The Acquisition of Japanese Compound Accent Rule

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abstract

This paper reports the results of research on the process of acquisition of Japanese compound accent rules by children aged 4-5. The results reveal: 1) Children acquire general rules before they acquire lexical idiosyncratic rules. 2) Children failed to retain the accent of the second element, and instead place an incorrect accent on the penultimate foot. This result suggests that children acquire placing accent on the penultimate foot prior to retaining the lexical accent of the second element. We discussed a similarity between above result and a constraint-reranking phenomenon in adults' phonology. 3) The syllable, which plays a important role in adults' CA rules, does not contribute to the CA rules in children's phonology. We assumed that children have not acquired sufficient understanding of the syllable to contribute to the CA rules.

INTRODUCTION

In noun-noun compound formation in Japanese, the accent of the compound is to a large extent systematically determined . Native Japanese speakers can produce a correct accent pattern even when they encounter a new phrase for the first time, because native Japanese speakers possess Japanese compound accent (CA) rules. 1. Recently, an account of CA rules has been proposed in the framework of a constraint-based theory known as Optimality Theory. 2.3. This theory provides a systematic account of CA rules and it is expected to denote a acquisition process in a very simple style. However, research on acquisition of CA rules by children is limited. The purpose of our research is to examine how Japanese children acquire knowledge of CA rules, to determine whether there are CA rules which are more natural for children and are acquired prior to other rules.

1. ADULTS' CA RULES

In adults' phonology, the CA pattern is essentially determined by the second element noun. When the second element of a compound is a 2-mora or 3-mora noun, the CA rules can be formulated as follows.

(a) If the second element is lexically unaccented, then a new CA emerges on the penultimate foot of the compound. This type of CA is by far the most productive. (In Japanese a bimoraic unit is considered a foot.)

ex.
ka'buto + musi => kabuto'-musi 'beetle' (' denotes accent location)
no' + nezumi => no-ne'zumi 'field mouse'

(b) If the second element is lexically accented, the lexical accent of the second element is retained in the resultant compound except when it is within the syllable (e.g. C1V'C2 or CV1'V2).

ex.
Pe'rusya + ne'ko => perusya-ne'ko 'Persian cat'
migaki + ni'sin => migaki-ni'sin 'dried filleted herring'

(b') However, if the lexical accent of the second element is within the syllable, a new CA emerges on the penultimate foot of the compound. (CV, C1VC2, and CV1V2 are syllable units in Japanese. Furthermore, in Japanese, which is a mora-timed language, not only CV but also C2 and V2 are considered to be one unit, namely a mora. Both syllables and moras play a certain role in Japanese phonetics.)

ex.
i'ndo + zo'o => indo'-zoo 'Indian elephant'

(c) Lexically idiosyncratic rules. An example of a relatively productive lexically idiosyncratic pattern is an unaccented compound which occurs for some final-accented second elements. It is not possible to predict or explain occurrence of this type based on the nature of the second element of the compound.

ex.
atago + yama' => atago-yama 'Mt.Atago'

2. METHOD

subjects
The subjects were 22 average children aged 4-5. They were all native speakers of Tokyo Japanese.

test words
The test compounds used in this experiment were selected by taking the above rules into account. There were 12 test compound words. In addition the practice session for this experiment used 4 compound words. The individual element nouns of the compounds were familiar animal names for children. The resulting compounds were neologisms which

were defined as representing imaginary animals (e.g. 'panda-neko' was defined to mean a kind of cat which has some giant panda-like features). The first element of the compound was limited to a single word (3-mora, unaccented). Each of the test compounds was described on cards. A list of the test compounds used in this experiment is provided below.

Type(a)
usagi + usi => usagi'-usi
usagi + buta => usagi'-buta
usagi + suzume => usagi-su'zume
usagi + mogura => usagi-mo'gura

Type(b)
usagi + ri'su=> usagi-ri'su
usagi + ka'ba => usagi-ka'ba
usagi + sa'i => usagi'-sai
usagi + hyo'u => usagi-hyo'u
usagi + go'rira => go'rira
usagi + pa'nda => usagi-pa'nda
usagi + oba'ke=> usagi-oba'ke

Type(c)
usagi + yama' => usagi-yama

procedure

This experiment consisted of two sessions, specifically, a practice session and a test session.

First, the experimenter showed each of the subjects pictures describing each of the element words, subjects were then asked to pronounce the individual element words. During the practice session, the experimenter showed one picture of the practice compounds to the subjects, produced its accent, and asked the subjects to imitate the pronunciation. Next, the experimenter showed the subjects the remaining cards for the practice compounds and asked the subjects to produce the compound words. After the practice session, the experimenter showed the picture cards of the test words to the subjects, and asked the subjects to produce the test compound words.

Accent patterns were judged perceptually by one of the authors. In the following data analysis, accent patterns which correspond to the rules, listed above were considered to be the correct patterns.

3. RESULTS

Tables 1 and 2 show the CA patterns actually produced by the children for each of the excepted correct CA patterns. 'Children's pattern' means a major type of CA pattern produced by the subjects. 'Others' mean incorrect answers which show the different word structures from the word structure example produced by the experimenter (e.g. reversing the order of the two word elements; i.e. usagi-si => usi-usagi, inserting a particle '-no' between the two word elements; i.e. usagi no usi and simple speech errors; i.e. usa usi).

The results of the analysis reveal the following points.

Firstly, for type (c) compounds which are formed by

idiosyncratic rules, the correct-answer rate was lowest (23.1%). Incorrect answers followed the pattern in which the accent was placed on the penultimate foot of the compound.
children: usagi + yama' => usagi'-yama

(correct: usagi-yama)

Secondly, for type (a) compounds, the correct-answer rate was highest (81.3, 77.2%). Incorrect answers of type (a) were the only answers included in 'others'.

Thirdly, for most of the type (b) compounds, when the second element of the compounds was a 3-mora, initial accented noun, the correct-answer rate was high (90.5%). However, for other compounds of type (b), the correct-answer rate was lower. For compounds whose second element was a 3-mora, second accented noun, incorrect answers followed the pattern in which the accent was placed on the penultimate foot of the compound. (The correct-answer rate was 52.2%.)
children: usagi + oba'ke => usagi-o'bake

(correct: usagi-oba'ke)

When the lexical accent of the second element was a 2-mora noun which was accented on the first mora lexically, incorrect answers also followed the pattern in which the accent was placed on the penultimate foot of the compound. (The correct-answer rate was 68.2%.)
children: usagi + ri'su => usagi'-risu (correct: usagi-ri'su)
        usagi + ka'ba => usagi'-kaba (correct:usagi-ka'ba)

Fourthly, for type (b') compounds, the correct-answer rate was lower (49.1%). Incorrect answers followed the pattern in which the accent within the syllable was retained in the resultant compound.
children: usagi + sa'i => usagi-sa'i (correct: usagi'-sai)
        usagi + hyo'u => usagi-hyo'u (correct: usagi'-hyou)

4. DISCUSSION

Firstly, our results indicate that idiosyncratic compounds are replaced with the rule governed pattern. This suggests that children acquire general rules before they acquire lexically idiosyncratic rules.

Secondly, children produced the correct answers for most type (a) compounds, and for type (b) compounds whose second element was a 3-mora, initial accented noun. The incorrect answers for type (b) and type (c) followed the pattern in which the accent was placed on the penultimate foot. Children produced the pattern in which the penultimate foot of the compound is accented more frequently than any other CA patterns. There are two possibilities that they produce this pattern frequently. One possibility is that the CA pattern which is accented on the penultimate foot of the compound is by far the most productive in adults' phonology. This means that children hear this type of CA pattern more frequently, in other words, it is a more frequent pattern as input to children . Another possibility is that the pattern in which the accent is on the penultimate foot of the compound is 'natural' for children in some sense. The above results do not allow us to draw any conclusions regarding the reason for the prevalence of this pattern, i.e. whether it is due to its productiveness in adults'

phonology or to naturalness for children in some sense, that children more frequently produce compounds which are accented on the penultimate foot.

The incorrect answer of type (b) compounds, which was accented on the penultimate foot of the compound, is further considered as follows. As described above, the incorrect answer of the type (b) compounds followed the pattern in which the accent on the final foot of the compound was not retained but a new accent was placed on the penultimate foot. In adults' phonology, when the second element is lexically accented, this accent is basically retained in the resultant compound. However, there are some exceptions observed.

When the second element of the compound is a 2-mora noun accented on the initial mora, some compounds show exceptional accent patterns.

ex.
ni'ngyo + hi'me => ningyo'-hime   (not ningyo-hi'me)
'Little Mermaid'

In addition, when the second element of the compound is a 3-mora noun accented on the second mora, some compounds show individual or conditional variations.

ex.
na'ma + tama'go => nama-tama'go ~ nama-ta'mago 'raw egg'

In sum, in adults' phonology, there are some cases in which the lexical accent of the second element is not retained which is supposed to be retained in the resultant compound, and a new accent is placed on the penultimate foot of the compound.

The analysis of CA rules based on Optimality Theory basically predicts that the 'Parse-accent' constraint outranks the 'Nonfinality-foot' constraint in the adults' phonology. The 'Parse-accent' constraint means that the lexical accent is retained in the resultant compound. The 'Nonfinality-foot' constraint means that a new accent is placed on the penultimate foot of the compound. The exceptions described above indicate that the 'Parse-accent' constraint undergoes demotion, so that it is outranked by the 'Nonfinality-foot' constraint. A possible explanation for this constraint-reranking phenomenon is that the 'Nonfinality-foot' constraint is a 'natural' constraint, and the 'natural' constraint initially outranks other constraints in the constraint hierarchy. Based on this explanation, it is considered that the tendency for children to fail to retain the accent of the second element, and instead place on the incorrect accent on the penultimate foot, is essentially a phenomenon in which children acquire a 'natural' pattern prior to other patterns during the process of acquisition. If placing the accent on the penultimate foot of the compound is 'natural' for children, they should only place the accent on the penultimate foot of the compound without retaining the lexical accent of the second element during the earlier stages of acquisition. Further research on younger children is needed to clarify this assumption.

Thirdly, even when the lexical accent of the second element

was within the syllable, the children tended to retain this accent. In other words, it was retained in the resultant compound both when the second element of the compound was a 2-mora, 1-syllable noun as well as when it was a 2-mora, 2-syllable noun. This suggests that the syllable does not contribute to the CA rules in children's phonology. We assume that children have not acquired sufficient understanding of the syllable to contribute to the CA rules.

With reference to the developmental changes of timing-control and patterns of speech perception, one problem which has been discussed is whether the syllable-based system or the mora-based system is acquired first by Japanese children. There are several studies that suggest children were not exactly able to control utterance and perceive speech based on the mora-timed rhythm at a certain developmental stage. For example, with regard to timing-control in speech production, it was reported that children 4 years of age were not able to produce the mora with the full time span produced by adults. 4. With reference to speech perception, it was reported that 60% of children 4 years of age were not able to distinguish minimal-pairs of words which contained the same number of the syllables but a different number of morae. 5. In view of these facts, several researchers point out the possibility that Japanese children acquire the syllable-based system prior to the mora-based system. However, no definite experimental evidence has been provided to support this view. Therefore, further experiment is needed to confirm whether children acquire the syllable unit or the mora first.

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Table 1. Relative frequency of CA patterns produced by the children for each type of correct pattern (bimoraeic second element). * indecates 1mora, ' indecates accent location.

		children's pattern			
		***'_**	***_*'*	***_**	others
type(a)	***'_** usagi-usi usagi-buta	**81.3**	4.2	0.0	14.6
type(b)	***_*'* usagi-risu usagi-kaba	18.0	**68.0**	0.0	14.0
	***'_** usagi-sai usagi-hyou	**49.1**	43.4	0.0	7.5
type(c)	***_** usagi-yama	50.0	7.7	**23.1**	19.2

Table 2. Relative frequency of CA patterns produced by the children for each type of correct pattern (trimoraeic second element). * indecates 1mora, ' indecates accent location.

		children's pattern		
		***_*'**	***_**'*	others
type(a)	***_*'** usagi-suzume usagi-mogura	**77.2**	0.0	22.8
type(b)	***_*'** usagi-panda usagi-gorira ***_**'*	**90.5**	0.0	9.5
	usagi-obake	30.4	**52.2**	17.4