

Early Assessments as Predictors of Cognitive Development in Children with Developmental Delay

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Introduction

Developmental delay (DD) is a significant concern in pediatric neurology, affecting around 4.5% of children under 5, with complex causes such as cerebral palsy (CP), autism spectrum disorder (ASD), and genetic syndromes. Early interventions and assessments during this critical period can positively impact cognitive abilities and overall development. This study aims to explore whether early cognitive assessments in children with DD can reliably predict subsequent cognitive development.

Methods

This study focused on children diagnosed with DD between January 1, 2015, and May 31, 2023. Eligible participants, diagnosed with DD, underwent the Korean Bayley Scales of Infant and Toddler Development Second Edition (K-BSID-II) before 36 months of age. The Korean Wechsler Preschool Primary Scale of Intelligence Fourth Edition (K-WPPSI-IV) test was done afterward, with a minimum 1-year interval. Diagnostic tests, including brain magnetic resonance imaging and chromosomal microarray analysis, were conducted post-DD diagnosis to rule out genetic diseases. CP was diagnosed based on motor dysfunction and abnormal neuroimaging or clinical history, while ASD followed Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. The DD group comprised individuals without CP and ASD (Table 1).

Characteristics	Number or mean (SD)
DD group	
Male	47
Female	17
Age at K-BSID-II (months)	25.0 (6.3)
Age at K-WPSSI-IV (months)	56.0 (12.9)
CP group	
Male	15
Female	7
Age at K-BSID-II (months)	18.8 (7.0)
Age at K-WPSSI-IV (months)	51.4 (14.0)
ASD group	
Male	7
Female	2
Age at K-BSID-II (months)	29.1 (6.2)
Age at K-WPSSI-IV (months)	54.9 (11.7)

Table 1. Demographic data. Values are presented as mean (SD) or number; SD, standard deviation.

Group	Receptive index		Correlation coefficient (<i>p</i>)	Expressive index		Correlation coefficient (<i>p</i>)
	First	Second		First	Second	
All (n=95)	60.0 (23.4)	75.6 (27.3)	0.682 (<0.001)	54.6 (20.5)	70.8 (28.0)	0.592 (<0.001)
DD (n=64)	62.0 (22.8)	81.7 (25.0)	0.672 (<0.001)	54.8 (18.7)	77.4 (24.7)	0.621 (<0.001)
CP (n=22)	67.1 (20.0)	73.1 (25.3)	0.580 (0.005)	63.7 (21.8)	68.2 (27.3)	0.436 (0.043)
ASD (n=9)	29.0 (7.6)	38.9 (18.8)	0.160 (0.673)	30.7 (7.4)	30.6 (17.2)	0.235 (0.543)

Table 3. Correlation analysis of language assessment by SELSI and PRES. Values are presented as mean (SD) or number.

Result

Ninety-five children meeting inclusion criteria were categorized into CP, DD, and ASD groups. K-BSID-II and K-WPPSI-IV were conducted at different ages for each group. A significant positive correlation was found between the initial Mental Developmental Index (MDI) from K-BSID-II and later Full-Scale Intelligence Quotient (FSIQ) from K-WPPSI-IV scores, particularly in DD (correlation coefficient: 0.466, $p < 0.001$) and CP groups (correlation coefficient: 0.682, $p < 0.001$), while ASD group showed no significant correlation (correlation coefficient: -0.359, $p = 0.342$) (Table 2). Receptive and expressive language indices correlated positively with Sequenced Language Scale for Infants (SELSI) and Preschool Receptive-Expressive Language Scale (PRES) in DD and CP groups, but no significant correlations were found in the ASD group (Table 3).

Conclusion

This study found significant correlations between initial cognitive assessments (MDI in K-BSID-II) and later cognitive outcomes (FSIQ in K-WPPSI-IV) in children with DD and CP. However, such correlations were not observed in children with ASD. Language development showed strong correlations in the entire group and children with DD and CP, but not in those with ASD. The study categorized children into DD, CP, and ASD groups, highlighting the lack of cognitive continuity in ASD compared to DD and CP. Language and cognitive development were considered similar in children with DD, CP, and ASD. The findings underscore the importance of early evaluation and periodic follow-up for cognitive and linguistic competence in children with DD. Limitations include small sample sizes, necessitating further research for demographic comparability.

Group	K-BSID-II MDI	K-WPSSI-IV FSIQ	Correlation coefficient (<i>p</i>)
All (n=95)	58.5 (13.6)	77.4 (25.0)	0.427 (<0.001)
DD (n=64)	57.2 (12.0)	84.1 (23.7)	0.466 (<0.001)
CP (n=22)	64.6 (17.6)	71.1 (21.5)	0.682 (<0.001)
ASD (n=9)	52.6 (7.7)	44.9 (7.1)	-0.359 (0.342)

Table 2. Correlation analysis of cognitive index in DD, CP, and ASD groups. Values are presented as mean (SD) or number.