

A survey of the development of syntactic comprehension in neurotypical infants

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A survey of the development of syntactic comprehension in neurotypical infants

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Abstract

The present survey was conducted to examine the development of syntactic comprehension in neurotypical children. Prior to the main survey, a preliminary survey was conducted involving 45 children aged between 3 and 10 years old to determine sentence patterns and the frequencies for which the tasks should be implemented. The subjects were 125 neurotypical infants aged 3 – 6 years old. Eight syntactic tasks (involving comparative, causative, and passive sentences, as well as those expressing the acts of giving and receiving) were prepared, and a correct response rate of 60% for each age group was defined as the passing point for each task. Correlations among each of the eight syntactic tasks, the Test for Delayed Language Development Based on Sign-Significant Relations (S-S test), the Picture Vocabulary Test – Revised (PVT-R), and short version of the Question-Answer Interaction Test were examined. The correct response rates increased with age in all of the tasks. Infants in all age groups did not have satisfactory skill levels to understand causative sentences, and those associated with the acts of giving and receiving. Correlations were observed between the tasks in the present test and the PVT-R and short version of the Question-Answer Interaction Test. The results suggested that syntactic comprehension is associated with the development of vocabulary comprehension.

KEY WORDS

Syntactic comprehension, language development, syntactic tasks, Language assessment, neurotypical infants

Introduction

In the process of development in children, language acquisition is the most important for their effective communication with other people. However, it is also known that language development may be inhibited for a variety of reasons. Delayed language development may be caused not only by individual variation among children (impairment of general intellectual function, emotional disturbance, social impairment, and impaired sensory and motor functions, including impaired ability and sense of hearing), but also by the environment in which the child

was raised (child abuse, two-language environments, etc.).¹⁾²⁾³⁾ In some cases, delayed language development is due to problems associated with the parents, including those with intellectual impairment who are unable to raise their children, or those who do not speak to their children appropriately. In recent years, support for child-raising has become an important issue in the fields of health and welfare care. When implementing interventions, regardless of cause, it is necessary to assess the level of language development, including both language comprehension and expression skills. In Japan, few examinations are

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conducted to assess the level of language development in infancy. Although general development tests, such as the Enjoji-style Analytical Developmental Test for Infants, the Tsumori-Inage-style Mental Development Questionnaire for Infants, the Japanese Version of Denver Developmental Screening Test, and the Kyoto Scale of Psychological Development 2001, partially assess language development, these tests are unable to assess the ability of infants to understand and express words and sentences in detail.¹⁾²⁾³⁾

Infants aged approximately one year old usually start to speak simple one-word sentences, and they will be able to speak longer sentences including two or three words by approximately 18 to 24 months of age. Infants aged approximately two years old can speak sentences including case particles such as "ga" (Subjective case), "o" (Adhering case), "no" (Genitive case), "ni, e" (the case indicating the attached place), "kara" (the case indicating the starting place or time), and the like. In Japanese, the role of case particles is very important. While in some languages case is expressed by the order of words or by the declension of nouns, it is general in Japanese that case is expressed by case particles that are placed after nouns.⁴⁾

At the age of three years or older, infants speak many types of sentences, including simple sentences, complex sentences involving relative clauses, and sentences with passive and causative verbs, while using a larger number of particles. Infants are thought to begin understanding these various types of sentences prior to developing their skills for language expression. It is believed that their vocabulary increases to several thousand words during the preschool period, and that they understand most Japanese sentence structures by late infancy. The above-mentioned developmental tests are unable to effectively assess infants' language development to implement intervention programs. Few of these developmental tests include items to assess syntactic skill levels.

To assess children's language development, it is necessary to determine their levels of vocabulary, syntactic, and pragmatic skills. In the U.S.A. a large number of screening and comprehensive language tests have been developed since the 1980s, some of which are designed to assess bilingual skills.⁵⁾⁶⁾ In addition, studies of programs for advice on syntactic comprehension have also been conducted.⁷⁾⁸⁾⁹⁾ On the other hand, Japanese tests to assess the level of language development in children include S-S test <Draft 1> developed by Koderia

et al. (1981),¹⁰⁾ the Picture Book for Language Tests published in 1987 as a screening tool,¹¹⁾ the Test for Delayed Language Development Based on S-S test <Draft 2> (S-S test),¹²⁾ and the Picture Vocabulary Test (PVT) published in 1991.¹³⁾ Following this, no comprehensive test was developed for a long period of time until the LC scale was published in 2005.¹⁴⁾ At present the S-S test, Syntactic Test for Aphasia (Draft II A),¹⁵⁾ Japanese Test for Comprehension of Syntax and Semantics (J.COSS),¹⁶⁾ and the LC scale are able to assess syntactic skills. Although preschool children can also undergo the Syntactic Test for Aphasia (Draft II A), sentences used in the tasks may be slightly difficult for them; thus, there is little data on infants. As for the J.COSS and the LC scale, it is necessary to obtain more clinical data.

The S-S test is designed to recognize the three aspects of verbal behavior, sign-significant relations, basic processes, and communication, and assess them using a step-by-step approach from the pre-linguistic period, as well as develop consecutive training programs based on the test results.¹²⁾ A survey conducted by Satake et al. (2005) suggested that the S-S test is used in approximately 70% of pediatric clinical settings.¹⁷⁾ Although this method is frequently used, there are only two tasks used to assess syntactic skills: syntactic measure (word order) (developmental age: four years and two months), and syntactic measure (particles) (developmental age: five years and eleven months).

Skills for language development, such as understanding syntactic strategies, expansion of abstract concepts, and learning meta-communication, are learned in children aged four years and two months to five years and eleven months old. To provide learning support for younger school-aged children, it is essential to enhance their verbal comprehension skills (syntactic and meaning comprehension). Previous studies have suggested that because the development of syntactic comprehension has a hierarchical structure, infants who are unable to understand particles use specific information such as the order of words and their meanings to understand sentences.^{18)~21)} In his study on language acquisition conducted in 1976, Hayashibe suggested that infants pass through stages of learning vocabulary (understanding irreversible sentences by relying on the information provided by word meanings), word-order (understanding basic word orders in reversible sentences by adding the

agent to the noun phrase at the beginning of a sentence), and particles (comprehending case particles and understanding all types of sentences, including those with reversed word order).²²⁾

Assessment of the skills of school-aged children for syntactic comprehension and expression is important to help them learn; however, effective assessment methods have not yet been developed in Japan. To assess the syntactic comprehension skills of healthy children, which develop in late infancy, the present study aimed to obtain basic data for the development of new syntactic tasks based on the concepts of the S-S test.

Methods

1. Preliminary survey

1) Subjects

Subjects were 45 children, including nursery school students, who were regarded as neurotypical by their nursery school teachers, as well as first-to-third-year elementary school students without visual, auditory, or intellectual disabilities living in Saitama Prefecture, who also attended after school programs (Table 1). The parents and nursery teachers of the infants received

written and oral explanations of the study, and were asked to provide participation consent.

2) Methods

Between September and December 2012, individual children underwent the tasks described below conducted by three speech therapists with 10 or more years of clinical experience for approximately 30 minutes in cooperative health care institutions.

The present study used six syntactic sentence patterns: positive word order (Task1), “comparative sentences” (Task2), “causative sentences” (Task3), “lending and borrowing sentences” (Task4), “passive sentences” in the normal word order (Task5), and three modified sentences (created by inverting the subject and object) (Task6), and “sentences to express the acts of giving and receiving” (Task7 and 8). Eight tasks (Table 2) were prepared to assess the children’s acceptance (comprehension) skills. Task 1 utilized a sheet with 16 pictures and figures, while the other tasks utilized sheets with six pictures and figures. The tasks were conducted according to the following procedure: stimulus sentences were read out to the children, who were then asked to choose the picture expressed by the sentence by pointing

Table 1. Number of infants by age – Preliminary survey -

Age (years old)	3	4	5	6	7	8	9	10
Number	6	6	5	9	5	7	6	1

Table 2. Example sentences used in tasks -Preliminary survey-

Task	sentence pattern	Stimulus sentences:	Number of times
1	Positive word order of 4	The “boy/girl” “takes/puts” “candy/wood blocks” “out of/in” the “box/bag”.	4
2	comparative	The apple is larger than the car. The cup is smaller than the apple.	4
3	causative	The boy pushes the girl. The girl has the boy push.	10
4	lending and borrowing	The boy borrows something from the girl.	10
5	passive	The rabbit chases the boy. The girl is chased by the rabbit.	11
6	passive	The mother scolds her daughter. The girl is scolded by the boy.	11
7	giving and receiving	The dog washes the rabbit. The panda is washed by the rabbit.	11
8	giving and receiving	The cat gives the bear the rabbit. The cat receives the rabbit from the bear.	12

Example of pictures (Task 5)

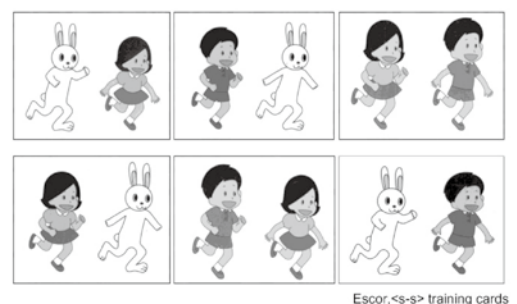


Figure 1 .Examples of pictures used (Example sentence of Task 5: The rabbit chases the boy.)

among training picture cards (published by Escor Co., Ltd.) placed in the center of the desk.

The tasks (stimulus sentences) were prepared based on previous studies (conducted by Fujita, Kodera et al.).^{12) 23) 24)} Scores for each task of either one or zero points were given for correct and incorrect responses, respectively, and children with a correct response rate of 60% or higher in the acceptance-related tasks were regarded as having passed the tests.

The present study was conducted with the approval of the ethics committee of Seirei Christopher University (approval number: 13059).

3) Statistical analyses

Statistical analysis software R was used, and Pearson's product-moment correlation coefficients were calculated.

4) Results of the preliminary survey

Although the children in all age groups passed Tasks 1 (Example: The boy takes candy out of the box.) and 2 (Example: The apple is larger than the car.), only children aged four years or older passed Tasks 4 (Example: The boy borrows something from the girl.), 6 (Example: The mother scolds her daughter.), and 7 (The dog washes the rabbit.). Whereas children aged five years or older passed Tasks 3 (Example: The boy pushes the girl.) and 5 (Example: The rabbit chases the boy.), none of the age groups passed Task 8 (Example: The cat gives the bear the rabbit.). Children aged five and a half years or older

passed the majority of the tasks (Table 3).

5) Correlation between age and the score of each task

The correlation scores and each task were investigated (Table 4). Although there were no or weak correlations between Tasks 1 or 2 and the scores, other tasks showed moderate correlation with the scores received by all subjects. The correct response rate for Task 8 was lower than 60% in all age groups; the present survey adopted sentence patterns related to the acts of giving and receiving, because other assessment methods implemented in Japan and Western countries had also used these patterns. In addition, items that should be excluded were determined based on the correlation between the item and scores received in each of the tasks, as well as the results of descriptive statistics (difficulty levels and standard deviations). Prior to the implementation of the main survey tasks, the number of items was reduced if one or both of the following conditions had been fulfilled: (i) the correlation coefficient of the scores for the preliminary survey task was small; (ii) the ceiling/floor effects were identified.

2. Main survey

1) Subjects

The subjects were 125 nursery school students living in Saitama Prefecture, including 75 males and 50 females. There were 15 three-, 40 four-, 44 five-, and 26 six-year-old preschoolers (Table 5). The recruitment method and

Table 3. Numbers of children who chose the correct answer, by age group-Preliminary survey-

	3 years old	4 years old	5 years old	6 years old	7 years old	8 years old	9 years or older	Total
Number of infants	6	6	5	9	5	7	7	45
Task 1	6	6	5	9	5	7	7	45
Task 2	4	5	5	9	5	7	7	42
Task 3	3	2	3	8	5	7	7	35
Task 4	2	6	5	8	4	7	7	39
Task 5	3	3	5	8	5	7	7	38
Task 6	2	4	4	4	4	7	7	32
Task 7	3	4	4	7	4	6	7	35
Task 8	0	0	0	3	1	1	2	7

□: The rate of infants who passed the task is 60% or higher

Table 4. Correlation between age and the score of each task

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8
correlation coefficients	0.069	0.334	0.655**	0.529**	0.567**	0.436**	0.529**	0.485**

**P<0.01

exclusion criteria of the infants were the same used in the preliminary survey.

This survey was also conducted with the approval of the ethics committee of Seirei Christopher University (approval number: 13059).

2) Implementation methods

The number of tasks performed was smaller than in the preliminary survey, although the implementation methods were the same (refer to the remarks). The size of the pictures used was smaller (A4). Between April and October 2013, individual infants underwent the tests conducted by two speech therapists (STs).

Within one month of the survey, the two STs with 10 or more years of clinical experience for approximately, conducted by the Test for Delayed Language Development Based on Sign-Significant Relations S-S test, the Picture Vocabulary Test-R (PVT-R), and short-version in the Question-Answer Interaction Test for all subjects, and the correlation among Tasks 1 to 8 and subject attributes were examined using Pearson's correlation coefficients. The tests were conducted within 20 to 30 minutes. The Test for Delayed Language Development Based on Sign-Significant Relations consists of a task to assess the actions of the infants (arrangement of wood blocks and drawing) and another task using picture cards with words written on them to assess their abilities to understand and express sentences. In each PVT-R question, infants are required to choose one of four pictures that express a specific word. Because upper and lower time limits were set for

answering the questions, only a minimal amount of time was required to conduct the test. The short-version in the Question-Answer Interaction Test is a task in which infants are required to respond to speech-language-based questions, including questions related to daily activities, quizzes, and explanations of affiliations.

Results

Table 6 shows the results of the present survey, including the correct response rate of each task.

1. Age-group specific results

Table 6 shows the mean correct response rates and standard deviations for the tasks in each age group. In Tasks 1 and 2, the correct response rate in all groups of three-to-six-year-old infants was 60% or higher. In Tasks 3 and 8, the correct response rate in all groups was lower than 60%. In Tasks 4 and 7, the correct response rate among infants aged four years or older was 60% or higher. In Task 5 and 6, the correct response rate among infants aged five years or older was 60% or higher.

2. Rates of infants who were able to complete the tasks

Table 7 shows the number of infants in each age group whose correct response rate was 60% or higher in each task. Whereas the rate of infants who passed the task among three-year-old infants was 60% or higher only in Task 2, the rate among four-year-olds was 60% or higher in both Tasks 1 and 2. The rate of infants who passed the task is was 60% or higher in Tasks 1, 2, 4, 5, and 7 in five

Table 5. Survey subject characteristics

	3 years old	4 years old	5 years old	6 years old	Total
Male	6	26	27	16	75
Female	9	14	17	10	50
Total	15	40	44	26	125

Table 6. Mean correct response rates and standard deviations for each task, by age group

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8
Number of times	4	4	6	8	7	6	7	8
3 years old	60.0(31.05)	62.3(28.14)	38.9(21.52)	43.0(18.18)	38.1(22.7)	38.9(20.57)	54.3(29.18)	16.7(13.08)
4 years old	76.9(18.25)	75.0(20.41)	43.8(24.95)	60.9(23.37)	56.1(20.81)	52.5(16.69)	64.6(223.33)	23.4(15.03)
5 years old	88.1(41.26)	92.6(14.84)	43.2(28.15)	72.4(19.55)	66.6(18.98)	61.7(22.9)	67.2(23.58)	33.8(20.81)
6 years old	85.6(21.42)	90.4(14.28)	44.2(24.47)	73.1(20.22)	76.4(19.35)	80.1(19.45)	82.4(17.75)	26.0(19.01)
Total	80.6(22.40)	83.0(21.20)	43.1(25.42)	65.6(22.60)	61.8(22.93)	59.9(23.48)	68.0(24.37)	26.8(18.62)

(□): Standard deviation

Table 7. Numbers of infants, by age group, whose correct response rate was 60% or higher in each task

	Number of infants	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8
3 years old	15	6	10	3	2	2	2	6	0
4 years old	40	33	27	12	23	14	14	23	0
5 years old	44	40	41	15	35	31	24	28	6
6 years old	26	23	25	8	22	19	23	22	3

□: The rate of infants who passed the task is 60% or higher

Table 8. Passage rate of each task in each age group

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8
3 years old	0.600	0.633	0.389	0.472	0.408	0.415	0.543	0.167
4 years old	0.769	0.750	0.438	0.611	0.561	0.525	0.646	0.234
5 years old	0.881	0.926	0.432	0.724	0.666	0.617	0.672	0.338
6 years old	0.856	0.904	0.442	0.731	0.764	0.801	0.824	0.260

Figures in table correspond to Passage rate

Table 9. Correlation among the tasks

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Total
Task 1	1								
Task 2	0.340	1							
Task 3	-0.014	0.004	1						
Task 4	0.289	0.206	0.070	1					
Task 5	0.279	0.236	0.073	0.369	1				
Task 6	0.232	0.299	-0.005	0.391	0.445**	1			
Task 7	0.310	0.260	0.070	0.451**	0.315	0.462**	1		
Task 8	0.187	0.238	0.073	0.265	0.331	0.189	0.331	1	
Total	0.492**	0.471**	0.298	0.700**	0.675**	0.655**	0.718**	0.573**	1

**P<0.01

Table 10. Correlation among the tasks and other test methods

	Age in months	<S-S methods>			PVT-R	Q&A
		Activity	Comprehension	Expression		
Task 1	0.363	0.351	0.267	0.290	0.487**	0.381
Task 2	0.456**	0.358	0.376	0.284	0.43**	0.499**
Task 3	0.021	-0.040	-0.006	-0.010	-0.013	0.066
Task 4	0.385	0.301	0.354	0.290	0.468**	0.352
Task 5	0.476**	0.426**	0.477**	0.345	0.462**	0.498**
Task 6	0.539**	0.461**	0.460**	0.298	0.546**	0.482**
Task 7	0.335	0.241	0.313	0.236	0.408**	0.423**
Task 8	0.199	0.260	0.265	0.144	0.348	0.255
Total	0.576**	0.483**	0.528**	0.388	0.650**	0.610**

**P<0.01

year olds and Tasks 1, 2, 4, 5, 6, and 7 in six year old. In Tasks 3 and 8, the rate of infants who passed the task was lower than 60% in any age group.

3. Passage rate of each task in each age group

Table 8 shows the Passage rate of each task in each age group. Tasks 1 and 2 showed high passage rate in all age groups. Task 3 and 8 showed low passage rate with any age group. Task 4, 5, 6, and 7 showed high passage rate in infants aged four years or older.

4. Correlation among different tasks

Tasks 4 to 8 showed moderate correlation between Tasks 4 and 7, Tasks 5 and 6, and Tasks 6 and 7 (Table 9). While the correlation to all the other tasks (and the total scores) was not significant in Task 3, the correlation among the other tasks were all statistically significant ($p < 0.01$).

5. Associations among the eight tasks and results of other tests

The associations among the eight tasks, the activity-related tasks of the Test for Delayed Language Development Based on Sign-Significant Relations S-S test, developmental age in language comprehension/expression, vocabulary age in the PVT-R, and the short version in the Question-Answer Interaction Test (Q&A test)-based developmental age were examined (Table 10).

Moderate correlation was observed among the following: Task 1 and the PVT-R; Task 2, the PVT-R, and Q&A test; Task 4 and the PVT-R; Tasks 5 and 6, age in months, the activity-related tasks of the S-S test, comprehension-related tasks, the PVT-R, and Q&A test; and Task 7, the PVT-R, and Q&A test. Weak correlation was observed among the following: Task 1, age in months, the activity-related tasks of the S-S test, comprehension-related tasks, expression-related tasks, and Q&A test; Task 2, the activity-related tasks of the S-S test, comprehension-related tasks, and expression-related tasks; Task 4, the activity-related tasks of the S-S test, comprehension-related tasks, expression-related tasks, and Q&A test; Tasks 5 and 6 and the expression-related tasks of the S-S test; Task 7, age in months, the activity-related tasks of the S-S test, the activity-related tasks of the S-S test, comprehension-related tasks, and expression-related tasks; and Task 8, the activity-related tasks of the S-S test, comprehension-

related tasks, the PVT-R, and Q&A test. In Task 3, the correlation to all the other standards was not significant, and the correlation (0.144) between Task 8 and the expression was not significant either. Except these results, the correlations in all the other tasks were significant to all the each standards ($p < 0.01$).

Discussion

The present study aimed to develop methods for the assessment of various types of syntactic (grammar) comprehension acquired by Japanese people in their infancy, and to collect basic data. Although syntactic comprehension and expression ability is important to support learning in the school-aged period, there have been no assessment methods established in Japan. Therefore, the present study aimed to obtain basic data for the development of new syntactic tasks based on the concepts of the S-S test, to assess the syntactic comprehension skills that develop in late infancy.

Although infants as young as three years were able to complete tasks easily when the word order was normal, correct response rates were low in tasks involving passive and causative sentences, as well as those expressing the acts of giving and receiving, regardless of their age which is consistent with the results of previous studies.^{20) 21)} In particular, the rate of comprehension of causative sentences was lower than 60% in infants. The correct response rates according to task and age, as well as their correlation with other assessment methods are discussed in the following paragraphs.

Task 1, involving a sentence pattern consisting of four words in normal order, correct response rates among infants aged three years or older were higher than 60%; the higher the age of infants, the higher the rates, and correct response rates were high in all age groups. This suggests that Task 1 is of significance as a syntactic comprehension test for infants. On the other hand, the correct response rates for both Tasks 3 and 8 even among older infants were 50% or lower; the rates for Task 8 were particularly low. However, some children were able to understand sentence patterns used in Task 8 in a preliminary test using data of children aged up to ten years old. Therefore, it is necessary to collect data of older children.

Moderate or strong correlation was observed between the correct response rate and age in all tasks excluding

Tasks 3 and 8. This suggests that the higher the age of infants, the higher the correct response rate of these tasks. The correlation among different tasks were also examined; moderate correlation was observed among Tasks 4, 5, 6, and 7 involving passive sentences and those expressing the acts of lending, borrowing, giving, and receiving. These sentence patterns show similar pattern, with subject and object influencing one another.

Regarding sentence pattern type, the comprehension rate of three-year-old infants was 60% or higher in Task 2, involving comparative sentences. Three-year-old infants were able to comprehend comparative sentences, presumably because the particle “*yori*” is usually learned in their early infancy. Similarly, the comprehension rate of four-year-old infants in Task 1 was 60% or higher, presumably because the particle “*kara*” is learned at the age of three, when “*yori*” is acquired. The correct response rates in Task 4, which express the acts of lending and borrowing, and Tasks 5 and 6, which involve passive sentences, were high among infants aged four years or older, and the rates among five-year-old infants were 60% or higher. This suggests that the ability to comprehend these sentence patterns develops at the age of four to five years old. The correct response rate was the lowest in Task 8, which involve sentences that express the acts of giving and receiving with two objectives (“A gives B C.”) and then Task 3, which involves causative sentences (“A has B verb.”). Infants had difficulty performing Task 8 involving complex sentence patterns although the correct response rate in Task 7, which involve sentences expressing the acts of giving and receiving with one objective, among five- and six-year infants was 60% or higher. However, in the preliminary survey, the correct response rate in Task 3 among infants aged five years or older was 60% or higher, and some six-year-old infants were also able to choose the correct answer in Task 8. Thus, it is necessary to continue data collection of infants aged six years or older for investigation of when the above-mentioned comprehension skills are acquired.

The ALADJIN (assessment of language development for Japanese children) suggested that children had learned sentences involving words in the normal order, reverse order, those expressing the acts of giving and receiving (younger than five years old for sentences related to giving, and six years and eight months for sentences related to receiving), relative clauses (modified

subjects), relative clauses (modified objects), and passive sentences at the age of “five years or younger”, “five years and nine months”, “six years and eight months”, “six years and eight months”, “seven years and one month”, and “seven years and nine months”, respectively.²⁰⁾ A previous study on the J.COSS suggested that first- and second-year students of elementary schools were able to understand passive sentences.²⁵⁾ The following are the level of comprehension of sentence patterns adopted by both the J.COSS and present study: The correct response rates for comparative sentences used in the J.COSS among early, late infancy groups, and first and second graders of elementary schools were 7.5, 28.4, and 70.1%, respectively. On the other hand, the correct response rate for comparative sentences used in Task 2 of the present study among infants aged three years old was 63.3%, higher than the rate for the J.COSS. According to the results of a previous study conducted by Nakagawa et al., the correct response rate for passive sentences in the J.COSS among early, late infancy groups, first and second graders of elementary schools, and third to sixth graders were 10.0, 32.4, 65.4, and 92.3%, respectively. The correct response rates for passive sentences used in Tasks 5 and 6 of the present study among children aged five years or older were higher than 60.0%, higher than the rates reported by the study conducted by Nakagawa et al. According to the study conducted by Nakagawa et al., the correct response rates for “sentences expressing the acts of giving and receiving” among early, late infancy groups, and first and second graders of elementary schools were 45.0, 79.7, and 94.4%, respectively. The correct response rates for “sentences expressing the acts of giving and receiving”, or Task 7, among children aged four years or older and six years or older were 60 and 80% or higher, respectively.²⁶⁾ These results suggest that the skills of neurotypical infants will also develop as they advance to the first- or second-year of elementary schools, although the rate of the development may vary among individuals depending on the sentence patterns. It will be necessary to develop syntactic comprehension tests for children in early infancy through to the third or fourth year of elementary schools - the period by which they will have learned the above-mentioned sentence patterns.

Relationships with other tests

In the tasks except Tasks 3 and 8, moderate or strong correlations were observed in PVT-R. The PVT-R is a test

designed to assess the ability of children aged three to twelve years and three months old to understand words.²⁷⁾ Tasks 1 through 8 of the present study assess the ability of syntactic comprehension, which is associated with vocabulary comprehension, particularly the understanding of names, higher-level concepts, and abstract words. However, the comprehension-related items of the S-S test, which are also designed to assess comprehension skills, showed only moderate correlation with Tasks 5 and 6, and weak correlation with other tasks. This may be due to the fact that the comprehension-related items of the S-S test for infants at the developmental age of three years and five months only include tasks designed to assess their skills for word comprehension and to understand sentences consisting of up to three words in the normal order. Test items for infants at the developmental age of four years or older only include two tasks: a test for word order (four years and two months) and a task to assess the ability to understand syntactic patterns involving particles (five years and eleven months). Q&A test is a test based on verbal questions and answers to assess both comprehension and expression skills, and moderate correlation was observed among this and Tasks 2, 5, 6, and 7. Significant correlations were observed between the present test and Q&A test because both assess skills for sentence comprehension. Because Tasks 5, 6, and 7 involve passive sentences and those expressing the acts of giving and receiving, infants are required to not only understand the meanings of sentences, but also to shift their perspectives to give correct answers. To understand sentences with complex syntactic structures, it is necessary to both learn grammatical rules and develop memory skills to maintain phonological styles.²⁸⁾ Regarding the sentences used Q&A test, or normal data used in the auditory comprehension tasks, the correct response rates among five-year-old infants for all four items of the short version of the task were 80% or higher.²⁹⁾ Although the auditory retention span was not included in the test as an assessment item, investigation of the relationships among age, total score, and Q&A test suggest that the auditory retention span may influence correct response rates. Although the present study only assessed syntactic comprehension skills, future studies will investigate syntactic expression to review the lower-order items of Q&A test as well as activity-related tasks.

In the present study number of subjects was small, and the analyses require further improvement. Because the number of three-year-old infants who participated in the present survey was small, it is necessary to conduct research involving a larger number of subjects in this particular age group. Additionally, because the ability to understand the sentence patterns used in Task 8 presumably develops at the age of six or later, it will also be necessary to investigate the performance of school-aged children. The aforementioned ALADJIN suggests that children acquire the comprehension skills for normal-order sentences significantly earlier than those for reverse-order sentences, “sentences expressing the acts of giving and receiving”, passive sentences, and relative clauses, and that infants acquire the comprehension skills for reverse-order sentences and “those expressing the acts of giving and receiving” significantly earlier than the skills for passive sentences.²⁵⁾ This is consistent with the acquisition order of the J.COSS; normal-order sentences, relative clauses, and passive sentences.²⁶⁾

For syntactic comprehension disorders, patients with aphasia, which is also a sequela of stroke, often develop impaired syntactic comprehension.³⁰⁾ Patients with Broca’s aphasia in particular tend to have difficulty with particle comprehension, and attempt to understand sentences in the order of words included in them. Therefore, many of these patients have difficulty understanding inverted, passive, and causative sentences, as well as those associated with the acts of giving and receiving, as suggested by several previous studies.^{31) 32)} Findings of the present study on syntactic comprehension in neurotypical children are significant due to the attention that has been focused on similar issues related to syntactic comprehension in children with developmental disabilities, such as autism, and auditory impairment, for which interventions have been provided.^{33) 34)}

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定型発達幼児を対象とした統語理解の発達調査

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要 旨

本研究では、定型発達児の構文理解の発達を調査した。方法は、まず、予備調査を3歳から10歳の45名で行い、構文の内容、施行数を検討し、その後、本調査を行った。本調査では、3歳から6歳の定型発達児125名に対し、構文課題8項目（比較形、授受構文、使役、受身形など）を作成し、年齢別に、60%以上正答した地点を各課題の通過率として評価した。また、8つの構文課題の各々と、〈SS法〉言語発達遅滞検査、絵画語い発達検査（PVT-R）、質問-応答関係検査（短縮版）についての相関を検討した。その結果、全体として年齢が上るにつれて、すべての課題で正答率が上昇した。文型別では、使役文と目的語が2つある授受構文については、どの年齢群も60%の通過率に達しなかった。構文課題と他の言語検査との関係では、PVT-R、質問-応答関係検査（短縮版）間に相関を認めた。構文の理解には、語彙理解の発達が関係していると考えられた。