

# The Acquisition of Contrastive Implicatures

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## *Abstract*

*This paper discusses children's acquisition of pragmatic knowledge by examining contrastive implicatures (CIs) induced by the focus particle wa 'Foc' in child Japanese. The results of an experiment show that the knowledge of CIs induced by wa 'Foc' is available to Japanese-speaking children early on, which is contrary to the assumption of the Pragmatic Delay model of the course of language acquisition, according to which pragmatic knowledge is acquired late.*

*Keywords: implicatures, contrastive wa in Japanese, models of the course of language acquisition*

## 1. Introduction

The aim of this paper is to discuss the acquisition of pragmatic knowledge. In previous studies of first language acquisition based on the theory of generative grammar, two models of the course of language acquisition have been proposed that make different assumptions concerning children's acquisition of pragmatic knowledge. One is the Pragmatic Delay model, which assumes that pragmatic knowledge is acquired late.<sup>1</sup> The other is the Modularity Matching model (Crain and Thornton (1998), Crain and Wexler (1999)), which assumes that children have adult-like pragmatic knowledge. In this paper, I would like to show new-found data on Japanese-speaking children's acquisition of contrastive implicatures (CIs) induced by the focus particle *wa* 'Foc', and examine the validity of the two models.

This paper is organized as follows: In section 2, I will define CIs induced by *wa* 'Foc'. In section 3, I will investigate CIs induced by *wa* 'Foc' in child Japanese. After reviewing previous experimental work from Kobayashi (1992), (section 3.1), I will show the results of a new experiment on children (section 3.2). In section 4, based on the data obtained through the experiment in section 3.2, I will argue that Japanese-speaking children have the knowledge of CIs induced by *wa* 'Foc' early on. Implications for models of the course of language acquisition will be discussed (section 4.1), and other issues arising from the results of the experiment in section 3.2 will be considered (sections 4.2 and 4.3). In section 5, I will make a conclusion.

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<sup>1</sup> "The Pragmatic Delay model" is the term borrowed from Chierchia et al. (1998) and Chierchia et al. (2001).

## 2. Contrastive Implicatures Induced by *Wa* 'Foc'

In Terunuma (2003), I defined CIs induced by *wa* 'Foc' in Japanese as in (1), borrowing the terminology from Rooth (1985, 1992).

- (1) When the assertion of the sentence is  $\llbracket \dots \alpha_F \dots \rrbracket^o$ , one of the propositions contained in  $\llbracket \neg[\dots \alpha_F \dots] \rrbracket^f$  is true. (Terunuma (2003: 205))

$\alpha_F$  in (1) indicates a focus marked by contrastive *wa* 'Foc'.  $\llbracket \quad \rrbracket^o$  and  $\llbracket \quad \rrbracket^f$  are the ordinary semantic value and the focus semantic value respectively.  $\alpha_F$  in the focus semantic value is a variable identical with  $\alpha$  in type. The focus semantic value of a sentence containing  $\alpha_F$  is a set of propositions, of which the ordinary semantic value of the sentence is a member.

The definition in (1) amounts to saying that CIs are always computed at the level of root clauses. However, CIs induced by *wa* 'Foc' can be embedded. Let us consider the case of (2) as an example. Having the object noun phrase in the embedded clause marked by contrastive *wa* 'Foc', the sentence in (2) has the following interpretation: "Mary didn't eat an apple but ate something else, and John is aware of it."<sup>2, 3</sup>

- (2) John-wa Mary-ga ringo-wa tabe-nakat-ta koto-o shitteiru.  
 John-Top Mary-Nom apple-Foc eat-Neg-Past fact-Acc know-Pres  
 'John knows the fact that Mary didn't eat an apple.'

If CIs were always computed at the level of root clauses, the CI of (2) would be that at least one of the propositions contained in (3a) is true. The set of propositions indicated by (3a) is something like (3b).

- (3) a.  $\llbracket \neg[\text{John knows that Mary didn't eat [an apple]}_F] \rrbracket^f$   
 b.  $\{ \neg[\text{John knows that Mary didn't eat an apple}], \neg[\text{John knows that Mary didn't eat a banana}], \neg[\text{John knows that Mary didn't eat an orange}], \dots \}$

The interpretation of (2) mentioned above does not immediately result from the CI computed in this way plus the assertion of (2). In contrast, if the CI of (2) is computed at the level of the

<sup>2</sup> The particle *wa* has been classified into two types in the literature: contrastive *wa* 'Foc' such as that marking the embedded object noun phrase in (2) in the text, and thematic *wa* 'Top' such as that marking the main subject noun phrase in (2) in the text. Kuno (1973: 47) and Nakanishi (to appear) point out the prosodic difference between them. McGloin (1987) points out some syntactic differences between them as well.

<sup>3</sup> In this paper, I will use the following notation: Top = topic, Foc = focus particle, Nom = nominative, Acc = accusative, Pres = present tense morpheme, Past = past tense morpheme, SFP = sentence-final particle.

embedded clause, it would imply that at least one of the propositions contained in (4a), which indicates a set of propositions like (4b), is true.

- (4) a.  $\llbracket \neg\neg[\text{Mary ate [an apple]}_F] \rrbracket^f$   
 b.  $\{ \neg\neg[\text{Mary ate an apple}], \neg\neg[\text{Mary ate a banana}], \neg\neg[\text{Mary ate an orange}], \dots \}$

The interpretation of (2) mentioned above naturally derives from such an embedded CI.<sup>4</sup>

Thus, I argue that CIs induced by *wa* 'Foc' are computed at each clause. That is, the definition in (1) needs to be replaced by (5), and the computation following (5) should be done clause-by-clause.<sup>5</sup>

- (5) The clause whose ordinary semantic value is  $\llbracket \dots\alpha_F \dots \rrbracket^o$  gives rise to the implication that at least one of the propositions contained in  $\llbracket \neg[\dots\alpha_F \dots] \rrbracket^f$  is true.<sup>6</sup>

<sup>4</sup> The observation that CIs can be embedded is inspired by Chierchia (2001), who points out the existence of embedded scalar implicatures (SIs). According to Chierchia (2001), the sentence in (i), giving rise to a SI, is interpreted as follows: "Some though not all students are waiting for John, and John is aware of it."

(i) John knows that some students are waiting for him.

If SIs are computed at the level of root clauses, as the (neo-)Gricean view of SIs in Grice (1975), Horn (1972, 1989) and Levinson (1983) assumes, the SI of (i) is (ii).

(ii) It is not the case that John knows that every student is waiting for him.

The interpretation of (i) mentioned above, however, does not derive straightforwardly from the SI in (ii) plus the assertion of (i). If SIs are computed at the level of embedded clauses, by contrast, the SI of (i) is (iii).

(iii) John knows that it is not the case that every student is waiting for him.

The interpretation of (i) mentioned above naturally derives from the SI in (iii) plus the assertion of (i).

<sup>5</sup> Based on the observation that there are embedded SIs, Chierchia (2001) argues that at least SIs among pragmatic phenomena are computed in the pragmatic component at each relevant step of a derivation in tandem with computations in the syntactic and the semantic components. The architecture of grammar envisaged in Chierchia (2001) is in conformity with the one assumed in Chomsky (2001), who assumes that computations in the three components of language, namely the syntactic, the phonological, and the semantic components, are done in parallel at each phase. Chierchia (2001) extends the enterprise in Chomsky (2001) to the pragmatic component.

Clause-by-clause computations of CIs induced by *wa* 'Foc' are feasible in the architecture of grammar in Chierchia (2001). However, even if computations in the components of language are serial, namely even if the output representation of one component is passed on to another component as the input, clause-by-clause computations of CIs are possible as long as pragmatic computations can be done cyclically in the relevant component. More investigation is needed as to how implicatures are computed in the architecture of grammar.

<sup>6</sup> Kuroda (1970) and Kato (1985: 88) point out that CIs induced by *wa* 'Foc' can be divided into two types. Using the terminology in this paper, the two types of CIs are represented as in (ia, b). (ia) is the same as (5) in the text.

(i) The clause whose ordinary semantic value is  $\llbracket \dots\alpha_F \dots \rrbracket^o$  gives rise to the implication  
 a. that at least one of the propositions contained in  $\llbracket \neg[\dots\alpha_F \dots] \rrbracket^f$  is true, or  
 b. that it is not certain whether propositions contained in  $\llbracket \dots\alpha_F \dots \rrbracket^f$  except  $\llbracket \dots\alpha_F \dots \rrbracket^o$  are true.

Kuroda (1970: 145) claims that CIs in (ib) are basic and that CIs in (ia) are possible depending on contexts. I rather regard (ia) as salient CIs, however, because informants I consulted, as well as I, hit

### 3. Contrastive Implicatures Induced by *Wa* 'Foc' in Child Japanese

#### 3.1. A Previous Study: Kobayashi (1992)

Kobayashi (1992) conducted an experiment to investigate whether Japanese-speaking children could understand CIs induced by *wa* 'Foc'. To the best of my knowledge, this is the only experimental work on the acquisition of CIs induced by *wa* 'Foc' in Japanese.

The purpose of her experiment was to examine Japanese-speaking children's interpretations of two kinds of test sentences. In one kind of test sentence, the object noun phrase is marked by contrastive *wa* 'Foc'. In the other kind, it is marked by the accusative Case particle *o*. These are exemplified in (6) and (7) respectively.

- (6) *Watashi-wa koppu-wa arai-masu.*  
I-Top glass-Foc wash-Pres  
'I will wash the glass.'
- (7) *Watashi-wa koppu-o arai-masu.*  
I-Top glass-Acc wash-Pres  
'I will wash the glass.'

In adult Japanese, the former kind of test sentence gives rise to a CI in which the entity referred to by the object noun phrase ( $O_1$ ) is contrasted with another entity ( $O_2$ ). The test sentence in (6), for example, has the CI "I won't wash  $O_2$ " in addition to the assertion "I will wash  $O_1$ ". Using the terminology adopted in section 2, the assertion and the CI of the test sentence in (6) are represented as in (8a) and (8b) respectively.

- (8) a.  $\llbracket$  I will wash [the glass]<sub>F</sub>  $\rrbracket^o$   
b. At least one of the propositions contained in  $\llbracket \neg$ [I will wash [the glass]<sub>F</sub>  $\rrbracket^f$  is true.

On the other hand, the latter kind of test sentence does not give rise to a CI. For example, the test sentence in (7) has the same assertion as (8a) except that the object noun phrase is not a focus, and does not have the CI in (8b). The sentence remains neutral as to whether or not  $O_2$  will be washed.

Let us take a look at the design and procedure of Kobayashi's (1992) experiment. First the experimenter makes an utterance that includes a test sentence, while showing a picture, in

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upon CIs in (ia) first when they are given sentences containing *wa* 'Foc' out of the blue. In the remainder of this paper, I consider CIs induced by *wa* 'Foc' to be (ia), namely (5) in the text, unless it is specified otherwise explicitly.

front of a child. When the test sentence is (6), for example, the experimenter's utterance is either (9) or (10), and the picture shown with it is like Figure 1.<sup>7</sup> At the beginning of the experimenter's utterance, the test sentence is presented as an utterance of a girl named Hanako. Since all the test sentences have first person singular pronoun *watashi* 'I' as the subject noun phrase and are affirmative sentences expressing future time, they always describe what Hanako is going to do with  $O_1$ . After the test sentence presented as Hanako's utterance, the experimenter's own opinion is shown on what Hanako will do with  $O_2$ . In the picture shown with the experimenter's utterance, Hanako,  $O_1$  and  $O_2$  are drawn and the test sentence is written in *hiragana*, the Japanese cursive syllabary.

- (9) Hanako-chan-ga ii-mashi-ta. "Watashi-wa koppu-wa arai-masu." Nokori-no osara-wa doo suru-ndaroo? Sensei-wa Hanako-chan-wa arawa-nai to omou-nda keredo.  
'Hanako said, "I will wash the glass." What will she do with the dish? I think that Hanako won't wash it.'
- (10) Hanako-chan-ga ii-mashi-ta. "Watashi-wa koppu-wa arai-masu." Nokori-no osara-wa doo suru-ndaroo? Sensei-wa Hanako-chan-wa arau to omou-nda keredo.  
'Hanako said, "I will wash the glass." What will she do with the dish? I think that Hanako will wash it.'

Figure 1



Then, the experimenter requires the child to judge whether or not the experimenter's utterance is right. Taking the case where the test sentence is (6) as an example again, the experimenter's utterance in (9) is compatible with the CI in (8b) since the experimenter thinks that Hanako will not wash  $O_2$ . In contrast, the experimenter's utterance in (10) is contradictory to the CI in (8b) since the experimenter thinks that Hanako will wash  $O_2$ . Thus, when the child accepts

<sup>7</sup> The glosses in (9) and (10) in the text are my own. The last two sentences of each are not necessarily word-to-word translations. In particular, the word *nokori-no* in the interrogative sentence is not translated. *Nokori-no* means "remaining", and the appropriate use of the expression *nokori-no osara* 'remaining dish(es)' is to mention the dish(es) that remain when the other dish(es) have been already dealt with. In the experimental context in Kobayashi (1992), however, there is only one dish. In such a context, the expression *nokori-no osara* 'remaining dish(es)' sounds awkward.

the utterance in (9) but rejects the utterance in (10), it is proved that the child assigns the interpretation with a CI to the test sentence. When the child accepts both of the utterances in (9) and (10), it is proved that the child assigns the interpretation without a CI to the test sentence. The design and procedure of the experiment is the same in the case of the test sentence in (7) as well, except that the test sentence included in the experimenter's utterance and written in the picture is (7).

After two trials for warm-up sentences, the two kinds of test sentences were presented on six trials each. Both kinds of test sentences were included in the utterances like (9), which were compatible with CIs, in three trials, and in the utterances like (10), which were contradictory to CIs, in the remaining three trials. The participants of the experiment were thirty first grade students (6 or 7-year-olds), thirty third grade students (8 or 9-year-olds), thirty fifth grade students (10 or 11-year-olds) and thirty adults.

Although Kobayashi (1992) does not give specific figures concerning the rate at which each age group assigned the interpretation with a CI to the two kinds of test sentences, she summarizes the results of her experiment as in Table 1. The presence and absence of CIs in the interpretation of the test sentences are indicated by "+" and "-" respectively.

Table 1: Presence or absence of contrastive implicatures induced by *wa* 'Foc'

Examples of test sentences	6 or 7 -year-olds	8 or 9 -year-olds	10 or 11 -year-olds	Adults
(6) <i>Watashi-wa koppu-wa arai-masu.</i>	-	+	+	+
(7) <i>Watashi-wa koppu-o arai-masu.</i>	-	+	-	-

As Table 1 shows, both kinds of test sentences were given the interpretation without a CI by 6 or 7-year-olds, but were given the interpretation with a CI by 8 or 9-year-olds. 10 or 11-year-olds, like adults, gave the interpretation with a CI only to the test sentence of *wa* 'Foc'.

Based on these results, Kobayashi (1992) claims that it is not until the age of 8 or 9 that Japanese-speaking children acquire the knowledge of CIs induced by *wa* 'Foc'. If children younger than 8 or 9 years of age lack the knowledge of CIs induced by *wa* 'Foc', CIs should be counted among pragmatic knowledge that is acquired late. However, the results of Kobayashi's (1992) experiment could be interpreted differently, as Kobayashi (1992: 40) herself notices. Specifically, 6 or 7-year-olds' responses in her experiment may not reflect the absence of the knowledge of CIs induced by *wa* 'Foc'. In Kobayashi's (1992) experiment, test sentences are all affirmative. CIs arising in affirmative sentences containing contrastive *wa* 'Foc' are negative propositions. On the contrary, CIs arising in negative sentences containing

contrastive *wa* 'Foc' are positive propositions. As has been previously pointed out (cf. Ota (1980: 272-277)), when negative sentences are used, corresponding affirmative propositions are under consideration, but when affirmative sentences are used, corresponding negative propositions are not necessarily under consideration. Accordingly, it is more difficult to associate affirmative sentences with corresponding negative propositions than to associate negative sentences with corresponding affirmative propositions. Given this, it is plausible that Japanese-speaking children will understand CIs induced by *wa* 'Foc' in negative sentences earlier than in affirmative sentences. This amounts to saying that the reason why 6 or 7-year-olds do not display the knowledge of CIs induced by *wa* 'Foc' in Kobayashi's (1992) experiment is not because they lack the knowledge itself, but because they have difficulty in computing negative CIs out of affirmative test sentences. That is, children do have the knowledge of CIs induced by *wa* 'Foc', but cannot implement it correctly in a certain environment. If so, it is conceivable that children of or below 6 or 7 years of age can compute CIs in an environment that makes the computation easier (e.g. where contrastive *wa* 'Foc' is contained in a negative sentence or where affirmative sentences containing contrastive *wa* 'Foc' are easy to be associated with corresponding negative propositions due to context).

In order to clarify whether Japanese-speaking children younger than the child subjects of Kobayashi's (1992) experiment have the knowledge of CIs induced by *wa* 'Foc', I carried out an experiment on 4 or 5-year-olds. The next section deals with the experiment.

### 3.2. The Experiment

#### 3.2.1. The Design

An experiment with the truth value judgment task was conducted to investigate whether Japanese-speaking children could understand CIs induced by *wa* 'Foc' in negative sentences. The experiment includes a control part and a test part. The designs of items in each part are shown below.

The control item of the experiment is designed to examine whether children know the meaning of Neg. Sentences like (11) are used as control sentences.

- (11) Otokonoko-wa ninjin-o kawa-nakat-ta yo.  
 boy-Top carrot-Acc buy-Neg-Past SFP  
 'The boy didn't buy the carrot.'

The control sentence is paired with two pictures. One of them embodies the context where the control sentence is true (the match context). The other embodies the context where the control sentence is false (the mismatch context). For example, the control sentence in (11) is

presented with pictures in Figures 2 and 3, which depict the match and the mismatch contexts respectively.

Figure 2

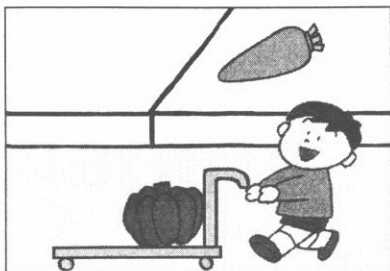
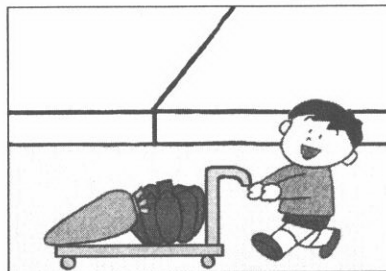


Figure 3



Children pass the control test when they accept the control sentence in the match context and reject it in the mismatch context.

The experiment comprises two kinds of test items. One of them is the test item of *wa* ‘Foc’, which is designed to examine whether children understand CIs induced by *wa* ‘Foc’ in negative sentences. Negative sentences like (12), in which the object noun phrase is marked by contrastive *wa* ‘Foc’, are used as test sentences.

- (12) Onnanoko-wa koppu-wa arawa-nakat-ta yo.  
 girl-Top glass-Foc wash-Neg-Past SFP  
 ‘The girl didn’t wash the glass.’

The test sentence of *wa* ‘Foc’ is paired with two pictures. One of them embodies the context where the interpretation with a CI is true (the contrastive context). The other picture embodies the context where the interpretation without a CI is true (the neutral context). For example, the test sentence in (12) is presented with pictures in Figures 4 and 5. In adult Japanese, the sentence in (12) has the assertion that the girl did not wash the glass, and implies that she washed something other than the glass. In Figure 4, a girl is not washing a glass but is washing something other than the glass, namely a dish. In Figure 5, a girl is washing neither a glass nor a dish. Figures 4 and 5 show the contrastive and the neutral contexts respectively.



Figure 4

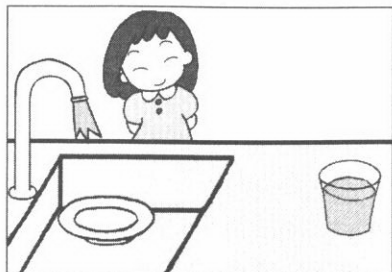
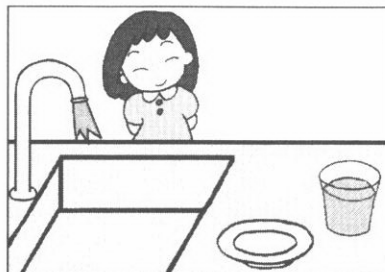


Figure 5



In addition to the test item of *wa* 'Foc', the test item of *o* 'Acc' is also included in the experiment to examine whether children distinguish sentences with contrastive *wa* 'Foc' from those without it. The test sentences are negative sentences like (13), in which the object noun phrase is marked by the accusative Case particle *o* instead of contrastive *wa* 'Foc'.

- (13) Kirin-san-wa momo-o tabe-nakat-ta yo.  
giraffe-Top peach-Acc eat-Neg-Past SFP  
'The giraffe didn't eat the peach.'

The test sentence of *o* 'Acc' as well is paired with the two pictures: the picture embodying the contrastive context and the picture embodying the neutral context. For example, the test sentence in (13) is presented with pictures in Figures 6 and 7. The assertion of (13) is that the giraffe did not eat the peach. If the accusative Case particle *o* gave rise to implicatures as contrastive *wa* 'Foc' does, the sentence in (13) would imply that the giraffe ate something other than the peach. In Figure 6, a giraffe has not eaten a peach but has eaten something other than the peach, namely a strawberry. In Figure 7, a giraffe has eaten neither a peach nor a strawberry. Figures 6 and 7 show the contrastive and the neutral contexts respectively.

Figure 6

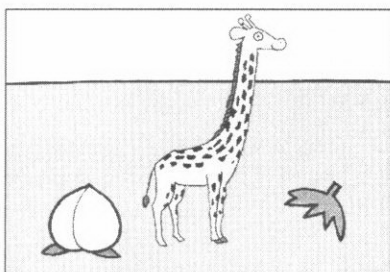
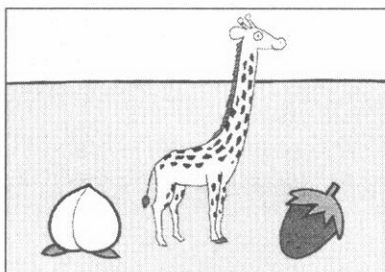


Figure 7



In both kinds of test items, children's acceptance of the test sentence in only the contrastive context indicates that they assign it the interpretation with a CI. Children's

acceptance of the test sentence in both the contrastive and the neutral contexts indicates that they assign it the interpretation without a CI. In adult Japanese, contrastive *wa* 'Foc' induces CIs but the accusative Case particle *o* does not. Thus, in adult-like response, test sentences of *wa* 'Foc' should be accepted only in the contrastive context and those of *o* 'Acc' should be accepted in both the contrastive and the neutral contexts.

The design of the experiment in this paper differs from that in Kobayashi (1992) in that the test sentence itself is judged against the given context and in that the two pictures are used to embody the interpretations with and without a CI respectively. These changes are made to draw more attention of the participants of the experiment to the presence/absence of CIs in the interpretation of the test sentence.

### 3.2.2. The Procedure

Each participant of the experiment was given two trials for the control item of Neg, the test item of *wa* 'Foc' and the test item of *o* 'Acc' each. In order to check whether children were still involved in the task, three trials for filler items were interspersed as well. The experimental methodology is the truth value judgment task. In each trial, the experiment proceeded as follows: First, the experimenter showed two pictures and explained the content to a child. Next, pretending that a puppet was uttering it, the experimenter played back a sentence recorded on an MD. Finally, the experimenter asked the child to judge whether the puppet's utterance was right or wrong in each picture. The child was instructed to point at one of the pictures if the puppet's utterance was right only in that picture, and to point at both pictures if the puppet's utterance was right in both pictures. When a child pointed at only one of the two pictures, the experimenter asked the child what was wrong in the other picture in order to confirm that the child had rejected it for a relevant reason. Children's judgments and comments were written down on score sheets. The whole experiment was recorded so that it could be checked later whether the contents of the score sheets were accurate.

The experiment was carried out in one session, and took about ten minutes to complete. Children were tested individually in a quiet room near their classroom after they played and felt comfortable with the experimenter. Every child was familiarized with the truth value judgment task at the beginning of the experiment with several warm-up items. At that time, the experimenter had children understand that the puppet's utterance might be right only in one of the pictures and might be so in both pictures.

### 3.2.3. Subjects

Twenty-one monolingual Japanese-speaking children participated in the experiment. They ranged in age from 4;2.20 to 5;1.23. For comparison, fifteen Japanese-speaking adults

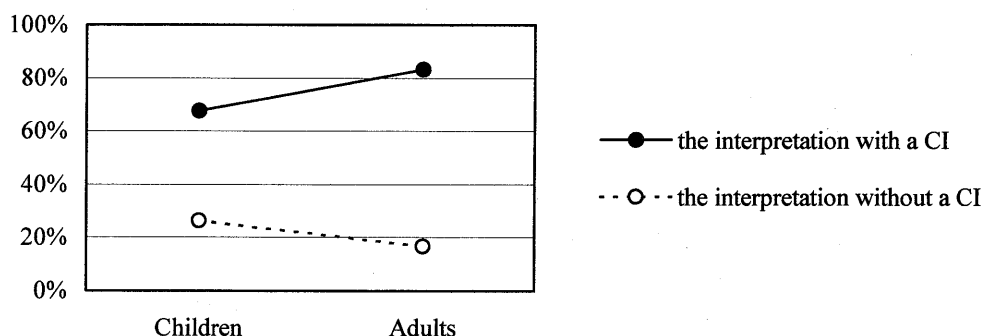
were also tested.<sup>8</sup>

### 3.2.4. Results

Two children failed the Neg control test. Another two children lost their concentration halfway and could not complete the experiment. These four children were excluded. The remaining seventeen children passed the Neg control and completed the experiment. The age range of the seventeen children is 4;2.30 to 5;1.23. In the following, the results for test items of *wa* 'Foc' and *o* 'Acc' are shown in turn. As mentioned in section 3.2.1, in both kinds of test items, the acceptance of test sentences in only the contrastive context demonstrates the presence of CIs, and the acceptance of test sentences in both the contrastive and the neutral contexts demonstrates the absence of CIs.

To the test sentence of *wa* 'Foc', the interpretation with a CI was assigned 67.6% of the time (23/34 trials) by children and 83.3% of the time (25/30 trials) by adults, and the interpretation without a CI was assigned 26.5 % of the time (9/34trials) by children and 16.7% of the time (5/30trials) by adults.<sup>9</sup> The results concerning the test sentence of *wa* 'Foc' are diagramed in Table 2.

Table 2: The interpretation of the test sentence of *wa* 'Foc'



To the test sentence of *o* 'Acc', the interpretation with a CI was assigned 61.8% of the time (21/34 trials) by children and 3.3% of the time (1/30 trials) by adults, and the interpretation without a CI was assigned 29.4 % of the time (10/34trials) by children and 93.3% of the time

<sup>8</sup> Adult subjects were tested all at once. In each trial, the experimenter first showed them two pictures, explaining their contents. Then, the experimenter played back a sentence recorded on an MD. Finally, adult subjects were required to write on their own answer sheets whether the sentence was right or wrong in each picture. They were also required to give a brief justification for their judgments.

<sup>9</sup> Two children (4;3.17 and 4;10.20) accepted the test sentence of *wa* 'Foc' in only the neutral context in one trial. These two trials are excluded from the results as noise.

(28/30 trials) by adults.<sup>10</sup> The results concerning the test sentence of *o* 'Acc' are diagrammed in Table 3.

Table 3: The interpretation of the test sentence of *o* 'Acc'

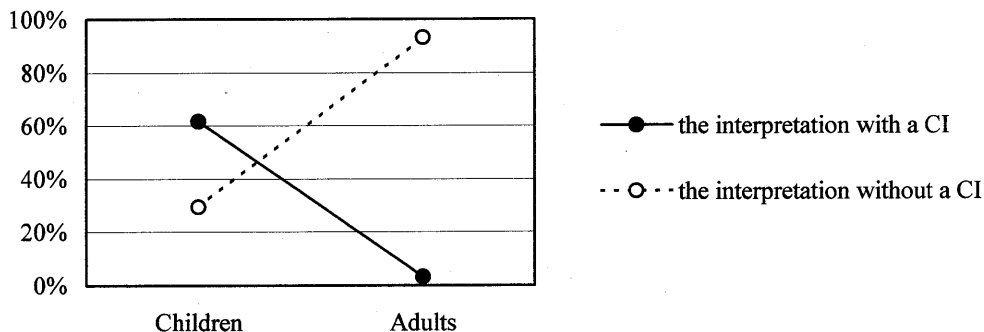


Table 2 indicates that children as well as adults (tended to) give the interpretation with a CI to the test sentence of *wa* 'Foc'. Table 3 indicates that children also tended to give the interpretation with a CI to the test sentence of *o* 'Acc', as opposed to adults.

The rate at which children gave the interpretation with a CI to the test sentence of *wa* 'Foc' (67.6%) is not so high that we can conclusively say that they have the knowledge of CIs induced by *wa* 'Foc'. However, even adults' performance was not perfect (83.3%) with the test sentence of *wa* 'Foc' in the experimental situation. Furthermore, if children lack the knowledge of CIs, they should assign the interpretation with a CI to the test sentence of *wa* 'Foc' at much lower rate. The results above suggest that Japanese-speaking children have the knowledge of CIs induced by *wa* 'Foc'.<sup>11</sup>

#### 4. The Acquisition of Implicatures

##### 4.1. Implications for Models of the Course of Language Acquisition

Noveck (2001) and Musolino and Lidz (2002) find that English-speaking and

<sup>10</sup> Two children (4;2.30 and 4;10.20) accepted the test sentence of *o* 'Acc' in only neutral context in one trial. One of the two children (4;10.20) also rejected the test sentence in both the contrastive and the neutral contexts in the other trial. Furthermore, one of the adults as well rejected the test sentence in both the contrastive and the neutral contexts in one trial. These four trials are excluded from the results.

<sup>11</sup> I will discuss children's and adults' imperfect performance concerning the test sentence of *wa* 'Foc' in section 4.2. The results of the experiment concerning the test sentence of *o* 'Acc' will be discussed in section 4.3.

French-speaking children (between 5 and 10 years of age) do not display the knowledge of scalar implicatures (SIs) in the experiment, but suggest that the results of the experiment might be only apparent. They point out that children's knowledge of SIs might be masked due to the demands imposed by the experimental task. Other recent experimental studies on English-speaking and Italian-speaking children demonstrate that they have the knowledge of SIs early on (at the age of 3 to 6), and falsify the assumption of the Pragmatic Delay model that pragmatic knowledge is acquired late (Chierchia, Crain, Guasti and Thornton (1998), Chierchia, Crain, Guasti, Gualmini and Meroni (2001), Gualmini et al. (2001)).

The results of the experiment in section 3.2 are interpreted as indicating that the knowledge of CIs induced by *wa* 'Foc' is available to Japanese-speaking children early on (at the age of 4 or 5). These results are also contrary to the assumption of the Pragmatic Delay model. The early availability of the knowledge of CIs induced by *wa* 'Foc' to Japanese-speaking children is another piece of counterevidence against the Pragmatic Delay model.

The Modularity Matching model makes the assumption opposite to the one made by the Pragmatic Delay model concerning children's pragmatic knowledge. The Modularity Matching model assumes that children are equivalent to adults in principles of every component of the language, the system of verbal working memory and the processing mechanism. This amounts to hypothesizing that children have the same pragmatic knowledge as adults. The early availability of CIs induced by *wa* 'Foc' to Japanese-speaking children does not contradict the assumption of the Modularity Matching model.

As Chierchia et al. (1998) notice, however, the Modularity Matching model cannot be maintained in its strong version. Some recent studies claim that children are devoid of certain pragmatic knowledge such as that concerning coreference of pronouns and that concerning object scrambling (Thornton and Wexler (1999), Schaeffer (2000)). Others claim that, although children are adult-like in linguistic knowledge that is relevant to the interpretation of nominal expressions and to SIs, they sometimes cannot implement it correctly due to their insufficient working memory (Avrutin (1999), Reinhart (1999), Chierchia et al. (2001)). The claims of these studies are incompatible with the Modularity Matching model. More investigation is needed as to what kind of pragmatic knowledge is or is not available early on to children and to what extent children's non-adult-like linguistic behavior is explained not by the lack of the knowledge but by other factors.

#### *4.2. Children's and Adults' Imperfect Performance in the Experiment*

In the experiment in section 3.2, although Japanese-speaking children tended to assign the interpretation with a CI to the test sentence of *wa* 'Foc', the rate at which they did so was not as high as the rate at which Japanese-speaking adults did so. In addition, even the rate of

Japanese-speaking adults' was not at its full. The rates in question are 83.3% in the case of adults, and 67.6% in the case of children. The degraded performance of children and adults needs explaining.

One conceivable reason for the imperfect performance is the second type of CI induced by *wa* 'Foc' mentioned in (ib) in note 6, whose definition is repeated as (14).

- (14) The clause whose ordinary semantic value is  $[[ \dots\alpha_F \dots ]^o]$  gives rise to the implication that it is not certain whether propositions contained in  $[[ \dots\alpha_F \dots ]^f]$  except  $[[ \dots\alpha_F \dots ]^o]$  are true.

If this type of CI is induced, the test sentence of *wa* 'Foc' can be accepted in both the contrastive and the neutral contexts in the experiment in section 3.2. For example, according to (14), the CI of the test sentence in (12), repeated below, is (15).

- (12) Onnanoko-wa koppu-wa arawa-nakat-ta yo.  
 girl-Top glass-Foc wash-Neg-Past SFP  
 'The girl didn't wash the glass.'

- (15) It is not certain whether the girl didn't wash things other than the glass.

The sentence in (12) with the second type of CI in (15) can be judged to be true and accepted in both Figure 4, namely the contrastive context, and Figure 5, namely the neutral context. In the experiment in section 3.2, the test sentence is counted as having the interpretation without a CI when it is accepted in both the contrastive and the neutral contexts. Consequently, the rate at which test sentences of *wa* 'Foc' are assigned the interpretation with a CI is made lower than as it is in the case of children and adults who invoke the second type of CI defined as in (14).

Another reason is conceivable for the degradation of children's performance, in addition. As mentioned in section 4.1, recent studies point out that children sometimes cannot implement their linguistic knowledge correctly due to their limited working memory. For example, Avrutin (1999) claims that children, whose working memory is limited, sometimes fail to access other speakers' representations of the discourse because doing so requires much working memory. In the experiment with the truth value judgment task in section 3.2, children are required to infer what the other speaker implies and to judge whether or not the implication of the other speaker is right in the given context. In such a situation, children sometimes encounter difficulty in making inferences about the other speaker's intentions. As opposed to this, such a difficulty does not arise in spontaneous speech.<sup>12</sup>

<sup>12</sup> Reviewing previous studies on English-speaking children's knowledge of contrastive stress in

### 4.3. Contrastive Implicatures and the Accusative Case Particle *O*

In the experiment in section 3.2, it is also found that Japanese-speaking children are different from adults in that they tend to give the interpretation with a CI to the test sentence of *o* 'Acc'. A similar tendency can be seen in the results of the experiment carried out in Kobayashi (1992). As we have seen in Table 1 in section 3.1, Kobayashi (1992) as well finds that Japanese-speaking children assign the interpretation with a CI to both the sentence of *wa* 'Foc' and that of *o* 'Acc' before they, like adults, come to assign such an interpretation only to the sentence of *wa* 'Foc'.

This non-adult-like response of children might result from their non-adult-like hypothesis that not only contrastive *wa* 'Foc' but also the accusative Case particle *o* induces CIs. Children learn later from positive evidence that the sentence of *o* 'Acc' is able to have the interpretation without a CI.

## 5. Conclusion

This paper has investigated the acquisition of CIs induced by *wa* 'Foc' in Japanese. I have provided a piece of counterevidence against the Pragmatic Delay model by demonstrating that CIs induced by *wa* 'Foc' are available to Japanese-speaking children early on. Discussions have been held as well on children's and adults' imperfect performance concerning CIs induced by *wa* 'Foc' in the experiment conducted and the function of the accusative Case particle *o* with respect to CIs in child Japanese.

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relation to the interpretation of pronouns, Thornton and Wexler (1999: 71-77) point out that children use contrastive stress correctly in their spontaneous speech, but show difficulty in comprehending it. This is a similar situation to the case of Japanese-speaking children's production and comprehension of CIs induced by *wa* 'Foc'.

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