Original Article

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# The Predictive Value of Language Scales: Bayley Scales of Infant and Toddler Development Third Edition in Correlation With Korean Sequenced Language Scale for Infant

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**Objective** To compare the relationship of the Bayley Scales of Infant and Toddler Development 3rd Edition (K-BSID-III) language score and the Sequenced Language Scale for Infant (SELSI) score and evaluate the sensitivity and specificity of K-BSID-III language score and optimal cutoff value with receiver operator characteristic (ROC) curve analysis in infants and toddlers with delayed language development.

**Methods** A total of 104 children with suspected language developmental delay were included in this retrospective study. Subjects were tested using the K-BSID-III and SELSI and subdivided into several groups according to the severity of language scores. ROC curve analysis was performed to assess K-BSID-III for delayed language development.

**Results** Receptive and expressive language subscales of the K-BSID-III showed markedly significant correlation with the SELSI scores ($p<0.001$). ROC analysis showed an area under the curve of 0.877 ($p<0.001$) in SELSI receptive score and 0.935 ($p<0.001$) in SELSI expressive score. The optimal cutoff value where sensitivity of 85% and specificity of 81% were achieved with the K-BSID-III receptive score was 1.50 (between average and low average) in the SELSI receptive score. The optimal cutoff value where sensitivity of 96% and specificity of 82% were achieved with the K-BSID-III expressive score was also 1.50 in the SELSI expressive score.

**Conclusion** In this study, the correlations between K-BSID-III and SELSI language scores were statistically significant. However, the interpretation should be considered carefully in low average group due to tendency of underestimation of delayed language development.

**Keywords** Language development, Receptive language, Expressive language, SELSI, K-BSID-III

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## INTRODUCTION

Delayed language development is easily observed in 5%–8% of children in preschool years with learning, socio-emotional, or behavior problems. Moreover, 20% of 2-year-old children showed delayed expressive language. In 50%–75% of cases, the language delay resolves by 4–5 years of age, but others have persistent delay [1-5]. In the diagnosis, the standardized assessment tools for Korean language are used. The most common tools are the Sequenced Language Scale for Infants (SELSI) and the Preschool Receptive-Expressive Language Scale (PRES). The SELSI is used in infants and toddlers aged <36 months, and the PRES is used in preschoolers aged from 36 months to 6 years. The SELSI is subdivided into two subcategories, including receptive and expressive language abilities. Delayed language development was diagnosed when language age is below two standard deviations in the SELSI [6-8]. In case of children with severe language delay who are aged >36 months, the SELSI can be used instead of the PRES [2].

The most widely used developmental assessment test is the Bayley Scales of Infant and Toddler Development 3rd Edition (K-BSID-III), which is used in infants and toddlers aged 1–42 months. It has five domains, namely, cognition, language (receptive language, expressive language), movement (large muscle movement, small muscle movement), emotion/sociality, and adaptive behavior. In contrast to the K-BSID-II, K-BSID-III separated the language and cognition domains from mental developmental section. Both the K-BSID-III and SELSI can evaluate the language function of infants and toddlers.

Early delayed language is an important indicator of neurodevelopmental disorders, which is the most prominent problem showing superficially in infancy. Since early diagnosis and intervention can provide an improvement in the developmental function, an initial diagnosis is crucial in adopting therapeutic intervention and reducing the sequelae of disabilities. A previous study compared the K-BSID-III and PRES [9], but there has been no study that showed a correlation between K-BSID-III and SELSI. This study aimed to evaluate the relationship between the K-BSID-III and SELSI, with a specific focus on the receptive and expressive language subscales. In this study, the K-BSID-III was used concurrently with the SELSI to determine the value of the Korean infant development test as a useful diagnostic test for language development through mean comparison and correlation analysis.

## MATERIALS AND METHODS

### Subjects

The complete test scores of the K-BSID-III and SELSI were retrospectively assessed in 104 infants and toddlers who visited Physical Medicine and Rehabilitation and Pediatrics Department of Soonchunhyang University Cheonan Hospital from December 2014 to December 2018 for evaluation of language development. A total 104 infants and toddlers were included in this study (Table 1). All participants completed both tests in a maximum duration of 3 months, and children aged 12–52 months were included. Subjects who only performed one of either test were excluded. Typically, children aged >36 months have to perform the PRES other than the SELSI. However the children who have difficulties in performing the PRES, such as significant language delay at the time of the language test, by language therapist and physician, performed SELSI instead. Both tests were conducted according to the manual guidelines, in a single or multiple

**Table 1.** General characteristics of the subjects (n=104)

| Variable | Number of subjects (%) |
|---|---|
| Sex | |
| Male | 62 (59.6) |
| Female | 42 (40.4) |
| Gestational age (wk) | |
| <37 | 49 (48.0) |
| ≥37 | 53 (52.0) |
| Birth weight (g) | |
| <2,500 | 43 (42.2) |
| ≥2,500 | 59 (57.8) |
| K-BSID-III test age (mo) | |
| ≥12 and <24 | 34 (32.7) |
| ≥24 and <52 | 70 (67.3) |
| SELSI test age (mo) | |
| ≥12 and <24 | 34 (32.7) |
| ≥24 and <52 | 70 (67.3) |

K-BSID-III, Korean version of Bayley Scales of Infant and Toddler Development 3rd edition; SELSI, Sequenced Language Scale for Infant.

sessions by reliable occupational therapist and language therapist, to perform an objective study. This study was approved by the Institutional Review Board of Soonchunhyang University Cheonan Hospital, Korea (No. SCHCA 2019-04-016). Informed consent was waived due to retrospective chart reviews.

### Language assessment

The K-BSID-III is subdivided into five subcategories: cognition, motor, language, emotion, and behavior scales. In our study, we only focused on receptive and expressive language abilities and the corresponding scaled scores. Moreover, the SELSI is also subdivided into two subcategories: receptive and expressive language abilities.

We compared each group and then analyzed the correlation of these scores between language scaled scores of the K-BSID-III and two subcategories of the SELSI. In the K-BSID-III, the raw scores of each items were converted into scaled scores (mean=10, standard deviation [SD]=3), 10 points is average, 7 points is -1 SD, and 4 points is -2 SD. Based on means and SDs, the test scores were classified as follows: average (≥9); low average (≥7 and <9), within -1 SD of the mean; mild delay (≥4 and <7), up to -2 SD; and delay (<4), >-2 SDs below the mean scores [10]. In the SELSI, the raw scores were classified in accordance with standard guidelines: average, within -1 SD of the mean; mild delay, up to -2 SD; and delay, >-2 SDs below the mean scores.

### Statistical analysis

To assess the statistical correlation and compare between the K-BSID-III and SELSI scores, analysis was performed using linear-by-linear association, Spearman correlation, Somers' D, and Kendall's tau-b methods. Sensitivity and specificity were assessed using the cutoff scores on the K-BSID-III. Using the receiver operator characteristic (ROC) curve, the proper combination of sensitivity and specificity for the K-BSID-III results with optimal cutoff score was determined. A p-value <0.5 was considered statistically significant. All statistical analyses were estimated using SPSS version 25.0 (IBM SPSS, Armonk, NY, USA).

## RESULTS

This study included 104 children (62 male and 42 female). All children were tested using the K-BSID-III and the SELSI. The general characteristics of the subjects are presented in Table 1. There were no significant differences between the groups with respect to sex, gestational age, and birth weight.

The K-BSID-III-tested subjects were classified into four groups (average, low average, mild delay, and delay groups) according to their language scale scores. Moreover, the SELSI-tested subjects were classified into three

**Table 2.** Comparison between K-BSID-III language score and SELSI score

| | K-BSID-III receptive language score | | | | Total | p-value |
|---|---|---|---|---|---|---|
| | Average | Low average | Mild delay | Delay | | |
| SELSI receptive language score | | | | | | |
| Average | 13 (12.5) | 2 (1.9) | 1 (1.0) | 0 (0.0) | 16 (15.4) | <0.001* |
| Mild delay | 1 (1.0) | 2 (1.9) | 2 (1.9) | 0 (0.0) | 5 (4.8) | |
| Delay | 12 (11.5) | 14 (13.5) | 34 (32.7) | 23 (22.1) | 83 (79.8) | |
| Total | 26 (25.0) | 18 (17.3) | 37 (35.6) | 23 (22.1) | 104 (100) | |
| SELSI expressive language score | | | | | | |
| Average | 9 (8.7) | 1 (1.0) | 1 (1.0) | 0 (0.0) | 11 (10.6) | <0.001* |
| Mild delay | 2 (1.9) | 3 (2.9) | 1 (1.0) | 0 (0.0) | 6 (5.8) | |
| Delay | 2 (1.9) | 10 (9.6) | 41 (39.4) | 34 (32.7) | 87 (83.7) | |
| Total | 13 (12.5) | 14 (13.5) | 43 (41.3) | 34 (32.7) | 104 (100) | |

Values are presented as number (%).
K-BSID-III, Korean version of Bayley Scales of Infant and Toddler Development 3rd edition; SELSI, Sequenced Language Scale for Infant.
*p<0.001 by linear by linear association & by Spearman correlation & by Somers' D & by Kendall's tau-b.

groups (average, mild delay, and delay groups) according to their language raw score. A total of 34 children (91.9%) in mild delay group and 23 children (100%) in the delay group of K-BSID-III showed delay in SELSI receptive language score, and 41 children (95.3%) in the mild delay group and 34 children (100%) in the delay group of K-BSID-III showed delay in SELSI expressive language score. However, 12 children (46.2%) in the average group and 14 children (77.8%) in the low average group of K-BSID-III showed delay in SELSI receptive language score, and 10 children (71.4%) in the low average group of K-BSID-III showed delay in SELSI expressive language score.

### Correlation between K-BSID-III and SELSI scores

Evaluation of the receptive and expressive language test results between the K-BSID-III and SELSI are described in Table 2. The K-BSID-III receptive and expressive scores were statistically significantly correlated with the SELSI receptive and expressive scores.

### Sensitivity, specificity, and ROC curve of K-BSID-III language scores

ROC curve analysis was performed to evaluate the K-BSID-III test for language assessment. ROC analysis showed an area under the curve (AUC) of 0.877 (95% confidence interval [CI], 0.798–0.933; p<0.001) in the SELSI receptive score and 0.935 (95% CI, 0.869–0.974; p<0.001) in the SELSI expressive score (Fig. 1). The optimal cutoff

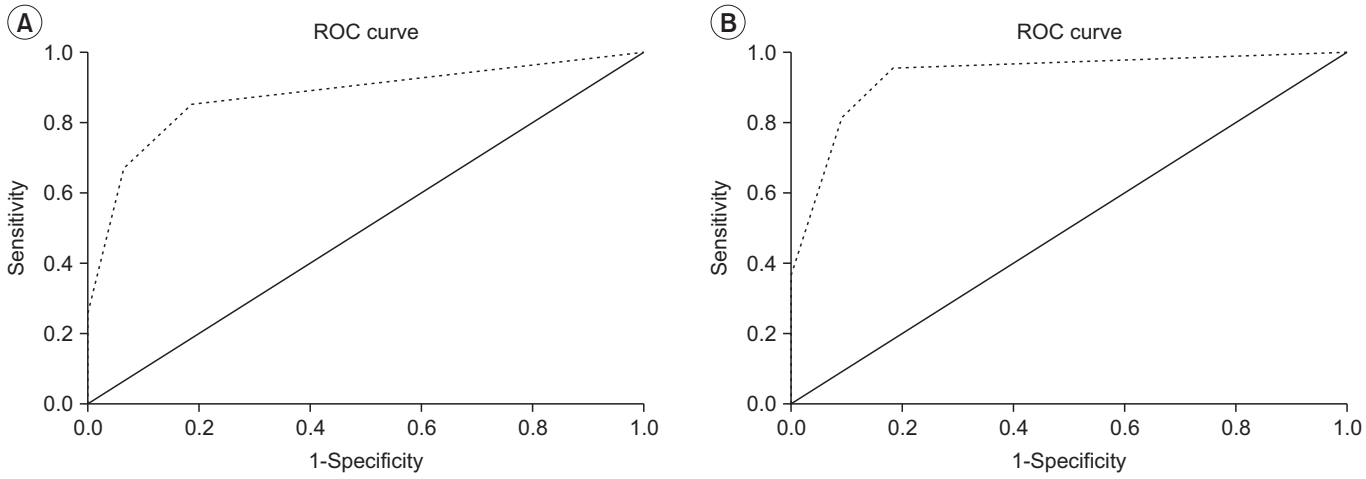


**Fig. 1.** Receiver operating characteristic curves for SELSI according to different cutoff values of (A) K-BSID-III receptive language (AUC=0.877; 95% CI, 0.798–0.933; p<0.001) and (B) K-BSID-III expressive language (AUC=0.935; 95% CI, 0.869–0.974; p<0.001). SELSI, Sequenced Language Scale for Infant; K-BSID-III, Korean version of Bayley Scales of Infant and Toddler Development 3rd edition; AUC, area under the curve; CI, confidence interval.

**Table 3.** ROC analysis of K-BSID-III language score based on SELSI as a standard test

| Cutoff value of K-BSID-III | Receptive K-BSID-III | | | | Expressive K-BSID-III | | | |
|---|---|---|---|---|---|---|---|---|
| | Sensitivity | Specificity | False positive | False negative | Sensitivity | Specificity | False positive | False negative |
| 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 |
| 1.50[a)] | 0.85 | 0.81 | 0.15 | 0.19 | 0.96 | 0.82 | 0.04 | 0.18 |
| 2.50 | 0.67 | 0.94 | 0.33 | 0.06 | 0.82 | 0.91 | 0.18 | 0.09 |
| 3.50 | 0.26 | 1.00 | 0.74 | 0.00 | 0.37 | 1.00 | 0.63 | 0.00 |
| 5.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 |

ROC, receiver operator characteristic; K-BSID-III, Korean version of Bayley Scales of Infant and Toddler Development 3rd edition; SELSI, Sequenced Language Scale for Infant.
[a)]Optimal cutoff value of K-BSID-III score.

value with a sensitivity of 85% and specificity of 81% was 1.50 (between average and low average) in the receptive language of K-BSID-III, and that with a sensitivity of 96% and specificity of 82% was 1.50 (between average and low average) in the expressive language of K-BSID-III (Table 3).

## DISCUSSION

Communication disorders and delayed language development comprised the highest proportion, approximately 3%–20% of neurodevelopmental disorders [11,12]. In addition, there are many cases showing language development delay that it is unknown in advance even though it is accompanied by intellectual disorder, autism spectrum disorder, psychosocial deprivation, hearing loss, and a lack of education, so the differential diagnosis of the causes of language delays is important [11,13,14]. In fact, other studies indicate that the more delays in language development, the more severe the overlapping disability becomes [15,16]. Moreover, the final diagnosis of children who visited the hospital for delayed language development showed that 40% of them had coexisting disabilities and 35% had simple language problems [17,18]. Especially when the receptive and expressive language is delayed, it is likely to be diagnosed as mental retardation or autism spectrum disorder later due to severe language delay [18,19]. Therefore, there is a high possibility that the problems of other developmental areas other than the language area are duplicated, so it is important to detect children with delayed language development at an appropriate time, to induce normal language development and minimize complications through early treatment.

Some children with delayed language development may improve spontaneously over time, but they often experience speech, emotional, behavioral, and learning problems if not treated properly. Therefore, it is greatly important to diagnose delayed language development early and prevent appropriate complications by providing appropriate treatment. Particularly, it is important that the treatment is performed before the age of 3 years, which is the time when the explosive power of the vocabulary or comprehension ability starts to increase [2,20]. However, it is difficult to distinguish between normal and abnormal development because language developmental range is large and difficult to evaluate. Thus, a comprehensive evaluation with long-term follow-up examination of language development and early intervention of learning ability from early childhood to the school period is needed.

For early detection of language developmental delay, several tests were developed, such as the Ages and Stages Questionnaire, the Wechsler Preschool and Primary Scale of Intelligence, the Korean Developmental Screening Test for Infants, and the Denver Developmental Screening Test (DDST). Presently, the most widely used language development screening tools in Korea are PRES and SELSI. The SELSI is used mainly in children aged <36 months to assess receptive and expressive language ability. The SELSI is a proven standardized language test tool that can evaluate a wide range of language abilities, and validity and reliability of the SELSI were proved by previous studies in Korea. It is possible to analyze the developmental age, percentile, and regional variation of receptive and expressive language [8].

Both the PRES and SELSI have the advantage of evaluating language ability, but it takes a relatively long test time of approximately 30–40 minutes. Moreover, since a trained speech therapist is required to perform the test, if these facilities are unavailable, they will be transferred to a higher-level medical institution that can perform the test [2,21].

Currently, the K-BSID-III is the most commonly used developmental test globally. It is possible to conduct multidisciplinary examination and diagnosis of the child's developmental status, provide comprehensive information on various developmental areas, and collectively understand the relative strengths and weaknesses of the areas [22]. The K-BSID-III language scale is an extremely useful test tool in that it can accurately assess receptive and expressive communication abilities in an integrated viewpoint. This K-BSID-III language scale proves high reliability as a tool for evaluating the language development of Korean infants and toddlers [9].

Moreover, the K-BSID-III was highly correlated with the existing recognized language assessment tools, PRES and M-B CDI-K (MacArthur-Bates Communicative Development Inventories-Korean) [9]. Therefore, the K-BSID-III expressive language scale proved to be similar to the existing language evaluation tools despite the differences in the age of measurement, sophisticated expert tests, and integrated developmental tests. However, the DDST, also

commonly used as a developmental test, is less reliable when there is language delay [11,23].

The K-BSID-III is composed of phonology and semantics to understand and express, morphology to respond to numerous vocabularies in various forms, syntax to use words to understand and express long sentences, and pragmatics to communicate with others [9]. The SELSI consisted of semantics related to cognitive abilities, syntax related to linguistic knowledge, and pragmatics related to social interaction skills [8].

The difference between two tests is the children's age. The K-BSID-III's age of testing ranges from 1 months to 42 months, while that of the SELSI ranges from 1 months to 36 months. However, there was no significant difference between the two tests in terms of the contents. The questions were composed of easy to difficult questions. Furthermore, the question items of both tests were distributed evenly according to the elements of language and arranged by importance at each age level.

Both the SELSI and K-BSID-III have already proven that they are valid and reliable as a language domain and generalized developmental area, respectively. In this study, we attempted to understand the reliability of the language developmental area of the K-BSID-III test by performing the SELSI and K-BSID-III tests simultaneously for children with language development delay who visited our clinic.

In our study, a significant correlation was found between the K-BSID-III language scale and SELSI scores in both receptive and expressive languages. ROC analysis showed the K-BSID-III is a good performance model for assessment of language development. Furthermore, the optimal cutoff value with a sensitivity and specificity was high in both the receptive and expressive language of K-BSID-III between the average and low average groups. However, the sensitivity and specificity of receptive language was lower than those of expressive language. This might be due to attachment disorder, cognitive impairment, and environmental factors, such as inadequate adaptation to unfamiliar situation at the time of the test. However since this is a retrospective study, it is inevitable due to the nature of the data collection method.

Since the introduction of the K-BSID-III, there is a concern that children's neurodevelopment is overestimated because the score is generally highly rated compared to that of the previous version [24-26]. It was suggested that the BSID-III underestimates the developmental delay compared to the BSID-II. In our study, the result of the K-BSID-III was not significantly different from that of the SELSI in the mild delay and delay groups in both receptive and expressive language and the average group in expressive language. However, the average group in receptive language and low average group in both the receptive and expressive language showed differences. It is presumed that the tendency of the BSID-III to underestimate language developmental delay has affected the interpretation of results in clinical and research settings. In BSID-III standardization, 10% of children with the possibility of developmental delays in the normative population were included [22,24].

In our study data, we found that the K-BSID-III can be useful in predicting language development delays, especially in the mild delay and delay groups. Therefore, it seems that the language scale of the K-BSID-III can assess these deficiencies and includes linguistic factors that were not included in the existing language evaluation tools. We believe that the K-BSID-III is a useful test and can effectively diagnose delayed language development to adapt the proper management for language rehabilitation and provide opportunity to detect further neurodevelopmental delay. However, the children in the average group in receptive language and the low average group in both the receptive and expressive language should always be considered carefully, and additional tests should be applied.

There are few limitations in this study. First, analysis of this study is performed in a single center, so the conclusions should be drawn with caution. In the future, more extensive regional and environmental characteristics should be obtained to ensure that the questions are properly structured for Korean infants and toddlers around the country, and standards should be established to assess the language skills more accurately. However, the results of this study may be indicative of clinical tendencies.

Second, significant language development delays can result from either environmental or biologic causes. Language disorders can be observed more commonly in boys than in girls and especially among children who have a family history of language or reading disorders in first-degree relatives. Moreover, some studies reported that children of low socioeconomic status are more likely to

show language delays [14]. However, our findings only indicate a non-significant association with male sex and demonstrated a significant result in gestational age, birth weight, and tested age. Therefore, it is necessary to study and analyze the differences in language development by evaluating environmental factors and family history as factors that influence language development in the future.

Lastly, both tests are mostly performed using an indirect method, except for some categories in K-BSID-III where a direct method is required. Infants and toddlers have difficulty to express their language skills through words and actions, so an indirect method was used. It is a method that is performed by parental reports or behavioral observations rather than directly to the infant. It is inevitable in some cases and has many advantages, but it is difficult to overcome the limitations of subjective, exaggerated, and underestimated inspections.

However, to the best of our knowledge, this study showed valuable results since it is the first study that compared the SELSI and K-BSID-III on language development in infants and toddlers. Therefore, in this study, we attempted to determine the reliability of language development area of the K-BSID-III by simultaneously conducting the SELSI and K-BSID-III, which proved to be reliable in children who visited our hospital. Particularly, since it is used as a basic evaluation in most domestic medical institutions, it is considered as good as the first applied test for children who are suspected of having language development delay.

In conclusion, correlations between diagnosing language abilities of children using the K-BSID-III and SELSI were statistically significant. Furthermore, in the cutoff value, high sensitivity and specificity were verified in the range of K-BSID-III language scores between the average and low average groups. However, interpretation of language evaluation should be considered carefully in children in the low average group in K-BSID-III language scales due to the tendency of underestimation of language development delay.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

## AUTHOR CONTRIBUTION

Conceptualization: Kim SA. Methodology: Kim SA, Park S. Formal analysis: Heo NH, Park N. Project administration: Kim SA. Visualization: Kim Y, Oh K, Park N, Park S. Writing – original draft: Doh JH, Kim SA. Writing – review and editing: Kim SA. Approval of the final manuscript: all authors.

## REFERENCES

1. Eun JJ, Lee HJ, Kim JK. Developmental profiles of preschool children with delayed language development. Korean J Pediatr 2014;57:363-9.
2. Choi SW, Seo HS, Lee HJ, Lee KW, Kim CA, Son BH. Assessment of children with language developmental delay: Korean Infant and Child Development Test (KICDT) and Preschool Receptive-Expressive Language Scale (PRES), Sequenced Language Scale for Infant (SELSI). J Korean Child Neurol Soc 2015;23:51-6.
3. O'Neill H, Murphy CA, Chiat S. What our hands tell us: a two-year follow-up investigating outcomes in subgroups of children with language delay. J Speech Lang Hear Res 2019;62:356-66.
4. Moyle J, Stokes SF, Klee T. Early language delay and specific language impairment. Dev Disabil Res Rev 2011;17:160-9.
5. Bishop DV, Price TS, Dale PS, Plomin R. Outcomes of early language delay: II. Etiology of transient and persistent language difficulties. J Speech Lang Hear Res 2003;46:561-75.
6. Kim SW, Jeon HR, Park EJ, Kim HI, Jung DW, Woo MR. The usefulness of M-B CDI-K short form as screening test in children with language developmental delay. Ann Rehabil Med 2014;38:376-80.
7. Kim SW, Kim JY, Lee SY, Jeon HR. The comparison of M-B CDI-K short form and K-ASQ as screening test for language development. Ann Rehabil Med 2016;40:1108-13.
8. Kim YT. Content and reliability analyses of the Sequenced Language Scale for Infants (SELSI). Commun Sci Disord 2002;7:1-23.
9. Lee JY, Kim YT, Bang HJ, Lee SH, Lee JY, Kim YT, et al. A preliminary study on standardizing the K-Bayley-III Expressive Communication Scale. Commun Sci Dis-

ord 2004;19:320-30.
10. Cromwell EA, Dube Q, Cole SR, Chirambo C, Dow AE, Heyderman RS, et al. Validity of US norms for the Bayley Scales of Infant Development-III in Malawian children. Eur J Paediatr Neurol 2014;18:223-30.
11. Kwon JY, Kim JS, Woo AM, Kim HJ, Chung ME, Kim HS, et al. Diagnosis of speech disorder and language developmental delay in Korean preschoolers. J Korean Acad Rehabil Med 2006;30:309-14.
12. Tomblin JB, Records NL, Buckwalter P, Zhang X, Smith E, O'Brien M. Prevalence of specific language impairment in kindergarten children. J Speech Lang Hear Res 1997;40:1245-60.
13. Kim SJ, Kim YH, Lee YK, Kim DU, Han SH, Chung SY, et al. The clinical features of children with developmental language disorder. J Korean Child Neurol Soc 2001;9:122-8.
14. Feldman HM. Evaluation and management of language and speech disorders in preschool children. Pediatr Rev 2005;26:131-42.
15. Valtonen R, Ahonen T, Lyytinen P, Lyytinen H. Co-occurrence of developmental delays in a screening study of 4-year-old Finnish children. Dev Med Child Neurol 2004;46:436-43.
16. Silva PA. The prevalence, stability and significance of developmental language delay in preschool children. Dev Med Child Neurol 1980;22:768-77.
17. Kim SW, Shin JB, You S, Yang EJ, Lee SK, Chung HJ, et al. Diagnosis and clinical features of children with language delay. J Korean Acad Rehabil Med 2005;29:584-90.
18. Kim SW, Kim YK, Chung HJ. Well baby clinic: developmental guidance according to the parent's chief complaints. J Korean Med Assoc 2009;52:244-61.
19. Tomblin JB, Buckwalter PR. Studies of genetics of specific language impairment. In: Watkins RV, Rice ML, editors. Specific language impairment in children. Baltimore, MD: Paul H Brookes; 1994. p. 17-34.
20. Whitehurst GJ, Fischel JE. Practitioner review: early developmental language delay: what, if anything, should the clinician do about it? J Child Psychol Psychiatry 1994;35:613-48.
21. Jang JH, Park ES, Park JH, Baek JH, Won YH, Rha DW. Clinical usefulness of Capute Developmental Test as a screening test for detecting the language delay. J Korean Acad Rehabil Med 2010;34:544-9.
22. Bayley N. Bayley Scales of Infant and Toddler Development. San Antonio, TX: PsychCorp; 2006.
23. Borowitz KC, Glascoe FP. Sensitivity of the Denver Developmental Screening Test in speech and language screening. Pediatrics 1986;78:1075-8.
24. Yi YG, Sung IY, Yuk JS. Comparison of second and third editions of the Bayley Scales in children with suspected developmental delay. Ann Rehabil Med 2018;42:313-20.
25. Anderson PJ, de Luca CR, Hutchinson E, Roberts G, Doyle LW; Victorian Infant Collaborative Group. Underestimation of developmental delay by the new Bayley-III Scale. Arch Pediatr Adolesc Med 2010;164:352-6.
26. Jary S, Whitelaw A, Walloe L, Thoresen M. Comparison of Bayley-2 and Bayley-3 scores at 18 months in term infants following neonatal encephalopathy and therapeutic hypothermia. Dev Med Child Neurol 2013;55:1053-9.