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A Comparative Study of the Speech Development of Japanese and American Children (Part Six)

—Preparation for the Developmental Interrelation of the Phonemicization, the Symbolization, and the Syntacticization Processes—*

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Summary

We recorded the speech sounds of nine Japanese and three American infants in Japan and two American infants in the U.S.A. Most of them were between the ages of ten to twenty months. We then compared the developmental process of the speech sounds up to the beginning of the phonemicization, the symbolization, and the syntacticization processes of the three groups.

At about twelve months of age the infant begins to use a few conventional words and sounds which he makes up himself. Then he utters some chains consisting of two, three or more sound clusters, which are made up of the conventional or the self made words as well as some other meaningless sounds.

From about the middle of the second year phonemes and words uttered by the infant increase in number. Through the first several months of the phonemicization and the symbolization processes, 1) he begins to articulate stops, nasals, and front vowels in one- or two-syllable-words fairly correctly, 2) and he begins to use two different expressions to describe the same objetc, e.g. he sees a cup of coffee and sometimes calls it "Coffee" and sometimes calls it "Hot", and also he begins to use the same word to describe other objects, e.g. he uses the word "Tea" for both a tea cup and a tea kettle. Then he begins to put two or three words together.

We do not find significant differences between the there groups, except that the group of American infants in Japan shows as do other bilinguals a slower developmental process.

I. Introduction

In former articles (Nakazima, S., 1970, 1972, 1973), we described as follows: At about twelve months of age the infant begins to use words. During the first several months of the second year, he utters, in all sorts of situations, word sounds and meaningless sounds with various articulatory forms. Then he begins to utter some chains consisting of two, three or more sound clusters, which are

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made up of word sounds and some other meaningless sounds. Through these efforts of expression in sounds he begins to notice some kind of symbolic relationship between words and the world and he acquires some kind of learning set so that he can use words in reference to what he wants to express. At about the middle of the second year he begins to develop his phonemicization and symbolization processes, i.e. phonemes and words uttered by him increase in number. Most of the words he utters are those which could be classified as nouns. Some of them are those which could be classified as pronouns, adjectives, and adverbs. Through the first several months of the phonemicization and the symbolization processes, he begins to notice some kind of dissimilarity between them. Then he begins to put two of them together and constructs two-word-uterances.

In this article we would like to clarify the developmental process of the infant's speech sounds up to the beginning of the phonemicization, the symbolization, and the syntacticization processes. We describe how the infant begins to organize his sounds into a phoneme system of a language; how he begins to use his sounds as symbols; how he begins to organize his words into a syntactic structure of the language; what kind of interrelation exists between the phonemicization, the symbolization, and the syntacticization processes; and what kind of factors have influence on them.

II. PROCEDURES

There were fourteen subjects, nine of whom were Japanese and five were Americans. As shown in Table 1, there were four female and five male Japanese, and one female and two male Americans who were living in Kyoto, and two Americans living in the U.S.A., one female and one male. We recorded on tape the speech sounds of each subject and those of his parents in the home and described the situations in which the child spoke and behaved. Each recording took about half an hour. We used two kinds of tape recorders: TEAC (TD 102, AR 11) for the subjects in Japan, and SONY EM-1 for the subjects in the U.S.A. The overall recording and reproducing characteristic of the former was from 40 Hz to 15000 Hz$\pm$3 dB, that of the latter from 100 Hz to 7000 Hz$\pm$5 dB, speed 7 1/2 inch/second. We analyzed these speech sounds on a soundspectrograph.

III. RESULTS AND DISCUSSION

In order to save space we present two cases; the developmental process of utterances in Table 2, the development of articulation of vowels in Table 3 and 5, the development of articulation of consonants in Table 4 and 6, the preparation for the developmental interrelation between the phonemicization, the symbolization, and the syntacticiztion porcesses in Table 7 and 8.

We would like to describe what we found in our study as follows.

1. General trends of the developmental processes of utterance. Refer to

Table 1. Subjects and Recording Conditions.

Nationality	Place where S's voices were recorded	Subjects (Sex)	Beginning of recording by tape recorder	One recording per
Japanese	Kyoto, Japan	E.T. (f)	28 days (0 : 0, 28)	1 wk.
		Ya.N. (f)	1 mo. (0 : 1)	2 wks.
		Y.S. (f)	2 mos. (0 : 2)	2 wks.
		N.O. (f)	6 mos. (0 : 6)	2 wks.
		H.K. (m)	1 mo. (0 : 1)	2 wks.
		T.Y. (m)	1 mo. (0 : 1)	2 wks.
		T.T. (m)	7 mos. (0 : 7)	2 wks.
		T.U. (m)	12 mos. (1 : 0)	2 wks.
		Yu.N. (m)	13 mos. (1 : 1)	2 wks.
American	Kyoto, Japan	F.P. (f)	6 mos. (0 : 6)	2 wks.
		C.W. (m)	6 mos. (0 : 6)	2 wks.
		E.D. (m)	7 mos. (0 : 7)	2 wks.
American	Urbana and Champaign, Illinois, U.S.A.	M.O. (f)	16 mos. (1 : 4)	2 wks.
		C.C. (m)	6 mos. (0 : 6)	2 wks.

Table 2.

1.1 After the beginning of the use of words and before the development of phonemicization and symbolization.

For a few months the infants used not only conventional words but also words made by themselves. Some of them uttered these self made words very frequently, e.g. when a female Japanese wanted her mother to name some objects or to say something about them she pointed at the picture of the objects and uttered [ŋənne]-like sounds, which seemed to come from the word [nani] (what?).

During this period they uttered meaningless sound clusters most frequently.

1.2 After the beginning of phonemicization and symbolization.

They uttered conventional words much more frequently than before.

Frequently some of them uttered conventional words spontaneously rather than in imitation. Some of them still continued to make their own words but some stopped. Some of them uttered meaningless sound clusters less often than before and some uttered them still frequently. Those, who frequently uttered conventional words spontaneously rather than in imitation, tended to continue making their own words and uttering meaningless sound clusters. The American infants did this more than the Japanese.

2. Development of articulation of vowels and diphthongs. Refer to Table 3 and 5.

In Japanese, there are only five vowels: /i/, /e/, /a/, /o/, and /u/. The most popular sound of each vowel is [i], [e], [a], [o], and [ɯ], which is articulated with spread lips. In Japanese it does not matter whether a diphthong is articulated as two vowels or as one diphthong. Therefore it is easier to articulate Japanese

vowels than to articulate English vowels and diphthongs. In Japanese, however, the difference in the lentgh of each vowel changes the meaning, e.g. [obasaN] (aunt) and [obaːsaN] (grandmother).

2.1 After the beginning of the use of words and before the development of phonemicization and symbolization.

The infants did not articulate vowels and diphthongs differentiatedly. During this period they did not develop their articulation.

2.2 After the beginning of phonemicization and symbolization.

Number of vowels and diphthongs uttered by the infants increased much.

For the first few months they did not articulate vowels and diphthongs differentiatedly yet. Both American and Japanese infants tended to articulate vowels without differentiating them. In other words, they tended to articulate [ə] instead of other vowels, e.g. [pə] instead of [pəːs] (purse), [məː] instead of [moː] (cow or bull). And also, on the one hand they tended to open their mouths wide, on the other hand to shut them tight, i.e. some of front, middle, and back vowels were replaced by [a], and some of front vowels were replaced by [i], some of back vowels by [ɯ], e.g. [banɪ] instead of [bʌnɪ] (bunny), [pi] instead of [pɪp] (pip), [bɯ] instead of [bʊk] (book). We think that this tendency also is an example of undifferentiated articulation. The American infants showed this tendency more clearly than did the Japanese. At this age [u] uttered with round lips requires more differentiated articulation than does [ɯ] with spread lips.

In American English, /e/ and /o/ are articulated as [eɪ] and [oʊ] respectively. Then, in order to make clear the developmental process of articulation at this age level ,we treated /e/, /o/ and diphthongs as one group. The American infants tended to articulate them as single vowels, e.g. [bebɪ] or [bɪbi] instead of [beɪbɪ] (baby).

The American infants tended to omit vowels and diphthongs in unstressed syllables and the Japanese tended to omit vowels in the second and in the third syllables of words. In Japanese, each syllable is articulated with almost equel stress.

2.3 After a few months of practice and maturation, the American infants began to articulate their front vowels and diphthongs, the Japanese their front and middle vowels, in one- or two-syllable-words fairly correctly.

Only in a few cases the Americans began to articulate back vowels correctly, e.g. [bɔ] (ball), [kɑ] (car). But in almost all cases they did not articulate middle and back vowels correctly, in more than half of the cases the Japanese did not articulate back vowels correctly.

As for words with more than three syllables, they tended to articulate only two and to omit others, e.g. [bɪppɯ] instead of [tɕɯːʃippɯ] (tulip).

Their articulation of vowels was influenced by other vowels in the same word, e.g. [kɪkɪ] instead of [kʊkɪ] (cookie).

The Japanese infants did not articulate differentiatedly between long and short vowels, e.g. [obaːtaɴ] instead of [obasaɴ] (aunt).

At this level of the development of articulation of vowels, they began to make two- or three-word-utterances.

3. Development of articulation of consonants.

3.1 After the beginning of the use of words and before the development of phonemicization and symbolization.

The infants did not articulate consonants differentiatedly. During this period they did not develop their articulation.

3.2 After the beginning of phonemicization and symbolization.

The number of consonants uttered by the infants increased much. For the first few months they did not articulate consonants differentiatedly. Stops and nasals are the easiest consonants to articulate. Both groups began to articulate stops and nasals at the beginning of words fairly correctly. The Americans, however, omitted many of them at the end of words, e.g. [pɪ] instead of [pɪp] (pip), while the Japanese did so at the last syllable, e.g. [koe] instead of [koɾe] (this). In Japanese, a syllable consists of a consonant (C) and a vowel (V) or a vowel only, and consonants, except one of the nasals, /ɴ/, do not appear at the end of a word.

Because their ways of articulation had not become differentiated, often consonants were replaced by other consonants at the same point. There were some tendencies; the first was confusion between voiceds and voicelesses, e.g. [bə] instead of [pɚs] (purse), [goe] instead of [koɾe] (this), and the second was replacement by other consonants, e.g. [hatɕ] instead of [hɑt] (hot), [tɕetɕe] instead of [tetc] (hand), etc.

3.3 After a few months of practice and maturation, both groups began to articulate their stops and nasals, in addition the Japanese their semi-vowels, in one- or two-syllable-words fairly correctly.

As we said earlier in regard to vowels, the infants tended to articulate three- or more-syllable-words as two-syllable-words and to omit others.

Only in a few cases, both groups began to articulate some consonants which are difficult to articulate correctly, e.g. [dɹe] for [dɹɛs] (dress), [goɾogoo] for [goɾogoɾo] (sitting). Neither group, however, could articulate clearly most of the fricatives and the affricates, in addition the Americans did not articulate the laterals and the semi-vowels correctly, the Japanese did not the flappeds properly.

Their articulation of consonants were influenced by other consonants in the same word, e.g. [kɑkʰi] instead of [kɔfɪ] (coffee), [kɯgʷi] instead of [kɯgi] (nail).

The Japanese infants did not articulate single and double consonants differentiatedly, e.g. [koko] instead of [kokko] (hen or cock). [koko] means "Here".

At this level of the development of articulation of consonants, the infants began to make two- or three-word-utterances.

4. Development of symbolization.

4.1 After the beginning of the use of words and before the development of phonemicization and symbolization.

The infants expressed their needs by appropriate body movements and at the same time by using their own words and conventional ones.

4.2 After the beginning of phonemicization and symbolization.

The number of words uttered by the infants increased much.

At this age level, the infants showed Piaget's so-called "Symbolic play", e.g. a Japanese female's mother said to the infant "Go to bed at once" and the child lay down on the floor and pretended to sleep saying [ɣuːguː], which indicates the sound of snoring. According to Piaget (Piaget, J., 1953, 1962), our infants were at the level of the differentiation between "Signifier" and "Signified".

As stated in the forrmer article (Nakazima, 1973), most of the words uttered by the infants can be classified grammatically as nouns. But some words can be classified as pronouns, adjectives, or adverbs. At first for the infants these words were not differentiated in grammatical function. For example, a female American said [beɪbɪ] (baby) pointing at a picture of children, and also she said [baɪbaɪ] (byebye) pointing at a picture of children waving byebye.

4.3 After a few months of practice and maturation of symbolization, they began to use two different expressions to describe the same objet, e.g. calling a cup of coffee both "Coffee" and "Hot", and also they began to use the same word to describe other objects, e.g. "Tea" refering to a tea cup and a tea kettle.

At this level of the development of symbolization, the infants began to make two- or three-word-utterances.

We would like to add two points concerning the factors which had influence upon these processes described above.

In the former articles (Nakazima, 1972, 1973) we stated that parents' loving care combined with vocalization, as O.H. Mowrer mentioned (Mowrer, O.H., 1950), and infants' cognitive development based on their rich experience, as Piaget suggested (Piaget, 1953, 1962), were important in the development of their phonemicization and symbolization processes. Both of these factors are also important in the preparation for the developmental interrelation between the phonemicization, the symbolization, and the symtacticization processes.

Parents' loving care made the infants more stable emotionally and more active in talking with their family members and in handling objects in their environments.

Rich experience with many objects accerelated their development of cognition of object relations. For example, a female Japanese, at fourteen months of age, was fond of walking around with her baby-walker and did not talk much. Her interest expanded from her books to her whole house. Then for the following months her phonemicization and symbolization processes developed rap-

idly.

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Table 2. Utterances of two subjects, M.O., a female American, and Ya.N., a female Japanese. Figure shows percent of average total frequency of sound clusters uttered for thirty minutes.

Age Year Month	Utterances of M.O., an American*1					Utterances of Ya.N., a Japanese				
	Average total frequency of sound clusters uttered for thirty minutes	Conventional words uttered spontaneously	Words made and uttered by herself	Conventional words uttered in imitation	Meaningless sound clusters	Average total frequency of sound clusters uttered for thirty minutes	Conventional words uttered spontaneously	Words made and uttered by herself	Conventional words uttered in imitation	Meaningless sound clusters
0 : 10						124	6.9	4.5	0.8	87.8
0 : 11						127	22.0	21.3	7.9	48.8
1 : 0						83	18.8	16.4	4.2	60.6
1 : 1						122	4.1	57.4	12.3	26.2
1 : 2						110	0.9	10.0	9.1	80.0
1 : 3	271	53.5	0	10.0	36.5	94	28.2	1.1*2	29.7	41.0
1 : 4	201	54.2	0.2*3	12.2	33.4	99	50.0	0	31.3	18.7
1 : 5	257	60.8	6.0*4	4.5	28.7	114	54.8	0	37.7	7.5
1 : 6	270	58.7	1.1*5	10.7	29.5	173	39.4	0	53.6	7.0

*1 We began to observe her when she was fifteen months of age.
*2 For example, [gənne] for "[nani] (what?)".
*3 For example, [eɪheɪ] for "Swing".
*4 For example, [daɪdaɪ] for "Airplane".
*5 For example, [gəːkə] for "Handle".

Table 3. Development of articulation of vowels and diphthongs in the case of M.O., an American. Figure shows percent of average total frequency of vowels and diphthongs uttered for thirty minutes.

3.1.1. Vowels and diphthongs uttered spontaneously.

Age Year Month	Average total frequency of them uttered for thirty minutes	Articulated correctly	Main ways of uncorrect articulation						
			Omitted*1	/e/, /o/ & diphthongs articulated as single vowels*2	Vowels →ə*3	æ, ɚ, ʌ, ə, ɑ, ɔ→a*4	ɪ→i*5	ʊ, u →ɯ*6	Influenced by other vowels in the same word*7
1 : 3	214	30.4	6.5	5.6	28.2	2.8	7.9	5.1	0
1 : 4	169	34.9	2.9	10.1	13.7	14.3	4.8	6.0	0.6
1 : 5	241	33.3	4.6	5.4	11.7	10.0	14.6	11.7	0.4
1 : 6	237	48.2	1.3	5.1	5.1	14.4	2.8	6.3	2.5
	3.1.2. Uttered in imitation.								
1 : 3	30	36.7	6.7	0	30.0	6.1	0	3.3	0
1 : 4	35	35.3	0	11.8	14.7	5.9	8.8	14.7	0
1 : 5	14	35.7	0	0	21.4	28.6	7.1	7.1	0
1 : 6	43	47.6	9.1	2.3	6.8	4.5	0	6.8	0

*1 For example, [ɹi] instead of [mæɹi] (Marie : her name).
*2 Usually in the American English vowel system /e/[eɪ] and /o/[oʊ] are considered to be vowels, not to be diphthongs. But in order to make clear the developmental process of articulation at this age level, we, here, treated /e/, /o/ and diphthongs as one group. For example, [bebɪ] instead of [beɪbɪ] (baby).
*3 For example, [pəpɪ] instead of [pʌpɪ] (puppy).
*4 For example, [ba] instead of [bɑks] (box).
*5 For example, [pi] instead of [pɪp] (pip).
*6 For example, [bɯ] instead of [bʊk] (book). [ɯ] with spread lips is one of Japanese vowels.
*7 For example, [kɪkɪ] instead of [kʊkɪ] (cookie).

3.2. Differences of vowels and diphthongs, articulated correctly or omitted, due to whether in stressed syllables or in unstressed. Figure shows percent of average total frequency of vowels and diphthongs uttered spontaneously for thirty minutes.

Age	Articulated correctly		Omitted	
Year Month	In stressed syllables	In unstressed syllables	In stressed syllables	In unstressed syllables
1 : 3	18.7	11.7	0	6.5
1 : 4	12.4	22.5	0	2.9
1 : 5	16.5	16.7	1.0	3.5
1 : 6	24.1	24.1	0.2	1.1

3.3. Front vowels, except /e/, uttered spontaneously. Figure shows percent of average total frequency of front vowels, except /e/, uttered for thirty minutes.

Age Year Month	Average total frequency of them for thirty minutes	Articulated correctly	Omitted, in stressed syllables	Omitted, in unstressed syllables
1 : 3	44	54.5	0	6.8
1 : 4	55	70.9	0	1.8
1 : 5	82	48.8	3.6	4.9
1 : 6	103	69.9	1.0	2.0

3.4. Middle vowels uttered spontaneously. Figure shows percent of average total frequency of middle vowels uttered for thirty minutes.

Average total frequency of them for thirty minutes	Articulated correctly	Omitted, in stressed syllables	Omitted, in unstressed syllables
37	16.2	0	18.9
35	8.6	0	11.4
33	9.1	0	15.2
32	9.4	0	3.1

3.5. Back vowels, except /o/, uttered spontaneously. Figure shows percent of average total frequency of back vowels, except /o/, uttered for thirty minutes.

1 : 3	91	15.4	0	2.2
1 : 4	27	3.7	0	0
1 : 5	27	0	0	0
1 : 6	40	7.5	0	0

3.6. Vowels /e/, /o/ and diphthongs uttered spontaneously. Figure shows percent of average total frequency of /e/, /o/ and diphthongs, uttered for thirty minutes

42	50.0	0	4.8
52	38.5	0	1.9
99	37.4	0	1.0
62	59.7	0	0

Table 4. Development of articulation of consonants in the case of M.O., an American. Figure shows percent of average total frequency of consonants uttered for thirty minutes.

4.1.1. Consonants uttered spontaneously.

Age Year Month	Average total frequency of them uttered for thirty minutes	Articulated correctly	Main ways of uncorrect articulation					
			Omitted *1	Replaced by other consonants articulated at the same point of articulation			l,ɪ→ vowels *5	Influenced by other consonants in the same word*6
				Confusions between voiceds and voicelesses*2	t,d,ts,dz,tʃ, f,θ,s,z,ʃ,w →Φ,ɕ,tɕ, dʑ, *w**3	Others *4		
1 : 3	295	61.7	31.2	4.1	1.0	0	0	0
1 : 4	211	57.1	24.3	7.1	2.4	4.3	1.0	1.0
1 : 5	329	52.9	21.9	4.6	9.1	2.1	4.0	0.6
1 : 6	335	58.1	21.6	6.0	5.7	3.6	1.5	3.0
	4.1.2. Uttered in imitation.							
1 : 3	41	31.7	43.9	4.9	0	4.9	4.9	0
1 : 4	47	50.0	29.8	2.1	4.3	4.3	4.3	2.1
1 : 5	24	29.2	45.9	6.3	6.3	6.3	4.2	0
1 : 6	62	44.3	27.9	1.6	8.2	8.2	1.6	4.9

*1 For example, [pɪ] instead of [pɪp] (pip).

*2 For example, [bə] instead of [pɚs] (purse).

*3 For example, [biɕ] instead of [bidz] (beads). [Φ], [ɕ], [tɕ], [dʑ], [*w*] are some of Japanese consonants. They are articulated in less differentiated ways than those of [t], [d], [ts], [dz], [tʃ], [f], [θ], [s], [z], [ʃ], [w]. These Japanese consonants are articulated more easily than those American consonants.

*4 For example, [dada] instead of [sæntə] (Santa).

*5 For example, [mɪək] instead of [mɪlk] (milk).

*6 For example, [kakɪ] instead of [kɔfɪ] (coffee).

4.2. Differences of consonants, articulated correctly or omitted, due to positions in words. Figure shows percent of average total frequency of consonants uttered spontaneously for thirty minutes.

Age Year Month	Articulated correctly			Omitted		
	At the beginning of words	At the end of words	At other positions of words	At the beginning of words	At the end of words	At other positions of words
1 : 3	38.6	1.4	21.7	5.8	19.7	5.8
1 : 4	34.1	3.8	19.1	4.8	8.6	11.0
1 : 5	32.4	4.4	16.1	4.4	11.7	5.8
1 : 6	32.5	6.0	19.6	4.6	10.3	6.7

4.3. Stops and nasals uttered spontaneously. Figure shows percent of average total frequency of stops and nasals uttered for thirty minutes.

Age Year Month	Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the beginning of words	Omitted, at the end of words
1 : 3	240	74.2	0	13.0
1 : 4	156	74.4	0	5.8
1 : 5	238	70.4	1.7	11.3
1 : 6	230	77.8	1.7	6.1

4.4. Affricates uttered spontaneously. Figure shows percent of average total frequency of affricates uttered for thirty minutes.

Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the beginning of words	Omitted, at the end of words
1	0	0	—*
2	0	0	—
5	0	0	0
10	0	0	40.0

* — means that the infant did not utter words which had consonants (vowels) at the positions. The same as follows.

4.5. Laterals uttered spontaneously. Figure shows percent of average total frequency of laterals uttered for thirty minutes.

1 : 3	12	0	—	83.3
1 : 4	8	0	—	50.0
1 : 5	17	0	—	29.4
1 : 6	15	0	—	26.6

4.6. Fricatives uttered spontaneously. Figure shows percent of average total frequency of fricatives uttered for thirty minutes.

33	12.1	51.5	27.3
37	10.8	27.0	13.5
49	12.2	22.4	14.3
75	21.3	16.0	17.3

4.7. Semi-vowels uttered spontaneously. Figure shows percent of average total frequency of semi-vowels uttered for thirty minutes.

1 : 3	9	0	—
1 : 4	8	0	37.5
1 : 5	20	0	0
1 : 6	5	0	0

Table 5. Development of articulation of vowels in the case of Ya.N., a Japanese. Figure shows percent of average total frequency of vowels uttered for thirty minutes.

5.1.1. Vowels uttered spontaneously.

Age Year Month	Average total frequency of them uttered for thirty minutes	Articulated correctly	Main ways of uncorrect articulation						
			Omitted *1	Confusions between long and short vowels*2	i,e,o,ɯ →ə*3	e,o→a *4	e→i *5	o→ɯ *6	Influenced by other vowels in the same word*7
0 : 10	17	67.6	0	32.4	0	0	0	0	0
0 : 11	56	60.7	0	17.9	17.9	3.5	0	0	0
1 : 0	32	61.3	0	19.0	6.9	1.7	0	5.2	0
1 : 1	10	50.0	0	0	40.0	0	0	0	0
1 : 2	2	100.0	0	0	0	0	0	0	0
1 : 3	52	67.0	3.9	6.8	12.6	0	0	1.0	0
1 : 4	90	69.4	8.3	6.1	9.4	0.6	0	0	0
1 : 5	129	54.7	14.3	14.7	2.7	0	0	1.2	0
1 : 6	137	72.4	14.0	8.8	1.1	0.7	0	0	0.8

5.1.2. Uttered in imitation.

0 : 10	2	100.0	0	0	0	0	0	0	0
0 : 11	20	60.0	0	5.0	25.0	0	0	0	0
1 : 0	7	61.5	0	38.5	0	0	0	0	0
1 : 1	31	41.9	9.7	13.0	32.1	0	0	0	0
1 : 2	22	45.5	22.7	13.6	4.5	0	0	0	0
1 : 3	57	54.9	8.0	10.6	11.5	0.9	0	0	0
1 : 4	63	73.8	4.0	8.7	2.4	1.6	0	0	0
1 : 5	105	67.0	9.5	15.7	1.4	0	1.4	0	0
1 : 6	202	81.9	7.4	6.7	0.5	0.5	0	0	0

*1 For example, [ai] instead of [açifɯ] (duck).

*2 For example, [meme] instead of [meːmeː]. Japanese has five vowels ; /i/[i], /e/[e], /a/[a], /o/[o], /u/[ɯ]. Each vowel has long and short one. Difference in length causes difference in meaning, e.g. [meme] means "Eyes" and [meːmeː] means "Sheep" or "Goat".

*3 For example, [məː] instead of [moː] (cow or bull). In Japanese, [a] and [ə] are not distinguished phonemically and are considered to be /a/.

*4 For example, [mamɛ] instead of [meme] (eyes).

*5 For example, [tite] instead of [tete] (hand).

*6 For example, [bɯːzɪ] instead of [boːçi] (hat).

*7 For example, [ojõ] instead of [aɴjo] (leg).

5.2. Differences of vowels, articulated correctly on omitted, due to positions in words. Figure shows percent of average total frequency of vowels uttered spontaneously for thirty minutes.

Age	Articulated correctly			Omitted		
Year Month	At the first syllable of words	At the last syllable of words*1	At other syllables of words*2	At the first syllable of words	At the last syllable of words*1	At other syllables of words*2
0 : 10	17.6	50.0	—	0	0	—
0 : 11	26.8	33.9	—	0	0	—
1 : 0	25.8	35.5	—	0	0	—
1 : 1	10.0	40.0	—	0	0	—
1 : 2	50.0	50.0	—	0	0	—
1 : 3	34.0	27.2	5.8	1.0	2.9	0
1 : 4	38.9	24.4	6.1	0	7.2	1.1
1 : 5	28.7	15.1	10.9	2.3	5.8	6.2
1 : 6	38.2	24.3	9.9	1.1	9.2	3.7

*1 Words with more than two syllables. In Japanese, any consonant, except /N/, does not appear at the end of words. Therefore most of syllables are consisted with C (consonant) and V (vowel) or V only.
*2 Words with more than three syllables.

5.3. Front vowels, /i/[i], /e/[e], uttered spontaneously. Figure shows percent of average total frequency of front vowels uttered for thirty minutes.

Age	Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the first syllable of words	Omitted, at the last syllable of words
Year Month				
0 : 10	8	100.0	—	0
0 : 11	20	80.0	—	0
1 : 0	4	100.0	—	0
1 : 1	2	50.0	—	0
1 : 2	0	—	—	—
1 : 3	19	71.1	2.6	5.2
1 : 4	27	66.3	0	24.1
1 : 5	29	41.4	0	5.2
1 : 6	42	77.1	0	3.7

5.4. Middle vowels, /a/[a], uttered spontaneously. Figure shows percent of average total frequency of middle vowels uttered for thirty minutes.

Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the first syllable of words	Omitted, at the last syllable of words
7	26.7	0	—
1	0	0	—
7	7.7	0	0
6	50.0	0	0
2	100.0	0	0
15	86.7	0	1.9
32	88.5	0	0
50	67.0	0	2.0
47	87.1	0	0

5.5. Back vowels, /o/[o], /u/[ɯ], uttered spontaneously. Figure shows percent of average total frequency of back vowels uttered for thirty minutes.

0 : 10	2	100.0	0	0
0 : 11	35	45.7	0	0
1 : 0	21	71.4	0	0
1 : 1	2	50.0	0	—
1 : 2	0	—	—	—
1 : 3	18	45.7	0	0
1 : 4	31	54.5	0	0
1 : 5	50	49.5	6.1	10.0
1 : 6	48	54.2	3.2	22.9

Table 6. Development of articulation of consonants in the case of Ya.N., a Japanese. Figure shows percent of average total frequency of consonants uttered for thirty minutes.

6.1.1. Consonants uttered spontaneously.

Age Year Month	Average total frequency of them uttered for thirty minutes	Articulated correctly	Main ways of uncorrect articulation					
			Omitted *1	Replaced by other consonants articulated at the same point of articulation			f→ vowels *5	Influenced by other consonants in the same word*6
				Confusions between voiceds and voicelesses*2	t,d,ts,dz, s,z →ɕ,ʈɕ,ɖʑ*3	Others *4		
0 : 10	11	42.9	57.1	0	0	0	0	0
0 : 11	63	57.1	23.8	9.5	0	9.5	0	0
1 : 0	43	72.3	19.3	4.8	0	3.6	0	0
1 : 1	12	53.8	30.8	0	0	7.7	0	0
1 : 2	2	100.0	0	0	0	0	0	0
1 : 3	66	58.1	26.4	4.7	0.8	6.2	0	0
1 : 4	121	52.9	32.9	9.2	0	4.6	0	0.4
1 : 5	170	54.4	22.2	7.7	0.6	11.8	0	1.8
1 : 6	147	55.4	23.8	3.7	1.4	12.6	0	1.7

6.1.2. Uttered in imitation.

0 : 10	1	100.0	0	0	0	0	0	0
0 : 11	23	82.6	17.4	0	0	0	0	0
1 : 0	8	68.8	12.5	6.3	0	6.3	0	0
1 : 1	42	31.0	57.1	2.4	0	7.1	0	0
1 : 2	40	30.0	65.0	2.0	0	0	0	0
1 : 3	79	59.5	28.5	1.9	1.3	6.3	0	0
1 : 4	77	47.1	20.3	6.5	7.2	15.0	0	0
1 : 5	108	57.4	13.9	3.2	3.7	18.1	0	3.2
1 : 6	217	59.1	14.1	0.7	7.0	13.4	0	2.8

*1 For example, [koe] instead of [kofe] (this).
*2 For example, [goko] instead of [koko] (here).
*3 For example, [kaʈɕa] instead of [kasa] (umbrella).
*4 For example, [tjotjo] instead of [ʈɕoːʈɕo] (butterfly).
*5 We did not find any example of the case.
*6 For example, [kagi] instead of [kani] (crab).

6.2. Differences of consonants, articulated correctly or omitted, due to positions in words. Figure shows percent of average total frequency of consonants uttered spontaneously for thirty minutes.*

Age (Year : Month)	Articulated correctly			Omitted		
	At the first syllable of words	At the last syllable of words	At other syllables of words	At the first syllable of words	At the last syllable of words	At other syllables of words
0 : 10	36.8	10.5	—	52.6	0	—
0 : 11	38.2	25.5	—	1.8	12.7	—
1 : 0	35.9	34.4	7.8	3.1	7.8	0
1 : 1	30.8	0	23.1	0	30.8	0
1 : 2	50.0	50.0	—	0	0	—
1 : 3	32.5	26.3	6.1	1.8	14.0	1.8
1 : 4	28.6	22.9	8.1	6.2	12.9	5.2
1 : 5	24.8	22.4	8.4	2.2	10.9	6.8
1 : 6	25.4	19.9	10.8	1.7	15.3	5.6

* It is thought that the first half of a double consonant belongs to the syllable before it and the latter half of it belongs to the syllable after it. Therefore we, here, analyzed consonants except double consonants.

6.3. Stops, /p/[p], /b/[b], /t/[t], /d/[d], /k/[k], /g/[g], and nasals, /m/[m], /n/[n], /ŋ/[ŋ], uttered spontaneously. Figure shows percent of average total frequency of stops and nasals uttered for thirty minutes.

Age (Year : Month)	Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the first syllable of words	Omitted, at the last syllable of words
0 : 10	2	100.0	0	0
0 : 11	35	77.1	0	0
1 : 0	23	85.1	0	0
1 : 1	5	80.0	0	—
1 : 2	0	—	—	—
1 : 3	27	68.5	3.2	5.9
1 : 4	40	75.0	0	0
1 : 5	76	61.8	1.6	6.4
1 : 6	68	76.5	0	0.7

6.4. Affricates, /ts/[ts], [tɕ], /z/[dz], [dʑ], uttered spontaneously. Figure shows percent of average total frequency of affricates uttered for thirty minutes.

Average total frequency of them for thirty minutes	Articulated correctly	Omitted, at the first syllable of words	Omitted, at the last syllable of words
0	—	—	—
8	75.0	—	0
5	100.0	—	0
3	100.0	—	—
2	100.0	0	0
11	72.7	0	0
23	69.6	0	0
20	32.0	0	0
11	30.4	0	0

6.5. Flappeds, /r/[ɾ], uttered spontaneously. Figure shows percent of average total frequency of flappeds uttered for thirty minutes.

0 : 10	0	—	—	—
0 : 11	11	0	—	63.6
1 : 0	0	—	—	—
1 : 1	2	0	—	50.0
1 : 2	0	—	—	—
1 : 3	5	0	—	100.0
1 : 4	9	0	—	88.9
1 : 5	8	0	0	31.3
1 : 6	21	0	0	61.9

6.6. Fricatives, /h/[Φ], [ç], [h], /s/[s], [ɕ], uttered spontaneously. Figure shows percent of average total frequency of fricatives uttered for thirty minutes.

8	37.5	62.5	—
1	0	0	—
2	37.5	62.5	—
0	—	—	—
0	—	—	—
0	—	—	—
5	20.0	60.0	0
6	36.4	16.7	0
11	47.8	4.5	0

6.7. Semi-vowels /w/[ɯ], /j/[j], uttered spontaneously. Figure shows percent of average total frequency of semi-vowels uttered for thirty minutes.

0 : 10	0	—	—	—
0 : 11	0	—	—	—
1 : 0	0	—	—	—
1 : 1	0	—	—	—
1 : 2	0	—	—	—
1 : 3	8	87.5	0	—
1 : 4	19	60.0	21.0	5.3
1 : 5	30	60.0	5.2	15.0
1 : 6	16	74.2	13.5	6.3

6.8. One of nasals, /N/ [N], uttered spontaneously. Figure shows percent of average total frequency of /N/ uttered for thirty minutes.*1

Age Year Months	Average total frequency of them for thirty minutes	Articulated correctly	Omitted
0 : 10	0	—	—
0 : 11	0	—	—
1 : 0	3	0	100.0
1 : 1	2	0	100.0
1 : 2	0	—	—
1 : 3	7	57.1	28.6
1 : 4	10	55.0	45.0
1 : 5	22	72.7	22.7
1 : 6	16	50.0	46.9

*1 /N/ appears at the end of syllables and almost at the end of words, e.g. [ka:ʈɕaN] (mummy).

6.9. Double consonants uttered spontaneously. Figure shows percent of average total frequency of double consonants uttered for thirty minutes.*2

Average total frequency of them for thirty minutes	Articulated correctly	Omitted
1	0	100.0
8	12.5	87.5
10	55.0	44.0
0	—	—
0	—	—
8	6.3	93.7
15	6.7	93.3
8	31.3	68.7
4	25.0	75.0

*2 They appear between syllables, e.g. [kokko] (hen or cock) is distinguished from [koko] (here).

Table 7. The Preparation for the developmental interrelation between the phonemicization, the symbolization, and the syntacticization processes in the case of M.O., a female American.
S : subject M : mother

Age Year Month	Phonemicization process (Refer to Table 3,4)	Symbolization process (Refer to Table 2)	Preparation for syntacticization process
1 : 3	*Development of phonemicization and symbolization of speech sounds*[*1]		
	S did not articulate vowels differentiatedly and tend to articulate [ə] instead of other vowels, e.g. [bə] for "Box, book, bath, ball". S articulated stops or nasals and following vowels or diphthongs at the beginning of words, not always correctly, and omitted other vowels and consonants very often, e.g. [mə] for "More".	S made words by herself, e.g. [aːɪɪ]-like sounds for "Horsey". S found a picture of children waving byebye and said [baɪbaɪ]. S found M sipping a cup of coffee and said [haʈɕ] (hot)[*2]. When M and S finished reading a book, M said "All gone, night-night." S responded [maɪ] (night-night). When S found a squirrel outside, sometimes S said [kə] (squirrel), sometimes [aɪaɪ] (outside). Pointing at a microphone, M said "Don't touch it." S said [noʊnoʊ] or [noɯnoɯ] (no no)[*3]	S heard M saying "In a book" and imitated [bɪnnəbə].
1 : 4	S articulated vowels and consonants in various ways, e.g. [bɪbi], [bebɪ], [beɪbɪ], [bəpɪ], etc. for "Baby". S tended to open her mouth widely and close it tightly. Then S tended to articulate vowels in two ways, i.e. [a], on the one hand, and [i] or [ɯ] on the other hand, e.g. [ba] instead of [bɑks] (box), [pi] instead of [pɪp] (pip). When S uttered words with two syllables, S tended to articulate vowels or consonants in the same way of articulation	S could point at her eyes, mother's eyes and wooden-horsey's eyes. S said "Baby" not only for human baby but also squirrel's baby. S made some words by herself, e.g. [eɪheɪ] for "Swing", [daɪdaɪ] for "Airplane." When S found M sipping a cup of coffee, sometimes S said [hat] (hot), sometimes [kəkɪ] (coffee). When S found a picture of a kitty, sometimes S said [kɪfɪ] (kitty), sometimes [mi-	When S found a picture of rabbits, S said [baɪ] (bunny) patting the picture. S described her feeling for the bunnys with both speech sounds and bodily expressions.

*1 We began to observe her when S was fifteen months of age. We think S was at the level of phonemicization and symbolization processes.

*2 [t] was often replaced by [ʈɕ]. This tendency is also very popular among Japanese infants. [ʈɕ] is one of Japanese affricates.

*3 [ʊ] was often replaced by [ɯ]. [ʊ] is articulated with round lips, [ɯ] with spread lips. [ɯ] is one of Japanese vowels.

	repeatedly, e.g. [kakɪ] instead of [kɔfɪ] (coffee). S articulated [mɪə] or [mə] for "Milk". S confused between voiceds and voicelesses, e.g. [kɪkɪ] or [gɪgɪ] instead of [kʊkɪ] (cookie). S began to articulate /r/[ɹ], e.g. [ɹeɪɯ] for "Raison" spontaneously.	jaɯ] (miaow), When S finished looking at her favourite chicken's picture, S turned over the page saying [baɪbaɪ] (byebye).	
1 : 5	S articulated stops and nasals at the beginning of words fairly well, but S omitted many stops and nasals at the end of words, e.g. [pi] instead of [pik] (peek). S articulated [ək] for "Milk". S began to articualte affricates and fricatives at the end of words, only in a few cases correctly, e.g. [ΦɪɕΦ]*4 for "Fish" in imitation, [bəΦ] for "Boots" spontaneously. S still articulated at the same point of articulation repeatedly, e.g. [gaːkiː] for "Jersey"*5. But S showed some cases trying to overcome this tendency, e.g. [kɑkʲi] instead of [kɔfɪ] (coffee). Sometimes [t], [d], [ts], [dz], [tʃ], [θ], [s], [z], [ʃ] were replaced by [ɕ], [ʈɕ], [ɖʑ]*4*6, e.g. [aɪɕ] instead of [aɪz] (eyes). S began to articulate /s/[s], e.g. [ɯːs] for "Juice" in imitation.	S made some words by her self, e.g. [ΦɯΦɯ] for "Candle", [daɪ] for "Pajamas". S said [bɔm] (bomb) for everything which was out of order. When S found a picture of cars, sometimes S said [kaː] (car), sometimes [bɯː] (boo).	S found her buggy outside and said [maɪ] or [maɪn] (mine). S sat on M's chair and said [mamɪs] (mummy's). Sometimes S wanted to find Jersey*5 outside but S did not. Then S said [gaːkiː] (Jersey) [aʊ] (house)*7. When S did something foolish, S said to M [gəgə] (good girl).
1 : 6	*Pre-syntacticization process of words*		
	S artulated front vowels, especially in unstressed syllables, rather well, e.g. [kɪɪ] for "Kitty". S began to articulate some of back vowels, e.g. [bɔ] for "Ball", [kɑ] for "Car" spontaneously. As for stops and nasals, S	S made some words by herself, e.g. [gəːke] for "Handle".	When S found a picture of a baby with socks, S said [beɪbɪ akjɯ] (baby socks). When S found a picture of a lady with overcoat, S said [mamɪ baɪbaɪ]

*4 [Φ], [ɕ] are Japanese fricatives. [Φ] is articulated bilabially. [ɕ], [ʑ] are articulated without protruded lips.
*5 Jersey was a girl's name, who lived at the next door.
*6 This tendency is also popular among Japanese infants.
*7 Meaning "Jersey is in her house". This is the first case of two-word-utterances.

	articulated those at the beginning of words and those at the end of words, but not always correctly, e.g. [maːx] or [mɪək] for "Milk". Number of cases, S articulated affricates and fricatives at the end of words, increased. But S did not articulate most of them correctly, e.g. [toəç] for "Toys". S began to articulate consonant clusters, e.g. [dɹe] for "Dress" spontaneously. S still confused between voiceds and voicelesses, e.g. [gakɪ] instead of [kɔfɪ] (coffee).		(mummy byebye). After S looked at a picture of purses, S turned over the page saying [bɯːΦ baɪbaɪ] (purse byebye). After S watched a picture of Santa, S tried to find other pictures of Santa saying [daɪda mo mo] (Santa more more). S found a picture of a truck and siad [taːk bɯː] (truck boo)*8. When S found dishes cleaned and piled in the kitchen, S said [ɖʐɪɖʐɪç aːkā] (dishes all gone)*9.

*8 Meaning "Truck goes away honking".
*9 Meaning "Dishes are all cleaned and piled".

Table 8. The preparation for the developmental interrelation between the phonemicization, the symbolization, and the syntacticization processes in the case of Ya.N., a female Japanese.
S : subject F : father M : mother

Age Year Month	Phonemicization process (Refer to Table 5, 6)	Symbolization process (Refer to Table 2)	Preparation for syntacticization process
0 : 10	*Reorganization of babbling phonatory-articulatory-auditory mechanisms and their application to language* S began to use conventional wrods. F called S's name. S responded [aːɪjə]*1. Then S uttered [aːɪjə əːde aːijə aːjə]*1*2.		
	S uttered a few of words, e.g. [kokko] (hen), [boʈçɪ] (hat)*3, etc. S's skill of articulation of these vowels and consonants did not develop much following several months.	During this month S uttered [əkəʈçə]-like sounds*4 frequently. S uttered these sounds not only to M, but also to F and even when S was playing alone without any referance to M.	
0 : 11		When S wanted to go out with M, S put her hands on her head uttering [boʈçɪ]	When S found hens in the back yard, S shouted [kəkə kəkə kəkə]*5.

*1 [aːijə], [aːɪjə], [aːjə] are variations of [hai] (yes).
*2 This utterance seems to be one of processes from repetitive babblings to multi-word-utterances.
*3 [boʈçɪ] sounds are variations of [boːçi] (hat or cap).
*4 These sounds seem to come from [okaːʈçaɴ] (mummy).
*5 [kəkə] is one of variations of [kokko] (hen or cock).

		sounds (hat)*5.	
1 : 0		S uttered [kette]-like sounds*6 when S wanted M or F to turn over pages of her book, or to open the door, etc.	
1 : 1		When S was asking M or F to say about some things, S uttered [ŋənne]-like sounds*7.	S pointed at a picture of hens and said to M [ŋənne ŋənne ŋəeː]*8*9.
1 : 2	S was fond of walking around with her baby-walker and did not talk much. But her life space expanded from her books to whole house.		
1 : 3	*Development of phonemicization and symbolization of speech sounds*		
	Number of vowels and consonants, S tried to utter, increased much after this month. But, for a few months, S did not articulate vowels and consonants differentiatedly.	S uttered [kette]-like sounds and [ŋənne]-like sounds little and did not said [boʈɕɪ] sounds. S used [kofə] (this), [koʈʈɕi] (this one), and [aʈʈɕi] (that one), but not differentiatedly. M ordered S "Go bo bed!". S refused saying [ija] (no). M said again "Go to bed at once!". S lay down on the floor and pretended to sleep saying [ɣɯːgɯː]*10. When S was asked, S put out her hand, leg, mouth, but did not point at her eyes, nose, ears.	S pointed at a picture of monkys and asked [koe*wa*]*11. F answered [kjakkja] (monky). S pointed at a picture of lions and asked [koʈɕɪ]*12. F responded [koʈʈɕi ka] (this one?)*13. S pointed at a picture of an elephant sitting on the ground and said [əʈɕi]*14 and [googoo]*15. When S found some objects, e.g. a spoon, on the floor, S picked them up and said [əʈɕaː]*16.
1 : 4	S confused between voiceds and voicelesses, e.g. S sometimes said [ko*w*a], sometimes [go*w*a]*17.	When S wanted M or F to say about some objects, S pointed at a picture of them	When S and F were looking at a picture of the sitting elephant, F

*6 These sounds seem to come from [akete] (please open). S could not turn over pages of her book her self.

*7 [ŋənne]-like sounds seem to come from [nani] (what?). S uttered these sounds not only for things, of which S did not know, but also for these, of which S knew. S repeated these sounds until M or F told her what they were.

*8 [ŋəeː] seems to be one of variations of [kofe] (this).

*9 We are not sure [ŋənne ŋənne ŋəeː] means "What what this (What is it?)".

*10 [ɣɯːgɯː] is one of variations of [gɯːgɯː] (snoring sounds).

*11 [koe] in one of variations of [kofe] (this). /wa/[*w*a] follows a noun in a sentence and shows that the noun is a nominative case. [koe*w*a] means "What is this?".

*12 [koʈɕɪ] is one of variations of [koʈʈɕi] (this one or here).

*13 /ka/ appears at the end of a sentence and shows that the sentence is a interrogative one.

*14 [əʈɕɪ] is one of variations of [aʈʈɕi] (that one or there).

*15 [googoo] is one of variations of [gofogofo] (sitting or lying).

*16 [eʈɕaː] is one of variations of [atta] (found or there was). [atta] is a past form of [aɾɯ] (there is).

*17 [kow*ə*], [gow*ə*] are variations of [kofə*w*a] (what is this?).

		and said [kowə]. When S wanted to pass to next ones, S sometimes said [koʈʈɕi] sounds (this one), sometimes [aʈʈɕi] sounds (that one), but not differentiatedly. When S found a picture of an elephant sitting on the ground, S sometimes said [do]*18, sometimes [googoo].	said [dzo] (elephant) and S responded [goo-goo]. S said to her older brother [ʈɕiːtã pə̃]*19.
1 : 5	Number of two-syllable-words, S uttered spontaneously and in imitation, increased. But S did not articulated vowels and consonants in those words differentiatedly. S tended to articulate vowels and consonants in the same way of articulation repeatedly, e.g. [babaː] instead of [kaba] (hippocampus). S tried to articulate /r/[ɾ]*24, but not correctly, e.g. [goɹogoɹo] instead of [goɾogoɾo] (sitting) in imitation. S began to articulate [ɕ]*24 correctly, e.g. [ɕɯʈʈɕɯ] instead of [ɕɯɕɕɯ] (choochoo).	Number of onomatopoetic baby words decreased and number of conventional words increased. S began to utter [boːɕi] sounds (hat) again, not to express her need to go out but to say the name of the objects. S pointed at a tea cup and said [ʈɕaʈɕa] (tea)*20. S pointed at a teakettl and said [ʈɕaʈɕa], too.	F pointed at a picture of a street car and said [deɴɕa] (street car). S respoded [gö]*21. F asked S [toːʈɕaɴ *wa*] (where is your father?). S answered [kə]*22. F responded [ɯɴ koko ne] (yes, I am here). Pointing at a picture of giraffes, F asked [koɾe *wa*] (what is this?). S answered [tɪdī jaɯə]*23.
1 : 6	*Pre-syntacticization process of words*		
	S began to articulate front vowels, middle vowels, stops and nasals, especially in two-syllable-words, fairly well. S articulated two-syllable-words	Pointing at socks, S said [aɴjo] (foot or leg).	Looking at a kewpie doll, F asked S [kjɯːpi *wa*] (where is a kewpie?). S answered [kjɯtɪː goko]*25.

*18 [do] is one of variations of [dzo] (elephant).

*19 [ʈɕiːtã] is one of variations of [niːʈɕaɴ] (older brother). [pə̃] is one of variations of [paʈɕiɴ] (one of onomatopoeias, shows shooting sound of a toy gun). [ʈɕiːtã pə̃] means "Brother, shoot your toy gun!". It is the first case of two-word-utterances.

*20 [ʈɕaʈɕa] is a baby word of [ʈɕa] (tea).

*21 [gö] is one of variations of [go] (one of onomatopoeias, shows rumbling of street cars).

*22 [kə] is one of variations of [koko] (here).

*23 [tɪdī] is one of variations of [kiɾiɴ] (giraffe). [jaɯə] is one of variations of [jaɯa]. It is placed at the end of a sentence. Its function is similar to "Copula" in English. It is one of females' expressions. [tɪdī jaɯə] means "It is a giraffe".

*24 In Japanese, /r/[ɾ] and /s/[s], [ɕ] are the most difficult in articulation. [s] and [ɕ] are considered to be single /s/.

*25 [kjɯtɪː] is one of variations of [kjɯːpi] (kewpie). [goko] is one of variations of [koko] (here). [kjɯtɪː goko] means "The kewpie is here".

instead of three- or four-syllable-words, e.g. [bɪppɯ] instead of [ʈɕɯːɾippɯ] (tulip), [tako] instead of [taiko] (drum), [açi] instead of [açiɾɯ] (duck). S began to articulate /r/[ɾ] correctly, e.g. [goɾogoo] instead of [goɾogoɾo] (sitting) in imitation. S tended to articulate consonants at the same point of articulation repeatedly, e.g. [kagi]*28 instead of [kani] (crab). But S showed some cases trying to overcome this tendency, e.g. [kɯgʷi] instead of [kɯgi] (nail). S still confused between voiceds and voicelesses, e.g. [kagi]*28 instead of [kaki] (persimon). S did not articulate differentiatedly between [koko] (here) and [kokko] (hen) yet.		Pointing at a picture of the sitting elephant, S said [koe kɯooːʈɕɪɕɪ] *26. F pointed at a picture of a street car and said [koɾe deɴɕa] (this is a street car). S responded [goː ɖʑite]*27.

*26 [koe] is one of variations of [koɾe] (this). [kɯooː] is one of variations of [goɾogoɾo] (sitting). [ʈɕɪɕɪ] is one of variations of [ɕiteɾɯ] (be ~ing). [koe kɯooːʈɕɪɕɪ] means "This is sitting". It is the first case of three-word-utterances.

*27 [ɖʑite] is, also, one of variations of [ɕiteɾɯ] (be ~ing). [goː ɖʑite] means "It goes rumbling".

*28 [kagi] means "Key".