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## **English-acquiring 4-year-olds' Understanding of the Interaction between *too* and Focus**

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### **1. Introduction**

This paper presents results from a behavioral experiment in which we investigate English-acquiring 4-year-olds' interpretation of sentences that contain either a subject- or an object-associated *too*. By comparing their responses across the two types of sentences, we examine whether children understand the interaction between *too* and focus.

Additive particles like *too* trigger an additive presupposition, whose content crucially depends on the focus structure of a sentence (Rooth, 1985, 1992; König, 1991; Krifka, 1999; Beaver and Clark, 2008; among many others). Specifically, additive particles associate with the constituent under focus, giving rise to the presupposition that the predication holds for at least one alternative of the focused constituent (Krifka, 1999). The *too*-sentence given in (1) is thus ambiguous between (at least) two readings: (i) the subject-associated reading of *too*, which presupposes that someone other than John is holding a trumpet; and (ii) the object-associated reading of *too*, which presupposes that John is holding something other than a trumpet. This ambiguity is typically resolved through prosodic cue, i.e., the location of the nuclear pitch accent indicates which constituent is under focus as shown in (2).<sup>1,2</sup>

(1) John is holding a trumpet, *too*.

(2) a. Subject-associated reading

JOHN is holding a trumpet, *too*.

**Presupposition:** Someone other than John is holding a trumpet

b. Object-associated reading

John is holding a TRUMPET, *too*.

**Presupposition:** John is holding something other than a trumpet

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<sup>1</sup> The use of capital letters in linguistic examples indicates the location of the nuclear pitch accent.

<sup>2</sup> Not all languages use prosodic cue as a way of marking focus. For example, Japanese rely on the syntactic position of the particle to mark focus. See Aoyagi (1999) for more on how focus is marked in Japanese.

Hence, in order to arrive at the intended interpretation of a sentence containing *too*, children must understand that *too* associates with the focused constituent, and furthermore, that prosodic cue is used to indicate the focused constituent.

So, how do we test children's understanding of the interaction between *too* and focus? The most straightforward way to do this would be to investigate if children are able to resolve the ambiguity illustrated above, through which we probe their ability to infer the intended presupposition based on prosodic cue. Carrying out such an experiment, however, is not as easy as one might think. Additive particles cannot be used in an "out-of-the-blue" fashion: they are anaphoric and hence require an antecedent that makes the actual content of their presupposition salient in the immediate discourse (van der Sandt and Geurts, 2001; Kripke, 2009). Accordingly, (2a) and (2b) cannot be uttered felicitously on their own. Instead, the two sentences should be accompanied by an appropriate antecedent, for example, a preceding utterance that makes the content of the presupposition explicit, as shown in (3) and (4).

- (3) a. #JOHN is holding a trumpet, too.  
b. Mary is holding a trumpet, and JOHN is holding a trumpet, too.
- (4) a. #John is holding a TRUMPET, too.  
b. John is holding a flag, and John is holding a TRUMPET, too.

Unfortunately, doing so takes away the potential ambiguity for children to resolve, making the process of figuring out the intended presupposition trivial.

Previous studies that looked at children's understanding of the focus-sensitive nature of additive particles tried to retain the ambiguity in their task by not providing any discourse (Hüttner et al., 2004; Matsuoka, 2004; Bergsma, 2006; Matsuoka et al., 2006). They found that even school age children struggle to discern the difference between sentences containing an object-associated particle and sentences containing a subject-associated particle, wrongly accepting them in contexts adults would likely reject.<sup>3</sup> These results are taken as evidence that children lack an adult-like understanding of the focus-sensitive nature of additive particles, which leads to their mis-association of the particles with a non-focused constituent (Bergsma, 2006; Matsuoka et al., 2006). That said, it is also possible that children's difficulty with additive particles reflects a methodological problem of testing children's interpretation using infelicitous tasks. These studies tested children's interpretation of sentences containing an additive particle without providing any supporting discourse. Hence, their results are open to the criticism that children are ignoring the additive particles in the test sentences because the experiment lacks a natural context in which additive particles should be interpreted, which makes the use of additive particles infelicitous. As a result, we do not know whether children's non-adult-like interpretation of the test sentences

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<sup>3</sup> For example, children would accept sentences containing an object-associated particle in contexts where only the subject-associated interpretation would be considered felicitous by adults.

in previous studies stems from children's non-adult-like understanding of the particles or from the unnatural design of the tasks employed in the studies.

Therefore, to test children's understanding of the interaction between *too* and its focus-associate in the particle's naturally occurring context, we designed a novel task, which probes children's ability to infer the intended presupposition based on a prosodic cue when the presupposition is supported in context. However, part of the utterance preceding the test sentence is made inaudible, hiding the presupposition and thus requiring children to rely on the prosodic cue to recover it. We find that some (but not all) children are able to reliably distinguish between sentences containing *too* whose associate vary across the subject and the object.

## 2. Experiment

### 2.1. Design and material

The experimental task used in this study takes on the form of a "Guess who game". Children listen to a prerecorded conversation, in which two characters, a girl named Daisy and Daisy's father, talk about two monsters shown on a computer screen. Daisy is a girl who loves monsters, but she is still learning so she does not know much about them. Daisy's father, on the other hand, is a monster scientist, and so he knows everything about monsters, including their names. At certain points of the conversation, Daisy's father will make an utterance about one of the two monsters, which happens to contain the critical test sentence containing *too*. This utterance is immediately followed by another utterance in which Daisy's father mentions that same monster's name. The task for children is to help the experimenter figure out which of the two monsters shown on the computer screen had his name mentioned by Daisy's father. Since which monster Daisy's father is talking about is not made explicit in his utterance, this information must be inferred from the discourse context, for which children's ability to reason using the presupposition of *too* becomes crucial.

Two types of test sentences were constructed for the experiment. Both types of sentences contained a sentence-final *too*, but the associate of *too* was varied across the two types (subject-associated vs. object-associated).

- (5) Subject-associated *too*  
HE's holding a trumpet, too!
- (6) Object-associated *too*  
He's holding a TRUMPET, too!

Children are tested on their ability to discern the two types of sentences, through which we probe children's ability to infer the intended presupposition based on the location of the nuclear pitch accent.

To illustrate how the task works, let us walk through some examples from the critical test trials. There were two conditions in our experiment, SUBJECT-FOCUS and OBJECT-FOCUS. We will begin with the SUBJECT-FOCUS condition. The trial

begins with the appearance of two cartoon monsters. Daisy begins talking about the monsters by delivering an utterance that is directed towards one of the two monsters. Since Daisy knows nothing about the monsters, she refers to them by using the indefinite pronoun *somebody*. Her utterance will always be about the monster holding two items, which will be indicated by her pointing. During her utterance, a glitch happens to the audio, which makes part of her utterance not audible as shown in (7). Hence, we only get to hear part of what Daisy is saying.

(7) Daisy: Look! Somebody is holding <--white noise-->!

After Daisy is done talking, Daisy's father follows up on her by uttering the sequence of sentences in (8).

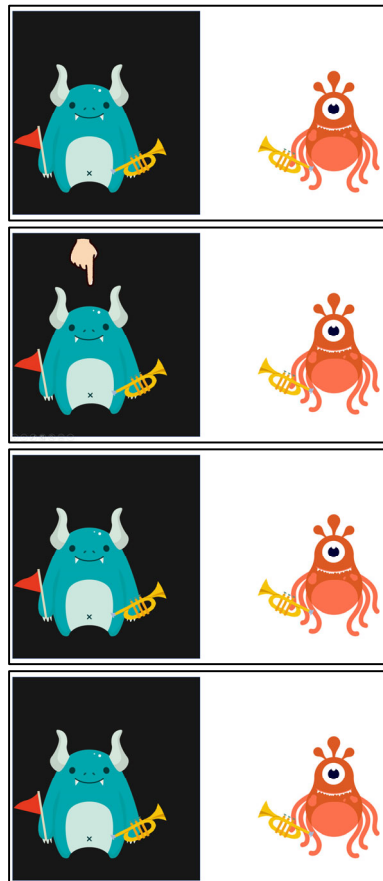
(8) Daisy's father: Yeah! And HE's holding a trumpet, too!  
His name is Mr. Gorphus!

The first sentence in the sequence is the critical test sentence containing a subject-associated *too*. In the second sentence, Daisy's father mentions one of the monster's name. The second sentence is uttered immediately after the first, and so *he* and *his* should be understood as referring to the same individual. However, unlike Daisy, Daisy's father does not point to the monster that he is talking about. Hence, the actual referent of the pronouns must be inferred from the experimental context. The entire procedure of the trial from start to finish is illustrated in figure 1 found below.

For the use of *too* in (8) to be considered felicitous, the intended presupposition must be satisfied in the context of the discourse. Typically, what the intended presupposition is and whether or not that presupposition is satisfied can be easily figured out from the preceding discourse. However, in this particular task, the information is not readily retrievable from the preceding discourse, because part of Daisy's utterance is covered by white noise as we saw earlier. Instead, the participants must infer the information from the visual context, for which they must first determine the associate of the particle based on prosodic cue, or more specifically, the location of the nuclear pitch accent within the test sentence.

The nuclear pitch accent on *he* indicates that the constituent under focus is the subject, giving rise to the presupposition that there is someone other than the referent of *he* that is holding a trumpet. Since there are only two monsters in the context of the discourse and Daisy has already made a comment about one of the monsters, the referent of *he* must be interpreted as the monster that is different from Daisy's pointing; otherwise, if *he* is interpreted as referring to the same monster as Daisy's pointing, then Daisy's father's utterance would just be repeating what Daisy had said literally a second ago, i.e., that the monster Daisy is pointing to is holding a trumpet. This is not what a sensible and cooperative speaker would do under normal circumstances. If we think that the goal of a

conversation is to broaden our common ground, then repeating a trivially true information does not achieve this purpose.



Experimenter:  
Hey! Look at those monsters!  
Let's see what Daisy and Daisy's  
dad have to say about them!

Daisy:  
Look! Somebody is holding  
<white noise>!

Daisy's father:  
Yeah! And HE's holding a  
trumpet, too! His name is Mr.  
Gorphus!

Experimenter:  
Alright. So which side of the  
screen is Mr. Gorphus on? Is he on  
the black side or the white side?

**Figure 1.** A sample trial of the task from the SUBJECT-FOCUS condition

The object-associated *too* condition proceeds in a similar fashion. First, two monsters appear on the computer screen. Daisy makes an utterance about one of those two monsters with her pointing indicating which. A glitch happens while Daisy is talking, and as a result, part of her utterance is rendered nonaudible. Once Daisy is done talking, Daisy's father responds to her with an utterance of his own, which could be about either monster. The difference is that the critical *too* sentence in Daisy's father's utterance contains a nuclear pitch accent on the object, as shown below. Immediately following his first utterance, Daisy's father proceeds to mention one of the monsters' name.

- (9) Daisy: Look! Somebody is holding <--white noise-->!  
 (10) Daisy's father: Yeah! And he's holding a TRUMPET, too!  
 His name is Mr. Gorphus!

The nuclear pitch accent on the object indicates that the constituent under focus is the object, giving rise to the presupposition that the monster that is the referent of *he* is holding some item other than a trumpet, namely the flag. Therefore, in order for Daisy's father's utterance to be interpreted naturally, his utterance must be understood as being about the same monster that Daisy was pointing to; there is no other monster that is holding something in addition to a trumpet. We illustrate the entire procedure of the trial in figure 2.

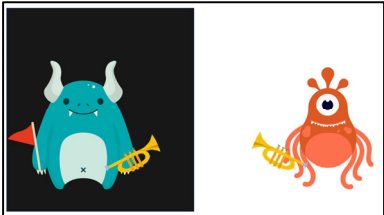
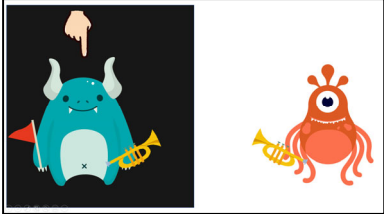
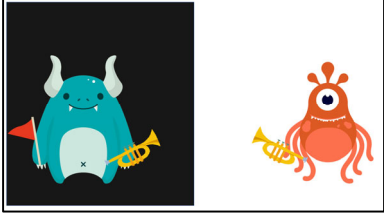
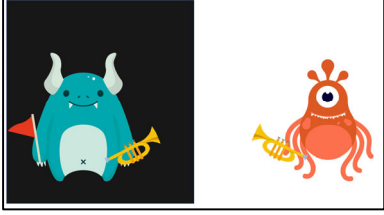
	<p><u>Experimenter:</u>        Hey! Look at those monsters!        Let's see what Daisy and Daisy's        dad have to say about them!</p>
	<p><u>Daisy:</u>        Look! Somebody is holding        &lt;white noise&gt;!</p>
	<p><u>Daisy's father:</u>        Yeah! And he's holding a        TRUMPET, too! His name is Mr.        Gorphus!</p>
	<p><u>Experimenter:</u>        Alright. So which side of the        screen is Mr. Gorphus on? Is he on        the black side or the white side?</p>

Figure 2. A sample trial of the task from the OBJECT-FOCUS condition

All utterances by Daisy and Daisy's father were prerecorded by native speakers of American English to keep the use of prosody consistent across all participants.

## 2.2. Procedure

The experiment is conducted over Zoom with children seated in front of a laptop computer in a quiet area of their home.

To become familiarized with the experimental materials, the child first played a quick game where s/he was asked to answer which side of the screen (black vs. white) an item mentioned by the experimenter is on (e.g., *Where's the trumpet? Is it on the black side of the screen or the white side of the screen?*).

After the exercise, the experimenter introduces Daisy and Daisy's father to the child. The experimenter explains to the child that together they will watch a series of cartoon clips in which Daisy and Daisy's father talk about two monsters shown on a computer screen. The child is further explained that during the cartoon, Daisy's father will mention one of the monsters' names and is asked to help the experimenter figure out which of the two monsters had its name mentioned. Once s/he is introduced to the rules, the child goes through a series of practice trials before entering the critical test trials so that s/he becomes familiar with the task. The basic setup is the same as the test trials. The main purpose of the training phase is to get the child familiarized with the general set up of the task. Specifically, it's crucial that the child understands that Daisy's father's utterance can be about the same monster as Daisy's utterance is about, but not necessarily. Put it another way, the child must be taught that for some trials, Daisy and her father can be talking about the same monster, but for others, they might be talking about different monsters. The training is there to teach this basic setup to the child. If the child does not learn this by the end of the training phases, then s/he is excluded from the sample and the results are not analyzed. Another purpose of the training is to get the child comfortable with the white noise in Daisy's utterance such that s/he is not distracted by it during the critical test trials.

After the training, the child enters the critical test phase, where s/he goes through the SUBJECT-FOCUS and OBJECT-FOCUS conditions in pseudo-random order (within-subject design). While it has been documented in previous literature that testing children on materials that involve prosodic manipulation can result in carry-over effects (Gualmini *et al.*, 2003; Snedeker and Yuan, 2008; Szendrői *et al.*, 2018), we were looking for the strongest possible evidence, and so, we proceed with a within-subject design. If we can show that the same child could distinguish between subject-associated and object-associated *too*-sentences in an adult-like way, then this would provide strong evidence that the child understands the interaction between *too* and focus. There are a total of twelve critical test trials: six SUBJECT-FOCUS and six OBJECT-FOCUS. The child never goes through the same type of trial more than two times in a row.

### 2.3. Participants

Twenty-eight monolingual English-acquiring children (age 4;0-4;9, mean age 4;3) were recruited for the experiment. Four children were excluded from the data analysis as they failed to pass training, leaving us with twenty-four children to analyze. In addition, eight adult native speakers of English participated as a control group in the experiment. Children and adults were tested using the same materials. While the adults were tested in-person, children were tested over Zoom to eliminate the risk of COVID-19 exposure during the experiment.

### 2.4. Predictions

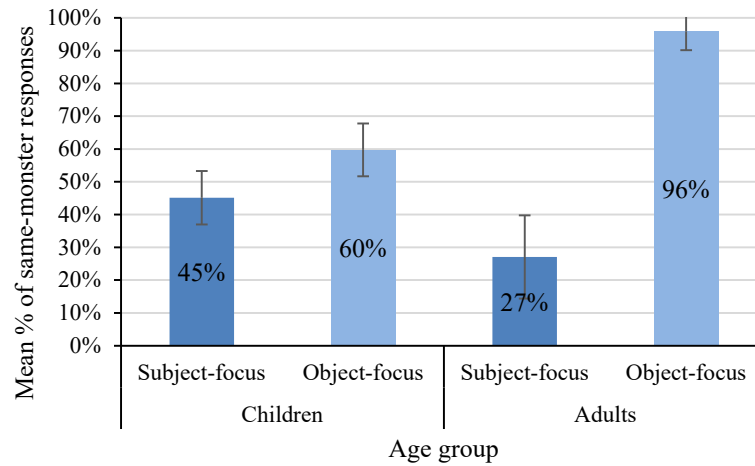
If children are able to use prosodic cue to determine the associate of *too*, then we predict different responses across the two types of sentences. After hearing the subject-associated *too*-sentence, children should give more different-monster (i.e., the monster that is different from Daisy's pointing) responses because the nuclear pitch accent on the subject indicates that the *too* in the test sentence (e.g., *HE's holding a trumpet, too*) associates with the subject, giving rise to the presupposition that there is another monster that is different from the one Daisy's father is talking about, who shares the same property of holding a trumpet. For this presupposition to be satisfied, Daisy and Daisy's father's utterances should be interpreted as being about different individuals. Conversely, after hearing the object-associated *too*-sentence, children should give more same-monster (i.e., the monster that is the same as Daisy's pointing) responses because the nuclear pitch accent on the object indicates that the *too* in the test sentence (e.g., *He's holding a TRUMPET, too*) associates with the object, triggering the presupposition that the monster that Daisy's father is talking about is holding something else in addition. Since the only monster that is holding a second item is the one Daisy first points to, Daisy's father's utterance should be interpreted as being about the same monster.

For the aggregated results, we will use the mean percentage of same-monster response as the dependent measure, and so, we expect to see more same-monster response in the OBJECT-FOCUS condition than in the SUBJECT-FOCUS condition, if children are sensitive to the additive presupposition of *too*. No such pattern is predicted if children are unable to use prosodic emphasis to discern the two types of test sentences.

### 2.5. Results

Figure 3 summarizes the results from the experiment, displaying the mean percentage of same-monster responses across the two conditions (SUBJECT-FOCUS vs. OBJECT-FOCUS) for each age group (Children vs. Adults).





**Figure 3.** Mean percentage of same-monster responses across two conditions for children and adults with error bars indicating 95% confidence interval

As can be seen in the figure, adults gave substantially more same-monster responses in the OBJECT-FOCUS condition than in the SUBJECT-FOCUS condition (96% vs. 27%). Although the magnitude of the difference is not as substantial, children displayed the same general pattern: they gave more same-monster responses in the OBJECT-FOCUS condition than in the SUBJECT-FOCUS condition (60% vs. 45%). 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 condition (SUBJECT-FOCUS vs. OBJECT-FOCUS) and age group (children vs. adults) as fixed factors and participants and trials as random intercepts. The model revealed significant effects of both condition ( $\beta = -8.032, p < 0.001$ ) and age ( $\beta = -5.096, p < 0.01$ ), with condition being the stronger predictor. We also found an interaction between the two ( $\beta = 6.968, p < 0.001$ ). Additionally, we analyzed just the children's results with condition as fixed factors and participants and trials as random intercepts to verify that the adults aren't the only driving factor for the statistically significant effect of condition. The model reveals a significant effect of condition for children ( $\beta = -1.005, p < 0.05$ ).

Additionally, to examine their individual performance, children's distribution was analyzed based on the number of trials in which they were able to give an adult-like response in each condition. The result of this analysis is summarized in table 1.

S-F \ O-F	0~1 trial(s)	2 trials	3 trials	4 trials	0~5 trials
0~1 trial(s)	0	0	0	1	4
2 trials	0	0	0	1	3
3 trials	1	1	0	0	0
4 trials	0	1	1	0	3
0~5 trials	3	2	2	1	0

**Table 1.** Observed distribution of children's individual performances for each sentence type based on the number of trials in which children gave an adult-like response

There are roughly three types of children: (semi-)adult-like children, object-bias children, and subject-bias children. The four children found in the bottom right section of the table is those we consider adult-like. These children were able to give an adult-like response at a very consistent rate in both conditions (more than four in both conditions). The three children found in the shaded section of the table were very close to being classified as adult-like but were 1 response short in making the criterion (i.e., more than four in one condition, but three in the other). We will classify these children as semi-adult-like. These seven children make up the group of (semi-)adult-like children. The remaining seventeen children are the group of non-adult-like children, who can be further broken into two groups. The first group comprise the nine non-adult-like children found in the top right section of the table. These children consistently gave a same-monster response, i.e., a response that is associated with the object-focus interpretation of *too*, regardless of which sentence type. This group of children, we classify as the object-bias children. Two adults also showed this pattern of responses across the entirety of the critical test trials. The other group of non-adult-like children is the subject-bias children. This group consists of the six children found in the bottom left section of the table. These children were very consistent at giving a different monster response, i.e., a response that is associated with the subject-focus interpretation of *too*, across both conditions. The remaining two children did not fit into any of the above groups.

### 3. Discussion

As expected, adults show a sharp contrast in the number of same-monster responses across two conditions. This pattern indicates that (the majority of the) adults are noticing the intonational difference across the two types of sentences and are able to use that information to determine the associate of the particles.

Although the degree of difference is much smaller, children also show a similar pattern, providing more same-monster responses in the OBJECT-FOCUS condition than in the SUBJECT-FOCUS condition. The results of the statistical analysis indicate that this difference in children's results is statistically reliable ( $p < 0.05$ ). Evidently, these results suggest that children as a group are able to distinguish the two types of sentences. Because the two sentence types only differ with regards to the location of the nuclear pitch accent, it's safe to assume that this pattern is driven by children's sensitivity to the prosodic information, and furthermore, their understanding of the interaction between *too* and focus.

That said, it's clear from our results that children did not perform as great as the adults. As illustrated in table 1, we see a clear difference in children's individual performances and also the strategies they adopted to arrive at those results. For the seven (semi-)adult-like children, we can safely assume that they have an adult-like understanding of the focus-sensitive nature of *too*. As for the remainder of the children, we were not able to find any sign of adult-like understanding of *too*'s focus-sensitive nature. A straightforward interpretation of the results would be that the remaining seventeen children have yet to acquire an understanding of the interaction between *too* and focus, and that they are still in the middle of developing adult-like knowledge of this interaction. Because they are not able to use the prosodic information to determine the associate of *too*, they must rely on other strategies to figure this out. This explains why the object-associated interpretation of *too* was the most common error among children. Without manipulating the prosody or syntax, the default focus structure of a sentence is the one where the direct object is focused. Having seen that there are no relevant cues that would allow them to disambiguate the associate of *too* (or so they think), it's likely that these children are settling for the default focus interpretation of a sentence. If that were the case, then the more interesting pattern is the bias for subject-associated interpretation that some children displayed, since subject-focus is the more marked interpretation. We suspect that this has to do with the setup of the task in which we present two monsters and ask children which of the two monsters had their name mentioned. Naturally, the task contrasts the two monsters against one another because the purported goal for children was to figure out which of the two monsters had its name mentioned. Daisy's pointing to the monster also increases the saliency of the subject contrast. This setup could over-highlight the contrast between the two monsters, leading children to default to the subject-associated interpretation of *too*. In that sense, the two types of strategy entertained by children are of similar vein, where children are both defaulting for a specific interpretation, except for different reasons. The children that consistently gave the object-associated interpretation of *too* default to the interpretation because it is the unmarked interpretation of focus. The children that consistently gave the subject-associated interpretation of *too*, on the other hand, are defaulting to the interpretation because it is the most salient contrast illustrated in the design of the task. These errors occur because the non-adult-like children do not realize the variation in pitch accent, or even if they did, they do not know it's relevance in disambiguating the scope of *too*.

Alternatively, there is a possibility that what's reflected in some children's non-adult-like performance is the lingering effect of a pitch accent manipulation that we put into place during the training phase of the experiment; we manipulated the intonational pattern of Daisy's father's utterances for the entirety of the training trials such that both the pronoun *he* and the object were marked prosodically by a pitch accent. The manipulation was done intentionally so that the children aren't trained to only pay attention to whether or not *he* was stressed. Perhaps, this manipulation worked too well and taught the children not to pay attention to prosodic information since it does not help the children discern which character Daisy's father is talking about during training.

Unfortunately, there is no way to tease apart these possibilities as children who does not understand the interaction between *too* and focus and children who were wrongly trained to not pay attention to the pitch accent will likely display the same kind of behaviors; i.e., they will default for whatever interpretation they feel is reasonable, which could be the unmarked object-associated interpretation or the more salient subject-associated interpretation.

Of course, this is just a speculation as there are no evidence in support of the view. However, we know independently from Szendrői *et al.*'s (2018) study that English-acquiring preschoolers aged 3 to 6 understand the relationship between prosodic emphasis and (contrastive) focus. Given that the two phenomena are closely related to one another, it's possible that children know the relevance of prosodic information in focus-association. The prosodic information that are relevant for completing the task in Szendrői *et al.*'s study is also relevant for completing the task in our experiment. Hence, future study should examine whether eliminating the prosodic manipulation from training would improve children's performance with the task. It would also be interesting to test Japanese-acquiring children on *mo* 'also' using the same method to see how well they perform. Japanese is a language that rely heavily on the syntactic position of the particle to mark focus-association (footnote 2). In theory, syntactic position of the particle should provide stronger cue given that the associate of the particle can be directly read off from word order: if *mo* adjoins to the subject, then it associates with the subject; if *mo* adjoins to the object, then it associates with the object.

#### 4. Conclusion

In this paper, we presented results from a behavioral experiment in which we investigated English-acquiring 4-year-olds' interpretation of sentences containing *too* with varying associate. We tested to see if children are able to distinguish between sentences containing a subject-associated *too* and sentences containing an object-associated *too* by comparing their responses across the two types of sentences, through which we probed children's understanding of the interaction between *too* and focus.

Contrary to previous report, we find that 4-year-olds as a group distinguish sentences containing a subject-associated *too* from sentences containing an object-associated *too*. That said, we do find variation in their performances across

individuals. While a third of the children that participated in our study were able to reliably distinguish between the two types of sentences, majority of the remaining children failed to do so. Future study will investigate how much of children's difficulty is due to their linguistic knowledge.

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