Children's Interpretation of Additive Particles *mo* 'also' and *also* in Japanese and English

Hisao Kurokami, Daniel Goodhue, Valentine Hacquard, and Jeffrey Lidz

1. Introduction

Additive particles like English *also* and Japanese *mo* 'also' contribute an additive presupposition to sentence meaning via their association with focus (König, 1991). For example, a speaker uttering the English sentence (1), which contains an object-associated *also* as indicated by pitch accent location, not only asserts that Mickey ate a banana but also presupposes that Mickey ate something other than a banana. Likewise, a speaker uttering the Japanese sentence in (2), which contains an object-associated *mo* as indicated by its post-object position in the sentence, makes the same assertion and presupposition.

(1) Mickey *also* ate a BANANA.[1]

(2) Mikki-wa   banana-*mo*   tabe-ta.[2]
     Mickey-TOP banana-also eat-PAST
     'Mickey *also* ate a BANANA'

Presuppositions consist of backgrounded information, whose truth is taken for granted by all discourse participants, i.e., they are part of the COMMON GROUND (Stalnaker, 1978). As such, additive particles like *also* typically require that the relevant information that satisfies (the truth of) the additive presupposition already be established as backgrounded information, prior to their use; if not, the use of the particles would be infelicitous. This is illustrated in example (3) below.

(3) A: What did Mickey eat for lunch?
     a. B: #Mickey *also* ate a BANANA.
     b. B: Mickey ate an APPLE, and he *also* ate a BANANA.

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[*] Hisao Kurokami, Daniel Goodhue, Valentine Hacquard, and Jeffrey Lidz: University of Maryland. Corresponding author: Hisao Kurokami, kurokamihisao@gmail.com.
[1] The use of capital letters in the linguistic example indicates the location of a pitch accent.
[2] Unlike in English where a phonological cue plays a crucial role in determining focus-association, it is typically the case that focus-association is determined by a syntactic cue in Japanese, i.e., Japanese focus particles associate with the constituent they adjoin to. Specifically, post-object *mo* marks object-association.

The use of *also* in (3a) is infelicitous as the particle-triggered presupposition *Mickey ate something other than a banana* is not satisfied in the discourse context provided in the example. This contrasts with (3b), where the additive presupposition is satisfied by speaker B's prior statement about Mickey eating an apple.

The above example shows that additive particles require an antecedent that satisfies the presuppositional contribution they trigger (Kripke, 2009); or even if the additive presupposition is not satisfied, the antecedent should make the relevant information that satisfies the presupposition maximally salient such that (global) ACCOMMODATION becomes possible (Lewis, 1979; von Fintel, 2000, 2008; Roberts, 2015). Relatedly, Abusch (2002) discusses that presupposition triggering expressions vary with respect to how easily their presuppositional contribution can be accommodated ('soft' vs. 'hard' distinction). Additive particles are among the so-called 'hard' triggers, whose presuppositional contribution is especially hard to accommodate compared to the likes of 'soft' triggers such as the English aspectual verb *stop*. Thus, the most natural way to use such particles would be in a context with a (linguistic) antecedent that satisfies the additive presupposition, i.e., a context that supports their presupposition.

The presuppositional nature of the contribution of additive particles poses a methodological challenge for those who study their acquisition. Because presuppositions consist of backgrounded information whose content cannot be directly denied or called into question, children's sensitivity to the additive presupposition must be assessed indirectly. To get around the issue, previous studies exploited the contextual constraint on the use of additive particles and tested whether children can respond to the anomaly in an adult-like way when the particles were used in contexts where the presupposition was either (i) false (Hüttner et al., 2004; Matsuoka, 2004; Bergsma, 2006; Matsuoka et al., 2006) or (ii) unsupported and had to be accommodated (Berger and Höhle, 2012). Such strategies, however, are not the most naturalistic way to test children's interpretation of the particles since additive particles would rarely get used in such contexts, particularly in child-directed speech (Dudley, 2017). Thus, in our study, we test whether children pick up on the additive presupposition when additive particles are used in a context that supports their presupposition like in (3b), which is how additive particles are naturally used.

In order to test children's interpretation of additive particles in their naturally occurring context, we conducted two experiments. Experiment 1 tested Japanese-acquiring 5-year-olds on their interpretation of object-associated *mo*, and Experiment 2 tested English-acquiring 4-year-olds on their interpretation of object-associated *also*. In both experiments, the additive particles were used in a context that supports their presupposition. Although children aren't fully adult-like, our results show that Japanese-acquiring 5-year-olds and English-acquiring 4-year-olds are able to account for the additive presupposition triggered by *mo* and *also*, correctly using the presupposition to restrict their answer to a *wh*-question. This suggests that the children tested in our study are sensitive to the additive presupposition triggered by *mo* and *also*.

2. Background

Spontaneous speech data show that children start producing additive particles at quite a young age, some well before their second birthday (Nederstigt, 2001; Matsuoka et al., 2006). Yet, previous studies that tested children's comprehension of additive particles report that Dutch-, German-, and Japanese-acquiring children up to age 7 have difficulty interpreting sentences containing an additive particle in an adult-like way (see Hüttner et al., 2004; Bergsma, 2006,; Matsuoka, 2004, Matsuoka et al., 2006). These studies tested to see if children can reject sentences containing an additive particle on the basis of a false presupposition. The Japanese-acquiring children were tested using a Truth-value judgement task, while the Dutch- and German-acquiring children were tested using a Picture-selection task. In all four studies, children failed to account for the additive presupposition, treating sentences containing an additive particle in the same way as those that lacked it. Berger and Höhle (2012), however, argue that children's failure to respond to the additive presupposition in these studies does not reflect children's true competence of additive particles, but could be due instead to a methodological artifact stemming from a mismatch between the presuppositional nature of the additive meaning triggered by these particles and the truth-value oriented nature of the tasks. As we've discussed in the previous section, additive particles contribute to the presuppositional content of a sentence, not its at-issue content, placing a contextual constraint on when a sentence can be uttered felicitously; false presupposition does not make the sentence false, but makes it infelicitous. Yet these studies used Truth-value judgement and Picture-selection tasks—two tasks that rely on truth-verification as a way of assessing children's interpretation of a sentence—to test children's comprehension of additive particles. As Berger and Höhle point out, the truth-value oriented nature of the tasks could lead children to downgrade the relevance of the additive presupposition in completing the tasks, as presuppositions do not affect the truth of a sentence, in which case children's poor performance would not be an accurate representation of their competence. That is, children could be fully aware of the additive presupposition triggered by the additive particles and still judge a sentence to be acceptable based solely on its asserted content.

In light of their argument, Berger and Höhle conducted an experiment using a Rewarding game task to test German-acquiring children's comprehension of *auch* 'also' in a context where the additive presupposition triggered by the particle was unsupported and had to be accommodated. Their design had two advantages over the earlier studies: (i) the content of the additive presupposition played a crucial role in deciding whether or not a puppet deserves a reward; and (ii) test sentences were presented as part of a larger discourse, making the presupposed event maximally salient. Their results show that children successfully distinguish sentences containing *auch* from those without it, giving significantly more rewards after sentences with *auch* than sentences without *auch*, and displaying at-ceiling, adult-like performance after *auch*-sentences. These results suggest that German-acquiring children are able to consider the additive presupposition

triggered by *auch*, and presumably, that children acquiring other languages can do the same for additive particles as well.

However, there are two potential concerns with Berger and Höhle's study. In their task, children displayed a non-adult-like tendency to reward the puppet even after sentences without *auch*, a condition in which adults almost never gave a reward. Hence, it is not immediately obvious how accurately Berger and Höhle's results represent children's competence, as their adult-like, at-ceiling performance with *auch*-sentences might be inflated by their natural tendency to give a reward. Additionally, Berger and Höhle tested children's interpretation of *auch* in a context where its presupposition was not supported and had to be accommodated, but this seems somewhat unnatural, given that in naturalistic data, additive particles, being hard triggers, tend to be produced in contexts where the presupposition is supported. In fact, Dudley (2017) finds that for the English additive particle *too*, children very seldom hear the particle used in a context that does not support its presupposition. To address these concerns, we designed a novel task which tests children's interpretation of additive particles in a context where their presuppositional contribution is supported. Furthermore, our task did not inherently bias children towards the target response like the Rewarding game task in Berger and Höhle's study did, giving us more reliable baseline.

3. Methods

Using a novel task, we tested Japanese- and English-acquiring preschoolers on their interpretation of object-associated *mo* and *also* respectively, in contexts that satisfied their presupposition. We assessed children's comprehension of the particles by comparing their responses to *wh*-questions with and without the particles to investigate whether or not children are able to use the presupposition to correctly restrict their answer to the *wh*-question. Given the right context, *wh*-questions with and without an additive particle yield different responses since the additive presupposition triggered by the particle places an extra constraint on what counts as a valid answer to the question. If children are sensitive to the additive presupposition, then there should be a difference in how children respond to the questions.

3.1. Incidental question task

To illustrate how our task works, we will walk through a test trial from the English experiment. The trial starts off with a short story about Mickey, Minnie, and Donald, who each eat an apple or a banana (or both).

(4) Mickey, Minnie, and Donald are going to eat fruit for breakfast. There are apples and bananas to eat. Mickey says, "I just woke up so I'm not that hungry. I'll just eat one fruit." Look, Mickey eats an apple! Mickey then says, "that was delicious. I'll eat another fruit!" Look, Mickey eats a banana! Minnie says, "eating too much fruit is not good for me. I'll just eat one fruit."

Look, Minnie eats an apple! Donald says, "I ate a lot for dinner yesterday, so I'm not hungry. I'll just eat one fruit." Look, Donald eats a banana!
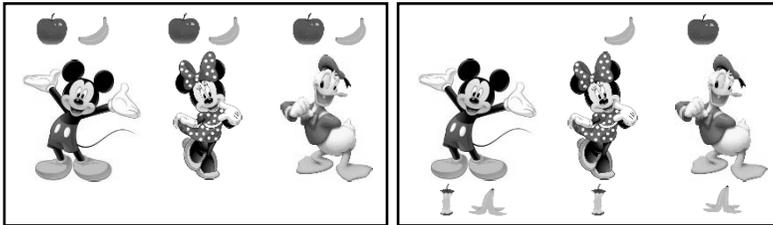
Figure 1. First and last slides from the sample story

As can be seen in Figure 1, there are two banana eaters in the sample story, Mickey and Donald. Of the two banana eaters, Mickey ate another fruit in addition to a banana, namely an apple. At the end of the story, an experimenter asks an on-screen puppet named Charlie a question like in (5), to test his understanding of the story. This question serves as a prompt for setting up the necessary context that makes the use of an additive particle natural.

(5) Who ate the most fruit in this story?

Charlie first responds to the experimenter's question by giving a recount of the story like (6).

(6) Well let's see. There were apples and bananas to eat. Donald didn't eat an apple, but Mickey and Minnie did.

However, being a forgetful chimpanzee, Charlie cannot remember some of the details and asks an incidental *wh*-question like (7) or (8) to solicit help. This incidental question happens to be our test question, which consists of the *wh*-question with and without *also* (between-subject manipulation). A sample question from Japanese is given in (9).

(7) Now, who ate a BANANA?

(8) Now, who *also* ate a BANANA?

(9) Are,   dare-ga   banana-o/*mo*   tabe-ta kana?
    hmm   who-NOM   banana-ACC/also   eat-PAST Q
    'Who (*also*) ate a BANANA'

An answer to the *also*-less-question in (7), interpreted as *which x are such that x ate a banana*, can be any individual who satisfies the at-issue content of the question *x ate a banana*, which would be Mickey and Donald in the given context.

Hence, *Mickey*, *Donald*, and *Mickey and Donald*, are all valid answers to the question. The *also*-question in (8), on the other hand, has a more restricted answer as *also*'s presupposition places an additional constraint on what counts as a valid answer to the question. Specifically, the answer to the question must satisfy both the at-issue content of the question *x ate a banana* and the presuppositional content of the question *x ate something other than a banana*. Given the above context, Mickey is the only character that satisfies this condition. Therefore, in a context where there are multiple banana eaters but only one of them ate something other than a banana, the two questions yield different responses.

Recall that additive particles require an antecedent that makes the content of the additive presupposition maximally salient. Hence, asking the question in (8) without any linguistic antecedent would result in a conversational breakdown. For this reason, the *wh*-questions were embedded in larger discourses like above, presented incidentally as part of the puppet's response to the experimenter's original question. In his recount of the story, Charlie explicitly states that Mickey and Minnie ate an apple. Therefore, by the time Charlie asks the incidental *wh*-question containing *also*, the necessary information that makes the presupposed content true is already established as backgrounded information. This allows us to test children's interpretation of *also* in a context that supports its presupposition, i.e., in its naturally occurring context.

3.2. Participants

Thirty-five monolingual Japanese-acquiring children (age 5;4-6;3, mean age 5;10) and eighteen monolingual English-acquiring children (age 4;0-4;9, mean age 4;5) were tested. Three Japanese-acquiring children and three English-acquiring children were excluded from the data analysis as they failed to complete the experiment or gave an incorrect response during filler trials, leaving us with thirty-two Japanese-acquiring children and fifteen English-acquiring children to analyze. In addition, eight Japanese-speaking and twenty-eight English-speaking adults participated as controls. (The target $n = 32$ for each age group so the study is still on-going.) The participants were randomly assigned to one of the following two conditions: ALSO or NO-ALSO; and had their results compared across the two conditions. Adults and children were tested using the exact same task.

3.3. Materials and Procedure

The experiment is conducted in a quiet space with a child seated next to the experimenter in front of a laptop computer.

The experimenter begins the session by introducing the on-screen puppet Charlie, a forgetful chimpanzee who loves stories, to the child. After a brief interaction with Charlie, the child is told that together they will be listening to some stories and that the child will be helping Charlie learn those stories by answering Charlie's questions, whenever Charlie cannot remember some details about the story and asks the child a question.

There are ten stories total (two practice, four test, and four filler), in which Mickey, Minnie, and Donald complete some tasks (e.g., eating fruit). In all of the stories, there is one character who completes one task (e.g., eats an apple), one character who completes a different task (e.g., eats a banana), and one character who completes both of those tasks (e.g., eats an apple and a banana). The character that completed both tasks varied across stories.

The child first goes through a training phase, which consists of two practice trials to get them familiarized with the task. After the training, the child enters the test phase, which alternates between test trials and filler trials. All trials, including practice, follows the same basic setup that we saw in §3.1. The experimenter tells a story and then asks Charlie a question about the content of the story to test Charlie's understanding of the story. The purported goal of the task was to help Charlie answer this question. Charlie responds to the experimenter's question by recounting the story, but failing to remember everything, Charlie seeks help from the child by asking an incidental question. After hearing the child's response, Charlie proceeds to answer the experimenter's original question. The experimenter then asks the child whether or not Charlie was correct to test Charlie's understanding of the story. Charlie's answer to the experimenter's original question was counterbalanced between correct and incorrect answers.

The crucial difference between the trials lies in the type of questions used by Charlie to solicit help from children: in the test trials, Charlie solicits help from children by using *wh*-questions, but in the practice and filler trails, Charlie uses *yes*/*no*-questions. The *wh*-questions used in the test trials are the critical test questions (e.g., *Who (also) ate a BANANA*?). We assess children's ability to consider the presupposition triggered by additive particles based on how they respond to the questions,. The filler trials are there as a control. Children who failed to give a correct answer to the *yes*/*no*-questions (e.g., *Did Mickey eat a banana?*) during the filler trials were excluded from the final analyses.

All utterances by Charlie were prerecorded by a native speaker of American English (and a native speaker of Japanese for the Japanese experiment) to keep the use of prosody consistent across all participants.

3.4. Prediction

If children are sensitive to the additive presupposition triggered by additive particles, we expect a different pattern in their responses across two conditions. Specifically, we expect children to give more TWO-ACTION CHARACTER (e.g., Mickey from the sample story, who ate both an apple and a banana) responses in the ALSO-condition than in the NO-ALSO-condition. Conversely, if they are not able to consider the additive presupposition triggered by additive particles, then we expect children to display the same pattern of responses across two conditions, as the test questions with and without an additive particle share the same at-issue content.

4. Results
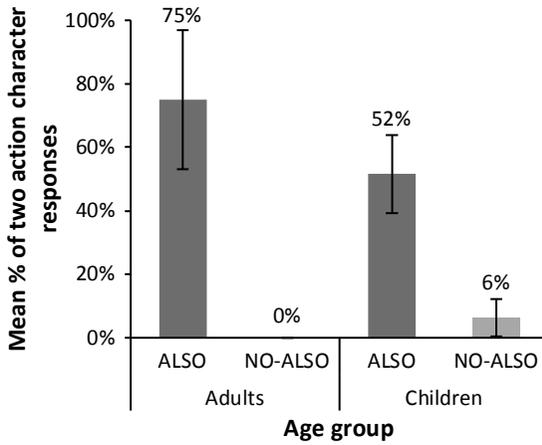
Figure 2. Mean percentage of two-action character responses across two conditions for each age group in the Japanese experiment with errors bars indicating 95% confidence intervals
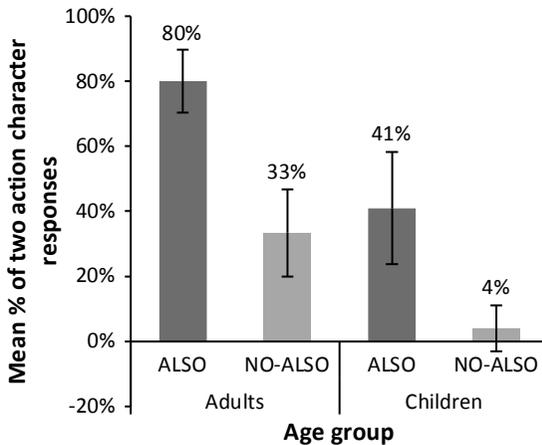
Figure 3. Mean percentage of two-action character responses across two conditions for each age group in the English experiment with error bars indicating 95% confidence intervals

Figure 2 summarizes the results from the Japanese experiment, displaying the mean percentage of two-action character responses across two conditions (ALSO vs. NO-ALSO) for adults and children. As can be seen in the figure, adults in the ALSO-condition gave more two-action character responses than those in the NO-ALSO-condition (75.00% vs. 0.00%), which is expected given the design of the

task. Although they aren't perfectly adult-like, children displayed the same general pattern, where children in the ALSO-condition gave more two-action character responses than the children in the NO-ALSO-condition (51.56% vs. 6.25%). Using the glmer function in the lme4 package on R (R Core Team, 2020), we ran a mixed-effects logistic regression of the results with age (Adults vs. Children) and condition (ALSO vs NO-ALSO) as fixed factors and participants and trials as random intercepts. The model revealed a significant effect of condition (β = -10.15, $p < 0.01$) but not age (β = -1.55, $p > 0.5$).[3]

Figure 3 summarizes results from the English experiment, again displaying the mean percentage of two-action character responses across two conditions (ALSO vs. NO-ALSO) for each age group (Adults vs. Children). As expected, adults in the ALSO-condition gave more two-action character responses than those in the NO-ALSO-condition (80.00% vs. 33.33%). Similarly, children in the ALSO-condition gave more two-action character responses than the children in the NO-ALSO-condition (English: 40.63% vs. 3.57%). Using the same mixed-effect logistic regression model, we ran a statistical analysis of the English results, which revealed a significant effect of both condition (β = -58.19, $p < 0.001$) and age (β = -57.68, $p < 0.001$).

One might wonder about the difference between Japanese- and English-speaking adults in the NO-ALSO-condition. While the Japanese-speaking adults never gave a two-action character response in the NO-ALSO-condition, the English-speaking adults in the NO-ALSO-condition gave a notable amount of two-action character responses. We suspect this difference is due to Japanese Q particle *kana* requiring complete answers (Miyagawa, 2001), which lead the Japanese-speaking adults in the NO-ALSO-condition to name both characters that satisfy the at-issue content of the test question. As for the English-speaking adults, the two-action character responses in the NO-ALSO-condition comes with no surprise, since such answers are perfectly sensible answers given the pragmatics of the task: if the purported goal of the task was to help the puppet answer the experimenter's question *Who ate the most fruit?* and it is clear from the immediate discourse that the puppet already knows that Mickey and Minnie ate an apple but Donald didn't, then Mickey eating a banana is the most helpful information one can provide in the given context.

5. Discussion

Looking at the children's result for both Japanese and English, we see a robust difference in the mean percentage of two-action character responses across two conditions (ALSO vs. NO-ALSO). This indicates that the Japanese- and English-acquiring children that we tested distinguish *wh*-questions with *mo* and *also* from those without. Moreover, children's adult-like tendency to give more two-action character responses in the ALSO-condition than in the NO-ALSO-condition, as

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[3] The lack of age effect could be due to the small sample size of adults in the Japanese experiment ($n = 8$).

indicated by the significant effects of condition from our statistical analyses, suggests that the above difference is a reflection of children's ability to consider the additive presupposition triggered by these particles, which children use to restrict their answer to a *wh*-question. In fact, both Japanese- and English-acquiring children in the NO-ALSO-condition very rarely gave two-action character responses. Since the only thing that is different across the two conditions is the use of additive particles in the critical test questions, what's responsible for the two-action character responses in the ALSO-condition must be the additive particles *mo* and *also*.

The lack of target responses in the NO-ALSO-condition in our study provides a nice baseline for responses in the ALSO-condition, which Berger and Höhle's study lacked. In their study, children displayed a general bias towards rewarding a puppet (their target response), even in the particle-less-condition where adults almost never gave a reward. Thus, it is not obvious whether children's adult-like, at-ceiling performance in their critical condition with *auch* is an accurate measure of children's competence or not. Specifically, if the German-acquiring children's performance in the *auch*-less-condition reflects their natural tendency to reward a puppet, then their results could be conflated with this bias. Hence, our task provides a good testing ground for children's comprehension of additive particles that is free of bias for the target response. And we see that while children do respond to the presence of the particle, they still differ from adults.

The question we should ask then is whether or not our results underestimate children's performance. Looking at the individual experiments, one potential complication that might have affected Japanese-acquiring children's performance lies in our design of the task (which likely affected the English-acquiring children as well). To succeed in our task, children had to pay close attention to the puppet's recounting of the story and update the common ground accordingly for the test questions with an additive particle to be interpreted in a natural context. The puppet's statement contained an elided argument right before the target question (e.g., *Mikki to Mini-wa tabe-ta-n-da* 'Mickey and Minnie ate ~~an apple~~'): children thus had to both resolve an ellipsis and assess a presupposition within a very short interval. This may have been a difficult task, given how much demand it places on children's processing abilities. The fact that the Japanese-speaking adults in the ALSO-condition failed to perform at ceiling suggests that the task was difficult even for the adults.[4]

In addition to the task being inherently difficult, the Japanese version of the experiment had a further complication having to do with the phonological similarity between the additive particle *mo* and the accusative case marker *o*. The

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[4] It's hard to make a definite conclusion about the difficulty of the task based just on the performance of Japanese-speaking adults in the ALSO-condition, given that there were only four subjects in this group. However, the English speaking-adults in the ALSO-condition also did not perform at the expected level. Since the two tasks were basically identical in terms of the design, it's safe to assume that whatever can be said about the design of the English experiment applies to the Japanese experiment as well.

position in which *mo* is used in our test questions, i.e., the position immediately following the object nominal, is a position usually associated with the accusative case marker *o*. Incidentally, the two elements are similar in terms of their pronunciation, which could lead to children misinterpreting *mo* as *o*.

The above two factors could have lead children to ignore *mo*, in which case our results would underestimate children's true competence with *mo*. Notably, the Japanese-acquiring children in the ALSO-condition were distributed bi-modally, displaying a consistent pattern in how they responded to the test questions across all four test trials: they consistently gave a two-action character response; or they consistently gave an answer in which they named both characters that satisfy the at-issue content of a question (e.g., Mickey and Donald, who both ate a banana). The distributional pattern fits well with the possibility that some Japanese-acquiring children had difficulty interpreting *mo* either due to the task being hard or mistaking *mo* for *o*.

The English-acquiring children's performance in the English experiment could also have been affected by the overall difficulty of the task. We see that like the Japanese-speaking adults, the English-speaking adults also showed below-ceiling performance in the ALSO-condition, suggesting the English version of the task was just as difficult as the Japanese version.[5] Considering that the English-acquiring children were a year younger than the Japanese-acquiring children (4- vs. 5-year-olds), it's even more likely that the difficulty of the task could have affected their performance. Hence, it's possible that the English results also underestimate children's competence with *also*.

Conversely, it is also possible that not all English-acquiring 4-year-olds have an adult-like knowledge of *also*, and that is what is being reflected in our results. A quick corpus analysis of three children, Adam, Sarah, and Eve, in the Brown corpus from CHILDES (MacWhinney, 2000) reveal that *also* is barely used in child-directed speech compared to the additive particle *too* (1 occurrence of *also* vs. 302 occurrences of additive *too* out of 116,020 utterances by the mothers), and thus that some 4-year-olds might simply not have acquired it yet. We are currently testing children's understanding of *too*, using a variant of our task that no longer involves an ellipsis before the test questions, to see if their performance might be more adult-like.

6. Conclusion

Additive particles are presupposition triggers, and hence, they must be used in contexts where the presuppositional contribution they make to a sentence is satisfied. Yet previous studies tested children's comprehension of the particles in contexts where the presupposition was either false or unsupported and had to be accommodated. Using a novel task, we tested children's comprehension of additive particles in a context that makes their use most natural, i.e., in a context

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[5] The English task also involved an ellipsis, not of an argument but of a VP, right before the test question.

where the presupposition is supported, by investigating whether or not children are able to consider and use the additive presupposition triggered by an additive particle to restrict the answer to a *wh*-question.

Our results show that, although they are not completely adult-like, both Japanese-acquiring 5-year-olds and English acquiring 4-year-olds correctly distinguish between sentences containing an additive particle and sentences lacking it, giving significantly more two-action character responses when they hear *wh*-questions with an additive particle than *wh*-questions without. This suggests that children are able to consider the additive presupposition triggered by additive particles and use that information in question comprehension. Nevertheless, it is not immediately obvious whether the results from our study are a faithful reflection of children's true competence, as there are some confounding factors that might affect children's performance in the task. Future study will investigate whether or not our results underestimate children's competence.

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