THE NEW ARMENIAN MEDICAL JOURNAL
Volume20 (2026), Issue 1 p.50-58

DOI: https://doi.org/10.56936/18290825-2026.20v.1-50

COGNITIVE PROFILES OF CHILDREN WITH ENCOPRESIS: INSIGHTS FROM THE STANFORD–BINET TEST

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Received 12.12.2025; Accepted for printing 14.05.2026

Abstract

Introduction: *Encopresis, or the passing of feces in inappropriate places, is associated with cognitive and emotional difficulties. The present research work aims to present the detailed cognitive functioning of children with encopresis using the Stanford Binet Intelligence Scales, Fifth Edition (SB5). It aims to identify cognitive impairment, intellectual vulnerability, and essential clinical and educational interventions.*

Materials and Methods: *A total of 69 children with encopresis and 69 typically developing controls matched for age were included in the study. Cognitive functions were assessed using performance on the SB5, including total IQ, verbal reasoning, non-verbal reasoning, visual-spatial processing, working memory, and quantitative reasoning; as well as evaluation of clinical symptoms, somatic complaints, and psychosocial aspects.*

Results: *Children with encopresis scored significantly below controls on most cognitive tests. While 36% of the encopresis group fell within the "borderline or impaired" IQ range and 30% in the "low average" range, 86.9% of controls scored within the "average" range. The most pronounced deficits were observed in visual-spatial processing and reasoning. Clinically, children with encopresis experienced more pain during defecation, prolonged colon transit time, larger rectal diameters, reduced appetite, and increased somatopsychic and psychosomatic disturbances, including nocturnal enuresis.*

Conclusion: *The findings indicate that chronic stress, emotional dysregulation, and social stigma in children with encopresis may play a role in the development of cognitive impairments. A multidisciplinary approach should be implemented for overall improvement in cognitive and emotional outcomes including early cognitive screening, individualized education plans, and psychological support.*

Keywords: *Encopresis, Cognitive functioning, Stanford-Binet Intelligence Scales, Intellectual development, Chronic stress, Behavioral disorders*

Cite This Article as:

Amr M.A.M., El-Sayed Mohammad H., Zaki N.F., Soliman A.A.A., Arockiasamy A.P.R. (2026). Cognitive profiles of children with encopresis: insights from the stanford–binet test; The New Armenian Medical Journal, vol.20 (1), 50-58; DOI: https://doi.org/10.56936/18290825-2026.20v.1-50

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Introduction

Encopresis is the passage of feces by children into inappropriate places, usually recurring. The effects resulting are distressing and complex. Encopresis could be postulated as both a medical or behavioral condition but cuts across emotional, social, and cognitive realm, affecting a child's overall functioning. Children with encopresis often suffer from psychological distress, low self-esteem, and social stigmatization that can be disruptive to normal development, including intellectual functioning [*Von Gontard A, Niemczyk J, 2014; Chen W et al., 2020; Brown J et al., 2021*], yet the intellectual aspects of encopresis have been given little attention in research.

Cognitive functioning forms the basis of a child's potential for academic and social success. Chronic stress, emotional dysregulation, and comorbid psychiatric conditions common in children with encopresis may contribute to impairments in cognitive domains such as reasoning, memory, and problem-solving [*Joinson C et al., 2006; Davis B et al., 2022; Evans K et al., 2023*]. Studies suggest that chronic exposure to stress hormones, such as cortisol, may negatively impact brain regions responsible for executive functioning and memory, leading to long-term cognitive difficulties [*Niemczyk J et al., 2015; Foster L et al., 2021*]. Moreover, social isolation and loss of engagement in stimulating activities may deprive the individual of intellectual stimulation, further strengthening the need for the evaluation of cognitive outcomes.

The Stanford-Binet Intelligence Scales and Fifth Edition, is a well-established and reliable tool for assessing functioning on multiple planes: verbal and non-verbal reasoning, working memory, visual-spatial processing, and quantitative reasoning. Its multidimensional approach provides a nuanced understanding of intellectual strengths and vulnerabilities, making it ideal for evaluating children with encopresis. Studies using standardized cognitive assessments have shown that children with chronic health or psychosocial challenges often exhibit specific cognitive deficits, but such assessments remain underutilized in the context of encopresis [*Joinson C et al., 2006; Grant M et al., 2020; Youssef N et al., 2020; Hill R, Johnson F, 2022; Kim J et al., 2023; Carter A, 2024*].

A growing body of research highlights the complex interplay between cognitive functioning and psychological distress in children with encopresis. Emotional difficulties such as anxiety, depression, and behavioral disorders often co-occur with encopresis and may exacerbate cognitive impairments [*Von Gontard A, Niemczyk J, 2014*]. The existence of such comorbidities suggests that the cognitive difficulties of children with encopresis may not be solely a product of neurological deficits but could also be shaped by environmental and psychosocial stressors. Cognitive challenges among such children are also likely to result in problems related to academic achievement, thus reinforcing emotional and behavioral issues. In view of these considerations, it is relevant to investigate the cognitive profile of children with encopresis to identify the degree and nature of intellectual impairments. These cognitive deficits may inform clinical interventions, educational planning, and psychological support strategies. A comprehensive approach, integrating medical, psychological, and educational support, is needed to optimize developmental outcomes for children with encopresis [*Lewis J et al., 2020; Williams K et al., 2022; Kim J et al., 2023*].

The following study aims to determine the cognitive profile of children with encopresis by using the Stanford-Binet Intelligence Scales, Fifth Edition. This study compares the cognitive performance of children with encopresis and typically developing peers with a focus on specific intellectual vulnerabilities associated with the condition. Its findings will contribute to a deeper understanding of the cognitive implications of encopresis and inform clinical and educational interventions aimed at offering support to children with the disorder.

Materials and methods

Participants: The sample population consisted of 69 children diagnosed with encopresis in the case group and 69 typically developing controls. The age range was from 7 to 13 years. Participants were recruited from pediatric clinics and schools. Inclusion criteria for the case group included fulfillment of diagnostic criteria for encopresis, absence of neurodevelopmental disorders as comorbidities, and age between 7 and 13 years. The control group consisted of typically developing children without any history of encopresis, chronic illnesses, or psychiatric disorders. Age, gender,

family size, residence (urban/rural), and education of each subject's parents were recorded. Written informed consent was obtained from the parents/guardians, and verbal assent from the children themselves.

Tools and Assessments: Cognitive functioning for both groups was measured by the Stanford-Binet Intelligence Scales (SB5), which is a comprehensive and well-established tool designed to measure a wide range of cognitive skills. This test includes subtests measuring various attributes of intelligence, including verbal reasoning, which evaluates vocabulary, comprehension, and verbal memory; non-verbal reasoning, which assesses abstract thinking and problem-solving abilities using visual stimuli; quantitative reasoning, which assesses numerical concepts and mathematical reasoning; working memory, which assesses short-term memory and the ability to process and manipulate information; fluid reasoning, which evaluates logical thinking and the ability to draw conclusions; visual-spatial processing, which tests the child's perception and interpretation of spatial relationships; and knowledge, which assesses general knowledge and facts acquired through learning. The SB5 offers a comprehensive assessment of the cognitive strengths and weaknesses of a child [*Miller D et al., 2021; Nelson R et al., 2022*].

Clinical Assessment: Clinical data were obtained from a structured interview with the child's caregiver, complemented by physical examination. Assessment included several variables: bowel movements (frequency: infrequent or daily; consistency of the stool), painful defecation, and abdominal pain. These were assessed as frequent or occasional, and appetite and feeding behavior were also reported by the caregivers. Gastrointestinal motility was studied by assessing colon transit time through radiological or sonographic examinations. Abdominal and rectal palpable masses were assessed for abnormalities. Daytime and nocturnal urinary incontinence was assessed as present or absent. Finally, the presence of comorbid behavioral and emotional disorders, such as anxiety, depression, or other emotional difficulties, was noted, contributing to the comprehensive clinical profile of the child [*Niemczyk J et al., 2015; Patel S et al., 2023; O'Brien L et al., 2024*].

Sociodemographic Data Collection:

Sociodemographic information was collected using a structured questionnaire. Data on age were categorized into 7-9 years and 9-13 years. Sex was recorded as male or female. Residence was noted as urban or rural. Education of the parents was categorized as illiterate, primary, secondary, and university education. Family size was determined by the total number of family members. Lastly, the birth order of the child was determined based on either first-born, middle-born, or youngest [*Taylor A et al., 2024*].

Procedure: Children in the case group underwent a thorough physical examination to establish a diagnosis of encopresis, which included the exclusion of other medical conditions that may interfere with bowel control. Upon confirmation that they were eligible to participate in the study, each child was given the Stanford-Binet Intelligence Scales, Fifth Edition administered by a psychologist. Tests were performed in a quiet area where there were no distractions. Controls were tested under similar conditions, ensuring that the children were matched for age and demographic characteristics to the case group. Each child in both groups was assessed individually. Clinical data were collected from medical records, parent interviews, and direct physical examination. This information was used to assess the physical and behavioral symptoms associated with encopresis [*Quinn B et al., 2020; Roberts H et al., 2021; Smith R et al., 2023*].

Statistical Analysis: The analyses were performed on continuous data using descriptive and inferential statistics. Regarding the categorical variables, the distribution between the two groups in sex, residence, and characteristics of bowel movements was analyzed using the Chi-square test. Continuous variables, including mean differences in cognitive scores between case and control groups, were analyzed using Student's t-test. Statistical significance was set at $p<0.05$. The statistical software used for statistical analysis included SPSS, Version 22.

Results and Discussion

Table 1 compares the sociodemographic characteristics of the patient group with those of a control group of typically developing children in order to better understand the sociodemographic factors that may influence the cognitive profiles of children with encopresis. It also presents the sociodemographic characteristics of both groups,

including age, sex, residence, parental education level, family size, and the child's position in the family. This helps in outlining potential confounding variables that may affect the results of cognitive testing.

Table 1 presents the sociodemographic characteristics of the participants. Among these demographic variables, sex, residence, parental education, father's occupation, mother's occupation, and family size showed no statistical differences between the patient and the control groups. In terms of age and the child's position, significant differences were obtained. More precisely, there was no significant difference in the age distribution between the two groups (χ^2=2.135, p=0.210), while there was a significant difference in the child's position within the family (χ^2=32.84, p<0.001), with the proportion of first-born children being higher in the control group than in the patient group. The results of our study indicate that, in most cases, disease onset occurred after the age of 5 years, affecting 43 children (62.4%). A smaller proportion of children experienced disease onset after 3 years of age (16 children, 23.1%), while 14.5% reported onset from birth.

The significant differences in several clinical parameters between the groups have been presented in table 2. Among the children in the case group, there was a highly significant increase in pain during defecation, abdominal pain, palpable

Table 1

Socio-Demographic Characteristics among Studied Groups

Characteristic	Control (N=69)	Cases (N=69)	Test of Significance
Age			
7-9 years	43 (62.3%)	51 (73.9%)	χ^2=2.135, p=0.210
>9-13 years	26 (37.6%)	18 (26.1%)	
Sex			
Male	57 (82.6%)	50 (72.5%)	χ^2=2.04, p=0.15
Female	12 (17.4%)	19 (27.5%)	
Residence			
Urban	38 (55.1%)	30 (43.5%)	χ^2=1.86, p=0.17
Rural	31 (44.9%)	39 (56.5%)	
Parent Education Level			
Illiterate	1 (1.4%)	2 (2.9%)	MC, p=0.14
Primary Education	20 (29.0%)	30 (43.5%)	
Secondary	27 (39.1%)	26 (37.7%)	
University	21 (30.4%)	11 (15.9%)	
Father's Occupation			
Working	65 (94.2%)	61 (88.4%)	χ^2=1.46, p=0.23
Not working	4 (5.8%)	8 (11.6%)	
Mother's Occupation			
Working	30 (43.5%)	24 (34.8%)	χ^2=1.09, p=0.29
Not working	39 (56.5%)	45 (65.2%)	
Family Size			
Mean ± SD	4.93 ± 0.71	5.12 ± 0.72	t=1.55, p=0.13
≤5	20 (29.0%)	12 (17.4%)	χ^2=2.60, p=0.11
>5	49 (71.0%)	57 (82.6%)	
Child's Position			
First	8 (11.6%)	30 (43.5%)	χ^2=32.84, p<0.00
Middle	29 (42.0%)	34 (49.3%)	
Last	32 (46.4%)	5 (7.2%)	

Note: *Statistically significant differences were found in the child's position in the family (χ^2=32.84, p<0.001).*

Table 2

Clinical Assessment between Studied Groups

Variable	Control (N=69)		Cases (N=69)		Test of Significance
	N	%	N	%	
Bowel movements					
Seldom	43	62.3	52	75.4	χ^2=2.74, p=0.09
Daily	26	37.7	17	24.6	
Large amount of stool					
Yes	11	15.9	29	42.0	χ^2=11.41, p=0.001*
No	58	84.1	40	58.0	
Normal stool (consistency)					
One half	0	0.0	20	29.0	χ^2=23.39, p<0.001*
Nearly half	69	100	49	71.0	
Pain during defecation					
One half	9	13.0	38	55.1	χ^2=27.14, p<0.001*
Seldom	60	87.0	31	44.9	
Abdominal pain					
Often	15	21.7	37	53.6	χ^2=14.94, p<0.001*
Seldom	54	78.3	32	46.4	
Appetite					
Reduced	20	29.0	37	53.6	χ^2=8.64, p=0.003*
Good	49	71.0	32	46.4	
Colon transit time					
Long	0	0.0	16	23.2	χ^2=18.09, p<0.001*
Normal	69	100	53	76.8	
Palpable abdominal mass					
Often	0	0.0	22	31.9	χ^2=26.17, p<0.001*
None	69	100	47	68.1	
Palpable rectal mass					
Often	0	0.0	9	13.0	χ^2=9.63, p=0.002*
Never	69	100	60	87.0	
Rectal diameter (sonography)					
Increased	0	0.0	13	18.8	χ^2=14.35, p<0.001*
Normal	69	100	56	81.2	
Daytime urinary incontinence					
One tenth	0	0.0	22	31.9	χ^2=26.17, p<0.001*
Seldom	69	100	47	68.1	
Nocturnal enuresis					
One third	0	0.0	37	53.6	χ^2=50.55, p<0.001*
Tenth	69	100	32	46.4	
Comorbidity with psychiatric disorders					
	8	12.0	69	100	FET, p<0.001*
Laxative therapy					
Helpful	69	100	24	34.8	χ^2=66.77, p<0.001*
Not helpful, even worsening	0	0.0	45	65.2	

masses, and increased rectal diameter compared to controls (p<0.001). Behavioral and emotional comorbidities were present in 100% of cases. In 65.2% of the cases, laxative therapy was ineffective or worsened the symptoms. Other parameters, including colon transit time and stool consistency, were also statistically different.

Results from clinical examination of participants are presented in table 2, reflecting data extracted from the clinical interviews. There was no statistically significant difference between patients with altered bowel frequency and those who were asymptomatic. However, there was a statistically significant difference in the frequency and character of the stool. The occurrence of painful defecation, abdominal pain, and loss of appetite was significantly higher in the case group compared to the control group. Colon transit time was also significantly longer in the case group. In the case group only, abdominal and rectal masses were palpated together with an enlarged rectal diameter. Urinary incontinence, nocturnal enuresis, and comorbid emotional and behavioral disorders were also seen exclusively in the case group. Though laxative therapy was helpful in all cases for the control group, it was effective in only 34.8% of the case group.

According to table 3, the differences in the IQ level of children with encopresis and the control group were statistically significant (χ^2=55.340, p<0.001). In the group with encopresis, a higher percentage of children scored in the borderline or impaired range (36%) and the low-average range (30%), while only 33% scored in the average range. The findings for the control group, in contrast, showed that 86.9% were within the average IQ score range, while 7.2% and 5.7% of children fell into the low-average and high-average IQ ranges, respectively. No children within the encopresis group fell within the high-average range.

Table 3

Stanford–Binet Fifth Edition (IQ) difference between cases (N=69) and control (N=69)

IQ Levels	Cases		Control		χ^2	P
	n	%	n	%		
Borderline or Impaired	25	36.0	0	0.0	55.340	<0.001*
Low Average	21	30.0	5	7.2		
Average	23	33.0	60	86.9		
High Average	0	0.0	4	5.7		

These findings suggest a strong association between encopresis and lower cognitive functioning. Therefore, children with encopresis should be considered for cognitive screening and individualized interventions.

The results of the IQ assessment showed significant differences in cognitive variables between children with encopresis and those in the control group across all domains. Children in the case group performed significantly worse on total IQ scores (96.72 ± 5.71 vs 85.28 ± 7.16, p < 0.001), and consistently lower scores were observed in verbal intelligence (98.58 ± 6.67 vs 87.19 ± 6.79, p < 0.001), as well as in non-verbal intelligence (92.17 ± 5.60 vs 82.97 ± 7.45, p < 0.001). The most prominent deficits in the case group were found in visual-spatial processing (88.52 ± 6.86 vs 100.20 ± 5.31, p < 0.001) and in reasoning abilities (89.67 ± 7.12 vs 100.25 ± 6.79, p < 0.001). These findings indicate that children with encopresis demonstrate significantly reduced cognitive performance, especially in reasoning, working memory, and problem-solving abilities (**Table 4**.)

Table 4 also presents the means and standard deviations (SDs) of IQ test scores for both groups. Highly significant differences were obtained between case and control groups in all cognitive domains: Total IQ, Nonverbal (NV), Verbal (V), Quantitative Reasoning, Working Memory (WM), Fluid Reasoning, Visual-Spatial Processing (VS), and Knowledge (KN). All of these domains were significantly lower in the case group compared to the control group, indicating marked cognitive differences among children with encopresis.

The differences of mean scores among the different domains of intelligence, comparing the control group and the case group, are summarized in **figure.** The control group consistently performed significantly better than the case group across all measures: total IQ, verbal, non-verbal, quantitative reasoning, working memory, fluid reasoning, visual-spatial processing, and knowledge. Large gaps between groups are especially noticeable in Fluid Reasoning, Visual-Spatial Processing, and Knowledge. These findings indicate a general reduction in cognitive functioning among children in the case group as compared to typically developing peers, with weaknesses in both general and specific intellectual domains.

Table 4

IQ Assessment Between Cases and Control Groups

IQ Domains	Control (N=69) Mean ± SD	Cases (N=69) Mean ± SD	Test of Significance
Total IQ	96.72 ± 5.71	85.28 ± 7.16	t = 10.38, p < 0.001*
Non-Verbal IQ	92.17 ± 5.60	82.97 ± 7.45	t = 8.19, p < 0.001*
Verbal IQ	98.58 ± 6.67	87.19 ± 6.79	t = 9.94, p < 0.001*
Quantitative Reasoning	95.86 ± 4.11	89.48 ± 6.62	t = 6.79, p < 0.001*
Working Memory	92.09 ± 7.73	83.67 ± 3.72	t = 8.15, p < 0.001*
Reasoning	100.25 ± 6.79	89.67 ± 7.12	t = 8.93, p < 0.001*
Visual-Spatial Processing	100.20 ± 5.31	88.52 ± 6.86	t = 11.18, p < 0.001*
Knowledge	94.51 ± 6.40	82.77 ± 10.56	t = 7.89, p < 0.001*

Note: *Statistically significant differences (p < 0.05) were observed in all cognitive domains between cases and controls*

This study demonstrates that clear cognitive differences are evident between children with encopresis and typically developing controls [*Grant M et al., 2020; Lewis J et al., 2020; Miller D et al., 2021; Nelson R et al., 2022; Kim J et al., 2023; Hill R, Carter A, 2024*]. It supports the need for a multidisciplinary approach toward assessment and intervention. The results support previous literature while also providing new insights into the cognitive vulnerabilities of children with encopresis. One major finding of the study was significantly lower levels of intelligence quotient (IQ) among children with encopresis compared to controls. The most representative groups for cases were "borderline or impaired" (36%) and "low average" (30%), while controls predominantly scored within the "average" range (86.9%). These findings correspond to previous research reporting cognitive impairments among children with chronic medical conditions, including encopresis, possibly related to associated stress and stigma [*Niemczyk J et al., 2015; Youssef N et al., 2020*]. It may be hypothesized that chronic stress linked to encopresis could contribute to cognitive dysfunction by disrupting neural pathways involved in learning and memory. Such mechanisms have been proposed to underlie stress-related impairments in cognition.

The study also established that children with encopresis demonstrated broad cognitive deficits across all domains assessed on the Stanford-Binet Fifth Edition, such as Total IQ, Verbal, Non-verbal, Fluid Reasoning, Visual-Spatial Processing, and Working Memory. Yet the most prominent deficits were in "visual-spatial processing" and "fluid reasoning". These findings are in agreement with Von Gontard A. & Niemczyk J. (2014) and Niemczyk J. and co-authors (2015), who suggest that deficits in executive functioning, emotional dysregulation, and chronic stress may underlie impairments in these

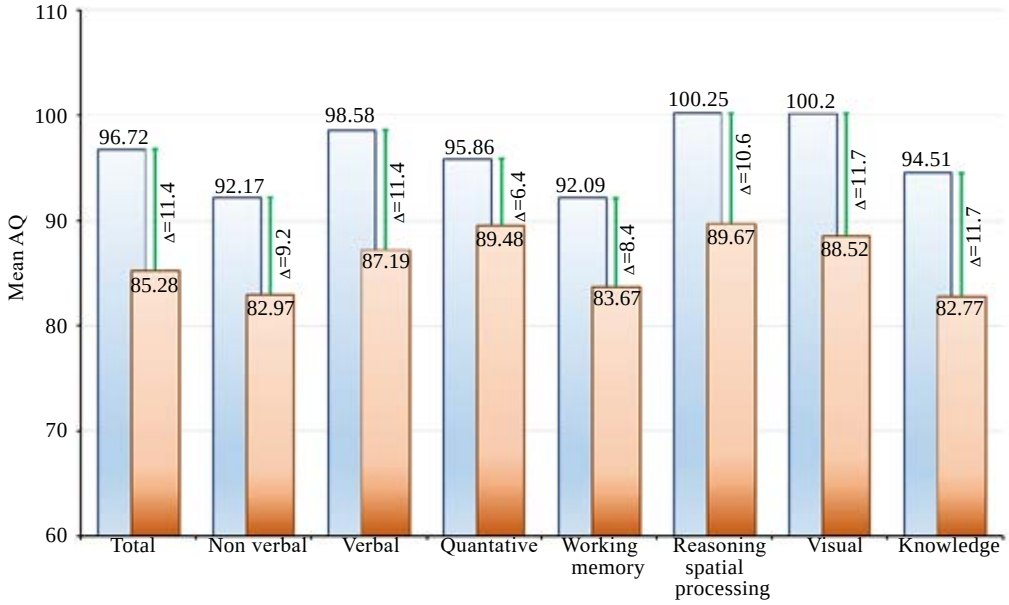

Figure 1. *Differences in IQ test results across the study groups. Control groups are shown in blue, case groups in chestnut, and green lines indicate differences between corresponding groups.*

cognitive domains. These difficulties in reasoning and visual-spatial processing could affect academic performance in mathematics and problem-solving tasks, potentially contributing to poorer educational outcomes for these children. Relatively speaking, previous studies have placed more emphasis on emotional and behavioral effects than on cognitive profiles. Joinson C. and co-authors (2006) discussed the psychological impact of encopresis, where affected children are often anxious and suffer from low self-esteem, which can indirectly affect cognitive performance. This study complements such research by quantitatively assessing the direct cognitive impact, reinforcing the need for integrated cognitive and psychological interventions.

Although the present study had a clear cognitive emphasis, it is important to consider the impact of emotional and behavioral factors. Previous studies have shown that emotional distress, including internalized shame, anxiety, and poor self-esteem, is significantly associated with encopresis [*Joinson C et al., 2006*]. Such psychological factors may provide a mediating link between encopresis and cognitive performance, potentially contributing to reduced levels of executive functioning, attention, and working memory. Besides, nocturnal enuresis, as observed in the present study, may signal the intersection between emotional and cognitive difficulties. Although there is some literature about encopresis mainly focused on behavioral and emotional aspects, the novelty of this research consists in providing a detailed assessment of cognitive functioning. Whereas other works found executive functioning weaknesses in children with encopresis, the present study extends these findings by identifying significant weaknesses in visual-spatial processing and fluid reasoning. Additionally, the current findings support the position that cognitive disturbances in children with encopresis are not simply a by-product of comorbid emotional problems but might be more integral to the condition itself [*Von Gontard A, Niemczyk J, 2014; Niemczyk J et al., 2015*].

These findings on cognitive impairment provide a basis for suggesting that specific cognitive interventions, as an extension of standard medical and behavioral therapies, might help children with encopresis. Routine studies should, therefore, be developed for early recognition and assistance of these cognitive deficits. Addressing deficits in reasoning, working memory, and visuospatial performance may further improve academic and social functioning by modifying individualized education plans and providing structured cognitive support programs accordingly.

Such multidisciplinary treatment in the form of medical management in concert with psychiatric consultation and cognitive rehabilitation is therefore crucial for treatment of both body and brain complications.

Most individualized education plans for cognitively delayed children have educational needs targeted learning interventions; parent and educator training programs address the skills to be used in working with an affected child effectively.

Finally, from a psychological point of view, there is also suffering due to distress, stigma, and social isolation associated with encopresis. Supportive therapies and peer group interventions may contribute importantly to emotional well-being, social inclusion, and overall quality of life in these children.

Conclusion

This study demonstrates that children with encopresis show significant reductions in cognitive performance across multiple domains, with the most pronounced differences in visual-spatial processing and fluid reasoning.

These findings underscore the need to view encopresis not only as a medical condition but also as one with substantial cognitive and emotional implications. The observed cognitive vulnerabilities may be associated with chronic stress, emotional dysregulation, and psychosocial burden associated with the disorder.

Early identification of cognitive vulnerabilities should be incorporated into routine clinical assessments, including tailored interventions addressing both intellectual and emotional aspects, in order to improve outcomes for affected children.

Future longitudinal studies are needed to explore causal mechanisms and to develop targeted therapeutic strategies.

Encopresis should therefore be addressed through integrated medical, psychological, and educational approaches, supported by multidisciplinary collaboration to improve cognitive functioning, ac-

ademic achievement, and overall quality of life.

Limitations of the Study: This study has a number of limitations that should be considered when interpreting its findings. Longitudinal studies are needed to clarify the causal relationships between encopresis and cognitive deficits and to examine developmental changes over time. A larger and more diverse sample would improve the generalizability of the findings.

Future studies should also account for potential confounding factors, such as socioeconomic status, familial influences, and environmental conditions, which may contribute to cognitive outcomes in children with encopresis.

Another limitation is the potential lack of comprehensive assessment of psychosocial and environmental variables, which may influence both clinical and cognitive outcomes.

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Most individualized education plans for cognitively delayed children have educational needs targeted learning interventions; parent and educator training programs address the skills to be used in working with an affected child effectively.

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THE NEW ARMENIAN MEDICAL JOURNAL

Volume 20 (2026) Issue 1

The Journal is founded by
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University after M. Heratsi.

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Our journal is registered in the databases of Scopus, EBSCO and Thomson Reuters (in the registration process)

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Print in "Monoprint" LLC
Director: Armen Armenakyan
Andraniks St., 96/8 Bulding
Yerevan, 0064, Armenia
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E-mail: monoprint1@mail.ru