"Subject-Only" Is Not Always Difficult for Children: Evidence from Unaccusative Constructions in Japanese

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1. Introduction

A central question in language acquisition is whether children's non-adult-like interpretations reflect a lack of knowledge or other factors, such as processing limitations or task complexity. This study addresses this question by focusing on a phenomenon where children's interpretations consistently differ from those of adults: the interpretation of sentences with a focus particle in subject position.

Crain et al. (1994) first observed children's non-adult-like interpretation of subject-*only*. In their study, English-speaking children aged 3 to 6 years were asked to judge sentences in which *only* was attached either to the VP, as in (1a), or to the subject, as in (1b), using a picture in Figure 1.

(1) a. VP-*only* sentence: The cat is *only* holding a flag.
b. Subject-*only* sentence: *Only* the cat is holding a flag.

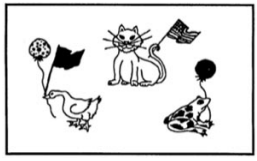

Figure 1: Sample visual stimulus from Crain et al.'s (1994) experiment

Adult speakers judge the VP-*only* sentence in (1a) as true and the subject-*only* sentence in (1b) as false for this picture. However, Crain et al. found that 21 of 38 children incorrectly accepted the subject-*only* sentence in (1b), interpreting it as if it were the VP-*only* sentence. In contrast, these children showed no difficulty with VP-*only* sentences. Because children incorrectly associate the focus particle *only* in subject position with the VP or the object, this error is called an "incorrect association error."

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Such errors have been reported across languages, including English (e.g., Crain et al., 1994; Philip & Lynch, 2000; Hackl et al., 2015; Sugawara, 2016), Mandarin (e.g., Notley et al., 2009; Zhou & Crain, 2010), German (e.g., Müller et al., 2011), European Portuguese (e.g., Santos, 2005), and Japanese (e.g., Endo, 2004; Mochizuki et al., 2021; Shimada et al., 2022; Sugawara et al., 2024).[1]

This study aims to identify the source of children's difficulty with subject-'only' sentences.[2] We propose that this difficulty results from the cognitive demands of visual inspection required to evaluate a subject-'only' sentence with a given picture, rather than from a lack of knowledge. Specifically, we hypothesize that judging the truth value of subject-'only' sentences requires more complex visual inspection than VP-'only' or object-'only' sentences.

We support this hypothesis with new experimental evidence showing that Japanese children aged 4 to 5 years, who often make errors with subject-*dake* 'only,' perform in a target-like manner when the cognitive load of visual inspection is systematically reduced. These results indicate that children's misinterpretations of subject-'only' sentences found in various languages reflect cognitive complexity in visual inspection.

2. Previous studies on child Japanese

Endo (2004) was the earliest study on Japanese children and found that children aged 3 to 6 made incorrect association errors with subject-*dake* 'only' in declarative sentences, as shown in (2). In this context, "IA" refers to the interpretation resulting from incorrect association.

(2) Butasan-dake-ga ringo-o tot-ta.
pig-only-NOM apple-ACC take-PST
'Only the pig took an apple.'/ IA: 'The pig took only an apple.'
(adapted from Endo, 2004, p. 146)

The 3- to 6-year-old children had an accuracy rate of only 31.7% with subject-*dake*, compared to 84% with object-*dake*.

Later studies have shown that Japanese children make incorrect association errors in various constructions with different word orders. Mochizuki et al. (2021) found such errors in right dislocation, as in (3a), and Shimada et al. (2022) found them in cleft constructions, as in (3b).[3] In both cases, subject-*dake* appears at the end of the sentence. The mean accuracy rates in these constructions were 25.0% and 55.0%, respectively.

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[1] To our knowledge, Hungarian is the only language reported to show the opposite pattern: children prefer a subject-focus interpretation in sentences with object-*csak* 'only' (Pintér, 2016). Because this pattern is uncommon across languages, we do not discuss Hungarian further here.

[2] We use 'only' in single quotation marks to refer to corresponding words or particles in any language, without limiting our discussion to English *only* or Japanese *dake*.

[3] The sentences are not the actual test sentences used in those studies. We adopted the sentence structures and used the lexical items from the English sentence in (1b).

(3) a. Hata-o mot-tei-ru yo, neko-dake-ga.
flag-ACC hold-PROG-PRES SFP cat-only-NOM
'(Lit.) <e_i> is holding a flag, only the cat_i.'

b. Hata-o mot-tei-ru no wa neko-dake da.
flag-ACC hold-PROG-PRES NMLZ TOP cat-only COP
'It is only the cat that is holding a flag.'

Taken together, previous studies on Japanese indicate that children's incorrect association errors occur independently of the linear order between the focus particle and the incorrectly associated element.

3. Explanations for children's misinterpretation of subject-'only' sentences

This paper discusses three main hypotheses on children's misinterpretation of subject-'only.' The first is the syntactic hypothesis (Notley et al., 2009; Zhou & Crain, 2010; Mochizuki et al., 2021; Shimada et al., 2022; Shimada, 2025), which attributes children's errors to non-adult-like grammatical knowledge.[4]

The hybrid hypothesis (Hackl et al., 2015; Sugawara, 2016) introduces a pragmatic factor, arguing that broad lead-in questions such as "What happened in the story?" are not fully felicitous for the use of *only*. When more specific sub-questions are provided (e.g., "Who is holding a flag?"), children's performance improves significantly. However, an asymmetry remains between subject-*only* and VP-*only*, leading Sugawara (2016) to conclude that the subject as a grammatical function still presents difficulty.

The performance-based hypothesis (Höhle et al., 2016; Paul et al., 2019; Deen et al., 2023) states that children have adult-like knowledge of 'only' but fail to use it because of performance limitations. Höhle et al. (2016) found that 4-year-old German-speaking children's accuracy with subject-*nur* 'only' correlates with inhibitory control. Paul et al. (2019) found that reducing visual scene complexity allows 6- to 8-year-old children to show adult-like predictive processing for subject-*only*. Deen et al. (2023) found that 3- to 7-year-old English-speaking children can interpret subject-*only* correctly when a lead-in sentence specifies a relevant superset (e.g., children judged the truth of a sentence without *only* such as "The panda got a car, and the rabbit got a car" before judging a sentence such as "Only the panda got a car").

However, previous research does not resolve whether younger children, who are most likely to make incorrect association errors, can reach adult-like interpretations without such contextual or pragmatic support.[5]

[4] Notley et al. (2009) and Zhou & Crain (2010) proposed that English-speaking children interpret *only* as a sentential adverb. For an alternative syntactic hypothesis, see Mochizuki et al. (2021), Shimada et al. (2022), and Shimada (2025).

[5] See also Santos (2005), Müller et al. (2011), and Sugawara et al. (2024) for their default focus hypothesis which attributes children's incorrect association errors to the assumption that (i) focus is assigned by default to the most deeply embedded constituent, or (ii) subjects are topics whereas objects are foci by default.

4. The visual inspection hypothesis

Our hypothesis is a form of a performance-based hypothesis. We propose that children have adult-like grammatical knowledge for interpreting sentences with subject-'only,' and that their incorrect association errors result from the cognitive load required by visual inspection of the experimental scenes. The visual inspection demands for subject-'only' are greater than those for object- or VP-'only,' and this increased cognitive burden interferes with children's ability to reach the adult-like interpretation.

First, consider how listeners incrementally process a Japanese sentence containing object-*dake* 'only' in canonical word order, and how this linguistic processing interacts with visual inspection of the accompanying picture. An example pair of a sentence and a picture is shown in (4) and Figure 2.

(4) Inusan-ga densya-dake-o tot-ta.
dog-NOM train-only-ACC take-PST
'The dog took only a train.'

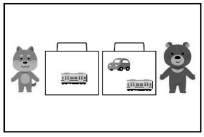


Figure 2: A picture taken from Mochizuki et al. (2021)

Figure 3 below summarizes the progression of visual attention as the test sentence unfolds incrementally.

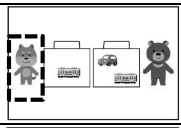
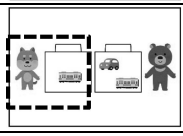
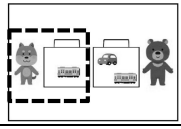
Incremental sentence processing	Visual attention	Cognitive process
Inusan-ga 'dog-NOM'		We predict that the sentence is going to be something about the dog.
Inusan-ga 'dog-NOM' *densya-dake-o* 'train-only-ACC'		We look at what the dog took. The presence of *dake* signals that exclusivity will be evaluated with respect to what the dog took.
Inusan-ga 'dog-NOM' *densya-dake-o* 'train-only-ACC' *tot-ta.* 'take-PST'		Because the dog did not take anything other than the train, we judge the sentence as true.

Figure 3: Incremental visual and linguistic processing for object-*dake* sentences

Crucially, when evaluating a sentence containing object-*dake*, it is unnecessary to inspect what the other animal, the bear, took (see also Paul et al., 2019).

Next, consider how processing a sentence with subject-*dake* interacts with visual inspection of the accompanying picture. For example, examine the test sentence in (5) together with the same picture in Figure 2.

(5) Inusan-dake-ga densya-o tot-ta.
dog-only-NOM train-ACC take-PST
'Only the dog took a train.'

Because the case of subject-*dake* is more complex than that of object-*dake*, we present the process step by step instead of summarizing it in a single figure. First, Figure 4 shows the partial sentence up to the subject, along with the corresponding visual scene.

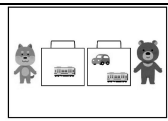
Incremental sentence processing	Visual scene
Inusan-dake-ga 'dog-only-NOM'	

Figure 4: Incremental processing of subject-*dake* sentences: Visual attention at subject onset

At this point in the sentence, the contrast set is not determined because the predicate has not been heard. It is unclear whether the listener should consider if any animal other than the dog took a train, a car, or another alternative.

However, because the subject—most likely the agent—carries *dake*, the listener predicts that the dog must be contrasted with another potential agent, namely the bear. As a result, the listener is likely to inspect what the bear took.[6] However, this is only a likely behavior, and children's visual search is not fully determined; they may (i) inspect what the contrast animal (the bear) took, (ii) scan the entire picture, or (iii) focus on the dog because it was just mentioned.

Listeners then encounter the predicate, as shown in Figure 5.

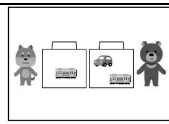
Incremental sentence processing	Visual scene
Inusan-dake-ga 'dog-only-NOM' *densya-o* 'train-ACC' *tot-ta.* 'take-PST'	

Figure 5: Incremental processing of subject-*dake* sentences: Visual attention after predicate

[6] See Paul et al. (2019) for an eye-tracking study on the predictive processing of subject-*only* by English-speaking children aged 6 to 8 years.

Once the predicate is encountered, the contrast set is fully specified. The listener then knows that two conditions must be evaluated: (i) the presupposition that the dog took a train, and (ii) the assertion that any animal other than the dog did not take a train. With the contrast set clarified, the listener must re-examine the picture and check the belongings of both animals to judge the truth of the test sentence.

The crucial point of our proposal is that, during this re-examination, the difference between the dog's belongings and the bear's belongings becomes highly salient. The dog has only one type of object, while the bear has two different ones, making the contrast perceptually prominent. We propose that children have difficulty moving past this salience, leading them to incorrectly judge, "Yes, the dog got only the train, unlike the bear!" At this stage, the focus particle *dake* attaches to the object, causing children to incorrectly accept the sentence. We argue that whenever children must evaluate the belongings of both agents, the contrast between those belongings becomes salient, which leads them to the incorrect interpretation of the test sentence.[7]

This does not mean that children ignore the meaning of *dake* (See Tieu & Schulz, 2025, for evidence that children do not ignore *only*). Instead, we propose that children include *dake* in their interpretation, but the prominent visual contrast between the animals' belongings leads them to associate *dake* with the fact that the dog has only a train compared to the bear. Thus, children compute the exclusivity of *dake*, but they map it onto an incorrect comparison because of the strong perceptual salience of the visual difference. We suggest that this process also applies to subject-*only* in English and possibly in other languages.

5. Research question and experimental design

The present study aims to determine whether children can correctly interpret sentences with subject-*dake* when the cognitive load during visual inspection is reduced. There are two main ways to reduce this load. First, the task itself can be modified to lower the cognitive demands of visual inspection; this method was recently used by one of the authors, who found that 5-year-olds correctly interpreted subject-*dake* in transitive constructions under a modified task (Ohba, 2025). Second, a specific construction involving subject-*dake* can be used, where the cognitive load of visual inspection matches that of object-*dake* in a transitive construction. This study adopts the second approach.

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[7] The same cognitive load occurs when the target answer is true. For example, consider the following sentence with the same picture: the dog bought a train, and the bear bought a train and a car.

(i) Kumasan-dake-ga kuruma-o tot-ta.
bear-only-NOM car-ACC take-PST
'Only the bear took a car.'

When comparing the animals' belongings, the bear's possession of two types of objects, unlike the dog, is notable. Because of this, children may respond, "No, the bear not only got the car, but also the train!" Consequently, they incorrectly reject the sentence.

The research question is: Can children interpret subject-*dake* correctly when the cognitive load in visual inspection is similar to that of transitive object-*dake*? A central challenge for us was to identify a type of subject-*dake* construction with visual inspection requirements equivalent to those of transitive object-*dake*. We propose that this can be achieved by attaching *dake* to a theme subject rather than an agentive subject. As explained in more detail later, when *dake* is attached to a theme subject, the listener needs to check only a single agent's belongings in the scene, similar to the process for transitive object-*dake*.[8]

The theme-subject construction used in our experiment is referred to as "the full unaccusative construction" (Sano et al., 2001), as shown in (6). This construction is a type of unaccusative, termed "full" because it contains an agentive *ni* 'by'-phrase, similar to full passives, in contrast to short passives that lack a by-phrase.[9]

(6) Neko-ga inu-ni tukam-at-ta.
cat-NOM dog-by catch-UNACC-PST
'The cat got caught by the dog.'

Sano et al. (2001) report that Japanese preschool children around age five demonstrate adult-like comprehension of full unaccusative constructions such as (6), but have difficulty with full passives. Because five-year-olds do not struggle with full unaccusative constructions, these structures serve as an effective case for testing whether children continue to make incorrect association errors when *dake* attaches to a theme subject.

Next, let us consider how the visual inspection cost of subject-*dake* in a full unaccusative construction matches that of object-*dake* in a transitive construction. We illustrate this with two patterns: one where the target answer is false, and one where it is true. We begin with the false condition, using the sentence in (7) and corresponding visual scene in Figure 6, both from our experiment.

(7) Panda-dake-ga kaba-ni tukam-at-ta.
panda-only-NOM hippo-by catch-UNACC-PST
'Only the panda got caught by the hippo.' (False)

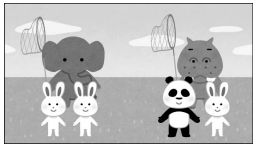


Figure 6: A sample picture presented with the test sentence

[8] A natural candidate for a theme–subject construction is the passive (e.g., "Only the cat was caught by the dog"). However, this is not suitable for our purposes because extensive evidence shows that pre-school children have difficulty with passives (e.g., Bever, 1970, de Villiers & de Villiers, 1973, Sano et al., 2001, among others).

[9] This construction differs from passives because it lacks the passive morpheme *-(r)are* and instead contains an unaccusative morpheme *-ar*.

We now examine the interaction between incremental sentence processing and visual inspection. First, the listener encounters the subject (see Figure 7).

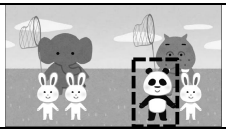
Incremental sentence processing	Where we look at
Panda-dake-ga 'panda-only-NOM'	

Figure 7: Incremental processing of subject-*dake* in unaccusative construction: Visual attention at subject onset

At this point, the listener likely looks at the panda that was just mentioned. When the focus particle *dake* is heard, the listener expects a contrast set. At this stage, it remains unclear whether the subject is a theme or an agent, because the unaccusative verb has not yet appeared. However, given the story's context, in which the panda is clearly the entity that gets caught, listeners may infer that the subject is a theme before hearing the verb.

Next, the listener encounters the by-phrase.

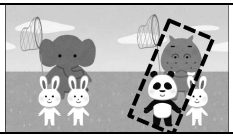
Incremental sentence processing	Where we look at
Panda-dake-ga 'panda-only-NOM' *kaba-ni* 'hippo-by'	

Figure 8: Incremental processing of subject-*dake* in unaccusative construction: Visual attention after by-phrase

At this point, listeners are predicted to look at the hippo.

Finally, they encounter the verb.

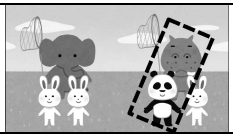
Incremental sentence processing	Where we look at
Panda-dake-ga 'panda-only-NOM' *kaba-ni* 'hippo-by' *tukam-at-ta.* 'catch-UNACC-PST'	

Figure 9: Incremental processing of subject-*dake* in unaccusative construction: Visual attention after verb

The listener then evaluates the truth value of the sentence based on the situation. In the depicted scene, the sentence is false because the hippo also caught the rabbit. This judgment does not require checking what the elephant caught; it only requires examining who the hippo caught. Thus, the visual processing demands of subject-*dake* in the unaccusative construction are similar to those of object-*dake* in a transitive construction (see Figure 3). Now, consider sentence (8), which is true in the same scene.

(8) Usagi-dake-ga zou-ni tukam-at-ta.
rabbit-only-NOM elephant-by catch-UNACC-PST
'Only the rabbit(s) got caught by the elephant.' (True)

First, the listener encounters the subject, as illustrated in Figure 10.

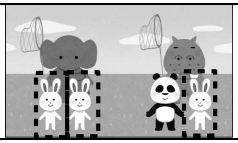
Incremental sentence processing	Where we look at
Usagi-dake-ga 'rabbit-only-NOM'	

Figure 10: Incremental processing of subject-*dake* (true condition): Visual attention at subject onset

Upon hearing the subject, the listener focuses on the rabbits. Because there are three rabbits in the picture and the Japanese bare noun *usagi* does not indicate singular or plural, listeners cannot determine which rabbit or rabbits are being referred to. The presence of *dake* triggers an expectation of a contrast set.

Next, listeners encounter the by-phrase (see Figure 11).

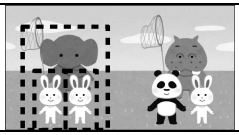
Incremental sentence processing	Where we look at
Usagi-dake-ga 'rabbit-only-NOM' *zou-ni* 'elephant-by'	

Figure 11: Incremental processing of subject-*dake* (true condition): Visual attention after by-phrase

At this stage, listeners likely focus on the elephant and the rabbits that the elephant caught. Once the elephant is mentioned, listeners no longer need to consider what the hippo caught.

Finally, the verb is parsed (see Figure 12)

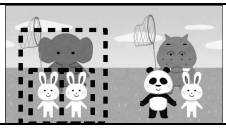
Incremental sentence processing	Where we look at
Usagi-dake-ga 'rabbit-only-NOM' *zou-ni* 'elephant-by' *tukam-at-ta.* 'catch-UNACC-PST'	

Figure 12: Incremental processing of subject-*dake* (true condition): Visual attention after verb

The sentence is judged true because the elephant did not catch any animal other than the rabbits. Importantly, this judgment can be made without checking which

animal the hippo caught. The lack of necessity to check the unmentioned animal's actions aligns with the case of object-*dake* in a transitive construction (Figure 3).[10]

Even within the same unaccusative construction, attaching *dake* to the by-phrase rather than to the theme subject increases visual processing cost. Consider the examples in (9) with the same picture above.

(9) a. Panda-ga kaba-*dake*-ni tukam-at-ta.
panda-NOM hippo-only-by catch-UNACC-PST
'The panda got caught only by the hippo.' (True)
b. Usagi-ga zou-*dake*-ni tukam-at-ta.
rabbit-NOM elephant-only-by catch-UNACC-PST
'The rabbit(s) got caught only by the elephant.' (False)

To answer these sentences correctly, listeners must check not only which animal the mentioned agent caught, but also which animal the unmentioned agent caught. For (9a), listeners must check whether a panda was caught by the hippo but not by the elephant. For (9b), they must check whether a rabbit was caught by the elephant but not by the hippo. This need to inspect the unmentioned agent's actions reflects the visual inspection cost with subject-*dake* in transitive sentences.

In our experiment, we also tested children's comprehension of sentences with *dake* on a by-phrase to see whether children would make incorrect association errors. If so, this would provide further evidence that children's difficulty with 'only' is not limited to subject position.

6. Experiment

Our experiment aims to determine whether Japanese children, who often make incorrect association errors with *dake*, can correctly interpret sentences containing subject-*dake* when the cognitive cost of visual inspection is reduced. To lower this cognitive cost, we use full unaccusative constructions with a theme subject and a by-phrase. We specifically compare children's interpretations of subject-*dake* in unaccusative constructions with their interpretations of by-*dake* in the same construction.

6.1. Participants

We divided participants into two groups: the subject-*dake* group, which received unaccusative sentences with *dake* on a theme subject, and the by-*dake*

[10] Exhaustivity differs between target-true and target-false items. In target-false items (e.g., (7)), only one panda appears in the scene, so the listener can focus on that panda immediately. In target-true items (e.g., (8)), three rabbits are present, so it is unclear at first which rabbit(s) the sentence refers to. Therefore, the contextual felicity differs between the target-true and target-false items, and thus the effect of *dake* may also vary between them. Although we will show that 4- to 5-year-olds' performance did not differ between target-true and target-false items, this remains an important issue because younger children might show a difference. We thank Yixuan Yan for raising this point.

group, which received unaccusative sentences with *dake* on a by-phrase. Table 1 presents participant information.[11]

Table 1: Number of participants and age range

	Children's information
Subject-*dake* group	*n* = 20 (4;7–5;10, mean: 5;4)
By-*dake* group	*n* = 17 (4;6–6;6, mean: 5;7)

We tested older children in the by-*dake* group than in the subject-*dake* group because we predicted that full unaccusative sentences with subject-*dake* would be easier to interpret than those with by-*dake*. We expected younger children to succeed with subject-*dake* sentences, while by-*dake* sentences would remain difficult even for older children.

6.2. Materials and procedure

We used the Truth Value Judgment Task (Crain & Thornton, 1998). As shown in Section 6.1, *Dake type* (subject-*dake* vs. by-*dake*) was a between-subject factor. Each child first completed two practice items with unaccusative constructions without *dake* (one true, one false) to confirm that children understood the task and correctly interpreted full unaccusative sentences. After the practice, children received four critical items containing *dake* (either subject-*dake* or by-*dake*), with two true and two false items. Each child completed six items in total, and each session lasted 10–15 minutes.

We used two verbs: *tukam-ar-u* 'get.caught' and *mituk-ar-u* 'get.found,' with two items for each verb. For *tukam-ar-u*, we created stories about tag; for *mituk-ar-u*, we created stories about hide and seek. Due to space limitations, we present only a sample story about tag in written format; the complete set of stories is available at this link: https://shorturl.at/gOKVd. The sample story about tag is summarized in (10a). After the story, the lead-in sentence in (10b) was given with Figure 13, followed by a puppet uttering the sentence in (10c) with subject-*dake* or the sentence in (10d) with by-*dake*.

(10) a. Story: Some animals are going to play tag. An elephant and a hippo are the taggers, and three pandas and three rabbits are fleeing from them. First, the elephant tagged a rabbit, then tagged another rabbit. The other animals were too fast, so the elephant switched roles with the hippo. The hippo then tagged a rabbit and a panda.[12]

[11] This table presents the data after excluding eight children for three reasons: failure on practice items (*n* = 4), providing irrelevant reasons to reject items (*n* = 2), and misanalysis of unaccusative sentences as transitive sentences (*n* = 2).

[12] We did not use the target unaccusative verbs or their transitive counterparts (*tukam-ae-ru* 'catch' and *mituk-e-ru* 'find') to avoid priming children with the critical verbs. For the stories about tag, we used the verb *eit-to-su-ru* 'go whoosh' to describe the action in which an animal catches another animal with a net.

b. Lead-in: This is what happened in the story. Now, a puppet will guess what happened. Let's hear whether the puppet can correctly guess what happened in the story.

c. Subject-*dake*
   Panda-dake-ga kaba-ni tukam-at-ta.
   panda-only-NOM hippo-by catch-UNACC-PST
   'Only the panda got caught by the hippo.' (False)

d. By-*dake*
   Panda-ga kaba-dake-ni tukam-at-ta.
   panda-NOM hippo-only-by catch-UNACC-PST
   'The panda got caught only by the hippo.' (True)

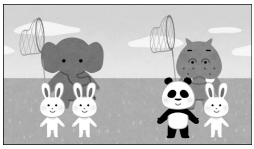


Figure 13: A sample picture presented with a test sentence

The test sentences followed a broad lead-in sentence: "Let's hear whether the puppet can correctly guess what happened in the story." This approach differs from studies by Hackl et al. (2015), Sugawara (2016), and Deen et al. (2023), which used more specific lead-in questions or sentences before presenting a sentence with *only*. Thus, our visual inspection hypothesis can be distinguished from the view that children's difficulties with 'only' result from insufficient contextual or pragmatic support.

Our prediction is as follows. When judging the truth value of a sentence with subject-*dake* in an unaccusative construction (10c), it is only necessary to check what the hippo caught, and not what the elephant caught, similar to object-*dake* in a transitive construction (e.g., *The hippo caught only a panda*). Therefore, we predict that children, who are prone to incorrect association errors, can interpret these sentences correctly.

In contrast, when judging the truth value of a sentence with by-*dake* in an unaccusative construction (10d), it is necessary to check both who the hippo caught and who the elephant caught, similar to subject-*dake* in a transitive construction (e.g., *Only the hippo caught a panda*). Therefore, we predict that children will make incorrect association errors and interpret sentence (10d) as having the same meaning as sentence (10c).

7. Results

As predicted, the children in the two groups responded significantly differently. Figure 14 presents mean accuracy for each group (subject-*dake* and by-*dake*), separated by target answer (true or false). Each dot in the figure represents an individual child's mean accuracy.

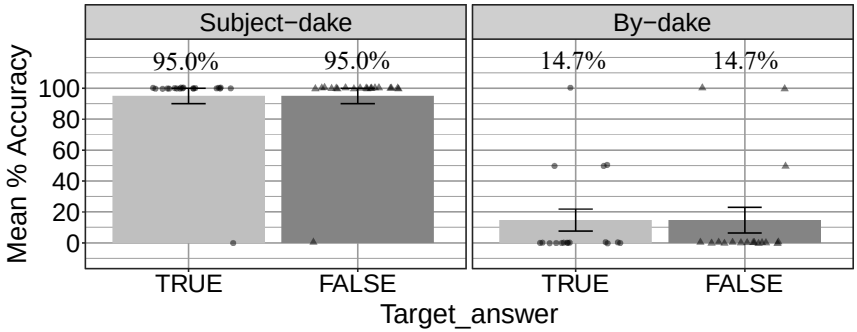


Figure 14: Children's mean acceptance rates by *Group* and *Target answer*. The error bars indicate standard errors of participant mean.

Children who received subject-*dake* (ages 4;7–5;10, mean: 5;4) almost perfectly interpreted the test sentences in unaccusative constructions. There was no difference between true and false items. Comparing the accuracy of subject-*dake* in this study with previous studies in Japanese, the overall accuracy here was 95.0%, while previous studies reported accuracy below or at chance (31.7% in Endo, 2004; 25.0% in Mochizuki et al., 2021; 55.0% in Shimada et al., 2022). This comparison shows that children do not have difficulty with subject-*dake* when *dake* appears on a theme subject.

In contrast, children who received by-*dake* (ages 4;6–6;6, mean: 5;7) had an accuracy of only 14.7%. Importantly, children's errors reflected incorrect association from the by-phrase to the theme subject, as evidenced by their justifications for false responses. For example, when incorrectly judging the sentence (10d) as false, children often explained that it was wrong because the hippo also caught a rabbit. Overall, the sharp contrast between the subject-*dake* condition and the by-*dake* condition shows that children's difficulty with *dake* cannot be attributed to subject-focus.

8. Discussion

The goal of our study was to examine whether Japanese children, who are prone to incorrect association errors, can interpret subject-*dake* in full unaccusative constructions when the visual inspection demands match those of object-*dake* in a transitive construction. Our experiment shows that this is the case: 4- to 5-year-olds performed almost perfectly with subject-*dake* sentences, while 4- to 6-year-olds performed poorly with by-*dake* sentences.

This observation supports our visual inspection hypothesis regarding the difficulty with subject-'only,' as reported in previous literature. This explanation is preferable to syntactic hypotheses, which suggest that children's errors result from non-adult-like syntactic knowledge of 'only.' According to the syntactic account, children would need negative evidence to revise their initial syntactic representation. Because such negative evidence does not appear in the input, it is more plausible that children already have an adult-like syntactic knowledge of

'only,' and that their errors result from the cognitive demands of visual inspection. As children's cognitive flexibility develops, this burden decreases because they can overcome the visual saliency discussed in Section 4, leading to adult-like performance. Höhle et al.'s (2016) findings also support this view, reporting a significant correlation between children's performance with subject-*nur* 'only' and their performance on the flanker task.

Importantly, our experiment used only a broad lead-in sentence, unlike earlier studies by Hackl et al. (2015), Sugawara (2016), and Deen et al. (2023), which provided much more specific contextual support. Despite the lack of such scaffolding, our 4- to 5-year-olds still showed adult-like performance with subject-*dake*.

This raises a possibility that children's previously reported difficulties with subject-'only' do not stem from a lack of contextual support. Instead, the improved performance observed in those studies may occur because such cues limit children's visual search space before they hear the sentence with 'only.' For example, hearing "Who is holding a flag?" directs attention to animals holding a flag, and hearing "The panda got a car, and the rabbit got a car" already restricts children's attention to checking whether these animals have a car or not prior to hearing "Only the panda got a car." We plan to conduct future studies to separate the pragmatic and visual factors.

Another point to discuss is that the better performance on theme-subject-*dake* than on agentive by-*dake* may indicate that the main difficulty is not with subject-*dake* itself, but with *dake* attached to an agentive theta-role, as previously noted by Endo (2004). However, our visual inspection hypothesis predicts that difficulty should arise whenever visual inspection demands are high, regardless of the grammatical function or theta-role of the focused element. Consider Sugawara et al.'s (2024) study, which shows that children tend to incorrectly associate *dake* attached to an indirect object with the direct object in ditransitive sentences such as (11) with the picture in Figure 15.

(11) Usagi-ga panda-dake-ni keeki-o age-ta yo.
rabbit-NOM panda-only-DAT cake-ACC give-PST SFP
'The rabbit gave a piece of cake only to the panda.'
IA: 'The rabbit gave only a piece of cake to the panda'
(adapted from Sugawara et al., 2024)

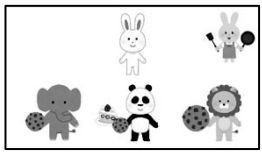


Figure 15: A picture taken from Sugawara et al. (2024)

To evaluate the truth of (11) using the given picture, children must examine all recipient–theme combinations in the scene, resulting in a high visual inspection

load. This accurately predicts children's difficulty, even when *dake* attaches to a non-subject, non-agent element (the recipient).

9. Conclusion

We showed that Japanese four- to five-year-old children correctly interpret subject-*dake* in full unaccusative constructions when presented with a broad lead-in sentence, unlike their performance with sentences containing by-*dake.* These findings support our visual inspection hypothesis and provide a unified explanation for children's incorrect association errors across constructions, grammatical functions, and theta-roles. More broadly, the results emphasize the importance of considering the interaction between sentence processing and visual inspection when studying child language acquisition.

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