

THE EMERGENCE OF SPEECH ACT PHRASE: EVIDENCE FROM A LONGITUDINAL STUDY OF TWO JAPANESE-SPEAKING INFANTS*

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1. Introduction

1.1. Pitch Contours before Two-Word Stage

It has been reported that children at the very early stage of language acquisition distinguish their pitch contours depending on their contexts (Dore 1974, Menn, 1975, Marcos 1987, among others). Menn (1975) reports that children make proper use of intonation contours with babbling in specific communicative contexts. In her investigation, she found that children make requests and rejections with intonation contours carried by babble-sequences.

Marcos (1987) also reports that there is a consistency of intonational form-meaning association in the speech of single-word speakers. Based on her observational study with 12 infants' Initial requests, Repeated requests, Giving, Showing and Labeling at the age of 1;5, 1;6.5, 1;8 and 1;9.5, she finds that pitch contours are distinguished in accordance with the intended meaning. In her investigation, the pitch contours for labeling and requests begin to be differentiated at the age of 1;3-1;4. Rising tones are more frequent for requests and falling tones for labeling.

Nakatani (2005) also observes the differentiation of the pitch contours of the babbling and one-word utterances based on her longitudinal observation of Niko, a Japanese-speaking girl at the age of 1;2 to 2;1. She reports that the babbling and one-word utterances of Niko are associated with the rising intonation contour for requests and interrogatives and the lowering intonation contour is found with declaratives. For example, in (1a), Niko was reading a picture book with her mother, and she asked a question using babbling with rising contour. However, in (1b), Niko replied with the falling contour when she was satisfied with the

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answer that the mother gave. We consider that those utterances are declaratives.

(1) Situation: Niko (1;7) is reading a picture book with her mother. She looks at a page with a lot of washing hanged out on the line.

a. Niko: [a↑a↑] + (pointing to an apron)

Mother: Kore wa Aa-tyan no epuron.
 this Top Aa-tyan's apron
 'This is Aa-tyan's apron.'

Niko: [a↑a↑] + (pointing to a pair of trousers)

Mother: Kore wa Aa-tyan no zubon.
 this Top Aa-tyan's trousers
 'This is Aa-tyan's trousers.'

b. Niko: [a:↓a:↓a:↓]

Mother: Un, un, un.
 yes yes yes
 'Yes, yes.'

Niko: [a:↓a:↓a:↓]

Figure 1 and 2 is the result of the PRAAT analysis. As shown in Figure 1, the pitch of the second utterance edge is associated with rising contour. On the other hand, as shown in Figure 2, the pitch contour of the declaratives in babbling is falling, and the pitch is lower than that of request.

Figure 1. F0 contour (pitch contour) of the utterance of babbling [a↑a↑] in request context uttered by Niko at 1;7.

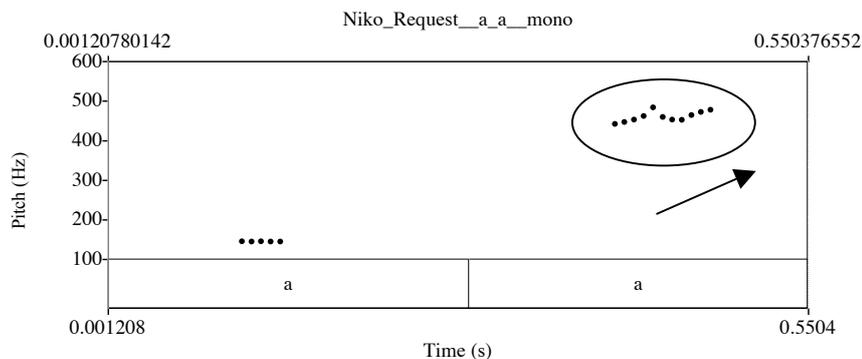
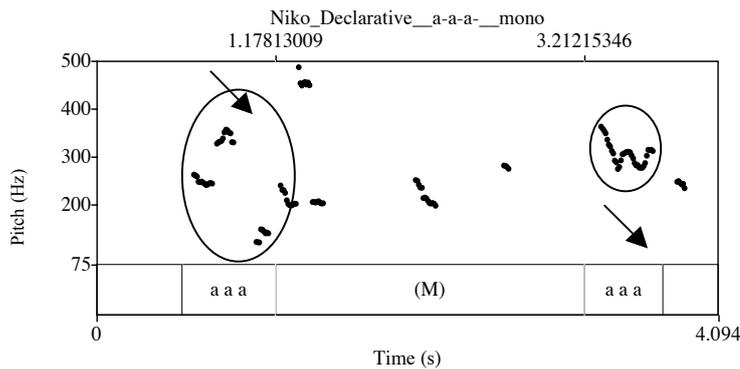


Figure 2. F0 contour (pitch contour) of the utterance of babbling [a:↓a:↓a:↓] in declarative context uttered by Niko at 1;7.



The pattern of intonation in one-word utterances is almost parallel with that of babbling. (2a) is an example of interrogatives and (2b) is an example of declaratives.

(2) Situation: Niko (1; 10) is reading a book.

- a. Niko: [nena] (=sister's name)
 [a: tan] (=mother)
 [nn:↑nn:↑] + (pointing to a pair of pants in a book)

Mother: Aa-tyan to onazi.
 Aa-tyan with same
 'It is the same as Aa-tyan's pants.'

- b. Niko: [ne na↓]
 [a: tan↓]

In (2a), Niko wanted to ask whether those pants were Nena's, her sister, and Aatan's, her mother, properties or not with rising contour. In contrast, in (2b), after her mother replied to her question, she uttered [nena, a: tan] again with satisfaction with falling contour. Figure 3 and 4 are their PRAAT analysis. The pitch contour of each one-word for request is rising at the end of the utterance as shown in Figure 3, while that is falling in the declaratives as shown in Figure 4.

Figure 3. F0 contour (pitch contour) of the utterance of one-word utterance [nena a: tan] in request context uttered by Niko at 1;10.

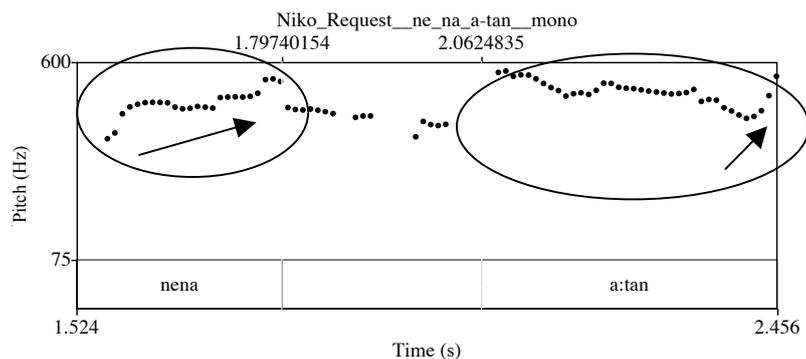
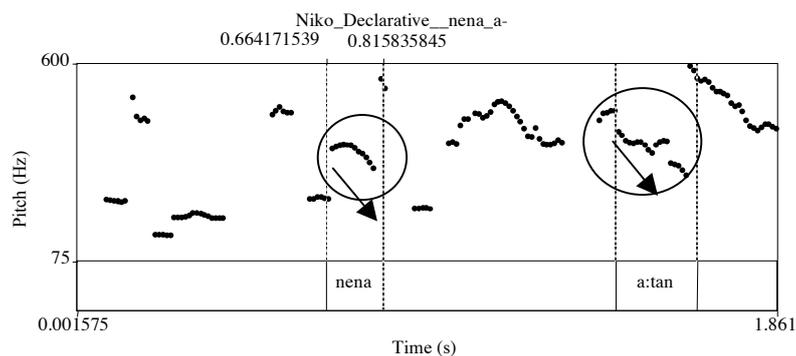


Figure 4. F0 contour (pitch contour) of the utterance of one-word utterance [nena a: tan] in declarative context uttered by Niko at 1;10.



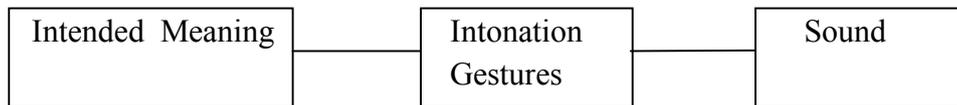
1.2. Continuity Hypothesis

How does the infants' knowledge of speech act differentiated by the intonation and pitch succeed to their syntax? According to Snow (2006), the intonation of their target grammar starts to appear after the two-word utterances. Snow (2006) argues that "the milestone event in children's acquisition of expressive syntax is the appearance of two-word combinations at about 18 months, which coincides exactly with the dramatic growth in intonation that was observed in this and other studies. (p.294)" Contra Snow, Prieto and Varnell (2007) discusses that children's emerging intonation is largely independent of grammatical development on the basis of the observation of four Catalan-speaking children from 12 to 26 months. Despite the fact that the start of the two-word period was so different across the two groups of children, they did not find a substantial difference in the production of nuclear pitch accents and boundary tones. However, they conclude that the infants' meaningful intonation patterns depend on adult interpretation of infants' vocalization, and the interpretation is influenced on the intonation patterns of the target languages. We call this the Discontinuity Hypothesis.

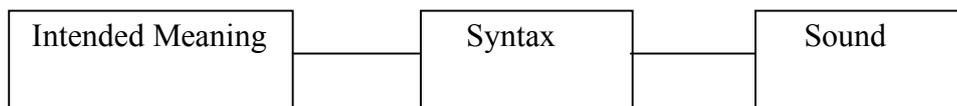
On the other hand, some researchers claim that infants' intonation patterns reflect the grammatical knowledge that they obtain innately. On the line of their theory, controlled intonation is the indication of the finite grammar and it remains in their speech. That is, there

is continuity between child languages and adult languages. We call this the Continuity Hypothesis. For example, Murasugi and Nakatani (2005) argue that the representation of the intended meaning starts before the onset of the single-word utterances, even though the adult lexicon is invisible and the utterances are not verbally syntactically structured. The combination of vocalization with intonation and gestures convey the propositions in babbling and single-word period by controlling intonation and gestures. They propose that the intonation and gestures carry the function that functional categories eventually take care of in the adult grammar and then, the intended meaning is associated with sound. Murasugi and Nakatani's analysis can be schematized as in (3). Children realize their syntax and lexicon by using intonation and gestures to connect intended meaning and sound, and link the discourse and the utterance. Demuth and McCullough (2008) examine the emergence of articles in five English-speaking one- to two-year-olds. They propose that the variability in children's early article use depends on phonological constraints rather than syntactic or semantic limitations. This suggests that there is a stage where children cannot represent the syntactic morphemes just like adults', despite the fact that they have the knowledge of it. From this perspective, we could predict that the meaningful intonations could be involved in the grammatical operations, even though they are invisible at the babbling and one-word stage, supporting the Continuity Hypothesis.

(3) a. Child



b. Adult



1.3. Adult Language

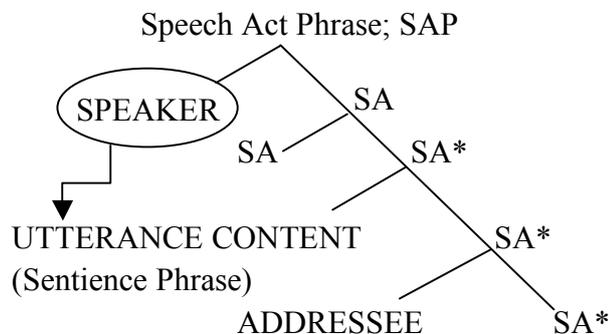
Then, what makes the sentence decide on its sentence type in adult language? Many researchers have said that it gets involved in the CP layers. Rizzi (1997) proposes “CP layers hypothesis” under which CP is a set of some independent projections such as Force, Topic, Focus, and Finite projections, and these projections are in layers. Force works together with Finiteness and specifies types of each sentence such as declarative, question, exclamative, for example. According to Rizzi (1997), CP works as the interface both with discourse and proposition. CP connects the upper structure, discourse, with the lower structure, proposition. Among those projections in the CP layers, the top-most layer projection, Force, is in charge of the interface with discourse, and this is the part relevant in the analysis we follow.

1.3.1. Speech Act Phrase

Basically assuming Rizzi's idea, Speas and Tenny (2003) discuss more closely the interaction between syntax and discourse. They propose that there is a phrase on the top of the syntactic structure called Speech Act Phrase. It corresponds to Force phrase in Rizzi's sense, and has a function to fix the notion of the point of view of the sentence, anchoring the proposition of the sentence in the interface with discourse.

Speech Act Phrase has three kinds of discourse-related roles: Speaker role, Addressee role, and Utterance Content role. These roles are universally available in human grammars like thematic roles, and responsible for the relation between syntax and discourse. Speech Act Phrase has a structure which is similar to the vP-shell structure in the sense of Larson (1988), and the three relevant roles are realized as described in (4) below. To be more precise, Utterance Content role is a role assigned to the phrase called Sentience Phrase which occurs below Speech Act Phrase. Sentience Phrase is a projection which is associated both with the proposition of the sentence and Speech Act Phrase. And, the role which controls the Utterance Content role will be responsible for the anchor of the point of view of the sentence.

(4) Declaratives



Speas and Tenny claim that (4) indicates the structure of declaratives. In (4), the Speaker role c-commands the Utterance Content role. In the Speech act phrase, the Speaker role controls the Utterance Content role, and this indicates that the speaker is the anchor of the point of view in this sentence.

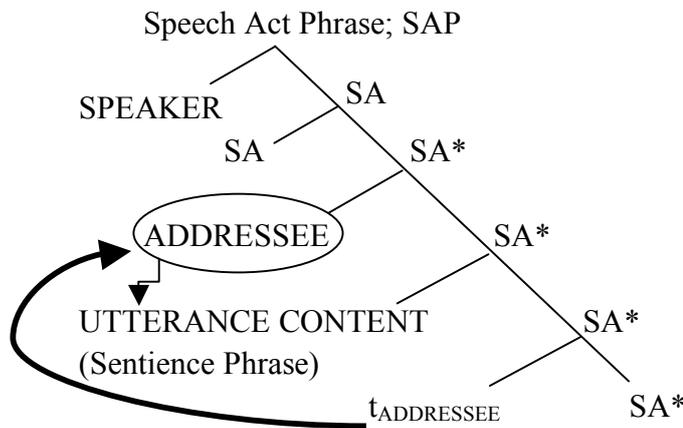
1.3.2. Interrogative Flip

Then, what happens when the speaker is not the anchor of the point of view, but the addressee is the anchor instead? For example, questions (interrogatives) are different from declaratives in that the anchor of their point of view is the addressee, not the speaker. Speas and Tenny (2003) propose that the switching the anchor is induced by a syntactic operation. In the recent work, Tenny (2006) named this operation "Interrogative Flip." They propose that "switching a declarative sentence to an interrogative sentence involves a simple flip of the Utterance Content role with respect to the discourse participants (speaker and addressee)." According to them, Interrogative flip is a completely syntactic operation, parallel to the one

given for dative shift by Larson (1988): The Addressee role moves up from the complement position to the specifier position of the lower head, and the former specifier (the Utterance Content role) is demoted to an adjoined position.

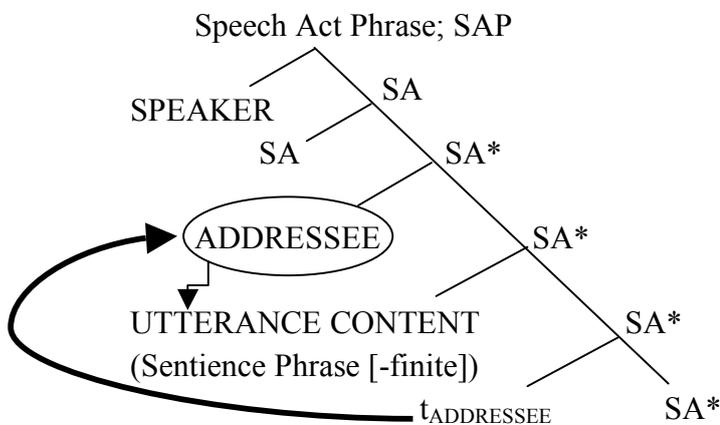
Now, how are interrogatives explained under this analysis? In the structure in (5), the Addressee role moves to the spec position above the Utterance Content role. The Addressee is now the closest c-commander of the Utterance Content, and thus controls it. Therefore, the Addressee becomes the anchor of the point of view in interrogatives.

(5) Interrogatives



In request and imperative sentences, the anchor of the point of view is the addressee just like the interrogatives. In this case too, the Addressee role undergoes the Interrogative Flip, as indicated in (6). Interrogatives on one hand and requests and imperatives on the other differ in that requests and imperatives are associated with nonfinite Sentence Phrase, indicated as [-finite] in (6), while interrogatives are associated with a finite argument.

(6) Imperatives



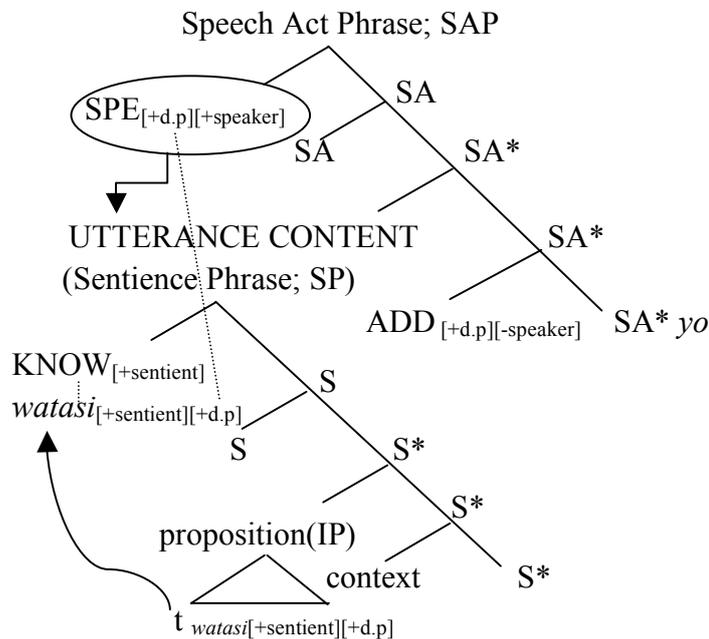
1.3.3. Speech Act Phrase in Japanese

Tenny (2006) develops this framework and compares declaratives and interrogatives in

Japanese. Japanese declaratives have particles *yo* while interrogatives have *ka*, and they appear sentence-finally at the right periphery. These particles indicate whether the sentence is declarative or interrogative. Given the fact, Tenny (2006) conjectures that these particles are the overt realizations of Speech Act head.

According to Tenny (2006), a declarative sentence such as *Watasi wa samui yo* (I feel cold) has a structure as illustrated in (7).

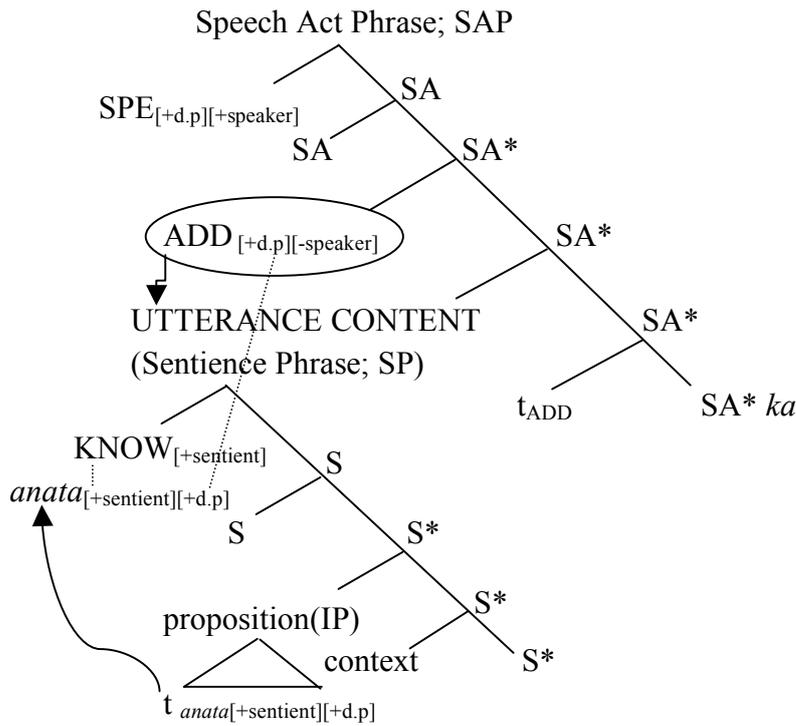
(7) Japanese declarative sentence: *Watasi wa samui yo* (I feel cold)



In a broad way, *watasi* (I) in the propositional phrase (IP), with [+sentient] and [+discourse participant] features, moves to the specifier position of the Sentence Phrase and is associated with [+sentient] of Seat of Knowledge role, which occurs within Utterance Content role. At the same time, [+discourse participant] feature of *watasi* is associated with that feature of the Speaker role. *Watasi* finally is also associated with [+speaker] in the Speaker role. Then, the sentence is licensed as declarative.

Tenny (2006) also shows the structure of Japanese interrogative sentences like *Anata wa samui ka* (Do you feel cold?). In (8), *anata* (you) moves to the specifier position of the Sentence Phrase, and is associated with the [+sentient] of Utterance content role there. Notice that the Speech Act Phrase performs the Interrogative Flip in this case. Hence, the closest c-commander of the Utterance content role is the Addressee role, not the Speaker role. Thus, *anata* is associated with [+discourse participant] and [-speaker] of the Addressee role in this case, and the sentence is licensed as interrogative.

(8) Japanese interrogative sentence: *Anata wa samui ka* (Do you feel cold?)



1.4. Goal of the Study

In this paper, we first examine how infants control pitch contours in babbling and one-word stage based on the longitudinal studies with two Japanese-speaking children from 0 to 2. In section 3, we report the results of our observation. Infants can control the pitch contours for requests, interrogatives, declaratives and exclamatives at the babbling and one-word stage, replicating the results of the previous studies. Based on the results, in section 4, we first summarize our descriptive findings, then we argue that the infant's differentiation of their intonation contours is best analyzed as involving manipulation of Speech Act Phrase, supporting the Continuity Hypothesis. We discuss how the child intonation system is involved in syntactic development using the framework of syntax-discourse interface proposed by Speas and Tenny (2003). We propose that infants at the pre-verbal stage already have Speech Act Phrase and their intonation is part of the representation of it. Then, we argue whether children share the same intonation system as adults' or not, and suggest the continuity in intonation system from the beginning of the language acquisition. Section 5 concludes the study.

2. Method

2.1. Subjects

This study is based on the longitudinal observation of two Japanese-speaking boys. We observed Keitaro, from 0;2 through 1;8 and Yuta from 0;1 through 1;5. Their parents use Japanese exclusively in the daily life.

2.2. Procedures

We constantly videotaped Keitaro for 60 minutes a week, and Yuta for 30 minutes a week. They were videotaped with digital video cameras (Victor GR-D250 for Keitaro and Sharp VL-NZ10 for Yuta). Their data was basically recorded under natural contexts at home with their mothers, or researchers, and/or other caretakers.

2.3. Coding

The collected data was reviewed by the researchers, and divided into 4 groups, requests, interrogatives, declaratives and exclamatives, on the basis of acoustic properties and contexts. We excluded the utterances which are close to crying, and we also excluded repetitions of the adults' utterances.

Phonetic properties of each utterance are analyzed by PRAAT, especially focusing on the pitch contours. PRAAT is software with which we can analyze, synthesize, manipulate speech, and create high-quality pictures for the articles and the thesis. We analyzed all the sound data we collected by this software in this study.

3. Results

3.1. Requests

Requests often appeared in our data. The examples (9) and (10) are some of them. In the context described in (9), Keitaro was playing with his mother. Keitaro was holding a puppet in his hand. He wanted the observer to manipulate the puppet for him. In this study, we regard this situation as a typical case of request. In this context, Keitaro produced babbling such like [e,e,e] as described in (9). When Keitaro asked his mother to operate the puppet, he repeated short and high pitched babbling like [e,e,e]. “↑” indicates that the pitch contour is rising.

(9) Situation: Keitaro (1;5.20) is playing with his mother in the room.

Keitaro: (Giving a puppet to mother)

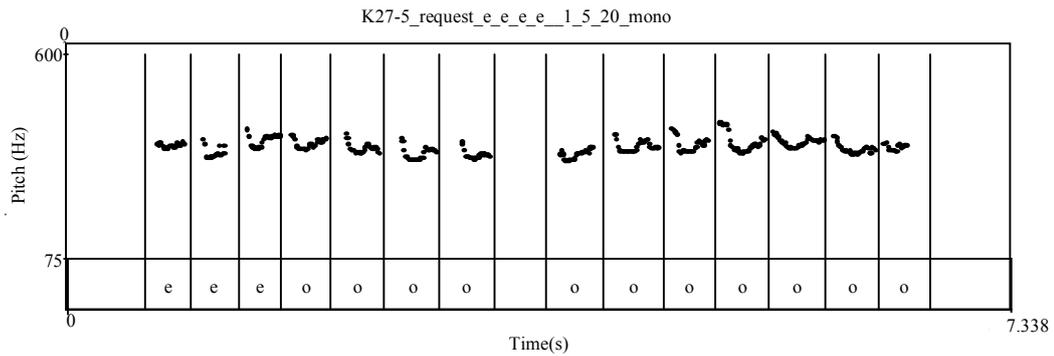
[e↑, e↑, e↑, o↑, o↑, o↑, o↑]

[o↑, o↑, o↑, o↑, o↑, o↑, o↑]

Intended meaning: ‘Manipulate the puppet for me.’

The pitch of each utterance-final-edge is consistently associated with rising contour. The intended meaning of his babbling in (9) could be kind of “Manipulate the puppet for me,” or just “Do it.” Figure 5 shows the results of the PRAAT analysis. It shows that each utterance has almost the same shape, and Keitaro is producing almost the same kind of [e] or [o] repeatedly, raising pitch at the utterance-edge-position.

Figure 5. F0 contour (pitch contour) of the utterance of babbling [e↑, e↑, e↑, o↑, o↑, o↑, o↑] [o↑, o↑, o↑, o↑, o↑, o↑, o↑] in request context uttered by Keitaro at 1;5.20.



The example (10) is another example of request produced by Yuta at the age of 1;4. Yuta was playing with his grandmother in the bathroom and tried to insert and take off a stopper of a sink. However, he could not reach the stopper, so, he made a request with babbles. The intended meaning of the utterance is ‘I want to insert a stopper.’ He made the request with repeated babbles with rising contour. Figure 6 is the PRAAT analysis of (10).

(10) Situation: Yuta (1;4.23) is trying to insert a stopper.

Yuta: [a↑a↑a↑a↑ a↑a↑a↑a↑]+ (reaching out his hand for a stopper.)

Intended meaning: ‘I want to insert a stopper by myself.’

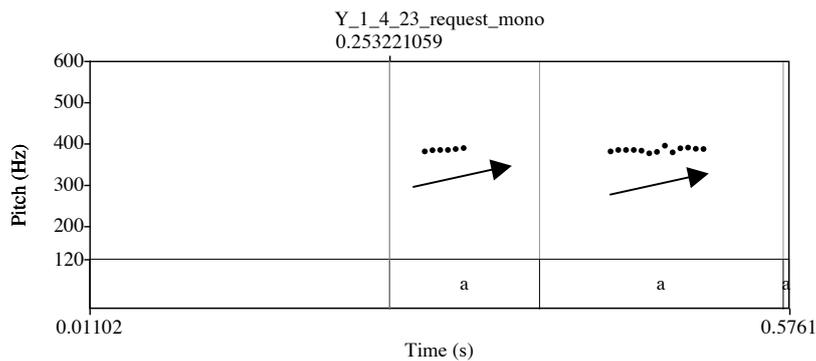
Mother: Hame tai no?
insert want Q

‘Do you want to insert a stopper?’

Yuta: [a↑]

Intended meaning: ‘Yes, I want!’

Figure 6. F0 contour (pitch contour) of the utterance of babbling [a↑a↑a↑a↑a↑a↑a↑a↑a↑] in request context uttered by Yuta at 1;4.23.



The percentage of two infants' utterances with rising and non-rising pitch contours in the request context observed in a 60-minute session, which is randomly picked up from whole data, is presented in Table 1.

Table 1. Percentage (number) of rising / falling pitch contours in the request context

Subject	Rising	Not Rising (Falling)
Keitaro (Total utterances=8)	100%(8)	0%(0)
Yuta (Total utterances= 57)	93%(53)	7%(4)

3.2. Interrogatives

We collected the data of interrogative context from Keitaro and Yuta. One of the examples is described in (11). In (11), Keitaro was playing with his mother. He was looking at flowers in the vase. Then he began to play with them. His mother told him not to do so. Then, apparently, he asked back what she said. We conjecture that this would be a typical case of interrogatives by the infants.

(11) Situation: Keitaro (1;4.6) is on the table, touching flowers in the vase.

Mother: Ohana wa daizi da yo.
flowers Top precious copula Part

‘You must cherish the flowers. They are precious.’

Keitaro: [e↑] [e↑] (Then, Keitaro looks at mother.)

Intended meaning: ‘What did you say?’

Mother: N? daizi da mon.
huh precious copula Part

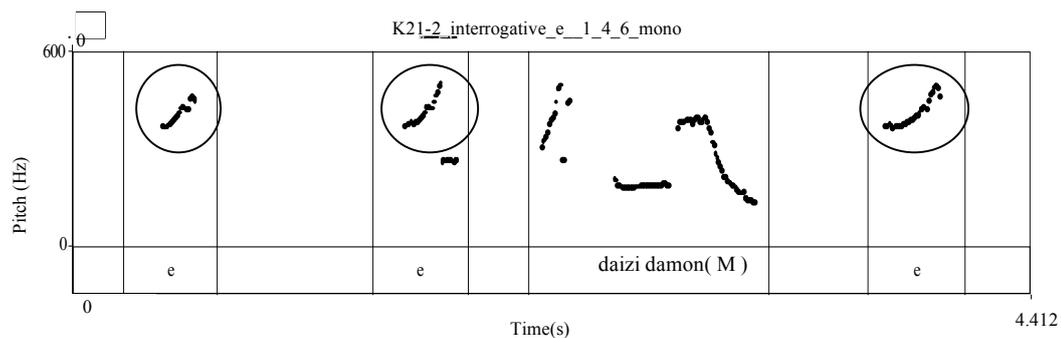
‘Huh? I said they are precious.’

Keitaro: (Looking at mother) [e↑]

Intended meaning: ‘What did you say?’

When Keitaro asked the question to his mother, he produced short and high pitched babbling, and its end was rising. The intended meaning could be kind of “What did you say now?” Whenever he babbled in this question context, he produced the same pattern of utterance whose final-edge was raised. Figure 7 shows that the babbling utterance in the interrogative context is short and has rising pitch contour at the end.

Figure 7. F0 contour (pitch contour) of the utterance of babbling [e↑] in interrogative context uttered by Keitaro at 1;4.6. (Circled)



The next example is also considered to be interrogative. In (12), Yuta was opening a present with his grandmother, wondering what was in it. When he looked into the bag, he uttered [a:], whose intended meaning would be ‘What’s in it?’ Then, after he found the things in the bag, he uttered [atta ta], which probably meant he found something in it. [atta ta] or [atta] is one of the one-words which he produced frequently at that time. Figure 8 is the PRAAT analysis of (12). It shows the rising pitch contour.

(12) Situation: Yuta (1;5.19) opens a bag of present.

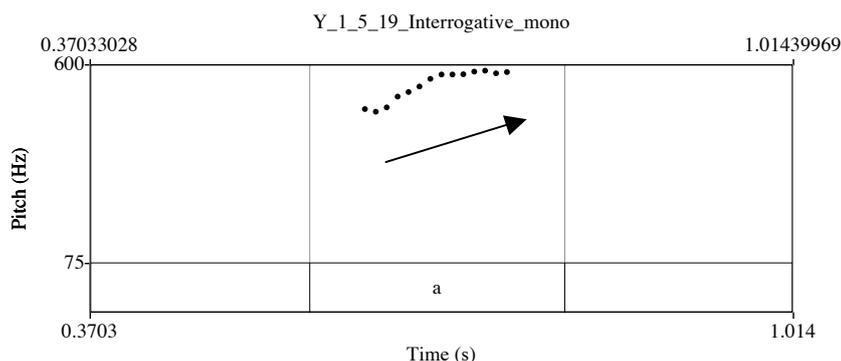
Yuta: [a:↑] + (looking into the bag)

Intended meaning: ‘What’s in it?’

[atta ta]

Intended meaning: ‘I found something in it.’

Figure 8. F0 contour (pitch contour) of the utterance of babbling [a↑] in interrogative context uttered by Yuta at 1;5.19.



The percentage of two infants' utterances with rising and non-rising pitch contours in the interrogative context observed in a 60-minute session, which is randomly picked up from whole data, is presented in Table 2.

Table 2. Percentage (number) of rising/ falling pitch contours in the interrogative context

Subject	Rising	Not Rising (Falling)
Keitaro (Total utterances=28)	100%(28)	0%(0)
Yuta (Total utterances= 2)	100%(2)	0%(0)

3.3. Declaratives

We also collected the utterances which were considered to be declaratives. In (13) Keitaro was watching his favorite movie. Suddenly the video stopped (the observer stopped the video on purpose), and the picture he saw disappeared. Keitaro described what has just happened in front of him by babbling [a]. The intended meaning could be kind of 'Something unusual has happened.' or 'It stopped.'

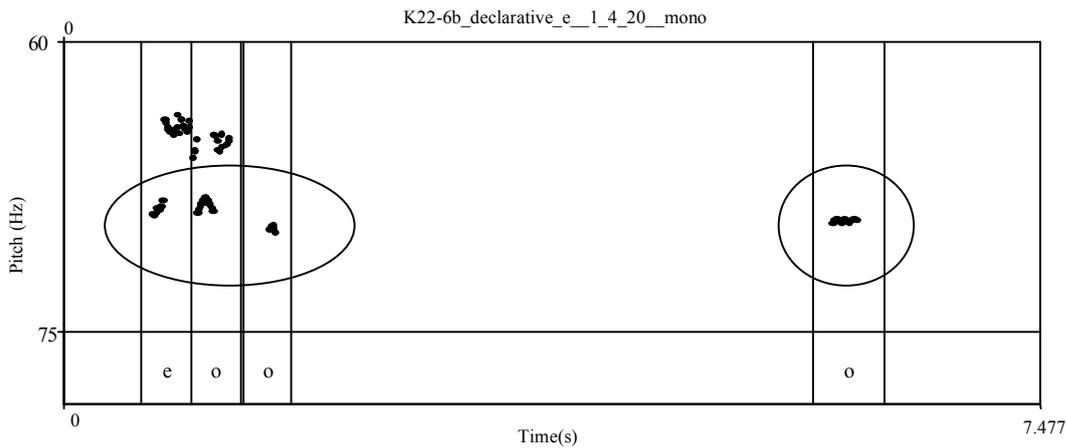
- (13) Situation: Keitaro (1;4.20) is watching movie. Suddenly the video stops and the picture disappears.

Keitaro: (Pointing at a part of the picture) [e, o, o↓][o]

Intended meaning: 'Something strange has happened.'

In this example, there is no rising pitch contour at the end of each utterance. This is the major difference from the utterances in the request and interrogative context. Figure 9 is the PRAAT result of Keitaro's utterance in (13). There is no rising pitch contour at the end of utterances.

Figure 9. F0 contour (pitch contour) of the utterance of babbling [e,o,o↓][o] in declarative context uttered by Keitaro at 1;4.6. (Circled)



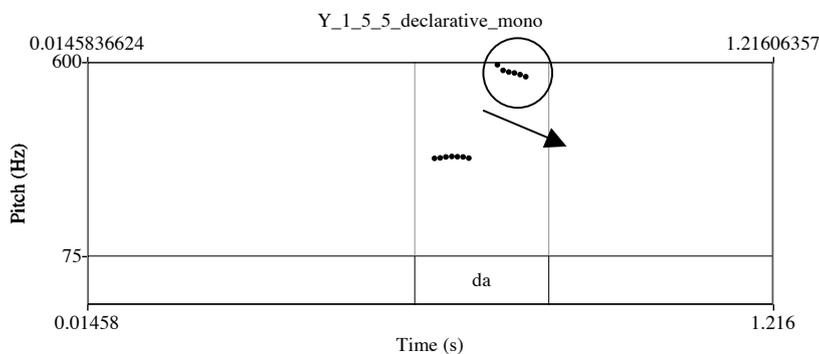
The example (14) is another example of declaratives produced by Yuta. In (14), Yuta was reading a picture book by himself. Every time he turned a page, he made babbling. We judge these utterances to be declaratives because that the book was one of his favorite and he had read the book over and over. We consider that he was describing the content of the story in the page such as “Here is a frog.” Yuta pointed to a frog on the page, and produced [da:] with falling contour as Figure 10 illustrates.

(14) Situation: Yuta (1;4.6) is reading a picture book by himself.

Yuta: [da↓] + (pointing to a frog on the page)

Intended meaning: ‘Here is a frog.’

Figure 10. F0 contour (pitch contour) of the utterance of babbling [da] in declarative context uttered by Yuta at 1;4.6. (Circled)



The percentage of two infants’ utterances with rising and non-rising pitch contours in the declarative context observed in a 60-minute session, which is randomly picked up from whole data, is presented in Table 3.

Table 3. Percentage (number) of rising / falling pitch contours in the declarative context

Subject	Rising	Not Rising (Falling)
Keitaro (Total utterances=28)	0%(0)	100%(28)
Yuta (Total utterances= 169)	3%(5)	97%(164)

3.4. Exclamatives

Lastly, we show the examples of exclamatives. When people describe something in surprise, they employ exclamatives. In (15), Keitaro was playing with his aunt. They were playing with an umbrella. First, Keitaro made a request to his aunt to open the umbrella by raising intonation, and then, his aunt opened the umbrella. What we focus here is the moment when the umbrella was opened. She opened the umbrella and showed it to him, and he was very surprised at the sudden motion of the umbrella. At the moment when the umbrella was opened, he said [oo] in admiration. We refer to the utterance made in this kind of situation as exclamatives.

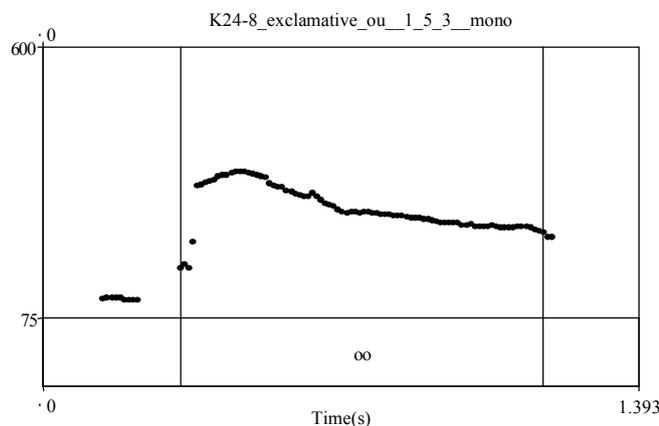
- (15) Situation: Keitaro (1;5.3) plays with his aunt with an umbrella. Keitaro's aunt opens the umbrella and shows it to him, and he is surprised at the motion of the umbrella.

Keitaro: (Looking at the umbrella) [oo↓]

Intended meaning: 'It's open!'

As shown in Figure 11, there is no rising pitch contour at the end of Keitaro's utterance in (15).

Figure 11. F0 contour (pitch contour) of the utterance of babbling [oo↓] in exclamative context uttered by Keitaro at 1;5.3.



Utterances in (16) are the other examples of exclamatives in babbling and declaratives in one-word, respectively. In (16), Yuta was reading a picture book with his father. When he looked at a picture of a ladder truck, he produced [oa:] with falling contour with excitement. Then he looked at the same truck on the page and produced [bapu], which meant 'bus' with falling contour, although father told Yuta the name of the truck, a ladder truck. [bapu] is an

overgenerated noun referring to the big square cars in general, and one of the earliest one-word utterance that Yuta acquired.

(16) Situation: Yuta (1;5.15) is reading a picture book with his father.

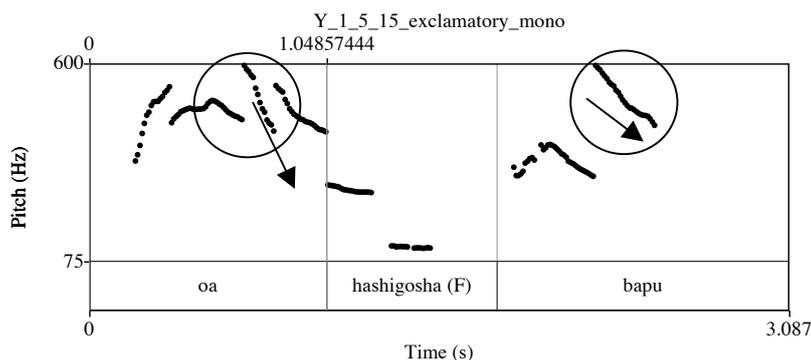
Yuta: [oa:↓] + (look at a picture of a ladder truck)
 Intended meaning: ‘What a cool truck!’ [exclamative]

Father: Oo, hashigosa.
 oh ladder truck
 ‘Oh, it’s a ladder truck.’

Yuta: [bapu↓] + (look at a picture of a fire engine)
 bus
 Intended meaning: ‘It’s a bus.’ [declarative]

Figure 12 is the PRAAT analysis of (16). The pitch contours of both utterances, exclamative in babbling and declarative in one-word, are falling. Nakatani (2005) reports that babbling and one-word utterances shared the same intonation patterns. Our results are consistent with her report. In addition, the duration of the babble of exclamative is longer than that of requests and interrogatives.

Figure 12. F0 contour (pitch contour) of the utterance of babbling [oa↓] in exclamative context uttered and the utterance of [bapu↓] by Yuta at 1;5.15.



The percentage of two infants’ utterances with rising and non-rising pitch contours in the exclamative context observed in a 60-minute session, which is randomly picked up from whole data, is presented in Table 4.

Table 4. Percentage (number) of rising / falling pitch contours in the exclamative context

Subject	Rising	Not Rising (Falling)
Keitaro (Total utterances=4)	25%(1)	75%(3)
Yuta (Total utterances= 10)	0%(0)	100%(10)

3.5. Summary

In Table 5, we summarized the phonetic patterns of utterances produced by Keitaro and Yuta depending on the context. Surprisingly, both infants shared exactly the same phonetic properties in each context, and each sentence type is characterized by distinctive phonetic patterns. In the context of request, the pitch contours are both rising at the end of utterances. In addition, the utterances were made in repetition with intensity, and the duration is relatively short. In interrogatives, the pitch contours are also rising, but the utterances are not repeated. Then, in declaratives, the pitch contours are falling, and the duration is relatively short. Finally, in exclamatives, the pitch contours are falling, but the duration of them is relatively long. In addition, the utterances of exclamatives are rather intensified compared to the declaratives.

Table 5. Summary of phonetic properties of each context

Type of sentence	Subject	Pitch contours	Duration	Intensity	Repetition
Requests	Keitaro	Rising	Short	Intensified	Repetition
	Yuta	Rising	Short	Intensified	Repetition
Interrogatives	Keitaro	Rising	-	-	No repetition
	Yuta	Rising	-	-	No repetition
Declaratives	Keitaro	Falling	-	-	(Repetition)
	Yuta	Falling	-	-	(Repetition)
Exclamatives	Keitaro	Falling	Long	Intensified	No repetition
	Yuta	Falling	Long	Intensified	No repetition

4. Discussion

4.1. Descriptive Findings in the Study

The present longitudinal study indicates that Keitaro and Yuta can skillfully control the four distinctive patterns of babbling, depending on the contexts. The most crucial phonetic property is the presence (and absence) of rising pitch contours. The subjects in the present study crucially control the pitch contour at very early stage of acquisition.

Our findings clearly support the claim by Nakatani (2005), Murasugi and Nakatani (2005), Murasugi and Nakatani-Murai (2007), and Nakatani-Murai (2008). Besides, we found another interesting fact. Keitaro and Yuta control the intonation patterns in the exclamative context as well. Utterances produced by the subjects in the contexts of request and interrogative are quite similar in that they both have the rising pitch contours at the end of the utterances. Unlike interrogatives and requests, declaratives and exclamatives do not involve the rising pitch contours at the end of utterances. These phonetic findings are confirmed more accurately by the use of PRAAT analysis in the present study.

The results we obtained from the subjects are exactly the same despite the fact that they were brought up in the different environment. The present results therefore reveal that there is

uniformity in the properties of pitch contours produced by the Japanese-speaking infants before two-word stage.

4.2. Speech Act Phrase in Child Grammar

Now, we discuss why infants control pitch contours, and distinguish requests and interrogatives from declaratives and exclamatives. The present data of pitch-controlled babbling possibly indicate that some part of syntactic faculty. We suggest that children in fact do make distinction even before two-word stage, and argue that Speas and Tenny's (2003) and Tenny's (2006) theory of Speech Act Phrase would provide a natural explanation for the infants' distinctive use of pitch contours.

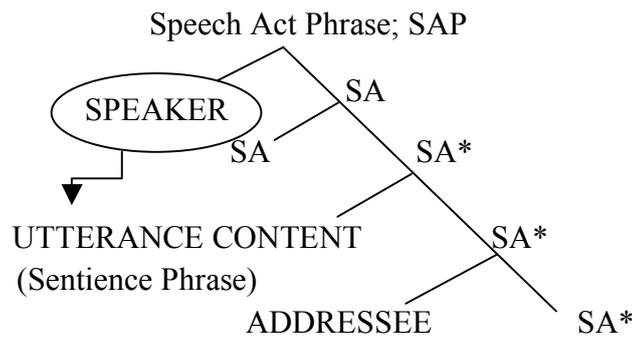
First of all, we clarify what infants know at the stage in question, as is summarized in (17). First, our descriptive findings show that infants seem to distinguish the presence or absence of the addressee. This fact suggests that they seem to know that the notion of addresser and addressee is necessary to identify a sentence already.

(17) What infants know at the stage in question:

- a. Point of View:
Infants can distinguish the presence or absence of the addressee.
- b. Pitch Contour:
When the infants ask or request for something, or when they expect responses from someone else, they produce babbling with the rising pitch contours.
- c. "Proposition":
Ask something (Food, or their curious things) or Describe something(interesting) (but they do not talk about past or future, nor unrealistic events.)
- d. "Syntax":
No verbal "combination"

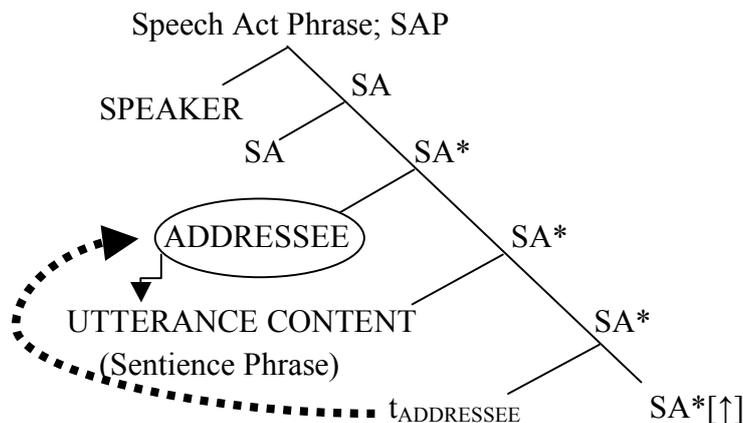
Under the theory of Speech Act Phrase, we analyze that when children produce utterances without rising pitch contours, the Addressee role in the Speech Act Phrase does not undergo Interrogative Flip. The infants' utterances therefore have a structure like (18). In (18), the Speaker role c-commands the Utterance Content role. The structure indicates that the speaker is the anchor of the point of view, and the sentence is interpreted as declarative. In other words, Speech Act head that does not perform Interrogative Flip does not trigger rising pitch contours by hypothesis, so that the declarative utterances are produced without rising pitch contours.

(18) Child Declaratives: [a] (No Interrogative Flip → No rising intonation)



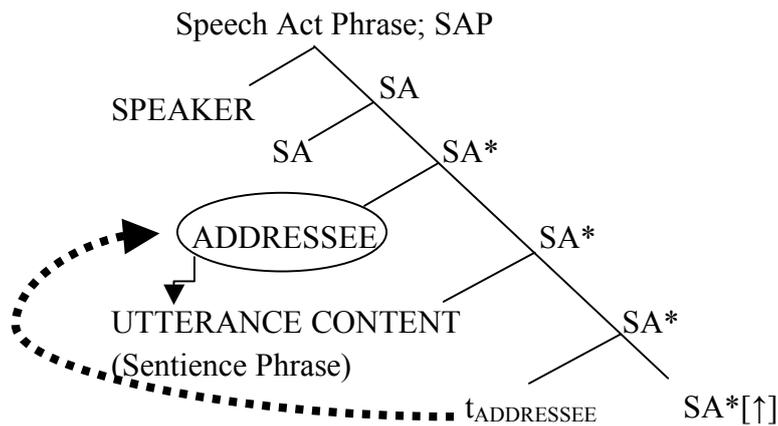
In child interrogatives, on the other hand, we analyze that Speech Act head that performs Interrogative Flip does trigger rising pitch contours by hypothesis, so that the declarative utterances are produced without rising pitch contours in this case. The structure of interrogatives that children have would be, just like adult grammar, something like (19) according to Speas and Tenny's framework. In (19), the Addressee role moves to the specifier position above the Utterance Content (proposition) role. The Addressee is now the closest c-commander of the Utterance Content (proposition) role. Then, the Addressee controls the Utterance Content, and become the anchor of the point of view.

(19) Child interrogatives: [e↑] (Interrogative Flip → Rising intonation)



Crucially, recall here that Speas and Tenny analyze both interrogatives and requests in the same way with respect to the Interrogative Flip. Under their analysis, children's pitch contours can be interpreted as those directly reflecting the natural class of interrogatives and requests. Children raise the pitch contour at the utterance edge for both types of utterances. Hence, in the case of child's requests, just like the interrogatives, the Addressee role moves to the spec position above the Utterance Content role by Interrogative Flip. The Addressee is now the closest c-commander of the Utterance Content argument as shown in (20). In requests, like interrogatives, the Addressee controls the Utterance Content role, and become the anchor of the point of view.

(20) Child Imperatives: [e↑, e↑, e↑, e↑] (Interrogative Flip →Rising intonation)



To summarize, the distinctive pitch contours found between requests/interrogatives and declaratives reflect the very early stage of child syntactic structure. At this stage, the topmost edge of CP layers, namely Speech Act Phrase, is at least realized as we can see from phonological properties such as pitch contours (and possibly gesture or eye gazing) employed by infants.

4.3. Pitch Contours in Infants' Babbling under Continuity Hypothesis

In this section, we consider the adult pitch contours for each context. In the interrogative sentence, the adults raise pitch contours at the sentence edge position, while they do or sometimes do not raise pitch contours at the end of the request sentences. Infants, on the other hand, raise pitch contours at the end of both request and interrogative utterances. We therefore also need to explain why infants, before “sentences” show up in their production, exclusively raise the pitch contour for requests, unlike adult.

It is generally considered that the feature in the head of CP layers is responsible for the adult pitch contour for interrogatives, request and declaratives. Several projections in the derivation are involved in the system, and the syntactic operation, such as Subject-Aux Inversion or Fronted versus in situ wh-questions, are also associated with the pitch contour. The pitch contours at the end of sentences are determined as a result of those proper licensing processes of “whole syntax” including Speech Act Phrase.

Though one might say that this fact indicates that infants have different licensing system from adults at the beginning of acquisition, we do not consider this is the case. We make a detailed PRAAT analysis of adults' requests, and show that the request in full sentences equips the falling pitch contour, while the casual request, which is not syntactically completed, is actually associated with the rising pitch contour as in (21) and Figure 13.

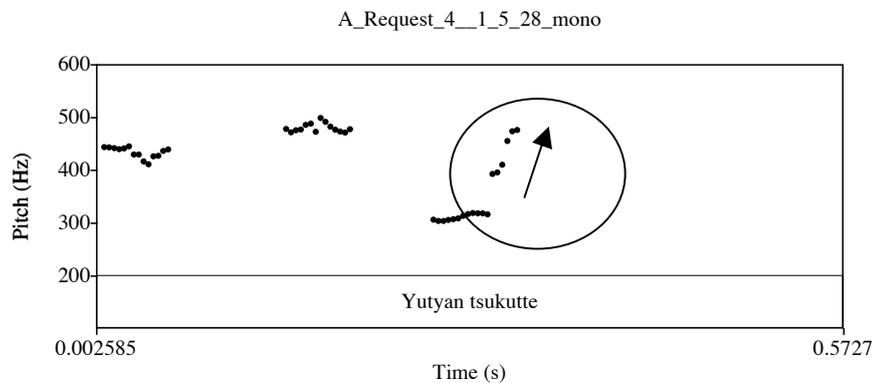
(21) Situation: Yuta's grandmother asks Yuta to lay blocks.

Grandmother: Yuutyān, tukuttemite.

Yuutyān lay-them-up

'Yuutyān, lay them up.'

Figure 13. F0 contour (pitch contour) of the utterance 'yuutyān, tukuttemite' in request context uttered by Yuta's grandmother. (Circled)



We consider that this result indicates that what apparently looks like the child-specific intonation pattern is not in fact deviant from adults', but is, in fact, in accordance with the intonation pattern associated with the truncated phrases in the adult grammar. We therefore suggest that once the whole phrases of the sentence are "verbalized," then, the children will begin to employ the "adult-like" lowering pitch contours in request sentences. Our findings indicate that the infants share the same intonation patterns with adults from the very beginning of acquisition, thereby supporting the Continuity Hypothesis.

5. Conclusion

In this paper, we examined how infants at the babbling and one-word stage controlled their pitch contours in accordance with the context based on the longitudinal observation with two Japanese speaking infants. We reported that the pitch contours in requests and interrogatives rises, but in declaratives and exclamatives falls. On the basis of these descriptive findings, we analyzed that the infants, whose utterances are not verbally syntactically realized, already have Speech Act Phrase and they can discriminate the sentence type. We proposed that children do have at least the CP layers (more specifically, Speech Act Phrase), the edge of the syntactic structure, from the beginning of acquisition, and they verbalize it by employing phonological properties such as pitch contours, (and possibly gestures or eye gazing) in the very early stage of acquisition. In addition, based on a detailed PRAAT analysis, we also reported that children and adults share the same intonation patterns from the very early stage of language acquisition. Taken together, the findings suggest that there is continuity between pre-verbal and verbal stage.

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