

Assessment of Basic Language and Communication Ability in Early Childhood: Validity and Reliability of the Ability for Basic Language and Communication Scale for Children (ABLS-C)

Satoshi Tamai¹, Sayaka Aoki², and Keiji Hashimoto^{1*}

¹Division of Rehabilitation Medicine and Developmental Evaluation Center, National Center for Child Health and Development, Tokyo, Japan

²Department of Global and Interdisciplinary Studies, Hosei University, Tokyo, Japan

*Corresponding author: Keiji Hashimoto, Division of Orthopaedic Surgery, National Center for Child Health and Development. Address: National Center for Child Health and Development, 10-1, Okura 2-chome, Setagaya-ku, Tokyo 157-8535, Japan, Tel: +81 (3) 3416 0181; Fax: +81 (3) 3416 2222; E-mail: hashimoto-k@ncchd.go.jp

Received: 16 Jul, 2019 | Accepted: 04 Aug, 2020 | Published: 11 Aug, 2020

Citation: Tamai S, Aoki S, Hashimoto K (2020) Assessment of Basic Language and Communication Ability in Early Childhood: Validity and Reliability of the Ability for Basic Language and Communication Scale for Children (ABLS-C). *Pediatr Neonatal Nurs* 4(1): dx.doi.org/10.16966/2470-0983.122

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Abstract

Objective: We developed a new screening scale of speech, language, and communication ability of children, the Ability for Basic Language Communication Scale for Children (ABLS-C). The Objective of this study was to examine the reliability and validity of the ABLS-C.

Method: The participants of the study were 28 children (aged between 10 and 66 months) who were suspected developmental delay or developmental disability. For these children, the ABLS-C was completed by their parents twice, to examine its internal consistency and test-retest reliability. To investigate its concurrent validity, the Kyoto Scale of Psychological Development 2001 (KSPD) and the Kinder Infant Development Scale (KIDS) were also administered.

Results: With regard to the test-retest reliability, a weighted Kappa between two responses for each item ranged from 0.469-0.737, except for Wakefulness (-0.054), while the Prevalence and Bias Adjusted Kappa-Ordinary Scale (PABAK-OS) was found to be more than 0.7 for all five items. In terms of concurrent validity, the total score of the ABLS-C showed a strong correlation with developmental age (DA) in the language domain measured by the KSPD ($r=0.866$), and with scores of the three language subscales in the KIDS ($r=.766-.879$). The score of each item in the ABLS-C was also found to have a moderate to strong relationship with the scores of language domain/subscales in the KSPD and KIDS, except for Wakefulness.

Conclusion: The results of this study indicate that ABLS-C is a good bedside screening tool for a child's language functioning, with sound reliability and validity.

Keywords: Speech-language-communication development; Children; ABLSC (Ability for Basic Language Communication Scale for Children); Clinical assessment scale; ICF (International Classification of Functioning, Disability and Health)

Introduction

Speech, Language, and Communication Difficulty (SLCD) is not an uncommon problem among children who are hospitalized because of various acute neurological disorders or conditions. SLCD is often associated with negative long-term outcomes in many areas, including low academic achievement and poor peer relationships in middle childhood [1], low phonological processing and low literacy skills in adolescence [2], and low educational attainment and occupational status in adulthood [3]. As an early intervention is vital to alleviate such negative outcomes [4,5], it is important to identify the type and degree of SLCD as quickly as possible, using a reliable and valid screening tool. In addition, since various types of professionals

including non-certified specialists are involved in the assessment and care of such hospitalized children, the screening tool should also be easy to administer without special knowledge or intensive training.

In Japan, a few tools have been developed to assess the speech and language ability of children; however, none of them is appropriate for screening in such settings. For example, the Language Communication Development Scale (L-C Scale) is a validated formal assessment scale [6] that is frequently used among Speech-Language-Hearing therapists (ST) in Japan. However, according to its manual, it requires skills for manipulation of test equipment and thorough, careful observation as well as specific knowledge to interpret the result. The S-S test [7] has also been used to assess children's speech, language,

and communication abilities, but takes too long to complete and must be administered by Speech and language therapists. Additionally, Ishida and Ishizawa (2016) introduced several tests for measuring speech language abilities in their textbook [8]. However, to administer the tests and interpret the results properly, it is necessary to have advanced knowledge of language and communication development. Taken together, to screen Japanese children under medical care, it is necessary to develop a new tool that is easily administered by diverse individuals at any setting.

In response to this need, we developed a new short screening tool, the Ability for Basic Language Communication Scale for Children (ABLS-C), which can be used at the child's bedside by clinicians and specialists, as well as parents, who care for children with diverse neurological conditions.

To confirm the technical adequacy of ABLS-C, it is essential to investigate its psychometric profile. As an initial step of this process, in the present study, we administered the ABLS-C to outpatient children and examined its test-retest reliability and concurrent validity using the Kyoto Scale of Psychological Development (KSPD) [16] and the Kinder Infant Development Scale (KIDS) [17]. As ABLS-C is supposed to be related to those on the subscales in the other tools measuring language development. For this reason, in our analyses, we mainly focused on the correlation between the total and the item scores of the ABLS-C and the scores of the language-related subscales in the other tools, while the correlations with the scores on the other subscales were also calculated for comparison.

Method

Participants

The participants of this study were 13 boys and 15 girls (median age=25 months old), who were referred to the Developmental Evaluation Center of the National Center for Child Health and Development (NCCHD), due to suspected developmental delay or developmental disability caused by a variety of disorders/high-risk conditions. The primary diagnoses of the participants were as follows: preterm low birth weight infant (n=12), developmental disorders (e.g., ASD/ADHD) (n=3), tethered spinal cord syndrome (n=3), congenital diaphragmatic hernia (n=2), VATER association (n=1), cerebral palsy (n=1), after living donor liver transplantation (n=1), vein of Galen malformation (n=1), 21-hydroxylase deficiency (n=1), ornithine transcarbamylase deficiency (n=1), leptomeningeal cyst (n=1), and postoperative cerebellar tumor (n=1). It should be noted that the actual number of participants whose data were used depended on analyses because for some participants, their scores on some of the tests could not be obtained due to their age, failure to complete the tests, or missing data (see the later subsections for the details).

Measures

Ability for Basic Language and Communication Scale (ABLS-C) [Figure 1]: The ABLS-C is a performance-based assessment scale, which is composed of 5 items regarding children's language and communication development: Wakefulness, Lalognosis (Comprehension), Speech (Expression), Intelligibility, and Social Interaction. To develop items in the ABLS-C, the authors who consisted of ST, pediatricians, a neurologist, and a psychologist, discussed the major aspects of language and communication in early childhood, while reflecting scales developed in other countries [9-11] in order to determine what contents are frequently covered in a similar screening tools. In addition, we also referred to the conceptual framework of

the International Classification of Functioning, Disability and Health (ICF) [12-14] as the framework is considered relevant and useful in pediatric rehabilitation settings [15]. After brainstorming the contents of the scale, we selected items that met the following criteria: (1) The items measure children's performance at any given moment, (2) scoring criteria for items are so clear that the scores are not affected by the examiner's type of expertise and amount of clinical experience, and (3) the items are matched with the ICF item codes. As a result, we chose five items: (1) Wakefulness, (2) Lalognosis, (3) Speech, (4) Intelligibility, and (5) Social Interaction. The ICF codes corresponding to each of the items are as follows; "Wakefulness" is corresponded to Consciousness function (b110) in the Body Function and Body Structure component, "Lalognosis" is to Communication-receiving (d310-d329) in the Activity and Participation component, "Speech" is to Communicating-producing (d330-d349) in the Activity and Participation component, "Intelligibility" is to Voice and Speech function (b310-b339) in the Body Function and Body Structure component, and "Social Interaction" is to the Basic learning (d130-d159) in Activity and Participation component.

Each item is rated on a 4-point scale. It takes only a short time to complete all items. The following are detailed descriptions of each of the items. "Wakefulness" refers to an ability to recognize others and the surrounding environment in response to communicative stimuli. The score should reflect the overall consciousness of the child being rated. The rater should assign 0 if the child shows no response to pain stimulation, 1 if the child is awakened when his/her body is shaken, 2 if the child is awakened when spoken to, and 3 if the child is awake without any stimulation. "Lalognosis" delineates one's capability of understanding and responding to others directions appropriately. The item is scored as 0 if the child does not respond at all when called, 1 if the child responds to the speaker by turning his/her head in the direction, 2 if the child follows verbal directions accompanied by gestures, and 3 if the child follows verbal directions without gestures. "Speech" assesses one's ability to convey his/her intention through either verbal or nonverbal methods. The item is scored as 0 if the child does not make any sound or gestures, 1 if the child utters vowel sounds such as "ooh" "ahh", 2 if the child conveys his/her desires and/or needs by pointing at objects or people, and 3 if the child speaks words with meaning. "Intelligibility" is the degree of clarity of a child's speech. This item was made in reference to the Intelligibility Test for Evaluating speech of Adults with Articulation Disorders, which has been used all over Japan in order to measure the severity of articulation difficulties by examining how clearly an adult patient speaks. A score of 0 indicates that it is impossible for anyone to understand the child's speech or the child is unable to speak, 1 indicates that less than half of the child's speech is understandable, 2 denotes that half or most of the child's speech is understandable, and 3 signifies that the child's speech is completely understandable. "Social Interaction" indicates a child's ability to be engaged in communication behaviors appropriately. The item is scored as 0 if the child has never had eye contact with others, 1 if the child smiles back when a person speaks to him/her, 2 if the child waves his/her hand at others, and 3 if the child plays together with his/her friend. For all items, the scores are given based on the children's maximum performance level. For example, on the item "Speech," if a child speaks words with meaning, 3 points are assigned even if he/she does not point at an object/person to convey his/her desires at the time when the questionnaire is administered. The rationale of this scoring is that it can be assumed that the child has already reached the developmental level at which he/she does not have to simply rely on gestures to express his/her desire.

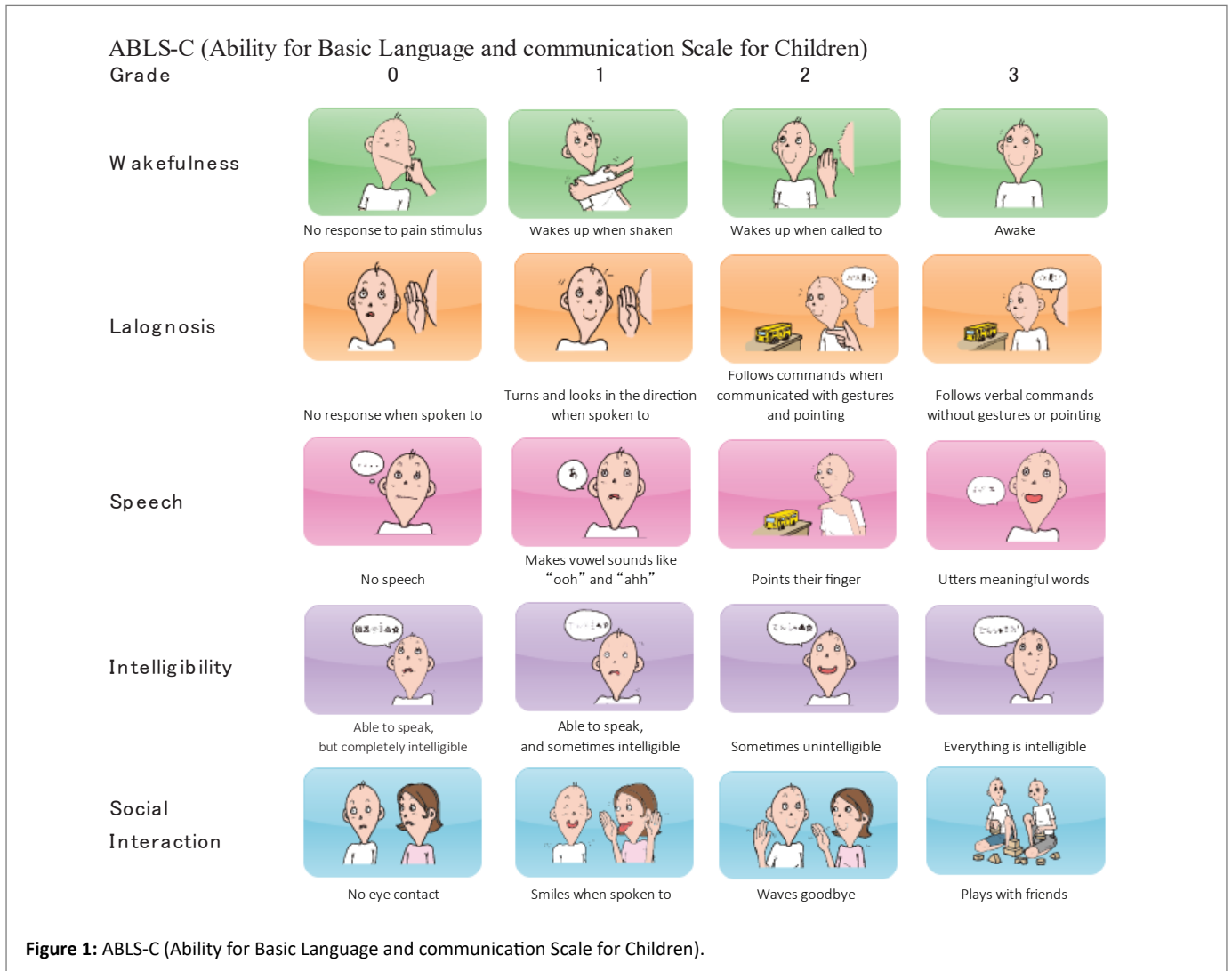


Table 1: The Response distributions of first testing and second testing on ABLS-C by parents.

Wakefulness					Speech					Social interaction				
	Second					Second					Second			
First	0	1	2	3	First	0	1	2	3	First	0	1	2	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	2	0	1	1	0	2	1	0
2	0	0	0	1	2	0	1	3	2	2	0	0	8	1
3	0	0	2	23	3	0	0	0	17	3	0	1	1	12
Lalognosis					Intelligibility									
	Second					Second								
First	0	1	2	3	First	0	1	2	3					
0	0	0	0	0	0	3	1	0	0					
1	0	3	0	0	1	1	6	0	0					
2	0	0	5	5	2	0	1	6	3					
3	0	0	3	10	3	0	0	1	4					

This table summarizes parents test-retest responses to each item of the ABLS-C. N=26. Rows depict first answers and columns demonstrate second answers on ABLS-C.

Table 2: Correlation coefficient between the items of ABLSC.

N=26	Wakefulness		Lalognosis		Speech		Intelligibility		Social interaction	
	r	P	r	P	r	P	r	P	r	P
Wakefulness	-	-	0.147	0.472	0.364	0.067	0.153	0.454	0.342	0.086
Lalognosis			-	-	0.423*	0.031	0.537**	0.005	0.434*	0.027
Speech					-	-	0.617**	0.000	0.556**	0.003
Intelligibility							-	-	0.637**	0.000
Social interaction									-	-

* p<0.05

** p<0.01

The table demonstrates the internal consistency of the ABLSC. N=26. This analysis was computed by the first (test) ABLSC rating for participants who completed both ratings (test-retest). Asterisks indicate statistically significant differences.

Table 3: Test-retest reliability of each ABLSC item by parents.

N=26	Range		Median	Mean	Reliability	
					Weighted κ	PABAK-OS
Wakefulness	0-3	Test	3.00	2.96	-0.054	0.897
	0-3	Retest	3.00	2.92		
Lalognosis	0-3	Test	2.50	2.38	0.469*	0.727
	0-3	Retest	3.00	2.46		
Speech	0-3	Test	3.00	2.54	0.663**	0.829
	0-3	Retest	3.00	2.65		
Intelligibility	0-3	Test	2.00	1.62	0.635**	0.761
	0-3	Retest	2.00	1.65		
Social interaction	0-3	Test	3.00	2.42	0.737**	0.829
	0-3	Retest	2.50	2.38		
Total scale of ABLSC	0-15	Test	12.50	11.85	0.556**	
	0-15	Retest	12.00	12.08		

* p<0.05

** p<0.01

The table shows a comparison of parent responses between the first (test) and second (retest) ratings, and test test-retest reliability of each item of ABLSC by parents. N=26. Asterisks indicate statistically significant differences.

The Kyoto Scale of Psychological Development 2001 (KSPD):

The KSPD [16] is a standardized developmental test that is widely used in Japanese clinical settings, to measure developmental level of individuals of all ages. The test has a total of more than 300 tasks in three distinct domains: Postural-Motor (P-M), Cognitive-Adaptive (C-A), and Language-Social (L-S), and the examiner selects the tasks depending on the examinee's chronological age and developmental level. Through the standardized assessment and scoring procedure, the test can provide the examinee's overall Developmental Age (DA) and Developmental Quotient (DQ) and those of the three subdomains. However, the scores of P-M domains are not calculated for typically developing children aged 4 or more, as they are expected to pass all the items in this domain. In the present study, for the children aged 3 or less, the overall DA and DA for all three subdomains were used for the correlation analyses, and for the children aged 4 or more, overall DA and DA for only C-A and L-S domains were calculated.

The Kinder Infant Development Scale (KIDS): The KIDS [17] is a parent-rating questionnaire that has been used for developmental

screening of children aged between 0 years 1 month and 6 years and 11 months. The KIDS consists of 4 types of questionnaires, Type A, B, C, and T, each of which was developed for children of different ages. In this study, Type T was used for all the participants because Type T is recommended by its authors to be administered to any child between the ages of 1 month and 6 years 11 months, who are suspected of being developmentally delayed. The questionnaire is composed of items describing observable behaviors that are divided into 9 categorical subscales: Physical-Motor, Manipulation, Receptive Language, Expressive Language, Social Relationships with Adults, Feeding, Language concept, Social Relationships with Children, and Discipline (self-care). The number of items for each subscale ranged between 22 and 37. For each item, the parent is asked to answer "O" (yes) if his/her child can perform the behavior, and "X" (no) if his/her child cannot. The row score for each subscale is the number of items that the parent answered "O," which can be converted into developmental age (DA) using the tables provided in the testing manual. In this study, the overall DA and DA for each

Table 4: Correlation between the ABLSC and KSPD.

ABLS-C			KSPD							
			Postural-Motor		Cognitive Adaptive		Language social		Total	
			N=26		N=28		N=28		N=28	
	Median	Range	r	P	r	P	r	P	r	P
Wakefulness	3.00	0-3	0.204	0.297	0.275	0.157	0.216	0.270	0.251	0.198
Lalognosis	2.50	0-3	0.423*	0.025	0.460*	0.014	0.539**	0.003	0.491**	0.008
Speech	3.00	0-3	0.462*	0.013	0.675**	0.000	0.735**	0.000	0.708**	0.000
Intelligibility	2.00	0-3	0.315	0.102	0.768**	0.000	0.830**	0.000	0.754**	0.000
Social interaction	3.00	0-3	0.267	0.170	0.598**	0.001	0.708**	0.000	0.633**	0.000
Total scale of ABLSC	13.00	0-15	0.473*	0.011	0.805**	0.000	0.866**	0.000	0.819**	0.000

ABLS-C: Ability of Basic Language Scale for Children.

KSPD: Kyoto Scale of Psychological Development 2001.

* p<0.05

** p<0.01

This table indicates results of correlation analyses between ABLSC and KSPD 2001. N=28. In calculating the P-M domain, two children were excluded, because they passed all the items in the domain. Asterisks indicate statistically significant differences.

subscale were used for the correlation analyses.

Data collection procedure

Data were collected between August 2015 and January 2016. The KSPD and the KIDS were administered and scored by two psychologists and a speech-language therapist at the NCCHD who were well acquainted with these tools and had been working with disabled infants and toddlers. While the participants took the KSPD and KIDS, his/her parent completed the ABLSC (first administration). For each of its items, the parents were asked to rate their children's behavior based on their daily observations. Approximately one week later, the parents filled out the ABLSC again at home and sent it back to the NCCHD (second administration).

This study was approved by the Research Ethics Committee of the NCCHD. When collecting the data, written informed consent was obtained from parents of all the participants.

Statistical data analyses

In this study, we investigated (1) internal consistency, (2) test-retest reliability, and (3) concurrent validity of the ABLSC. All statistical analyses were conducted using IBM SPSS Statistics 20. To evaluate the internal consistency of the ABLSC, Cronbach's coefficient alpha (Cronbach's α) among the 5 items was derived. Then, we also investigated whether Cronbach's α increases if one or a few items are omitted. To find an item that may decrease Cronbach's α due to a weak association with other items, Spearman's correlation coefficients between each of the 5 items were calculated.

To examine the test-retest reliability of the scores of each individual item and the total score of the ABLSC, a weighted Kappa between the scores obtained at the first administration of the ABLSC and those of its second administration were calculated, as the ABLSC is considered as an ordinal scale. If the score distributions were found to be skewed, the Prevalence and Bias Adjusted Kappa-Ordinary Scale (PABAK-OS) was also calculated, setting partial credit weights for near misses [18]. For these analyses, the data from 2 participants were excluded as their parents failed to fill in the questionnaire at home or send it back to the

researchers. As a result, the analyses were conducted on data from 26 of the participants whose parents completed the ABLSC twice.

To explore the concurrent validity of the ABLSC, the correlations between the scores of ABLSC and those of the Kyoto Scale of Psychological Development 2001 (KSPD) and Kinder Infant Development Scale (KIDS) were calculated using the Spearman rank method. Because we desired to understand not only the function of the scale but also those of individual items in the ABLSC, all the correlations between the item scores and the total score of the ABLSC, and the overall DA and subdomains DAs of the KSPD and the KIDS were calculated. For the analysis using the KSPD, the data from all the participants were used, except for the correlation analyses using the P-M DA, as the score could not be obtained for two of the participants due to their age (for a more detailed explanation, see the Measures. The Kyoto Scale of Psychological Development 2001 (KSPD) subsection). For the analyses with the KIDS, the data from 3 of the participants who failed to complete them were excluded, resulting in analyzing the data from the remaining 25 participants (for the analyses using the Language concept, Social Relationships with Children, and Discipline subscales, the data from 23 participants were used as the parents of two participants did not respond to all of the items for each of these subscales) The strengths of correlations were evaluated based on the categorization described in Taylor's review, which regarded $r \geq 0.68$ as strong, $0.35 < r < 0.68$ as moderate, and $r \leq 0.35$ as weak correlations [19].

Results

Score distribution

The distributions of the scores of each ABLSC item at the first and second administrations are presented in table 1. As can be seen, the distributions were highly skewed, specifically for Wakefulness; at the first administration, all the participants except for one, and at the second administration, all of those except for two scored 3 points.

Internal consistency

Cronbach's alpha among the 5 items of the ABLSC was 0.805. As

Table 5: Correlation between the ABLSC and the KIDS

ABLS-C	KIDS																						
	Median	Range	Physical-Motor		Manipulation		Receptive Lang.		Expressive Lang.		Lang. Concept		Soc. Rel. with Child.		Soc. Rel. with Adult.		Discipline		Feeding		Total		
			N=25	r	p	N=25	r	p	N=25	r	p	N=25	r	p	N=23	r	p	N=25	r	p	N=25	r	p
Wakefulness	3.00	0-3	0.284	0.168	0.256	0.218	0.227	0.275	0.184	0.377	0.065	0.769	0.210	0.336	0.128	0.543	0.226	0.300	0.199	0.340	0.227	0.275	
Lalognosis	3.00	0-3	0.51**	0.003	0.632**	0.001	0.657**	0.000	0.552**	0.004	0.337	0.116	0.334	0.119	0.518**	0.008	0.454*	0.030	0.666**	0.000	0.588**	0.002	
Speech	3.00	0-3	0.77**	0.000	0.771**	0.000	0.727**	0.000	0.808**	0.000	0.583**	0.003	0.741**	0.000	0.697**	0.000	0.634**	0.001	0.828**	0.000	0.816**	0.000	
Intelligibility	2.00	0-3	0.672**	0.000	0.774**	0.000	0.796**	0.000	0.816**	0.000	0.695**	0.000	0.627**	0.001	0.717**	0.000	0.759**	0.000	0.829**	0.000	0.790**	0.000	
Social interaction	3.00	0-3	0.621**	0.001	0.783**	0.000	0.791**	0.000	0.720**	0.000	0.687**	0.000	0.723**	0.000	0.731**	0.000	0.643**	0.001	0.689**	0.000	0.763**	0.000	
Total scale of ABLSC	13.00	0-15	0.788**	0.000	0.870**	0.000	0.879**	0.000	0.865**	0.000	0.766**	0.000	0.714**	0.000	0.815**	0.000	0.755**	0.000	0.911**	0.000	0.868**	0.000	

ABLSC: Ability of Basic Language Scale for Children

KIDS: Kinder Infant Development Scale

* p<0.05

** p<0.01

Notes: Lang. =Language, Soc. =Social, Rel. =Relationship, Child. =children.

This table shows the results of the correlation analysis between ABLSC and KIDS. N=25. Three of the 28 participants were excluded because they could not respond to all KIDS items. Asterisks indicate statistically significant differences.

the correlations between wakefulness and the other 4 items were lower than those among these 4 items [Table 2], we recalculated Cronbach's alpha after omitting Wakefulness. The alpha increased to 0.833.

Test-retest reliability

As mentioned above, first, a weighted Kappa coefficient between the two responses was calculated for each of the 5 items. The results are presented in table 3. As can be seen, the weighted Kappa was more than 0.6 for Speech, Intelligibility, and Social Interaction, 0.469 for Lalognosis, and -0.054 for Wakefulness. Since these values seemed to be influenced by high skewness of the score distributions, the PABAK-OS were also calculated and found to be more than 0.7 for all the five items. These results indicate high test-retest reliability for all the five items.

Concurrent validity

To examine the concurrent validity of the ABLS-C, we first calculated the correlations of the total score and the 5 items of the ABLS-C with the overall DA and DAs of the three subdomains in the KSPD. The results are presented in table 4. The total score of the ABLS-C had a moderate to strong correlation with the overall DA ($r=0.819$), the P-M DA ($r=0.473$), the C-A DA ($r=0.805$), and L-S DA ($r=0.866$). Among the correlations with the 3 domain DAs, the one with the L-S DA was the largest. With regard to the correlations between the ABLS-C item scores and the KSPD language subdomain score (L-S DA), Lalognosis($r=0.539$), Speech($r=0.735$), Intelligibility($r=0.830$), and Sociality($r=0.708$) were moderately to highly correlated with the KSPD L-S DA. On the other hand, Wakefulness was not significantly correlated with L-S DA ($r=0.216$).

We also computed correlation coefficients between the total score and item scores of the ABLS-C and the total score and the subdomain scores of the KIDS, which are shown in table 5. The total score of the ABLS-C was highly correlated with the total score ($r=0.868$), and Physical-Motor ($r=0.788$), Manipulation ($r=0.870$), Receptive- Language ($r=0.879$), Expressive Language ($r=0.865$), Social Relationships with Adults ($r=0.815$), Language concept ($r=0.766$), Social Relationships with Children ($r=0.714$), and Discipline (self-care) ($r=0.755$) subscale scores of the KIDS. In terms of the relationship between individual items in the ABLS-C and the language-related subscales in the KIDS, scores of Speech, Intelligibility, and Sociality showed statistically significant and strong relationships with scores of the Receptive Language and Expressive Language subscales ($r>0.7$), and a moderate association with the score of the Language Concept subscale ($r>0.5$). Lalognosis was moderately correlated with the scores of Receptive Language ($r=0.657$) and Expressive Language ($r=0.552$), but showed a weaker correlation with the Language Concept score ($r=0.337$). Similar to the KSPD, correlations between the score of Wakefulness and those of KIDS language-related subscales were quite weak ($r<0.25$).

Discussion and Conclusion

In this study, we developed a basic speech language communication scale for children (ABLS-C), which is a quick assessment tool used mainly for children at an early stage of language/communication development at the bedside by either specialists or non-specialists and examined its psychometric profile. The results indicate that the ABLS-C has high internal consistency and high test-retest reliability. The internal consistency of the individual items further increased when the item Wakefulness was omitted. The total score of the ABLS-C showed moderate to strong correlations with the L-S DA of the KSPD

and the score of language-related scales of the KIDS. This result means that the ABLS-C score is related to language development, suggesting it has high convergent validity. It should be noted that the total score of the ABLS-C was also highly correlated to the subscales of the KIDS which are not supposed to measure language ability. While such results may indicate somewhat low discriminant validity in general, taking account of the wide age range of the participants of this study, it is reasonable to find such high correlations as the scores of both measures reflect "overall" developmental level to some degree.

As mentioned above, ABLS-C was found to be a good bedside screening tool for a child's language functioning, with sound reliability and validity. However, when looking at the individual items independently, it is possible to take another perspective on this scale. Three out of the five items of the ABLS-C, Speech, Intelligibility, and Sociality, showed a high test-retest reliability and a strong association with the KSPD L-S DA and language subscales of the KIDS, the other two items, Lalognosis and Wakefulness, showed a weaker relationship with language development measured by the KSPD and KIDS. With regard to the Lalognosis, the item seems to measure a somewhat different aspect of language functioning from those assessed by the KSPD and KIDS. Based on the description of its response options, Lalognosis simply assesses the capability to respond and follow instructions given by parents but does not measure the level of vocabulary or expressive language, which are strongly associated with the KSPD L-S DA and language subscales of the KIDS. In terms of Wakefulness, while being conscious and able to recognize surrounding people and the environment well is essential for having verbal communication with others, it is not sufficient to develop age-appropriate language skills; for example, even those who are not verbal at all, such as patients with severe cerebral palsy, most of them are awake without stimulation. In fact, 23 out of 26 participants obtained 3 points on this measure at both administrations, regardless of their level of language development. Therefore, it is reasonable to find that the relationship between the Wakefulness score and language subscale scores in the KSPD and KIDS are weak.

Taking account of the results above, we can suggest an alternative way of using this screening scale. Because being awake is a necessary but not sufficient condition for communicating with other people, the item Wakefulness can be used as an item to determine whether the other 4 items can be administrable; if the score on this item is less than 3, the other 4 items should not be administered and the screening should be terminated. After confirming that the child obtains 3 points on this item, the other 4 items should be scored to measure their language functioning.

This study has several limitations. First, the range of the participants was somewhat limited. The participants in this study were mostly outpatients of the NCCHD who had been monitored after hospitalization due to a disease or condition (e.g., premature delivery) for a long time. Children who could not attend NCCHD because of severe and bedridden psychomotor retardation resulting from chromosomal abnormality and/or prenatal brain insult did not participate in this study. Therefore, a ceiling effect might have been observed for some items, particularly for the item Wakefulness; to understand the property of this item further, it would be necessary to test this tool with children who are in the acute phase and not fully awake. In addition, children who were "not diagnosed" with any disease or condition were not included in this study. As the ABLS-C was developed based on theories of speech-language development of typically developing children, to examine its generalizability, it is also important to replicate this study with a community sample. Second,

the raters of the study were also restricted to parents of children. As mentioned previously, the primary purpose of creating the ABLSC was to develop a screener of speech-language functioning that can be administered at the bedside not only by parents, but also by various experts, such as psychologists, nurses, and teachers. Therefore, to confirm its utility, it is essential to investigate inter-rater reliability among clinicians with different expertise and background knowledge about these children.

For further studies on ABLSC, several directions can be considered. First, as mentioned above, to increase its generalizability, it is important to administer this tool to a more diverse population and examine whether the tool is still reliable and valid for them. Meanwhile, it is necessary to evaluate the inter-rater reliability between some specialists to examine whether the tool functions as it was originally intended, being rated in a similar manner regardless of the raters' expertise and training. Furthermore, it might also be interesting to measure its predictive validity by using this tool in a longitudinal study and investigate the relationship between the ABLSC score obtained in early childhood and the score of tools measuring other aspects of development, such as an intelligence test or an achievement test.

Conflict of Interest

The authors declare no competing interests in this study.

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