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Decoding Executive Functioning Deficits among Children with Specific Learning Disabilities - A Quantitative Exploration

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Abstract: Children with Specific Learning Disabilities (SLD) such as dyslexia, dyscalculia, and dysgraphia often experience significant challenges in executive functioning, particularly in areas like working memory and inhibition. These cognitive deficits are not only under-identified in the Indian educational context but are also frequently misunderstood as behavioral problems. This study quantitatively examined the relationship between executive functioning deficits and academic performance in children diagnosed with or at risk for SLD. Using standardized tools—the Childhood Executive Functioning Inventory (CHEXI) and the Academic Performance Rating Scale (APRS)—data were collected from school-aged children across various educational and clinical settings. Statistical analyses revealed strong, negative correlations between executive functioning deficits and academic performance, with working memory emerging as a particularly robust predictor. These findings underscore the importance of incorporating cognitive profiling into SLD assessment and intervention frameworks, highlighting the need for early, tailored support systems that address both academic and cognitive-emotional challenges. The study calls for educational reforms that adopt a neurodevelopmental lens to foster inclusion and equity in learning environments.

Keywords: *Specific Learning Disabilities (SLD), Executive Functioning, Working Memory, Inhibition, Academic Performance, CHEXI, APRS, Cognitive Deficits, Inclusive Education.*

1. Introduction

Despite being grouped under the umbrella of specific learning disabilities, children with dyslexia, dyscalculia, and dysgraphia often present with remarkably distinct cognitive and behavioural profiles. However, one of the most consistently observed challenges across these subtypes is a struggle with executive functioning—the very set of mental skills that allow us to plan, organise, and control our behaviour. This points to the possibility of a shared underlying neurocognitive vulnerability, which may not be entirely captured by traditional academic assessments. In many Indian classrooms, such deficits are often misunderstood as laziness, inattentiveness, or even deliberate non-compliance, leading to further alienation of these children from mainstream learning spaces.

Moreover, while academic performance continues to be the most visible indicator of success in school, a child's ability to regulate emotions, shift between tasks, manage time, and retain information is equally crucial in determining both short- and long-term outcomes. Children with SLD who struggle with executive functioning may appear disorganised, forgetful, or impulsive—not due to a lack of intelligence, but because their cognitive control systems function differently. By acknowledging these invisible struggles, we not only humanise their learning journey but also create space for more tailored and empathetic interventions that look beyond the 'marks on paper' to understand the mind behind the performance.

1.1 *Aim Of The Study*

The research aimed to explore the relationship between executive functioning deficits and behavioural adjustment among Indian school-going children diagnosed with or at risk for Specific Learning Disabilities (SLD). The investigation intends to understand how children's ability to manage attention, impulse control, and emotional regulation (core elements of executive functioning) influences their overall academic performance.

1.2 *Objectives*

- To assess executive functioning deficits among children diagnosed with or at risk for SLD.
- To assess academic performance among children diagnosed with or at risk for SLD.
- To explore the relationship between executive functioning deficits and academic performance in children with or at risk for SLD.

1.3 Hypotheses

H1: There will be a significant negative correlation between executive functioning deficits and academic performance in children with or at risk for SLD.

H2: Higher deficits in executive functioning will be associated with lower levels of academic performance.

H3: There will be a significant relationship between executive functioning deficits and academic performance in children with or at risk for SLD.

2. Review of Literature

Executive functioning plays a vital role in children's cognitive development, and its deficits have significant implications for learning. In a pivotal study by Alloway et al. (2009), the researchers explored the impact of working memory deficits on children diagnosed with Specific Learning Disabilities (SLD). The study utilised the Automated Working Memory Assessment (AWMA) and the Wechsler Intelligence Scale for Children (WISC) to evaluate the cognitive profiles of 93 children aged between 7 and 11 years. These children were categorised into groups based on their learning profiles. Using multivariate analysis of variance (MANOVA), the study revealed that children with SLD displayed marked impairments in working memory, especially in tasks requiring phonological and visuospatial processing. These findings suggested that working memory challenges are not just a by-product of SLD but are often a core cognitive deficit that can severely hinder academic learning and day-to-day functioning. The study further emphasised that these impairments were not accounted for by differences in IQ, indicating a distinct cognitive profile in children with SLD that warranted specialised attention and intervention.

In a comprehensive study conducted by Trainin and Swanson (2005), the researchers explored the role of executive functioning in the academic success of college students with and without learning disabilities. The study utilised the Swanson Cognitive Processing Test (SCPT) to measure cognitive strategies related to executive functioning, such as working memory and cognitive flexibility. A total of 60 undergraduate students (30 with diagnosed learning disabilities and 30 without) participated. The researchers employed MANOVA and correlational analysis to examine group differences and cognitive predictors of academic performance. The results indicated that students with learning disabilities demonstrated significantly lower scores in executive processes, especially in strategic planning and metacognition. The findings underscored the crucial role that executive functioning deficits

play in academic struggles and highlighted the need for support services at the tertiary education level.

3. Methodology

3.1 *Variables Of The Study*

Executive Functioning Deficits: Refers to impairments in higher-order cognitive processes such as working memory, planning, organisation, impulse control, and emotional regulation. In this study, these are measured through parent/teacher reports using the Childhood Executive Functioning Inventory (CHEXI).

Academic Performance: Defined as a child's ability to meet educational benchmarks such as reading fluency, comprehension, written expression, mathematical reasoning, and classroom performance. Academic performance in this study is operationalised through teacher ratings using the Academic Performance Rating Scale (APRS).

3.2 *Sample And Its Selection*

The sample of the study comprised school-going children aged 9 to 15 years, either formally diagnosed with Specific Learning Disabilities (SLD) or identified as at risk for SLD by special educators or clinical psychologists. Participants were drawn from two resource and special education centres located in mainstream schools in South Delhi, as well as two therapy clinics that offer remediation services for children with learning and developmental challenges.

The purposive sampling technique was employed to ensure that the selected participants had observable or documented executive functioning difficulties and/or SLD-related concerns. Both boys and girls were included, and parental/guardian consent was obtained for every participant.

3.3 *Research Design*

The study adopts a correlational research design, which is suitable for examining the statistical relationship between the two primary variables: executive functioning and behavioural adjustment.

3.4 *Data Collection Tools*

Childhood Executive Functioning Inventory (CHEXI): The CHEXI is a well-validated, parent- and teacher-rated scale developed by Thorell and Nyberg (2008), designed to assess executive functioning in children aged 4 to 12 years. It includes 24 items divided into two key domains:

- Working Memory (e.g., “Has difficulty remembering things, even for a few minutes.”)
- Inhibition (e.g., “Interrupts others when they are talking.”)

Each item is rated on a 5-point Likert scale, from 1 (definitely not true) to 5 (definitely true). Higher scores indicate greater executive functioning difficulties. The CHEXI has shown strong psychometric properties, including high internal consistency (Cronbach’s $\alpha > 0.80$) and good convergent validity with clinical measures of ADHD and executive dysfunction.

Academic Performance Rating Scale (APRS): Originally developed by DuPaul et al. (1991), the APRS is a teacher-reported measure that evaluates a child’s classroom functioning across both academic and behavioural dimensions. The modified version used in this study includes domains such as:

- Academic Productivity and Performance
- Attentiveness
- Hyperactivity and Impulsivity
- Aggression
- Social Skills
- Adaptability

Items are rated on a Likert scale from 1 (never or almost never) to 5 (very often). This tool is widely used in school psychology to screen behavioural adjustment problems and is sensitive to detecting changes in children with neurodevelopmental and learning disorders.

3.5 Procedure

Before data collection, ethical clearance was obtained, and permission was sought from the respective heads of schools and clinical centres. A detailed explanation of the study's purpose and procedure was provided to special educators, therapists, and caregivers. Once informed consent was secured, participants were identified with the help of the school/clinic staff based on their learning and behavioural challenges.

Both CHEXI and APRS were administered to professionals familiar with the child, either the class teacher, special educator, or therapist, depending on the setting. In some cases, parent reports were also included to supplement the behavioural observations. Data collection took place for four weeks, ensuring that sufficient time was provided to respondents to complete the rating scales with accuracy and attention. The anonymity of participants was strictly maintained, and all responses were used solely for research purposes.

3.6 Statistical Analysis

The data collected was analysed using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistics (means, standard deviations) were computed to summarise the demographic and psychological characteristics of the sample. To test the hypotheses, Pearson's Product-Moment Correlation was employed to determine the strength and direction of the relationship between executive functioning deficits and behavioural adjustment scores. Further, multiple regression analyses may be conducted to assess the predictive value of executive functioning components (working memory and inhibition) on specific behavioural domains like attentiveness, adaptability, or aggression.

4. Results

Table 1: Descriptive Statistics

Variable	Mean	SD	Min	Max	Skew	Kurtosis
Academic Perf	22.50	8.208	8	38	0.332	-1.155
Inhibition	36.143	12.48	12	55	-0.479	-1.310
Working Memory	39.533	14.08	13	60	-0.548	-1.209

Note. Academic Perf, Academic Performance.

Further Pearson correlations and multiple regressions were conducted on these variables to examine their underlying associations. Descriptive statistics were conducted on the data. Since all skewness values (ranging from -0.548 to 0.332) and kurtosis values (ranging from -1.310 to -1.155) fell within the range of ± 2 for skewness and ± 7 for kurtosis (West, Finch, & Curran, 1995), the assumption of normality was not violated.

Table 2 : Pearson Correlations between Study Variables

	Academic Performance	Inhibition	Working Memory
Academic Performance	1	-.817**	-.828**
Sig. (2-tailed)		<.001	<.001
N	105	105	105
Inhibition	-.817**	1	.969**
Sig. (2-tailed)	<.001		<.001
N	105	105	105
Working Memory	-.828**	.969**	1
Sig. (2-tailed)	<.001	<.001	
N	105	105	105

A Pearson correlation analysis was conducted to examine the relationship between executive functioning deficits (inhibition and working memory) and academic performance in children with or at risk for specific learning disorders (SLD). The results revealed a strong, significant negative correlation between academic performance and inhibition deficits ($r = -0.817$, $p < .001$), as well as between academic performance and working memory deficits ($r = -0.828$, $p < .001$). These findings indicate that higher levels of executive functioning deficits are associated with lower academic performance. Additionally, a strong positive correlation was observed between inhibition and working memory ($r = 0.969$, $p < .001$), suggesting a close association between these two components of executive functioning.

Table 3: *Coefficients of Regression Model predicting Academic Performance*

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	Tolerance
1						
(Constant)	41.924	1.388		30.195	<.001	
Inhibition	-0.164	0.146	-0.249	-1.117	0.267	0.062
Working Memory	-0.342	0.130	-0.587	-2.636	0.010	0.062

A multiple linear regression analysis was conducted to examine the predictive value of executive functioning deficits—specifically, inhibition and working memory—on academic performance in children with or at risk for SLD. The overall model was statistically significant, $F(2, 102) = 112.84$, $p < .001$, accounting for approximately 68.9% of the variance in academic performance ($R^2 = .689$, Adjusted $R^2 = .683$). Among the predictors, working memory emerged as a significant individual contributor to academic performance ($\beta = -0.587$, $p = .010$), indicating that greater deficits in working memory were associated with lower academic achievement. In contrast, inhibition did not significantly predict academic performance when controlling for working memory ($\beta = -0.249$, $p = .267$). Despite the high multicollinearity between the two predictors ($VIF = 16.231$), these findings underscore the particularly strong role of working memory deficits in explaining academic difficulties among children at risk for SLD.

5. Conclusion

This study set out to explore the relationship between executive functioning deficits and academic performance in children with or at risk for Specific Learning Disabilities (SLD). Recognising the increasing academic and emotional challenges faced by this population, the research aimed to go beyond conventional academic metrics and understand the cognitive underpinnings that may be driving these struggles. Using a quantitative approach, the study employed two standardised scales- the Childhood Executive Functioning

Inventory (CHEXI) to assess executive functioning (focusing on inhibition and working memory), and the Academic Performance Rating Scale (APRS) to assess academic performance. The sample consisted of children from diverse school settings who had either been diagnosed with or were at risk for SLD. Statistical methods such as Pearson correlation and multiple linear regression were used to test the following hypotheses:

- H1: There will be a significant negative correlation between executive functioning deficits and academic performance in children with or at risk for SLD.
- H2: Higher deficits in executive functioning will be associated with lower levels of academic performance.
- H3: There will be a significant relationship between executive functioning deficits and academic performance in children with or at risk for SLD.

The findings provided strong support for all three hypotheses:

- Significant negative correlations were observed between executive functioning deficits (both inhibition and working memory) and academic performance. As predicted, higher deficits were associated with poorer academic outcomes.
- Working memory emerged as a particularly strong predictor in the regression analysis, even after controlling for inhibition. This suggests that among the components of executive functioning, difficulties in holding, manipulating, and recalling information may directly hinder academic engagement and output.
- Although inhibition was also negatively correlated with academic performance, it did not remain a significant predictor in the regression model when working memory was included. This may be attributed to high multicollinearity between the two variables, suggesting a close cognitive link and shared variance.

Taken together, the results highlight that executive functioning deficit — particularly in working memory — have a substantial impact on academic performance in students with SLD. These findings reinforce existing literature and theoretical frameworks (such as Baddeley's model of working memory and Barkley's theory of executive self-regulation), while also offering a clear lens into the cognitive struggles experienced by older school-age children. More broadly, the study underscores the need for early identification and intervention. It advocates for schools and professionals to move beyond surface-level academic assessments and adopt a neurodevelopmental and cognitive-informed approach to education. This includes using cognitive screeners, integrating EF training programs into classroom routines, and designing flexible assessment strategies that allow students with EF deficits to demonstrate their learning authentically.

In today's educational context — especially in light of India's National Education Policy (NEP) 2020, which champions inclusive, student-centric learning — the findings point to the urgent necessity of creating systems that not only accommodate but also empower children with diverse cognitive profiles. By understanding and addressing executive functioning deficits in students with SLD, we take a meaningful step toward achieving true educational equity and inclusion.

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