g., working memory, inhibition)	Category
Type_effect_size	Type of the reported effect size (should always be	Category

	"Standardized Mean Difference", unless a dimensional approach is adopted)	
Effect_size	Estimate of the effect size	Numeric
Std_Err	Standard Error of the effect size	Numeric
CI_lower	Lower bound of the effect size	Numeric
CI_upper	Upper bound of the effect size	Numeric
Tau_heterogeneity	The estimated Standard Deviation across true effects (Tau estimate)	Numeric
Publication_bias	A descriptive field reporting the authors' and our own considerations about the risk of publication bias in the meta-analysis, and possible adjusted effect size if computed	Text
Age_range	Reported age range of the participants, if available	Text
Age_group	A description of the developmental stage (e.g., children, adolescents, adults, mixed)	Text
Notes	Any note by the coder or the PI	Text

Data analysis

Since this is a meta-review, there will not be any new meta-analyses. Instead, a structured narrative synthesis based on findings presented by included meta-analyses will be attained. The primary goal is to compare cognitive domains (e.g., working memory, attention, processing speed) across ADHD, dyslexia, and neurotypical controls, as presented in the underlying meta-analyses. We will synthesize and extract effect sizes and their variance (to compute confidence intervals), the cognitive domain(s) assessed, age range and characteristics of the population, subgroup analyses and moderators (if any), methodological quality, including inclusion criteria, of all the meta-analyses.

For replicability and transparency reasons, this meta-review will be guided by the PRISMA 2020 statement (Page et al., 2021). A PRISMA flow diagram will be used to report identified records screened, excluded (with reason), and included in the

final synthesis. The PRISMA checklist will guide the reporting structure across all methodological phases of search strategy, eligibility criteria, and data synthesis.

Results will be grouped by disorder and by cognitive domain, with attention to convergence and divergence across meta-analyses. No statistical re-analysis of primary data will be performed.

Limitations

As with any meta-review, the strength of our synthesis relies on the quality of the existing work we're reviewing. The meta-analyses included in our review offer valuable insights, but they may differ in how they define and measure cognitive constructs, such as "working memory" or "attention", terms that often vary across theoretical frameworks and research paradigms. This variability could limit our ability to draw clean, one-to-one comparisons across disorders or cognitive domains.

Moreover, our review will not perform any new statistical aggregation or re-analysis of effect sizes. As such, we are relying on the original authors' handling of bias, heterogeneity, and moderator effects. This reliance may restrict our capacity to detect broader patterns, such as publication bias or other shared statistical flaws. Nonetheless, while we do not re-analyze meta-analytic data, we will consider whether the authors flagged any risk of publication bias, and whether they attempted to correct for it.

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