

An Analysis of the First 50 Words Acquired by Young Japanese Children

Midori IBA

Introduction

Longitudinal studies of early vocabulary growth have revealed that young children often show a sudden upturn in the rate of acquisition of new words during the second year of life (Bloom, 1973 ; Nelson, 1973 ; Halliday, 1975). They typically acquire their first words at a slow rate, with one or two new words added each week, until their vocabulary has grown to about 20-40 words at the average age of 20 months. I have been particularly interested in this transitional period between babbling and speech, so I collected and analyzed the first 50 words of eight normal, monolingual Japanese children. The collection of the first 50 productive words from very young children has been a common procedure in the field of the language development since Nelson (1973) collected and classified children's early words into several categories. Instead of focusing on such classification of data, the purpose of the present study is to examine the first phonemes found in the children's productive vocabulary and to make a basic word list that would eventually serve as a reference. The study deals with the following questions :

1. What kind of phonemes are produced in early speech ?
2. How are the phonemes distributed in place and manner of articulation ?
3. Is there any relationship between word choice and phoneme production in the very early stages of language development ? Do the babytalk terms affect the children in their word production ?

1. Subjects

The subjects were eight Japanese children (four boys and four girls) from Japanese-speaking monolingual families. The children ranged in age from 17 to 22 months, with a mean age of 19 months at the time when their productive vocabulary reached 50 words. There was one set of triplets and one set of twins ; the other three children had neither brothers nor sisters at the time of

TABLE 1. Subject information

	ordinal position	sex	month to 50 words	residential area
Child I	twin (first)	male	18	Tokyo (parents are from the Kansai district)
Child II	twin (second)	female	17	same as above
Child III	triplet (first)	female	20	Tokyo(one parent from Tokyo, the other from Osaka)
Child IV	triplet (second)	male	20	same as above
Child V	triplet (third)	female	20	same as above
Child VI	only child	female	18	Kobe
Child VII	only child	male	22	Kobe
Child VIII	only child	male	17	Tokyo

observation. Six of the children were residents of Tokyo and two of them were from Kobe. (See TABLE 1.)

2. Procedure

The parents of the children were asked to keep regular records of their children's spontaneous production of words with a video camera. Recording continued until they produced a vocabulary containing 50 words. The recordings were done at weekly, or more frequent, intervals, depending on the family. The collected words were then phonologically transcribed and analyzed by a linguist trained in phonetics and the present writer.

The use of parental reports or diary studies has been a major method in child language research. Parents have a keener experience with their children than any other observer that might allow them to provide unique insights into developmental phenomena; and yet asking them to provide on-line transcriptions of their children's speech makes it impossible to both compare diaries across children and make generalizations, because their lack of specialized training could produce a substantial bias in the results. Audio-visual recording was adopted to avoid this kind of observer bias.

All of the 400 words collected from the eight children were listed in the order of frequency, while taking into consideration the questions mentioned in the first part of this article. Then the top-50 words from the list were chosen,

TABLE 2. Number of vowels

	a	e	i	o	u	a:	ai	e:	i:	o:	u:	total
Child I	36	5	9	14	2	8	10	2	2	4	3	105
Child II	43	5	13	15	5	10	6	4	2	6	5	120
Child III	22	8	22	15	7	8	5	2	6	9	1	110
Child IV	39	6	21	16	3	4	4	-	9	6	1	113
Child V	38	1	17	26	7	7	4	-	7	6	3	120
Child VI	34	7	17	28	7	10	5	4	5	4	2	130
Child VII	33	4	17	14	16	6	7	-	1	3	3	111
Child VIII	38	15	22	29	14	5	4	-	5	4	5	146
total	283	51	138	157	61	58	45	12	37	42	23	955

and categorized into four items: nouns, verbs, adjectives, and expressions. Nouns were further classified into five items: parents and family members, food, parts of the body, and miscellaneous articles.

3. Results

The 400 words of the subjects in the present study comprised 2,006 phonemes. The entire corpus of phonemes is shown in TABLE 2 and TABLE 3.

3-1. Vowels

The total number of vowels was 955. Fig. 1 shows the frequency of each vowel out of the total number of vowels from TABLE 1.

The vowel /a/ (29.6%) had the highest count, which was the expected result. According to an investigation on the frequency of phonemes in current Japanese (the subjects were all adults) by Iba and Yoshikawa (1990), the most frequent vowel was also /a/ (28.8%), the second-ranked vowel was /o/ (20.1%), as it was with the very young children. However, the frequencies of the remaining four vowels were different. See TABLE 4.

The infant vocal tract is not a miniature version of the adult's. According to Lieberman, Crelin, and Klatt (1972), it resembles that of a non-human primate more closely than that of the human adult. Infant vocal productions are caused by the differences in anatomical structure. Due to the size and placement of the tongue in relation to the oral cavity, distinguishable vowel sounds are limited. Adding to that, the vowels in the Japanese language are not as rich in variety as in other languages. As for the very young children in the present study, I have found very limited use of vowels in their speech. There

TABLE 3. Number of consonants

	t	N	k	tʃ	n	p	m	b	d	ʃ	g
Child I	14	7	2	7	9	7	9	6	3	4	3
Child II	13	5	3	8	10	5	9	7	3	3	3
Child III	10	11	21	9	5	8	5	5	4	6	9
Child IV	18	19	11	23	4	5	3	8	8	6	5
Child V	19	16	17	15	9	11	4	4	4	5	4
Child VI	13	21	15	14	11	8	11	9	5	-	6
Child VII	7	13	18	6	15	12	6	6	2	2	1
Child VIII	33	27	30	5	7	6	6	7	5	8	3
total	283	119	117	87	70	62	54	51	14	34	34

	dʒ	ʀ	h	j	w	ɲ	ʒ	z	ç	ŋ	total
Child I	3	-	7	2	2	2	-	2	-	-	99
Child II	3	-	7	2	2	2	-	2	-	-	98
Child III	1	1	1	6	3	1	-	1	-	-	117
Child IV	1	1	3	3	2	-	4	1	-	1	149
Child V	4	-	4	5	2	1	-	-	-	-	141
Child VI	1	11	2	5	3	4	2	-	1	-	160
Child VII	4	3	2	2	2	3	1	-	1	-	116
Child VIII	3	12	2	-	-	2	5	-	1	1	171
total	20	28	28	25	16	15	12	6	3	2	1051

Fig. 1 Relative frequency of vowels

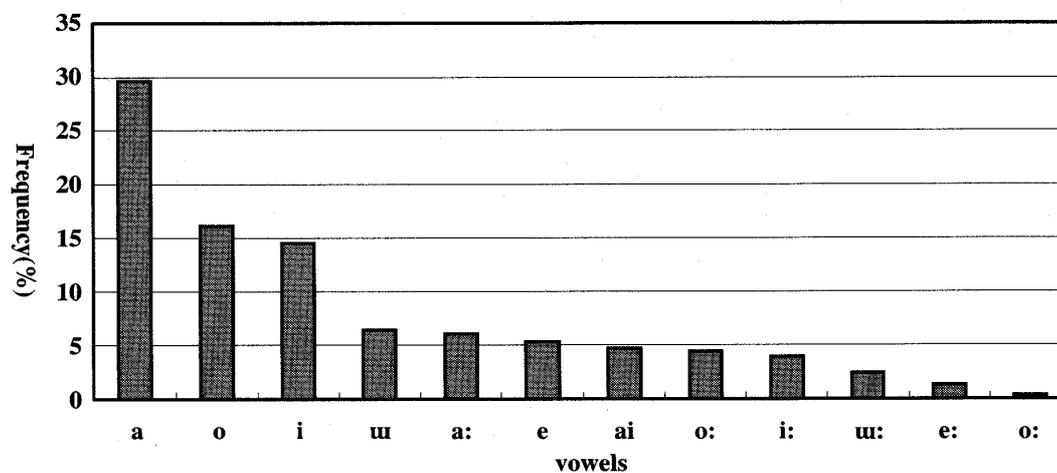


TABLE 4. Comparison of frequency of vowels

Adults (Japanese)	/a/	/o/	/e/	/i/	/u/	/ɔ/	
	28.8	20.1	18.0	11.7	7.6	4.2	(%)
The subjects of present study	/a/	/o/	/e/	/i/	/ɑ:/	/e/	
	29.6	16.1	14.5	6.4	6.1	5.3	(%)

TABLE 5. Manner of articulation—Percentage out of total number of consonants

Stops /p//b//t//d//k//g/.....	40.4%
Nasals /m//n//ŋ/.....	12.0%
Fricatives /z//f//z//r//h//ç/.....	10.6%
Affricates /tʃ//dʒ/.....	9.9%
Semi-vowels /j//w/.....	3.9%
Others.....	33.0%

TABLE 6. Place of articulation—Percentage of total number of consonants

Bilabials /m//p//b/.....	15.9%
Palato-alveolars /ʃ//z//tʃ//dʒ/.....	24.7%
Dentals /n//t//d//z/.....	22.5%
Palatals /n//j/.....	3.8%
Soft palates /n//k//g/.....	14.6%
Uvulars.....	11.1%
Others.....	3.3%

was only one diphthong /ai/ found in the survey. /ai/ was often clearly pronounced in words like “bye-bye,” or *nai-nai* (nothing). Other diphthongs such as /ou/ and /ei/ tended to be substituted with /o:/ and /e:/ respectively.

3-2. Consonants

The frequency of consonants according to the manner and place of articulation are shown in the following tables.

The fact that stops are the earliest true consonants to be produced may be related to the natural perceptual salience of syllables with a stop onset. Stops present the sharpest possible contrast with vowels in the acoustic stream of speech sounds such as [ma], [ba], [da] and [na]. Several studies have reported the same fact regardless of the target language (Hodge, 1989; MacNeilage and Davis, 1990, 1993).

Compared with adults, the children in the present study produce a more limited number of consonants, which is true of stops and nasals in particular. TABLE 7 shows the difference between the consonants of current Japanese produced by adults (Iba and Yoshikawa, 1990) and those of the subjects in this study.

TABLE 7. Comparison of frequency of consonants

Adults (Japanese)	/t/	/n/	/k/	/r/	/s/	/d/	/m/	/N/	/j/...
	14.5	14.0	12.8	8.5	8.3	7.0	6.9	5.4	4.0 (%)
The subjects in the present study	/t/	/N/	/k/	/tʃ/	/n/	/p/	/m/	/d/	/b/...
	12.1	11.3	11.1	8.3	6.7	5.9	5.1	3.2	4.9 (%)

While the consonant /t/ had the highest frequency for both the adults and children, the distribution of consonants differs more than that of vowels. This may suggest that it takes longer for the children to acquire the target consonants. For instance, no /s/ appeared in the children's early speech. The consonant /s/ was likely to be replaced by /tʃ/ or /t/, offering a reason why /tʃ/ was highly ranked in the collected consonants. In fact, all of the children substituted /tʃ/ or /t/ for /s/. They said "tampo" instead of "sampo" (stroll), "bachu" instead of "bus." Some of them showed the tendency to substitute /tʃ/ for /k/, such as "occhi" for "okki" (big).

Indeed the consonants produced by the children in this study did not sound nearly as "accurate" as those provided by adults, but we should take note of the previously mentioned anatomical evidence which questions the assumption that infants and adults share a similar sound production mechanism. Due to the difference of the shape of the vocal tract or the immaturity of the muscles, infants might have an articulatory filter which selects accessible words. It would be instructive to follow them longitudinally beyond the point where they have expressed their first 50 words to define the order of acquisition of "accurate" sounds.

3-3. Word Choice and Phoneme Production

One might predict that children are more apt to attempt words that have sounds already represented in their lexicon. One explanation for this is that children use words containing sounds easy to produce, but ease of production is difficult to define. What is easy for one child appears to be difficult for another. One subject in the present study said "banana" quite precisely, while several subjects said "nana," and a few subjects said "ba" for banana. Menn (1983) argues that it is not just phonological ease that determines the order in which sounds are mastered and that there must be other factors involved. Locke (1983) proposes that the distribution of sounds in the early production of very young children may reflect not only the child's physical ability to produce speech sounds but also the distribution of sounds in the target language and the ability of adults to recognize the word or token spoken by the child. After comparing

the phonemes of young children with those of adults, I can support this proposition. The absence of some phonemes in the speech of children may parallel the relative infrequency in adult phonology. It is expected that the influence of the ambient language will increase as the child advances in language use.

On the other hand, having observed the young children, I have found that some of them, instead of replacing adult sounds with ones within their repertoire, avoided saying them. This phenomenon may exist cross-linguistically; experimental work (Schwartz, Leonards, Loeb, and Swanson, 1987) suggests that such avoidance is especially likely to happen with children who have acquired less than about 25-75 words of output vocabulary. Children might also appear to seek out adult words which have sounds that lie within their repertoires even when they are not of high evident utility. Individual children vary in the extent to which they prefer to avoid adult words which they cannot render accurately. They seem to be aware of the inadequacies of their renditions of adults words.

3-4. The 50 Word List for Reference

The list of 50 words is attached in the appendix of the present article. The main purpose of the list is to make clear what kind of words are likely to be produced in the early speech of Japanese children. It can also help us discuss why those words are common among very young children.

As mentioned before, the 400 words of the eight children were ranked in order of frequency, then categorized into nouns, verbs, adjectives, and expression. Results show that 28 words out of the 50 (56%) were nouns, seven words (14%) were verbs, nine words (18%) were adjectives, and six words (12%) represented expressions.

One of the salient features of the list is that there are 37 two-syllable words (72%) with a repetition of the same syllable, such as "mama," "papa," and "wanwan" (dog). This suggests that two-syllable words are somehow essential to very young children. Adding to that, eight words in the list are monosyllabic, and there is only one word that has four syllables. Most words were very short and simple in structure.

As for the two-syllable words in the list, there is considerable use of onomatopoeia. Especially in nouns expressing animals, we see only onomatopoeia, such as *nyanya* (cat), *bubu* (pig), and *momo* (cow). Those are not the coinages of individual children but a speech register known as "babytalk," which contains special words for concepts used in the daily lives of small children. It is

also distinguished by certain phonological patterns and by morphological regularization. The lexical items are taught to children by adults who appear to simplify words in some uniform fashion in a way that reveals what adults perceive as difficult in the child's production of certain phonemes. The babytalk register is considered to be how children talk. This stereotyped babytalk of course cannot represent the very notable individual variations among children. Yet keeping in mind that there are 37 typical Japanese babytalk terms out of the 50 words in the list and that there are many different babytalk terms other than those in the list (i.e. in the 350 words collected for the present study), the use of babytalk terms is worth reconsidering. The fact may suggest that parents or caretakers use babytalk terms when they talk to their children with or without being conscious of it. They may presume that babytalk is easier for children to use, imitate and learn. In fact, babytalk items consist of more basic kinds of consonants than adult vocabulary, such as stops and nasals, which this study found to be the first and second most frequent groups produced. Phonology in babytalk items may parallel the developmental order of phonemes.

The babytalk terms tend to be one of the principal sources children use to create their lexicon. Very young children may be affected by baby talk when they chose words to label things and events. In fact, when I pointed out things to my twins (Child I and Child II in this study), I often taught babytalk terms and normal adult-form terms together. The results were that both of the twins chose to use the babytalk terms at all times. They seemed to recognize the adult-form terms because they could point to things when the adult words were used. I can only make probabilistic statements at this point, but babytalk might play an important role in the linguistic development of children.

4. Conclusion

I would like to conclude this article by providing a summary of information in response to the three questions posed in the introduction.

1. What kind of phonemes are produced in early speech ?

The sound /a/ clearly emerges as the vowel having the highest frequency. The following is the rank order of frequency of the remaining vowels : /o/, /i/, /u/, /ɑ:/, /e/, /ai/ /o:/, /i:/, /u:/, /e/ and /o:/. The vocant /a/ tended to occur with very high frequency in CV-syllables, which shows /a/ has a natural tendency to combine with consonants in CV-syllable production. The similar preference is found in Vihman's (1992) data.

As for the consonants, the following order of frequency of occurrence has been established: /t/, /N/, /k/, /tʃ/, /n/, /p/, /m/, /b/, /d/, /g/, /ʃ/, /r/, /dʒ/, /h/, /j/, /w/, /ɹ/, /ʒ/, /z/, /ç/ and /ŋ/.

According to Mitchell and Kent (1990), even at 11 months, less than half of the children's speech-like production includes consonants. Yet vowels have been less extensively investigated than consonants, primarily because they are particularly difficult to transcribe reliably and thus difficult to characterize without the benefit of tape-recording.

The data of this study show the words of young children at the 50 productive-word level (with a range in use of 17-22 months) are clear enough to be transcribed.

2. How are the phonemes distributed in place and manner of articulation at the developmental stage under consideration?

In manner of articulation, stops had the highest count (40.4%) in the whole consonant group. Second was nasals (12.0%), the third, fricatives (10.0%), the fourth, affricates (9.9%), and the fifth, semi-vowels (3.9%). Stops overwhelmingly accounted for the consonants found. This shows stops present the sharpest possible contrast with vowels in speech sound.

As to the place of articulation, palato-alveolar (24.7%) and dental (22.5%) are the consonant groups having the highest frequencies, followed by bilabial (15.9%), soft palate (14.6%), uvular (11.1%) and palatal (3.8%).

3. Is there any relationship between word choice and phoneme production in the very early stages of language development? Do the babytalk terms affect children in their word production?

After analyzing the words, I found that young children seem more likely to produce words whose phonological characteristics are consistent with their phonological systems. They seem to pick up on the words they think they can pronounce. Within this tendency, however, there are considerable individual differences in choosing vocabulary.

The babytalk items may fit the phonological system of children because the characteristic sounds of babytalk seem to coincide with the developmental order of a child's phonology, although the order needs further investigation. The babytalk items in the language of Japanese adults appear to influence the children's selection of words. Observation of the videotapes collected for the present study shows that babytalk items are popular among the children. Yet we should of course be careful about general statements. As there are

differences in families, some family members might be willing to use babytalk items when speaking to a child and some might not. Cross-linguistic research has yielded a small but growing body of evidence that prelinguistic vocalizations show effects of the ambient language for infants under ten months. No finer-grained generalization should be made unless further observation of the influence of the ambient language on the productive 50 word level of children is carried out.

Appendix

The List of the First 50 Words of Japanese Children

NOUNS

Parents, Family members

1. mama (or kaka, kashan) mother
2. papa (or toto, toshan) father
3. baba (or bachan) grandmother
4. jiji (or jichan) grandfather

Food

5. manma food
6. pan bread
7. banana
8. cha tea
9. gyugyu (or miku) milk
10. ringo apple

Parts of the Body

11. anyo [anjo] foot or walk (verb)
12. hana nose
13. ha teeth
14. te (or tete) hand
15. me (or meme) eye
16. pompon belly

Animals

17. nyanya (or nyan) cat
18. wanwan dog
19. bubu [bw:bw:] pig
20. meme [me:me:] sheep or goat
21. momo [mo:mo:] cow
22. kaka [ka:ka:] crow

Miscellaneous Articles

23. kukku shoes
24. bochi hat or cap
25. bachu bus
26. kichapoppo train
27. bubu car

28. chochobutterfly

VERBS

29. nenne (verb or noun) sleep

30. chichi (verb or noun) urinate

31. unchi (verb or noun) defecate

32. icchattahave gone

33. occhattahave fallen

34. tacchi stand

35. occhin sit

ADJECTIVES

36. acchi hot

37. chuppai sour

38. amai sweet

39. itai painful

40. nai no or nothing

41. babachi (or. bacchi) dirty

42. kai cute

43. kirei or kire pretty or clean

44. oichi tasty

EXPRESSION

45. hai yes

46. iya no

47. dojo please

48. atto thank you

49. me (or dame [dame]) do not

50. bye-bye

References

- Bloom, L (1973) *One Word at a Time*. The Hague : Mouton.
- Halliday, M. A. K. *Learning How to Mean: Explorations in the development of language*. London : Edward Arnold.
- Hodge, M. (1989) A comparison of spectral-temporal measures across speaker age : implications for an acoustic characterization of speech maturation. Doctoral dissertation, University of Wisconsin, Madison.
- Lieberman, P., Crelin, E. S. and Klatt, D. H. (1971) Phonetic ability and related anatomy of the new born, adult human, Neanderthal man and the chimpanzee. *American Anthropologist*, 74, 287-307.
- Locke, J. L. (1983) *Phonological Acquisition and Change*. New York : Academic Press.
- MacNeilage, P. F. and Davis, B (1990) Acquisition of speech production : frames then content. *Attention, Performance*, vol. 13.
- Menn, L. (1983) Development of articulatory, phonetic, and phonological capabilities, In B. Butterworth (ed.), *Language Production*, vol. 2, 3-50. London : Academic Press.
- Mitchell, P. R. and Kent, R. D. (1990) Phonetic variation in multisyllabic babbling. *Journal of Child Language*, 17, 247-65.

- Nelson, K. (1973) *Structure and Strategy in Language to Talk*. *Monographs of the Society for Research in Child Development*, 38, serial no. 149.
- Shwarts, R., Leonard, L. Loeb, D. F., and Swanson, L. (1987) Attempted sounds are sometimes not: An expanded view of phonological selection and avoidance. *Journal of Child Language*, 14, 411-18.
- Vihman, M. M. (1992) Early syllables and construction of phonology, In C. A. Ferguson, L. Menn, and C. Stoel-Gammon (eds), *Phonological development: models, research, implications*, 392-422. Timonium, Md: York Press.