

# Production and Perception in Language Acquisition

Setsuko Mizuno

## INTRODUCTION

While there exists a number of studies concerning various aspects of language development, few attempts have been made to investigate the entire process of acquisition by concurrent observations of a child's abilities both in the production and in the comprehension of messages from the phonological, lexical, syntactic, and pragmatic points of view. The present paper describes a case study based on observations on the language development of a Japanese girl from her birth to forty-eight months of age. The ability of message production was analyzed and quantified directly on the basis of data concerning the repertoires of speech sounds, words, word sequences and sentences actually used by a child, while the ability of language comprehension was analyzed indirectly on the basis of the child's conversation as well as verbal and non-verbal responses to questions. The results, even though they are from a single subject, present a wholistic image of the entire process of language acquisition as well as correlations among various aspects of development in the child's linguistic behaviors.

## METHOD

The present study was based on behavioral observations on a Japanese girl from her birth to forty-eight months of age. The main data consisted of recordings of her spontaneous utterances and conversations with her mother and an elder sister, for approximately one hour at a time. The lexical abilities were studied by using eighty picture cards both in naming and in word association tasks.

## RESULTS

### 1. Acquisition of Speech Sounds and Syllables

#### 1.1 Individual Speech Sounds

Voluntary production of speech sounds by a child occurs both in mimicking and spontaneous utterances. Before a child can produce them voluntarily, however, some of the speech sounds are produced incidentally in babbling. These incidental sounds can be regarded as precursors to the child's development of articulatory

skills (Fujisaki & Mizuno 1981, 1983). Hence three kinds of sound repertory are defined: (1) sounds found in incidental vocalization, (2) sounds used in mimicking, and (3) sounds used in spontaneous utterances. Figure 1 shows the growth in size of these three kinds of sound repertory with an increase in the chronological age. At 48 months, the size of the sound repertory used in spontaneous utterances is very close (90%) to that of adult speakers of Japanese.

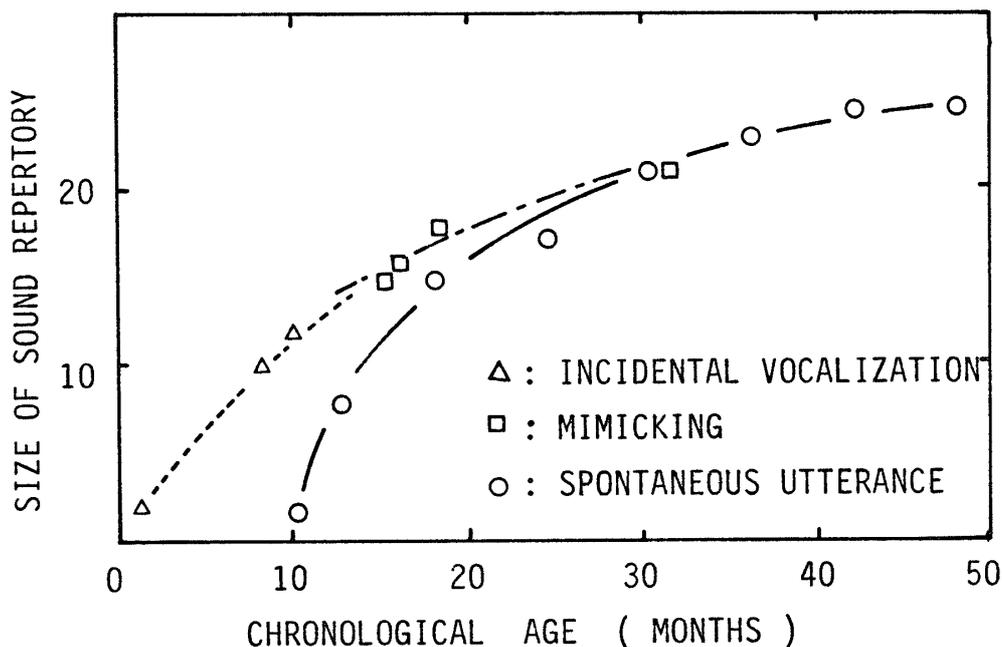


Fig. 1. Increase of sound repertory with chronological age.

The same tendency was proved by Okamoto (1962) who investigated the relation between mimicking and spontaneous utterances of children from seven months to one and a half years of age. It was reported that an interval between mimicking and spontaneous utterance of a sound became shorter gradually, and that the interval almost disappeared finally.

The order of appearance of speech sounds in spontaneous utterances shows the developmental stages of speech motor skills (Irwin & Chen 1945, Chen & Irwin 1946, Irwin 1947a, b, 1951, 1952). In vowels, [a] appears first at 10 months, followed by [i] and [u] at 12 months, then by [e] at 14 months, while [o] appears only after 24 months. Kirikae & Sawashima (1968) reported that the clearness of vowel articulation decreases in order of [a], [i] & [u], [e] and then [o] in the case of one-year old children. The similar tendency was reported also in English that [u], [o] & [i] occurred infrequently and that [æ] & [ɛ] were the most common vowels in early childhood (Lieberman 1980). In consonants, [m] appears first at 10 months. Non-nasal sounds and voiceless sounds appear after 12 months. The developments of consonantal production in regards to manner and place of articulation are illustrated in Figure 2. As for the manner of articulation, the nasal sounds appear first,

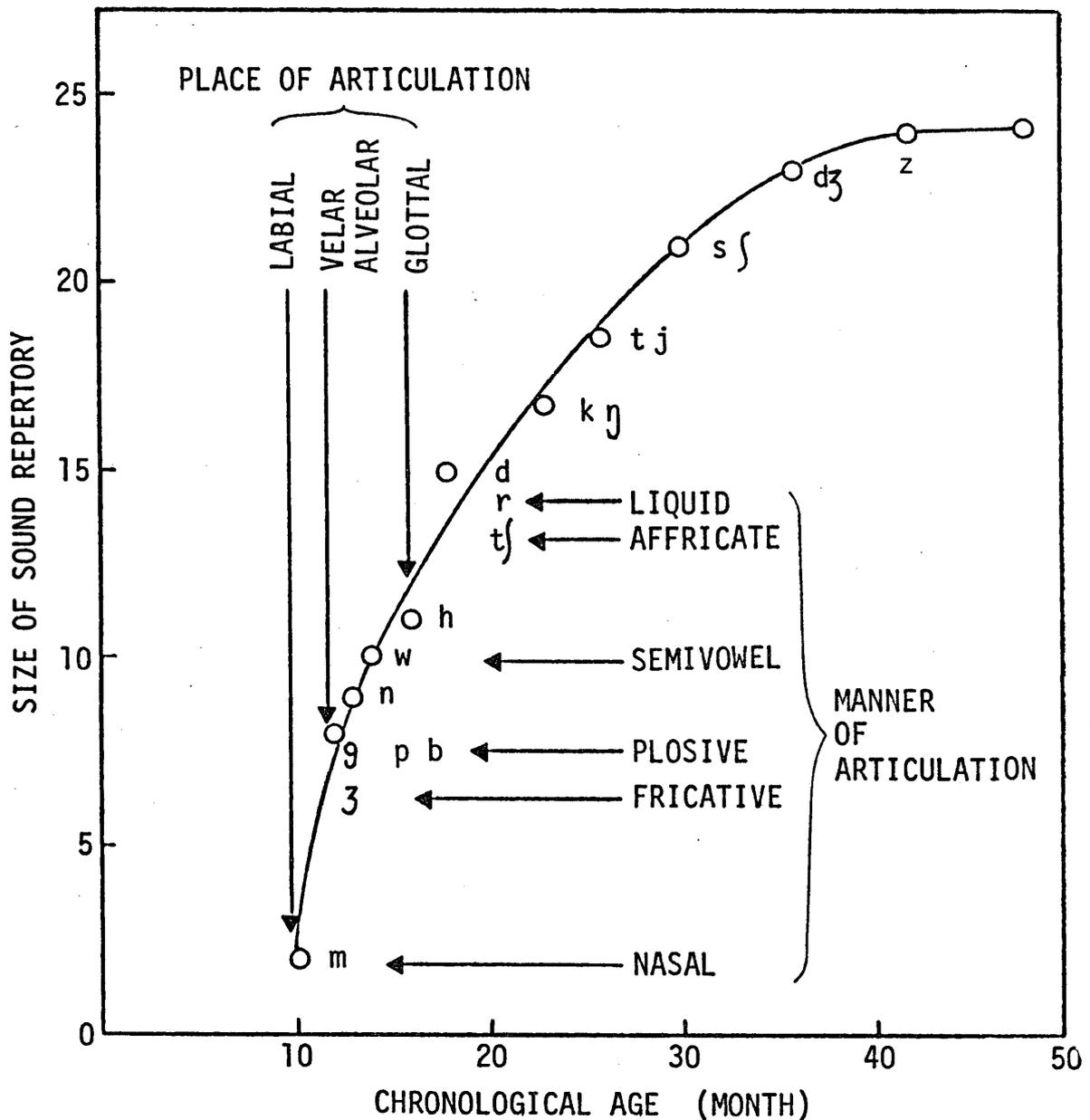


Fig. 2. Increase of sound repertory with chronological age in spontaneous utterances, indicating developments in consonantal articulation.

followed by the fricative and plosive ones. Then the semi-vowels appear, followed by the affricate, then by the liquid sounds. Regarding the place of articulation, the labial sounds appear first, followed by velar and alveolar ones, then by the glottal ones. The sounds [ts] or [dz] cannot be produced even at four years of age.

### 1.2 Syllables

The minimum unit of production of these sounds is a syllable. In Japanese, a syllable consists either of a vowel or a consonant followed by a vowel, and the total number of syllables is 95. In the early stages of acquisition of speech sounds, a consonant first appears only in a limited vowel context and then gradually extends

its distribution to other vowel contexts. Of all the 95 different syllables, the number of syllables which the child can mimick increases with the chronological age as shown in Figure 3.

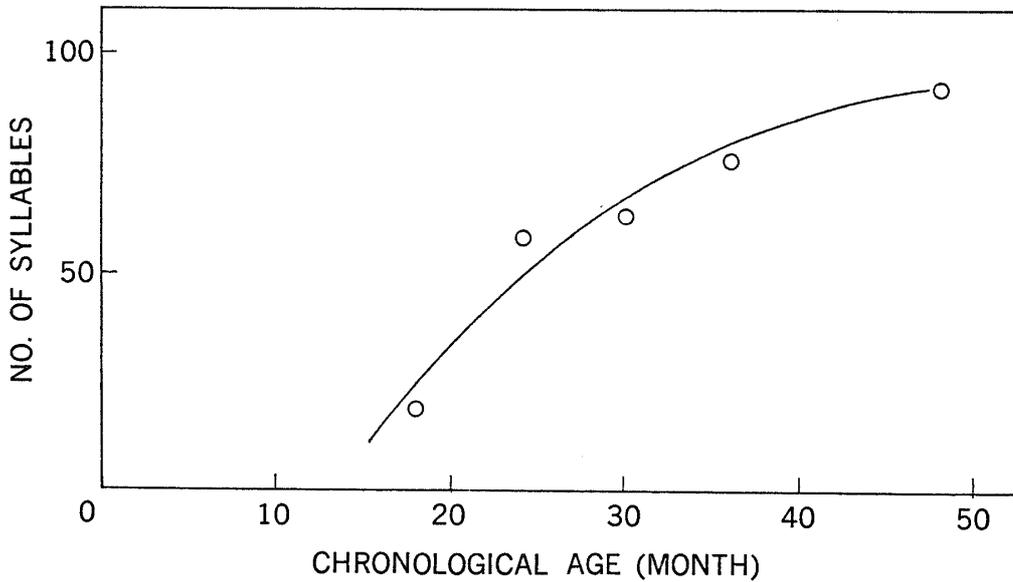


Fig. 3. Increase of syllables in mimicking with chronological age.

Each of the child's early utterances can be regarded as a word. Between 10 to 22 months of age, these words consist of one syllable or two syllables which often include repetition of the same syllable. After 2 years of age, the use of disyllabic words increases rapidly. Words consisting of three or more syllables appear at 24

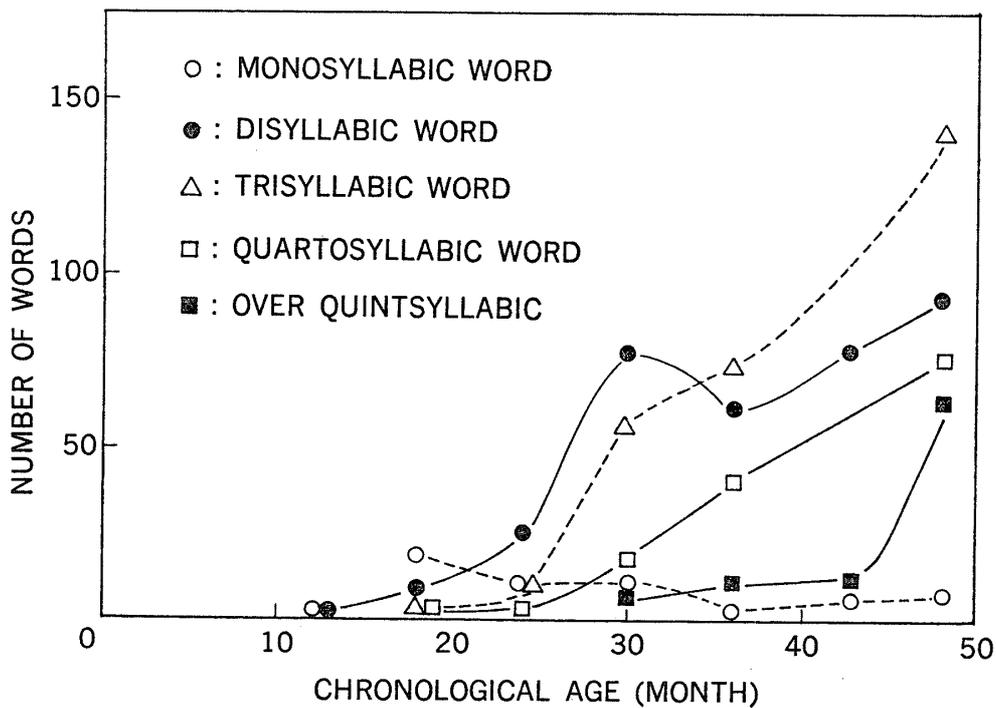


Fig. 4. Distribution of words according to the number of syllables in a word.

months, and also increases quite rapidly thereafter.

Words are classified according to the number of the syllables to examine the acquisition of syllable articulation. Figure 4 shows the number of words classified by the number of syllables.

The average number of syllables of a word increases as the chronological age as shown in Figure 5.

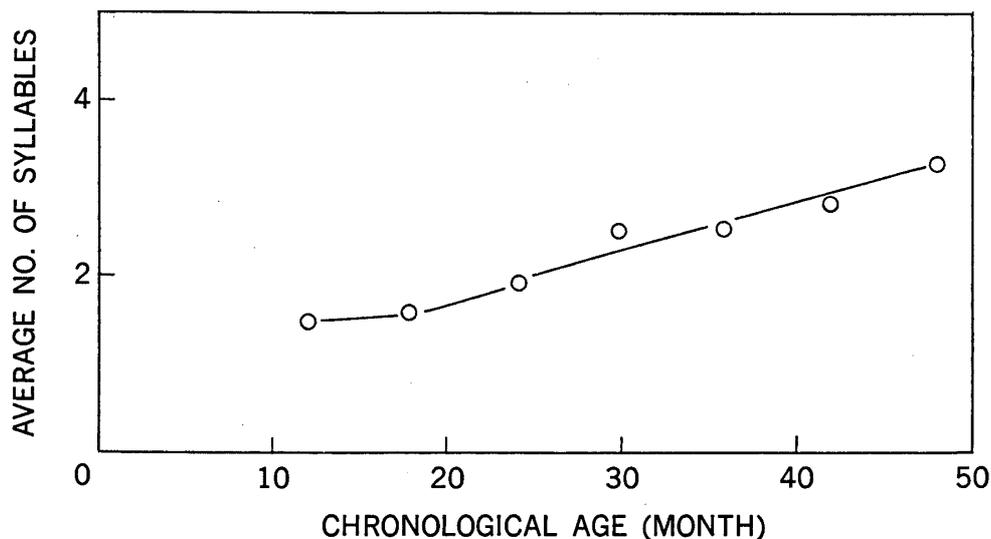


Fig. 5. Average number of syllables in a word.

## 2. Acquisition of Vocabulary

### 2.1 Size of the Vocabulary

Because of the child's gradual acquisition process of the sound repertory and the syllabic structure, a word initially used by a child is phonetically rather dissimilar to the corresponding word used by adult speakers. However, the size of the vocabulary increases very rapidly from the beginning, i.e., from only five at 12 months, to 92 at 24 months, and to nearly 500 at 30 months. Figure 6 illustrates the exponential growth of the vocabulary size with age. The initial vocabulary consists solely of nouns. Verbs, adjectives, etc. appear at about 20 months, and then rapidly rise with the chronological age as shown in Figure 7.

### 2.2 Semantic Content of the Vocabulary

The semantic content of the child's vocabulary was investigated by using a set of 80 picture cards. The perceptual ability, i.e. the ability of understanding the meaning of words, was measured by the child's pointing response of a card from among 10 alternatives to an orally presented word. The productive ability, i.e. the ability of using words in one's own utterances, was measured by the child's naming response to a visually presented card (Fujisaki & Mizuno 1982). Although the two kinds of test were not started at the same time, the results of these tests, conducted over the period from 30 to 48 months of age, confirmed the well-known tendency

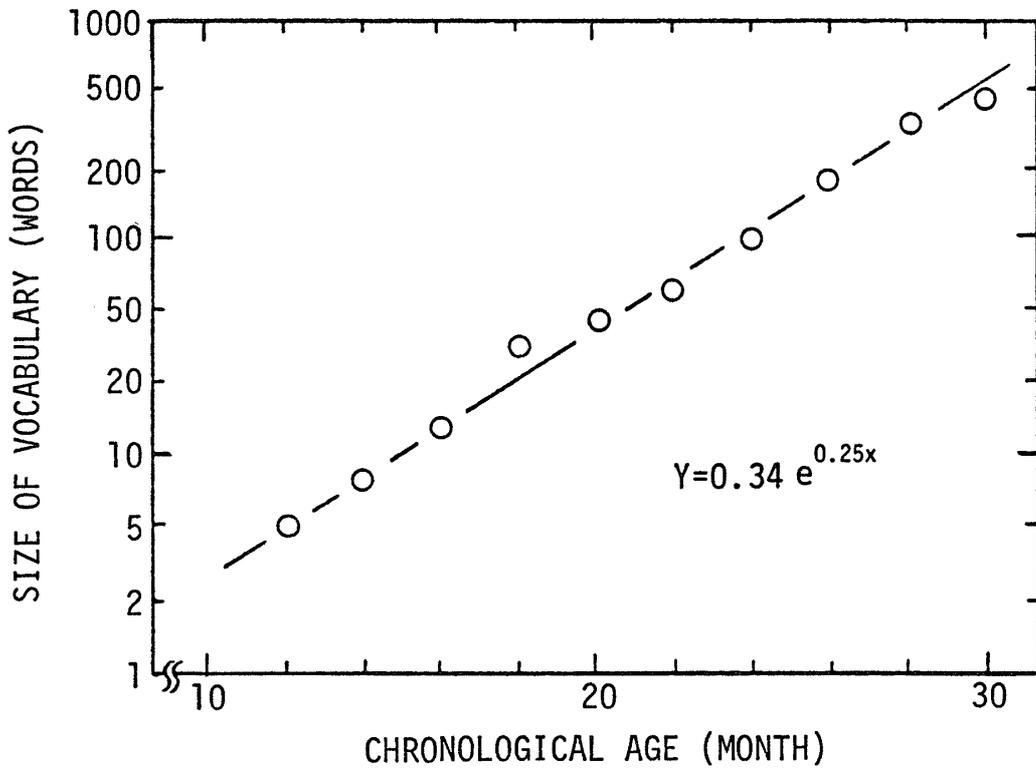


Fig. 6. Exponential increase of vocabulary size as a function of chronological age.

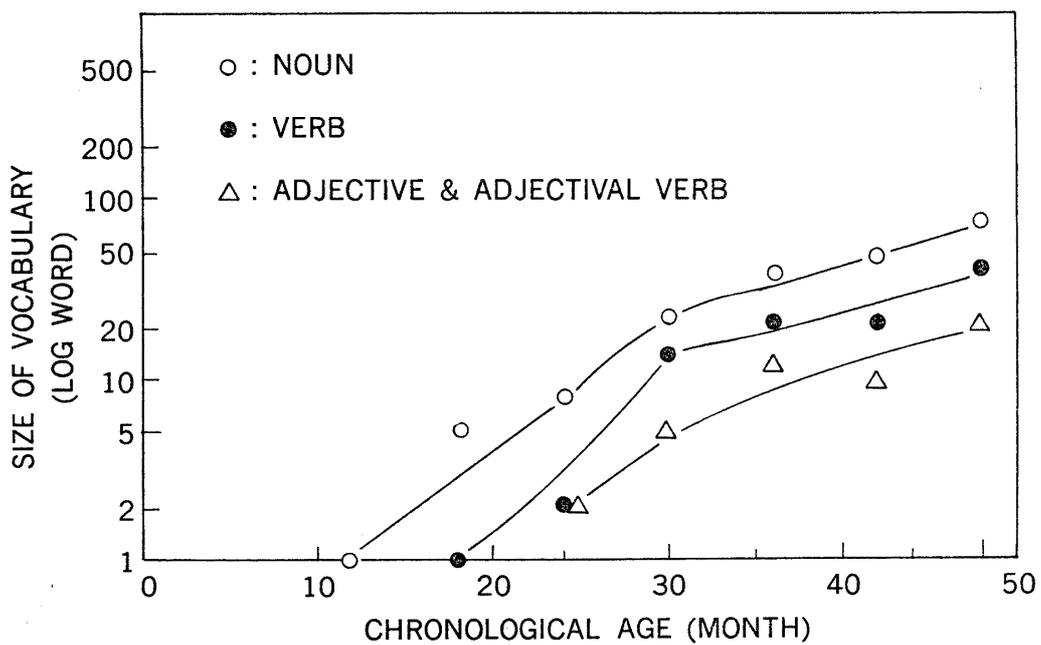


Fig. 7. Increase of vocabulary size of each part of speech with chronological age.

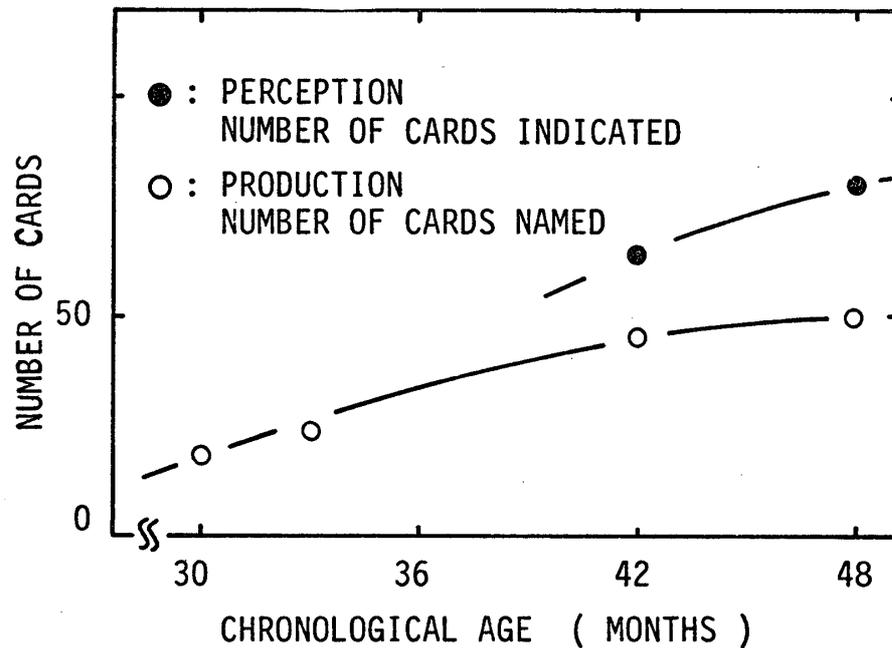


Fig. 8. Productive and perceptual ability of words.

that the perceptual ability is always higher than the productive ability, as shown in Figure 8.

### 3. Production and Perception of Sentences

#### 3.1 Productive Ability

The early utterances of a child can be regarded as one-word sentences, often repeated twice. If we define a two-word sentence as an utterance composed of two different words, the use of two-word sentences starts as early as at 15 months, and increases quite drastically after 2 years, when sentences of three or more words also

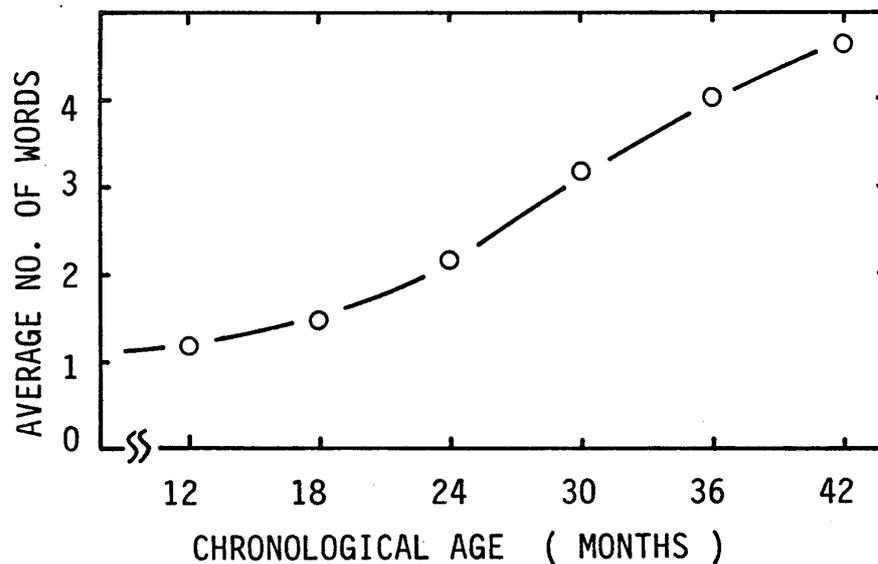


Fig. 9. Average number of words in a word sequence.

appear (Mizuno & Fujisaki 1981). Thus the average number of words within an utterance, i.e. a sequence of words which may contain repetition of the same word, increases from about 1.2 at 12 months to about 5 at 42 months as shown in Figure 9, which is very close to the average number of words in adult's utterances in the same conversational data.

It is interesting to note that the developmental growth in number of words within a sentence shows a tendency that is quite similar to the growth in number of syllables within an utterance, suggesting the existence of similar underlying mechanisms. Syntactic structures of the 152 two-word sentences, observed at 30 months of age, can be classified into the following three types: (1) Subject-predicate structure (about 80%), (2) Predicate only (about 10%), and (3) Others (about 10%).

### 3.2 Perceptual Ability

While the child's productive ability of sentences can be directly observed from her utterances in conversation, her perceptual ability can be inferred only indirectly through her responses to the immediately preceding utterances by the partner in conversation (Mizuno, Arakawa & Fujisaki 1982). From this point of view, the following four stages can be identified in the development:

- (1) Repetition of a particular word contained in sentences presented to the child, indicating that the child did at least recognize the word in question.
- (2) Paraphrasing a word contained in sentences presented to the child, indicating that the child did at least understand the meaning of the word in question.
- (3) Paraphrasing a sequence of words, usually a fragment of a sentence presented to the child, indicating that the child did at least understand that portion of the whole sentence.
- (4) Formation of a pertinent response to a given question, usually indicating that the child understood the whole question.

Analysis of the conversational data indicates that the percentage of adult's utterances fully understood by the child is about 50% at 12 months, but rises to 96% at 42 months. It should be noted, however, that no effort was made to control the complexity of the adult's utterances over the entire period of collecting the conversational data. Thus the adult's utterances tended to be more complex as the child's chronological age increases.

## 4. Pragmatic Ability in Conversation

The development of the child's pragmatic ability was analyzed from the following three points of view (Mizuno & Fujisaki 1987).

### 4.1 Function of Word Sequences

The function of word sequences can be classified into the following categories: interjection, simple answer, description, question, request, etc. The percentage of categories, description, question and request increases with the chronological age.

#### 4.2 The Child's Role in Conversation

The child's role in conversation can be inferred from her utterances and can be classified into the following three categories:

1. Simple yes/no answers.
2. Continuation of an on-going topic.
3. Change of topics.

The active role of the child in carrying out conversation was quantitatively demonstrated by the increase in percentage of utterances of categories 2 and 3 as shown in Figure 10.

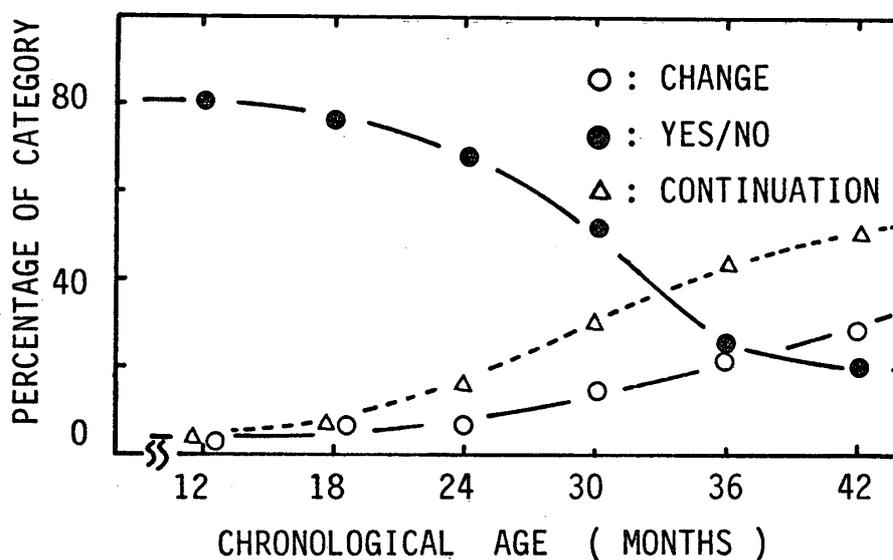


Fig. 10. Development of the role in conversation.

#### 4.3 Turn-taking in Conversation

The number of turn-taking in conversation can serve as an indirect index of overall language competence. The competence progresses with the chronological age as shown in Figure 11.

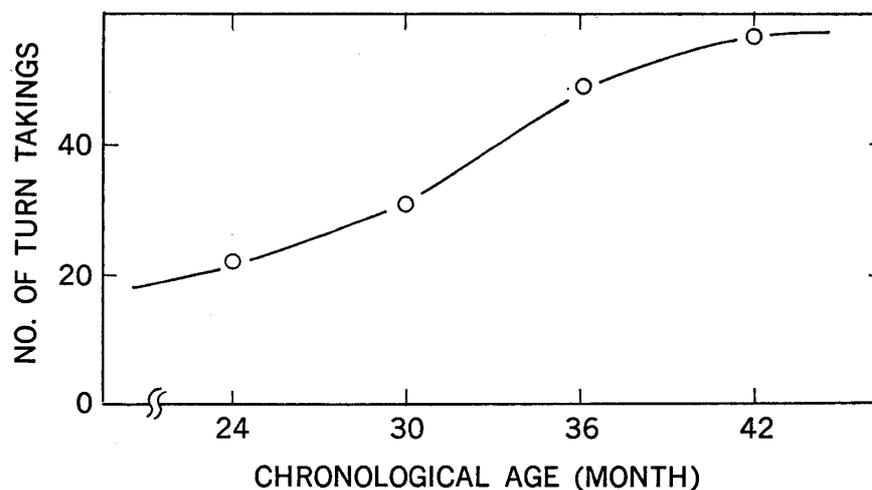


Fig. 11. Increase of turn-taking in conversation.

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**Abstract**

Investigation into the entire process of language acquisition by children has to be based on concurrent observations of their abilities both in the production and in the comprehension of messages from phonological, lexical, syntactic and pragmatic points of view. In the present study, the ability of language production of a child was analyzed and quantified directly on the basis of data concerning the repertoires of speech sounds, words, word sequences and sentences actually used by a child, while the ability of language comprehension was analyzed indirectly on the basis of the child's conversations as well as verbal and non-verbal responses to questions.