Children's Comprehension of Possessive and Adversative Passives in Japanese: Examining Alternating Hypotheses

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1. Introduction

Research has revealed that preschool-aged children showed difficulties in comprehending passive sentences cross-linguistically, and multiple proposals have been made regarding what makes passive sentences challenging for children. The current study examined alternating predictions driven by the hypotheses proposed thus far, utilizing a set of passive sentences in Japanese, a null-argument language that features a variety of passive constructions which allowed us to investigate the proposals in a single-study setting.

2. Hypotheses and findings on passive acquisition

Earlier hypotheses on the acquisition of passive sentences were proposed primarily based on passives in child English, attributing children's difficulties to aspects of their grammar: the *A-chain Deficit Hypothesis* (*ADH*, henceforth: Borer & Wexler, 1987) attributed children's difficulties to their immature ability to form an A-chain; the *Theta-transmission Hypothesis* (*TTH*, henceforth: Fox & Grodzinsky, 1998) attributed their difficulties to transferring the external theta-role involving a by-phrase. Recently, a sentence processing hypothesis, the *Incremental Processing Hypothesis* (*IPH*, henceforth: Huang et al., 2013), has been proposed, claiming that the source of children's difficulty is processing burden driven by the reanalysis required when they hit the passivized VP during the processing of a passive sentence.

The literature on the acquisition of passives was extended to child Japanese[1]. Before reviewing previous studies on Japanese passive acquisition, we will first

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[1] Each gloss abbreviation used in the current paper stands for: NOM=nominative particle; ACC=accusative particle; PASS=passive morpheme; PST=past tense marker; POSS=possessive marker; END=sentence end marker.

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present characteristics of passive sentences of Japanese relevant to the previous and current studies. Japanese has a wider variety of passive constructions than English, as is demonstrated in the examples below.

(1) Active

Panda-ga	neko-o	hippar-ta-yo
Panda-NOM	cat-ACC	pull-PST-END

'The panda pulled the cat.'

(2) a. Actional Full Passive

Neko$_i$-ga	panda-ni t_i	hippar-are-ta-yo
Cat-NOM	panda-by	pull-PASS-PST-END

'The cat was pulled by the panda.'

b. Actional Short Passive

Neko$_i$-ga	t_i hippar-are-ta-yo
Cat-NOM	pull-PASS-PST-END

'The cat was pulled.'

c. Actional Null-subject Passive

ϕ_i	panda-ni t_i	hippar-are-ta-yo
	panda-by	pull-PASS-PST-END

'(The cat) was pulled by the panda.'

(3) Active with a Possessor NP

Panda-ga	neko-no	ude-o	hippar-ta-yo
Panda-NOM	cat-POSS	arm-ACC	pull-PST-END

'The panda pulled the cat's arm.'

(4) a. Possessive Full Passive

Neko$_i$-ga	panda-ni t_i	ude-o	hippar-are-ta-yo
Cat-NOM	panda-by	arm-ACC	pull-PASS-PST-END

'The cat had his arm pulled by the panda.'

b. Possessive Short Passive

Neko$_i$-ga	t_i ude-o	hippar-are-ta-yo
Cat-NOM	arm-ACC	pull-PASS-PST-END

'The cat had his arm pulled.'

c. Possessive Null-subject Passive

ϕ_i	panda-ni t_i	ude-o	hippar-are-ta-yo
	panda-by	arm-ACC	pull-PASS-PST-END

'(The cat) had his arm pulled by the panda.'

(5) Adversative Full[2] Passive

Neko-ga	panda-ni	mado-o	aker-are-ta-yo
Cat-NOM	panda-by	window-ACC	open-PASS-PST-END

'The cat was adversely affected by the panda's opening the window.'

Like English, Japanese presents syntactic passivization involving an A-chain[3], which generates actional passives as in (2a) out of corresponding active sentences as in (1), where the transitive verb *hipparu* 'pull' was passivized and the internal argument *neko* 'cat' becomes the passive subject. Importantly, Japanese features *possessive passives* as in (4a-c), a type of passive construction where the possessor NP of the internal argument *neko* 'cat' in an active base sentence as in (3) is fronted and becomes the passive subject. In addition, there are also *adversative passives* as in (5), another type of Japanese-specific passive construction where there is no A-movement involved in derivation (e.g., Kubo, 1992). Just like English passives, all these passives can be realized without a phrase containing *ni* 'by,' creating short passives as in (2b) and (4b). In addition, Japanese is a null-argument language, which allows argument NPs to be dropped. Passives like (2c) and (4c) are possible, where the passive subject is dropped.

Let us now turn to the discussion on previous findings on the acquisition of passives in Japanese. Sugisaki (1999) and Minai (2001) examined children's passive comprehension using passive sentences with and without an A-chain. They revealed children's worse performance for passives with an A-chain (e.g., (2a) and (4a)) than those without an A-chain (e.g., (5)). They concluded that Japanese children were unable to form an A-chain, in support of the ADH. In contrast, Okabe and Sano (2002) examined children's comprehension of full and short passives (e.g., (2a) vs. (2b)), finding that their comprehension was better for short passives without a *ni*-phrase (2b) than for full passives containing a *ni*-phrase (2a), while both of these types involve an A-chain. These results supported the TTH, rather than the ADH; they claimed that the difficulty was due to the grammatical complexity for interpreting a *ni*-phrase.

Recently, Ishikawa and colleagues (2020) investigated the predictions from the IPH. The IPH assumes that the parser processes NPs as it encounters them, assigning thematic roles incrementally; typically, the first NP is assigned Agent due to the Agent-first bias, and the second NP tends to be Theme. In a passive sentence, the first NP is typically Theme and the second NP is Agent. When

[2] Adversative passives are rarely marked together with full/short as marked here. However, in this study, passive sentences in which NPs are deleted are used, such as a short passive in which the *ni* phrase is deleted and a null-subject passive in which the subject NP is deleted. For readers' clarity, passive sentences in which no NP elements have been deleted are marked as a 'full' passive.

[3] There is a debate in the literature regarding whether or not passives in Japanese are derived forming an A-chain (e.g., Kubo, 1992; Kuroda, 1979). In this paper, as in previous studies of children's language acquisition in Japanese, we employ a syntactic analysis of the Japanese accusative passives with A-movement that forms an A-chain (e.g., Kubo, 1992).

processing a passive sentence, the parser realizes that the current sentence is passive only when it hits the passivized verb, after assigning Agent to the first NP and Theme to the second. Then, the thematic roles assigned to the NPs thus far need to be revised, requiring syntactic reanalysis of the entire sentence. As children are known to be unable to flexibly reanalyze a sentence being processed (e.g., Trueswell et al., 1999), the IPH claims that processing of a passive sentence is challenging for children due to the need for syntactic reanalysis. In order to examine this claim in Japanese, Ishikawa and colleagues focused on the flexible word order attested in Japanese, and placed the passivized verb at the beginning of their test sentences as in (6a) below (V-initial sentences; Ishikawa et al., 2020). As the change of word order does not affect the truth condition of the sentence, the V-initial passives like (6a) have the same meaning as their counterpart in the canonical, SOV word order as in (6b).

(6) a. V-initial Passive

Ker-are-ta-yo	tora$_i$-ga	zou-ni	t_i
Kick-PASS-PST-END	tiger-NOM	elephant-by	

'The tiger was kicked by the elephant.'

b. Passive in Canonical SOV Word Rrder

Tora$_i$-ga	zou-ni	t_i	ker-are-ta-yo
Tiger-NOM	elephant-by		kick-PASS-PST-END

'The tiger was kicked by the elephant.'

Note that, in (6a), the passive morpheme *(r)are* appears at the beginning of the sentence. Therefore, the parser is cued that the current sentence is passive right from the start, before starting processing of any NPs for which thematic roles need to be determined. Hence, the IPH predicts that children's comprehension of V-initial passives (6a) might be more accurate than (6b), because the parser expects that (6a) is passive from the start; processing (6a) does not require reanalysis, while processing (6b) does. Contrary to this prediction, their findings revealed that children's comprehension accuracy was not significantly different between (6a) and (6b), running counter to the IPH. Based on these findings, the authors concluded that children's difficulties with passives cannot be explained solely by the general properties of their processing mechanisms.

Ishikawa and colleagues further revisited results of Okabe and Sano (2002) from a sentence processing perspective. Recall that Okabe and Sano found that full passives with a *ni*-phrase elicited lower comprehension accuracy than short passives without a *ni*-phrase, supporting the TTH. Ishikawa and colleagues pointed out that the full passives used in their stimuli involved two overt NPs (*ga*-marked Theme NP and *ni*-marked Agent NP, like (2a)), whereas their short passives involved one overt NP (*ga*-marked Theme NP only, like (2b)). On the basis of the sentence processing literature suggesting that the sentence processing load increases as the number of elements in a processed sentence increases (e.g., Mazuka et al., 1989), Ishikawa and colleagues raised an alternate possibility for

Okabe and Sano's findings; children's performance might have been lower for full passives like (2a) than for short passives (2b), as the former contains two NPs while the latter contains only one NP.

Based on the reanalysis of these findings, Ishikawa et al. (2018) and Ishikawa (2021) reexamined whether the presence or absence of a *ni*-phrase indeed affected the children's correct response rate in Okabe and Sano (2002), or whether the different number of NPs between passives with a *ni*-phrase (two NPs) and those without a *ni*-phrase (one NP) might have been the source of difference in children's comprehension accuracy. To tease apart these alternating scenarios, Ishikawa and colleagues designed the experiment as follows. In addition to the two types of passives used in Okabe and Sano, i.e., full passives as in (2a) which contain two NPs and short passives as in (2b) which contain one NP, Ishikawa et al. crucially added null-subject passives as in (2c) which only contain one NP, i.e., a *ni*-phrase. Comparing children's comprehension among these three types of passives allowed them to directly examine whether children's difficulty lies in the presence of a *ni*-phrase or in the bigger number of NPs to process. If the presence of a *ni*-phrase is the source, then children's comprehension accuracy would be lower for full passives (2a) and null-subject passives (2c) (both contain a *ni*-phrase) than for short passives (2b) (not containing a *ni*-phrase). If, on the other hand, the number of NPs matters, children's comprehension accuracy would be lower for full passives (2a) (containing two NPs) than the other two types of NPs (2b-c) (containing one NP).

Their results revealed the latter scenario; the correct answer rates were significantly lower for full passives (2a) than for short passives (2b) and null-subject passives (2c); also, there was no significant difference between short and null-subject passives. These findings ran counter to the TTH, suggesting that the number of NPs in passive sentences may be a crucial factor for children's difficulty in passive comprehension. Crucially, the findings suggested that the more NPs a passive sentence contains, the more difficulty children may undergo.[4] Based on these findings, Ishikawa proposed a new hypothesis, the *Noncanonical Assignment Hypothesis* (*NAH,* henceforth), claiming that noncanonical particle-theta-role paring caused by the passive morpheme *(r)are* creates additional processing burden that increases as the number of NPs increases. The key points of the NAH can be summarized as follows.

[4] Crucial finding in Ishikawa (2021) and Ishikawa et al. (2018) is that, for active sentences, the number of NPs in a sentence did not affect children's performance:children's correct responses for passive sentences were not as frequent as the correct responses for the active sentences, even though the number of NPs in the passive sentences was minimized (one NP). This result implies that there is 'secret factor(s),' aside from sentence processing load, derived from the number of NPs, which creates difficulty in passive comprehension for Japanese children.

(7) a. Children may expect typical pairings of a particle and a theta-role in NPs (e.g., Nominative-Agent pairing; e.g., Hakuta, 1982).

b. If the particle-theta-role pairing does not align with the typical paring, the semantic interpretation becomes difficult to process (e.g., Hirotani et al., 2011).

c. The processing load increases as the number of atypical particle-Theta-role pairs increases (Ishikawa et al., 2018; Ishikawa, 2021).

3. The current study

The current study aims to examine alternating predictions driven by the four hypotheses discussed above, ADH, TTH, IPH and NAH, utilizing a wide variety of Japanese passive constructions in a single-study setting. We are particularly interested in which of the four hypotheses would best account for children's comprehension patterns of these various passive constructions.

3.1. Design

The experiment was designed with two sessions. Session 1 was designed to examine children's comprehension of passive constructions with and without a *ni*-phrase, while the number of NPs (two) and the presence/absence of A-chain, remain the same across type. The Conditions were summarized in Table 1.

Table 1. Session 1 Design: 2-NP passives with/without a *ni*-phrase

(8)	**Actional full passive** (=(2a)) [*ni*-phrase involved]			
	Neko$_i$-ga	Panda-ni	t_i	hippar-are-ta-yo
	Cat-NOM	panda-by		pull-PASS-PST-END
	'The cat was pulled by the panda.'			
(9)	**Possessive short passive** (=(4b)) [*ni*-phrase <u>*not*</u> involved]			
	Neko$_i$-ga		t_i ude-o	hippar-are-ta-yo
	Cat-NOM		arm-ACC	pull-PASS-PST-END
	'The cat had (his) arm pulled.'			
(10)	**Possessive null-subject passive** (=(4c)) [*ni*-phrase involved]			
	ϕ_i	Panda-ni	t_i ude-o	hippar-are-ta-yo
		panda-by	arm-ACC	pull-PASS-PST-END
	'(The cat) had (his) arm pulled by the panda.'			

Whereas the actional full passives as in (8) and the possessive null-subject passives as in (10) involve a *ni*-phrase, the possessive short passives as in (9) do not involve a *ni*-phrase. By comparing children's comprehension across these types of constructions, we can directly examine the prediction based on the TTH that children's comprehension of those with a *ni*-phrase, (8) and (10), would be worse than those without a *ni*-phrase (9), and the prediction based on the NAH that children's comprehension would not differ across these conditions.

Session 2 was designed to examine children's comprehension of passive sentences with and without an A-chain, while the number of NPs (three) and the presence/absence of *ni*-phrases, remain the same across types. See Table 2 for examples.

Table 2. Session 2 Design: 3-NP passives with/without an A-chain

(11)	**Possessive full passive** (=(4a)) [A-chain involved]			
	Neko$_i$-ga	Panda-ni	t_i ude-o	hippar-are-ta-yo
	Cat-NOM	panda-by	arm-ACC	pull-PASS-PST-END
	'The cat had (his) arm pulled by the panda.'			
(12)	**Adversative full passives** (=(5)) [A-chain *not* involved]			
	Neko$_i$-ga	Panda-ni	mado-o	aker-are-ta-yo
	Cat-NOM	panda-by	window-ACC	open-PASS-PST-END
	'The cat was adversely affected by the panda's opening the window.'			

The possessive full passives like (11) involve an A-chain, while the adversative full passives as in (12) do not. Comparing children's comprehension across these types allowed us to directly investigate the predictions based on the ADH that children would show poorer comprehension for (11) than (12), and the prediction based on the NAH that their comprehension would not differ across conditions.

While the predictions based on TTH vs. NAH and ADH vs. NAH are examined within each Session, the design of Sessions further allows us to examine the predictions based on the IPH vs. NAH across Sessions. Note that the sentences used in Session 1 (8-10) contain two NPs, whereas those used in Session 2 (11-12) contain three NPs. The IPH would predict that children's comprehension would not significantly differ across Sessions, because all the types of sentences contain a passivized VP at the end, the source of children's difficulty requiring the reanalysis. On the other hand, the NAH would predict that children's comprehension would be lower for Session 2 (where sentences contain three NPs) than Session 1 (where sentences contain two NPs).

3.2. Participants

The participants were 17 Japanese-speaking five-year-old children (mean age=5;3) and 20 undergraduate/graduate students at the University of Tokyo as adult control. All the children lived in Tokyo areas and were enrolled in a local private kindergarten. None of these children were reported to have any linguistic or developmental disorders. Their caretakers provided signed consent to approve their child's participation in the experiment.

3.3. Materials

For actional and possessive passives used in the stimuli, we utilized the four transitive verbs: *arau* 'wash'; *hipparu* 'pull'; *keru* 'kick'; *naderu* 'pat'. For adversative passives, the following four transitive verb phrases were utilized: *mado-o akeru* 'open the window'; *kagi-o simeru* 'lock the door'; *terebi-o kesu* 'turn off the TV'; *denki-o tsukeru* 'turn on the light'. In a pilot testing ahead of the experiment, we had confirmed that Japanese children at around age five are familiar with these verbs. For each type of target passive sentence, we prepared eight test sentences, in which each verb was used twice combined with a different pair of subject noun and object noun, making none of the sentences identical. We also used a set of active sentences as control items (N=24 for Session 1, N=16 for Session 2), which corresponded to passive sentences used as the target sentences. All the stimulus sentences were narrated by a female native speaker of Japanese and audio-recorded prior to the experiment.

We also developed a set of picture materials, each depicting the event referred to by the verb used in the test sentence. In each picture, two animal characters participated in an event; one of them was Agent and the other was Patient or Affectee in adversative passives (the character affected by the other character's action). Half of the pictures correctly depict the event referred to in the test sentence ('Match' items), while the Agent and Patient/Affectee were depicted in reverse in the other half of the pictures ('Mismatch' items). The position in which the agent animal appears (left vs. right) was counterbalanced across pictures. Figure 1 below shows a sample 'Match' picture.

Figure 1. A sample 'Match' picture used with the actional passive 'The cat was pulled by the panda'

In total, we created 48 sentence-picture pairs for Session 1 (24 target items and 24 active control) and 32 sentence-picture pairs for Session 2 (16 target items and 16 active control), which were presented in pseudo-randomized order.

3.4. Procedure

The task was a picture-sentence verification. The participant viewed a picture-sentence pair and judged whether the sentence accurately described the picture. The participant was introduced to a toy monkey, a character who was trying to describe the picture in this task. In each trial, the experimenter first showed a picture to the participant, and asked him/her to name the animal characters depicted in the picture. Then, the pre-recorded test sentence was played through a speaker built into the toy monkey. The participant judged whether the sentence matched the picture ('right') or not ('wrong'), by pressing either the 'right' button or the 'wrong' button.

The testing started with four practice trials using simple intransitive active sentences. After the practices, Session 1 started. During Session 1, there were two or three breaks. Session 2 started after Session 1, following a 10-minute break.

3.5. Predictions

Session 1 was designed to examine the TTH and the NAH, comparing children's comprehension across three kinds of 2-NP passives: actional full (8), possessive short (9) and possessive null-subject passives (10). The TTH predicts poorer comprehension for those with a *ni*-phrase, i.e., (8) and (10), than for those without a *ni*-phrase, i.e. (9). On the other hand, the NAH predicts no significant difference across conditions, as all types of passives contain two NPs.

Session 2 was designed to examine the ADH and the NAH, comparing children's comprehension across two types of 3-NP passive conditions: possessive full passives (11) and adversative full passives (12). Because (11), but not (12), contains an A-chain, the ADH predicts poorer comprehension for (11) than for (12). On the other hand, the NAH predicts no difference, as both conditions contain three NPs.

Lastly, we examined the IPH and the NAH, comparing the comprehension accuracy across all kinds of passives (2-NP passives in Session 1 vs. 3-NP passives in Session 2). The IPH predicts no significant differences among all passives, while the NAH predicts lower accuracy for the 3-NP conditions than the 2-NP conditions.

3.6. Results

We calculated participants' mean percentages of correct comprehension responses (i.e., responses where participants accurately judged 'match' items as 'right'/'match' and those where participants accurately judged 'mismatch' items as 'wrong'/'mismatch'). While adults' comprehension for all types of passive sentences was at ceiling, children's comprehension accuracy varied. Figure 2 illustrates the mean percentage of correct response.

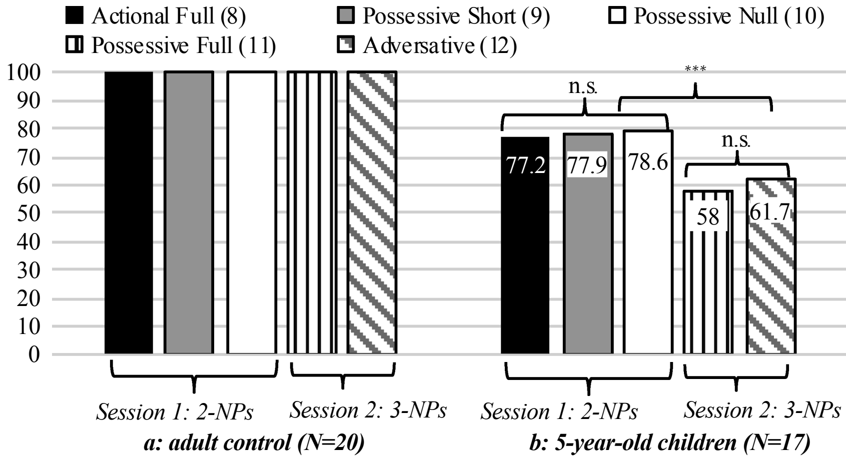

Figure 2. Percentage of correct answers for each passive condition: a. adult control; b. 5-year-old children

We analyzed children's responses with Generalized Linear Mixed models with a binomial function (e.g., Jaeger, 2008). We set the mean percentage of correct response as the dependent variable, entered Sentence Type as the fixed effect, and entered participants and items as random effects. Sentence Type was initially included as random slope for both random effects. We selected the best-fit model using a backward selection approach.

As for the results of Session 1, the analysis revealed that there was no significant difference between Actional full passives and Possessive short passives (p = .87), between Actional full passives and Possessive null-subject passives (p = .76), and between Possessive short passives and Possessive null-subject passives (p = .88). This finding suggests that children's comprehension of passives was not influenced by the presence or the absence of a *ni*-phrase, running counter to the TTH. As for the results of Session 2, there was no significant difference between Possessive full and Adversative full passives (p = .51), suggesting that children's comprehension of passives was not influenced by the presence or the absence of an A-chain, running counter to the ADH. We further analyzed whether children's comprehension accuracy was different across Sessions, which in turn examined whether children's comprehension accuracy was different between passives with two NPs (used in Session 1) and those with three NPs (used in Session 2). The results revealed that children's comprehension was significantly lower for Possessive passives containing three NPs used in Session 1 than those containing two NPs used in Session 2 (ps < .001), and also significantly lower for Adversative passives containing three NPs used in Session 1 than those containing two NPs used in Session 2 (ps <. 01), suggesting that children's comprehension was poorer as the number of NPs increased, in favor of the NAH, rather than the IPH.

As for active sentences used as control, both children and adults showed over 95% of correct responses.

4. Discussion and concluding remarks

In this study, we tested predictions from four hypotheses, ADH, TTH, IPH, and NAH, which have been proposed to account for children's difficulty in comprehending passive sentences. We designed a two-session experiment to examine all these hypotheses in a single-study setting. Results of Session 1 revealed no significant difference in children's comprehension accuracy between passives with *ni*-phrases and those without *ni*-phrases. These findings run counter to the TTH, while consistent with the NAH. Results of Session 2 revealed no significant difference in their comprehension accuracy between passives with an A-chain and those without an A-chain. These findings run counter to the ADH, while in line with the NAH. When we compared children's comprehension across Sessions (2-NP passives vs. 3-NP passives), the results showed that children's comprehension accuracy was lower for passives with three NPs than those with two NPs. Since all the passives used in this study contain a passivized VP at the end of a sentence and thus require revision according to the IPH, the lower comprehension accuracy for passives with three NPs than those with two NPs is not consistent with the IPH but is consistent with the NAH. As in the previous studies (Ishikawa et al., 2018; Ishikawa, 2021), the effect of the number of NPs was seen only for passive sentences, not for active sentences.

Why does understanding passive sentences become more difficult for children as the number of NPs in the sentence increases? As we presented in (7) above, the NAH assumes that there is a preferred, canonical/typical pairing pattern between the particle attached to an NP and the thematic role that the NP is assigned (Ishikawa et al., 2018). This assumption is grounded in findings which revealed that adult native speakers of Japanese prefer to interpret a *ga*-marked NP to be Agent, an *o*-marked NP to be Theme and a *ni*-marked NP to be Goal (e.g., Hirotani, 2011). In addition, research further revealed that Japanese-acquiring preschool-age children are also aware of this typical pairing between these particles with correspondingly preferred thematic roles for the NP with each particle (Isobe et al., 2004). Note that the current study also revealed that children were able to comprehend active sentences with the typical particle patterns correctly (over 95%), where *ga* is attached to the Agent NP and *o* is attached to the Theme NP. Hence, the preferred, canonical pairing pattern between the particle and the thematic role on NPs is likely to be established by around age five.

Crucially, the pairing between a particle to an NP and the thematic role the NP realizes does not align with this canonical pattern in passive sentences; a *ga*-marked NP is typically the Theme and a *ni*-marked NP is the Agent. As mature native speakers, adults possess complete knowledge of particles and thematic role assignment mechanisms, and thus are able to accurately assign thematic roles to NPs in passive sentences; they may initially be biased by the preferred particle-thematic-role pairing pattern in processing a passive sentence, but once they hit the passivized verb and know that the current sentence is passive, they are able to update the thematic role assignment accordingly. Children, on the other hand, may not yet acquire complete knowledge of particles and may yet be unaware of the particle-thematic-role pairing pattern which does not align with the canonical pairing pattern. Therefore, they are not yet able to revise thematic role assignment required for passives, resulting in committing non-adult-like passive comprehension.

The speculation on passive processing presented above is in line with the IPH, in that it attributes children's difficulty in part to their failure in revision in sentence processing. It should be highlighted, however, that the NAH further aims to account for why children's passive comprehension accuracy varies across types of passives, which the IPH cannot explain. One of our important findings is that passive sentences were not uniformly difficult for children, but their comprehension accuracy varied depending on the number of NPs; when there were less NPs in a passive sentence (two, rather than three), children correctly comprehended passives over 70% of the time. This suggests that 5-year-olds do not completely lack the information required for passive sentence interpretation.

Then, what explains the increased difficulty children face as the number of NPs increases? We would like to point out that children's successful deployment of their particle knowledge may rely on the position of the NP carrying the particle in a sentence. Hakuta (1982) found that Japanese-acquiring children know that a *ga*-marked NP refers to Agent, but in scrambled sentences, where an *o*-marked NP precedes a *ga*-marked NP, children's comprehension accuracy was lowered. Hakuta argued that children have a position preference; in order for children to fully deploy the knowledge that *ga*-marked NPs tend to be Agent, the *ga*-marked NP should appear in the sentence-initial position. Another relevant finding we remark upon is that children's difficulty in processing the first NP of the sentence may successively increase difficulty in processing subsequent NPs. Suzuki (2013) found in his sentence processing experiment with Japanese children that the *o*-marked Theme NP appearing sentence-initially elicited a slower reaction time than the sentence-initial, *ga*-marked Agent NP. Suzuki also found that, when the *o*-marked Theme NP preceded the *ga*-marked Agent NP, children's response time was also longer for the *ga*-marked Agent NP following the *o*-marked Theme NP.

Taken together, we argue that the current results suggest the following conclusions in favor of the NAH. Children, as well as adult speakers, have a preference to pair a *ga*-marked NP with Agent, an *o*-marked NP with Theme, and a *ni*-marked NP with Goal. However, such a pairing is not attested in passive sentences, where a *ga*-NP is Theme and a *ni*-marked NP is Agent. Although children know of the canonical/typical pairings, their knowledge of particles and thematic role assignment mechanism are not yet fully adult-like. Therefore, passive sentences create a challenge, because the particle-thematic role pairing on NPs is not typical. In addition, children also prefer that the *ga*-marked Agent NP is placed in the sentence-initial position. If this positional preference is not held, children may not be able to deploy their already-available knowledge of particles and their corresponding thematic roles. If the first NP of the sentence does not carry *ga* or Agent, children's processing of this NP is challenged, and the subsequent NPs increase the processing load cumulatively. The speculation developed here further predicts that children's comprehension difficulty is subject to the number of NPs for sentences other than passives, in which the canonical/typical pairing between particles and thematic roles on NPs is not held. Future research is called for to examine this prediction, as well as ultimately understand the precise mechanism of why the number of NPs may matter for those types of sentences.

In conclusion, our findings revealed that children's difficulty in comprehending passives in Japanese increased as the number of NPs in sentences increased, utilizing a wide set of passive sentences in Japanese in a single round of testing. Our results are most consistent with the prediction based on the Noncanonical Assignment Hypothesis, providing additional evidence in support for this hypothesis.

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