From Risk to Diagnosis: A Retrospective Look on Children at Risk for Co-Occurring Dyslexia and ADHD

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Abstract (250 words)

Children with co-occurring dyslexia and ADHD often face substantial academic challenges. Diagnoses for these disorders typically occur around ages 6 to 10, when behavioural symptoms and reading or spelling deficits become evident, while cognitive development may already be impacted. This study aimed to identify early cognitive characteristics of children at risk of developing dyslexia and/or ADHD.

We tracked 178 preschoolers at risk for dyslexia, ADHD, co-occurring dyslexia and ADHD, or without risk from age 5 until age 8. We assessed phonological skills, executive functions, processing speed, and receptive vocabulary. At age 8, they were regrouped based on their diagnoses of dyslexia, ADHD, co-occurring dyslexia and ADHD, or neither. The risk groups predicted clinical groups with 57% accuracy.

Linear mixed models showed differential growth per clinical group for phonological awareness, rapid naming, and block recall forwards. There was also an effect of time, as all children improved on all cognitive measures between the ages of 5 and 8. Diagnosis effects with post hoc comparisons revealed three patterns. First, shared deficits in processing speed, reaction time variability, and block recall backwards were observed across all clinical groups. Second, unique deficits in digit span and nonword repetition were found only in the dyslexia + ADHD group. Third, significant differences in fluency and no go accuracy were found between the typically developing and dyslexia + ADHD groups, with the latter performing poorest. These findings emphasise the complexity of cognitive development in children with dyslexia and/or ADHD while still underscoring the possibility of early identification.

Extended summary (993 words, including figure and references)

Cognitive development in early childhood is important as children acquire fundamental skills that influence their academic and social success [1, 2]. However, this development is impacted in children with developmental dyslexia (dyslexia) and/or attention-deficit/hyperactivity disorder (ADHD), leading to significant challenges in learning and academic achievement, often manifesting before formal diagnoses. Therefore, early identification is key, as untreated reading difficulties and ADHD symptoms often worsen over time and can hinder learning [3-5].

Dyslexia and ADHD, each affecting about 5-7% of children, have overlap rates of 15-40% [6, 7]. Dyslexia is primarily associated with phonological deficits [8, 9], while ADHD involves difficulties with inhibition and working memory [10, 11]. Cross-sectional studies in older children suggest that co-occurring dyslexia and ADHD may share cognitive deficits, especially in executive functions (EF) and processing speed (PS) [12, 13].

This study investigated the cognitive development of children recruited for being at risk for dyslexia, ADHD, or co-occurring dyslexia and ADHD, or without risk, over a span of four years. The total sample included 186 children, initially selected at age 5. We measured phonological skills, EF, PS, receptive vocabulary, and school achievement at ages 5, 6 and 8. At age 8, children were regrouped based on standardised reading, spelling, and ADHD-related behaviour assessments. By regrouping children based on their diagnostic outcomes at age 8, we aimed to better understand the cognitive trajectories leading to dyslexia, ADHD, or co-occurring dyslexia and ADHD. Our findings could enhance early identification strategies, supporting tailored interventions that address specific educational needs before formal diagnoses are made.

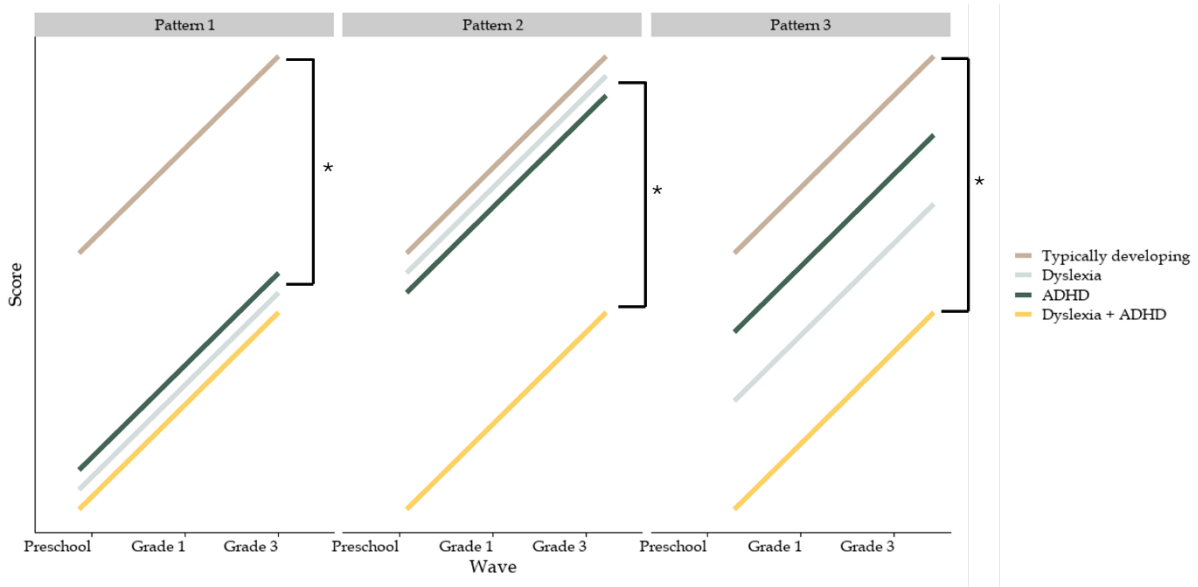
In the co-occurring risk group, most children received a clinical diagnosis by third grade, highlighting significant risk, but our overall detection accuracy was only 57%. Early risk classification at age 5 showed strong predictive value for the dyslexia risk groups (irrespective of co-occurring ADHD risk), underscoring the educational relevance of early screening.

We analysed group differences in cognitive performance across time points, accounting for individual variability, using linear mixed models. All children improved their performance on the tasks over time. Furthermore, post hoc comparisons of group differences showed three distinct patterns (Figure 1). In Pattern 1, typically developing children outperformed all clinical groups in PS, reaction time variability, and block recall backward tasks, with an additional difference where children with co-occurring dyslexia and ADHD (DAD) scored lowest in block recall backward. Pattern 2 showed DAD performing significantly lower than other groups on digit span forward, nonword repetition, and digit span backward (where dyslexia-only (DD) also scored

lowest). Pattern 3 found typically developing children scoring highest and DAD lowest, with no other significant differences. This was observed in fluency and no go accuracy; in no go accuracy, DD also scored higher than DAD.

These findings highlight the complexity of early identification for dyslexia and ADHD, as many children classified as at risk did not receive a diagnosis later. This indicates that early risk classifications should be complemented by continuous monitoring, as children's cognitive profiles can evolve over time. Ongoing support remains essential to address potential learning challenges. Notably, the presence of cognitive deficits in EF and PS underscores the need for tailored interventions. Existing research demonstrates that EFs are malleable and its development can be supported through targeted interventions [14]. This presents a significant opportunity for educators and clinicians to implement strategies aimed at enhancing EFs in children with co-occurring dyslexia and ADHD. Future studies should refine predictive tools to enhance educational outcomes for at-risk children. Such efforts will be essential to optimise cognitive development and improve educational outcomes for at-risk children, with the ultimate goal of supporting their success in learning.

Figure 1 Patterns of post hoc comparisons between diagnostic groups.



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