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Restrictions on addition: children's interpretation of the focus particles *auch* 'also' and *nur* 'only' in German*

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ABSTRACT

Children up to school age have been reported to perform poorly when interpreting sentences containing restrictive and additive focus particles by treating sentences with a focus particle in the same way as sentences without it. Careful comparisons between results of previous studies indicate that this phenomenon is less pronounced for restrictive than for additive particles. We argue that this asymmetry is an effect of the presuppositional status of the proposition triggered by the additive particle. We tested this in two experiments with German-learning three- and four-year-olds using a method that made the exploitation of the information provided by the particles highly relevant for completing the task. Three-year-olds already performed remarkably well with sentences both with *auch* 'also' and with *nur* 'only'. Thus, children can consider the presuppositional contribution of the additive particle in their sentence interpretation and can exploit the restrictive particle as a marker of exhaustivity.

INTRODUCTION

The German particles *auch* and *nur* – corresponding to the English *also* and *only* – are so-called focus particles, since they both share the feature that they are focus-sensitive and usually associate with the focused element in a

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sentence (König, 1991). They both contribute to sentence meaning by making the relation of the focused element to its contextually salient meaning alternatives explicit. By using an additive particle, meaning alternatives are included in a sentence, as in (1):

(1) Peter has also painted a BALL.¹

In this sentence the particle *also* indicates that Peter has done/painted something else within the relevant situational context.² Meaning alternatives are explicitly excluded from sentence meaning by using a restrictive particle, as in (2):

(2) Peter has only painted a BALL.

Here, the particle *only* explicitly rules out that Peter has done/painted something else within the relevant situational context, thereby leading to an exhaustive interpretation of the sentence.

Spontaneous speech as well as experimental production data from German- and Japanese-speaking children suggest that the acquisition of both kinds of particles is achieved early. Previous research has provided evidence that from the beginning of multiword utterances German-speaking children use the additive particle *auch* to encode aspects of information structure (Dimroth, 2009; Höhle, Berger, Müller, Schmitz & Weissenborn, 2009; Müller, Höhle, Schmitz & Weissenborn 2009; Naderstigt, 2003; Penner, Tracy & Weissenborn, 2000). For Japanese-speaking children the use of the additive particle *mo* 'also' and the restrictive particle *dake* 'only' has been observed in the productions of children from age 1;6–2;3 and from age 2;1–2;7 respectively, with a slight temporal delay for the restrictive particle (Matsuoka, Miyoshi, Hoshi, Ueda, Yabu & Hirata, 2006).

However, studies on the interpretation of the particles suggest that the acquisition of particles is an area in which the general tendency in language acquisition for comprehension to precede production does not hold (cf. Hendriks & Koster, 2010). Several studies have provided convergent evidence that children have difficulties, possibly beyond preschool age, in correctly interpreting sentences with focus particles like *also* and *only* in various languages (e.g. Bergsma, 2002; 2006; Costa & Szendrői, 2006; Crain, Ni & Conway, 1994; Drozd & van Loosbroek, 1998; Gualmini, Maciukaite & Crain, 2003; Hüttner, Drenhaus, van de Vijver & Weissenborn, 2004; Matsuoka, 2004; Matsuoka *et al.*, 2006; Notley, Zhou, Crain & Thornton, 2009; Paterson, Liversedge, Rowland & Filik, 2003; Zhou & Crain, 2010; for different results, see Höhle *et al.*, 2009).

[1] Capitalized words in language examples indicate focus accentuation.

[2] We will not use the English expressions *also* and *only* language-specifically but treat *also* as a paradigmatic additive particle and *only* as a paradigmatic restrictive particle.

Most comprehension studies done so far concentrate on children's interpretation of sentences containing the restrictive particle *only*. Children's difficulties in interpreting these sentences are mainly assumed to originate from their not restricting the scope of *only* in an adult-like fashion or from their preferring to associate the particle within the correct scope domain, but with a different constituent than adults do, i.e. with a non-focused one (e.g. Crain *et al.*, 1994; Gualmini *et al.*, 2003; Notley *et al.*, 2009; Zhou & Crain, 2010). Hence, young children are assumed to tend to misinterpret subject-associated *only* as if it were associated with the VP/object or to vary freely between VP/object- and subject-association.³ Paterson *et al.* (2003) pointed out another difficulty for children which may lead instead to not taking into account the meaning contribution of *only*: children may not always be able to instantiate the alternative set of the focused expression in the discourse model when processing sentences with *only*, which may result in their 'ignoring' the particle as there is no alternative set in the child's discourse model that the particle could operate on. English-speaking children in this study often accepted sentences containing *only* as in *The fireman is only holding a hose* or *Only the fireman is holding a hose* as appropriate descriptions of pictures displaying a fireman holding a hose and a ladder or a fireman and a policeman holding a hose, respectively, when tested in sentence verification tasks or picture selection tasks. However, this effect, namely interpreting a sentence with *only* non-exhaustively, might depend on the degree to which the meaning alternatives to the focused expression are made salient within the verbally given context (Müller, Schulz & Höhle, in press). Furthermore, as data presented in Paterson, Liversedge, White, Filik and Jaz (2006) revealed, even if children's performance seems to indicate a target-like, i.e. exhaustive, interpretation of sentences containing the restrictive particle *only*, the observed performance does not necessarily have to result from the interpretation of the particle itself: seven- to eight-year-olds, the youngest group of children tested in this study, were likely to display a fairly similar response pattern to sentences with and without a restrictive particle (see also Müller, Schulz & Höhle, 2011, for a detailed discussion of this finding).

Not taking the meaning contribution of the particle into account is also an issue that has been discussed for children's interpretation of sentences with additive particles. Hüttner *et al.* (2004) tested German-speaking three- to seven-year-olds' and adults' interpretations of sentences with the additive focus particle *auch* using a picture selection task without giving any additional context story. In German SVO-sentences containing *auch* in post-finite position, that is after the finite verb, the particle associates with

[3] Since the distinction between VP- and object-association of focus particles does not play any crucial role in the course of this paper, we will refer to both as object-association.

either the subject or the object depending on its accentuation. If the particle carries an accent, it is associated with the subject, as in *Max will AUCH Plätzchen backen* 'Also Max wants to bake cookies'. If the particle is unaccented, it is associated with the accented object of the sentence, as in *Max will auch PLÄTZCHEN backen* 'Max also wants to bake cookies'. In Hüttner *et al.*'s study, the participants had to choose between three pictures depicting the object-associated meaning, the subject-associated meaning and the meaning of a sentence without a particle, e.g. *Max backt PLÄTZCHEN* 'Max bakes cookies'. Even in the oldest group of five- to seven-year-old children, the performance was far from adult-like for both particle-containing sentence types. A detailed error analysis of the data suggested that the children most likely misinterpreted sentences with unaccented *auch* as if the particle were accented. The authors suggested that the accented *auch* reading (i.e. the subject-associated particle) is the default interpretation in children. More relevant with respect to the idea that children might ignore the particle, the second most frequent error (31% of the errors) that occurred in the youngest age group was treating sentences with a particle like sentences without a particle. This type of error decreased with increasing age. However, failing to take into account the particle in an *auch*-sentence would yield Max wanting to bake cookies but not Max already baking cookies, as displayed in the relevant picture. This slight discrepancy between visual and verbal material might have been responsible for the relatively rare occurrence of this error type in this study.

In a study by Bergsma (2006) with Dutch-speaking four- to seven-year-olds this error type occurred more frequently. Similarly to Hüttner *et al.*, Bergsma used a picture selection task to test the comprehension of sentences containing the particle *ook* 'also'. She tested children's interpretation of three different kinds of *ook*-sentences: the sentences contained the additive particle *ook* either in pre-subject position, which unambiguously marks subject-association, *Ook de JONGEN aait de hond* 'Also the boy is petting the dog', or in post-finite position. Similarly to German, the post-finite *ook* in Dutch associates either with the subject or with the object depending on its accentuation. If the particle is accented as in *De jongen aait OOK de hond*, it is associated with the sentence subject, while it is associated with the object when not the particle but the object is accented, as in *De jongen aait ook de HOND*. Each test sentence was presented with a set of three pictures at a time, only one of which matched the sentence. Although a context story was provided for each trial in this study that explicitly mentioned all characters belonging to the subject- and object-alternative sets, Bergsma found that 53% of the younger children (aged between 4;2 and 5;4) and 40% of the older children (aged between 5;5 and 6;4) consistently picked the picture that merely depicted a scene matching an interpretation without *ook* (The boy is petting the dog). In contrast, only

7% of the oldest children (aged between 6;5 and 7;11) chose this picture consistently.

Bergsma (2006) concluded “that Dutch children initially ignore the presuppositional contribution of the particle *ook* ‘also’ in their interpretation of sentences that contain the particle” (p. 346). Based on this assumption, differences between children’s comprehension of sentences containing additive and restrictive focus particles are expected because only the inclusion of semantic alternative(s) to the focused expression, as induced by the particle *also*, has presuppositional status. In contrast, the exclusion of meaning alternatives to the focused expression from sentence meaning, as indicated by *only*, is assumed to constitute a part of the asserted content of the sentence (Horn, 1969; König, 1991).

Data from Bergsma (2002) may support this idea. She tested Dutch-speaking three- to six-year-olds in a truth value judgement task (see Crain & Thornton, 1998) on subject- and object-associated *alleen* ‘only’, as in *Alleen BERT heeft een knikker gerold* ‘Only Bert rolled a marble’ and in *Bert heeft alleen een KNIKKER gerold* ‘Bert only rolled a marble’. She reported that the youngest children, aged between 3;5 and 4;4, reacted correctly in around 60% of all trials and displayed comparable results on both sentence types. Bergsma considered the results of the children above an age of 4;5, who showed between 75–94% correct reactions, as being almost adult-like for both sentence types. Comparing these results with those from her study on *ook* reported above (Bergsma, 2006), children seem to reach ‘adult-like’ competence with *alleen* earlier than with *ook*. However, as different experimental tasks were used in these two studies, an impact of task- and stimulus-related factors cannot be ruled out as an explanation for the different performance with additive and restrictive particles in Dutch-speaking children.

Nonetheless, studies from Matsuoka (2004) and Matsuoka *et al.* (2006) provide further evidence that children’s performance level is better for the restrictive than for the additive particle. They tested children’s comprehension of the Japanese additive particle *mo* and the restrictive particle *dake* with the same technique in two experiments using a truth value judgement task. In each trial, children listened to a context story acted out with props. The meaning contribution of the particles never matched the given context. Thus, a target-like interpretation was expected to result in a rejection of the test sentences. In the first experiment, children were tested on SOV-sentences containing subject- or object-associated *mo*, indicated by the position of the particle within the sentences: 80% of the tested four-, five- and six-year-olds consistently failed to reject both sentence types, that is with subject- and with object-associated *mo*. The frequency of this type of error was different for sentences containing *dake* in the second experiment. Only half of the four-year-olds consistently failed to reject both sentences with object-associated *dake* and sentences with

subject-associated *dake*. Moreover, only 20% of the five- and six-year-olds incorrectly accepted all *dake*-sentences. These data also reveal that Japanese-speaking preschoolers perform better with *dake* than with *mo*, and that good performance with *dake*-sentences is achieved at an earlier age. Keeping the degree of visual and verbal context information provided in the testing of *mo* and *dake* within the same paradigm constant, the incorrect acceptance of sentences was higher and more persistent in the *mo*-conditions than in the *dake*-conditions. This pattern of results is compatible with the view that children tend to ignore the meaning contribution of the additive particle to a much higher degree than the meaning contribution of the restrictive particle when carrying out the task. Thus, Japanese-speaking children displayed a pattern of performance which is in line with Bergsma's (2002; 2006) results for *alleen* and *ook* in Dutch-speaking children.

However, the question remains as to why it seems to be harder for the children to take into account the presuppositional contribution of the additive particle than the contribution of the restrictive particle to the assertion when tested on sentence interpretation with a truth value judgement task or a picture selection task. In our opinion, this does not reflect an inability in children to take the presupposition, triggered by *also*, into account for sentence interpretation. Rather children might downgrade its relevance for completing these specific kinds of experimental tasks. This minor priority may be related to the following aspects.

First, since the particle-induced inclusion of focus alternatives to the focused expression is presupposed content in a sentence like, e.g., *Peter has also painted a ball*, the additive particle has strictly speaking no effect on the truth or falsity of the sentence. That is, if the particle-triggered presupposition of the sentence is violated in a given context but the asserted content holds in this context, the truth value of the sentence cannot be determined by definition. Crucially, therefore, a sentence with *also* cannot be assumed to be false if the presuppositional contribution of *also* is violated in the context, but is rather said to be infelicitous. In contrast, in a sentence containing *only*, such as *Peter has only painted a ball*, the particle-induced exclusion of semantic alternatives to the focused expression plays a truth-conditional role as part of the sentence assertion: if the meaning of *only* is violated in the context (but the presupposition of the sentence is satisfied), the sentence is assumed to be false. Taking this distinction into consideration, children in previous studies had to reject *also*-sentences as correct descriptions of a scene, although these sentences were strictly speaking not false at the level of truth conditions. To put it differently: due to the violation of the meaning of *also*, children had to consider *also*-sentences as non-matching descriptions of a scene, although the asserted content of these sentences was matching the scene. This discrepancy did not occur for judging sentences with *only* in previous studies: if the context

did not match the meaning contribution of *only*, the asserted content of the sentences was correspondingly false. Thus, it might be the case that children have problems with rejecting a sentence as a non-matching description of a scene if its assertion is true, as it would be for sentences containing *also* (but not *only*) in the tasks that have been used so far.

A related claim – the pragmatic tolerance hypothesis – has been made by Katsos and Smith (2010) and Davies and Katsos (2010) in explaining children's poor performance with the interpretation of the quantifier *some*. Since *some* can be interpreted semantically as meaning 'some, and perhaps all', it is reduced pragmatically to 'some, but not all' by computing a scalar implicature. However, children do not reject a sentence containing the quantifier *some* in visual contexts which are appropriately described by a sentence containing the quantifier *all*. Katsos and colleagues suggested that children's acceptance of these pragmatically infelicitous but semantically true sentences containing *some* is not due to children's inability to compute scalar implicatures, as has been suggested by Noveck (2001) and Papafragou and Musolino (2003). Rather, Katsos and Smith (2010) and Davies and Katsos (2010) provided evidence that children are able to compute the scalar implicature with *some*, but tolerate the violation of this pragmatic meaning when they have to decide about match or mismatch between sentence and picture: they performed better with sentences with pragmatically infelicitous but semantically true *some* in a sentence–picture verification task if they were not forced to choose only between match and mismatch of sentence and picture but instead could choose between different degrees of mismatch. Under these circumstances children were able to express their reduced confidence with sentences containing *some* for contexts that suggested *all*.

Papafragou (2006) and Papafragou and Tantalou (2004) addressed this issue in testing children on scalar implicatures as well. They argued that pragmatic judgements about sentences, as demanded in experimental tasks, are typically absent in naturalistic conversations "in which what is said and what is implicated are not normally pitted against each other but are taken jointly to contribute to what is meant by the speaker" (Papafragou & Tantalou, 2004: 74).

With respect to the testing of the interpretation of *also*, the question would therefore be: Is it natural that a violation of the presuppositional proposition triggered by *also*, which typically contains backgrounded information, conflicts with and should outweigh the truth of the asserted proposition, which characteristically contains foregrounded information?⁴

[4] In fact, Taglicht (1984) and Karttunen and Peters (1979) analyze additive particles like *also*, *too* and *even* as triggering a conventional implicature, rather than a presupposition.

Taking up Stalnaker's (1973; 2002) perspective on presuppositions, this would be rather unlikely. He proposed a pragmatic account of (speakers') presuppositions and defined them as propositions whose fulfilment is taken for granted because speakers assume or act as if they assume them to be part of the common ground among interlocutors in natural conversation. Using a sentence–picture matching task, Hornby (1974) and Kim (2008) demonstrated experimentally that hearers (in fact readers) pay more attention to checking the truth of the asserted content of a sentence than to checking whether its presupposition is satisfied in a picture. Hornby (1974) demonstrated that adults more often mistakenly accepted a sentence as a correct description of a very briefly presented picture when the sentence–picture mismatch concerned the sentence presupposition rather than the assertion.

Supporting evidence comes from a more recent study by Kim (2008). She tested English-speaking adults' verification of sentences containing *only*, such as *Only the boys have books*. The written sentence was always presented prior to the presentation of a picture that displayed two boys and seven girls. The possessions of the children in the presented pictures were sometimes books, and sometimes non-books. Kim found comparable (short) reaction times for responses after the presentation of pictures containing a violation of the asserted proposition (=some of the girls having books) in combination with or without an additional violation of the presupposition (=boys having non-books). This indicates that checking the truth of the asserted proposition seems to have priority for this particular sentence type. Therefore, when presented with a sentence like the one described above, adults checked whether every girl in the picture had no book. If the boys in the picture had no books – which Kim assumed to be a mismatch with the presupposition of the test sentence – but the asserted proposition was true, this mismatch in presupposition would only be detected as a by-product when checking for the truth of the asserted proposition. However, Kim (2008) also suggested that the detection of presupposition failure is heavily dependent on the degree to which the content of the presupposition is made salient in the context: if the presupposed sentence content was made salient, adults did not hesitate to check for the satisfaction of the presupposition first.

These studies show that the natural conversational strategy of speakers assumed by Stalnaker is also active in hearers/readers under experimental conditions when participants are explicitly asked to match sentences with pictures. In the light of these findings with adults, children's poor performance in previous tasks testing the interpretation of *also* could be a

Under this view, the similarities between the quantifier *some* and the particle *also* would be even stronger.

result of a conversational strategy also found in adults, which leads to an (over)emphasis on checking the truth of asserted information in sentence verification tasks.

Taken together, these experimental findings give rise to the discussion of whether children's poor performance with *also* in truth value judgement tasks and picture selection tasks can serve as a reference point for drawing any firm conclusions about the course of acquisition in children. First, these tasks require the detection of presupposition failure, which works against a natural conversational strategy. Second, even if children detected the presupposition failure and therefore the infelicity of the sentence containing *also*, this would not necessarily be sufficient to reject the sentence as a correct description of a scene because the asserted content of the sentence would still be true in the given context. Consequently, it might be the case that children's interpretation of *also* is already appropriate, but just does not shine through in these kinds of tasks. We therefore tested children's comprehension of sentences with the additive focus particle *auch* 'also' in a task that addresses the two issues we have suggested to be related to the poor performance previously found with these sentences.

In the current study, we adopted the method that Papafragou and Tantalou (2004) originally introduced in order to test children on scalar implicatures. In our adaptation of the task, children were taught the rules of a rewarding game: a character, who is instructed to do a certain job consisting of performing two activities, should be given a reward if he completes the job, i.e. he does both things. If not, i.e. if he does one of the things but fails to do the other, he should not get a reward. Since the character is hiding behind a screen while performing his job, crucially the children's decision about rewarding is based solely on their interpretation of an utterance of the character that describes what he has done (*I did X* vs. *I also did X*). Several aspects of this task may be particularly suited to increasing the possibility of showing children's comprehension of focus particles. First, the technique does not require any evaluation of the truth/appropriateness of sentences in comparison with pictures from the children. The technique does not require participants to demonstrate the interpretation of *also* by detecting a presupposition failure and by evaluating the violation of the meaning of *also* against the truth of the sentence assertion. Therefore it might be a suitable means to find out whether young children are generally able to take the meaning of *also* into account when interpreting sentences. Second, the technique allows meaning alternatives to the focused constituent to be rendered maximally salient within a very natural conversational context. This has already been shown to play a positive role in the comprehension of *only* across languages (Bergsma, 2002; Gualmini *et al.*, 2003; Müller, 2010).

In a first experiment, we addressed German-speaking children's interpretation of the additive particle by testing whether they react differently to sentences containing the object-associated additive particle *auch* and sentences without a particle. If so, this indicates that they are generally able to take the particle-triggered presupposition into account when interpreting sentences. If not, this indicates that young children are solely able to interpret the asserted content of the *also*-sentence as this does not differ from the asserted content of the sentence without a particle. Since completing our task is not based on the detection of presupposition failure and a rejection of the sentences resulting from it, poor performance in our task would indicate that these requirements of previously used techniques were unlikely to cause poor performance. Furthermore, poor performance in our task would corroborate the possibility that young children's interpretation of sentences with *also* is generally impoverished due to their simply banning the presupposition from sentence interpretation.

EXPERIMENT 1

METHOD

Participants

Forty-four monolingual German-speaking children were tested in Experiment 1. All children finished the experiment and were taken into account for data analysis. All children were born on time, and none of them had a diagnosed speech or language impairment. Twenty-two of the children (twelve girls and ten boys) were about three years old with a mean age of 3;6 (range: 3;1–3;11) and the other twenty-two children (eleven girls and eleven boys) were about four years old with a mean age of 4;6 (range: 4;1–4;11). In addition, seventy-three monolingual undergraduate students (mean age 21 years; range: 18–40) participated as controls.

Materials and procedure

A total of twenty sentences in SVO-order were constructed. A first set of ten sentences contained the unaccented particle *auch* in post-finite position. The particle was always associated with the object of the sentences, which received focal accent.⁵ In each of the ten sentences in this set, a different character (animal) served as a referent for the subject. The ten sentences

[5] As already mentioned, *auch* placed in this position in a sentence can associate with either the subject or the object of the sentence it occurs in if focal accent information is not taken into consideration for disambiguation: if *auch* associates with the object/VP, the object receives a focal accent; if it associates with the subject, the particle itself receives a focal accent. Krifka (1999) assumed that in the latter case it associates with the contrastive topic of the sentence it occurs in. However, since we did not introduce salient

contained different object-NPs and transitive action verbs (*eat, wash, paint, colour, repair, clean, brush, feed, wrap, cook*). A second set of ten sentences lacked the focus particle but was otherwise lexically and syntactically identical to the ten sentences in the first set. In addition ten stuffed animals corresponding to the referent of the sentence subject were used in the task.

Children were tested individually with two experimenters present in each test session, which took about fifteen minutes. Each participant received a total of ten test sentences. Five of these belonged to the first set and hence contained the particle (*auch*-condition), while the remaining five were sentences from the second set without a particle (no particle-condition). Each of the ten sentences referred to a different animal. Two different versions were created to control for the order of the presentation of the two sentence types (for an exact description of trial order within the two versions in Experiment 1, see 'Appendix A'). The first version started with the presentation of a trial containing a test sentence with *auch*. This was followed by a trial containing a test sentence without a particle. In subsequent trials no more than two trials of the same condition (sentence type) were presented in a row. In the second version, each sentence was replaced with its counterpart either without the particle or with the particle; hence, the experiment started with a test sentence without a particle. While controlling for the mean age, three- and four-year-olds as well as adults were divided equally between the two versions.

To introduce the experimental materials, the setting and their task, children were first asked to play a game with the different stuffed animals. Each of the animals was introduced to the child to make sure they knew their names. Afterwards the rules of the following game were explained to the child¹.

Each of the animals had to complete a job that consisted of performing two different tasks. If an animal performed both tasks, the child should reward it by handing it a 'diamond'. Consequently, if an animal performed one thing but failed to do the other thing, it should not get a reward. The child was asked to determine whether the animal deserved a reward or not. If she gave a positive response, the 'diamond' was handed to her to be passed over to the animal. Adults were tested in groups. They were asked to mark their decisions about rewarding on a form.

The course of each trial will be exemplified by the following description of the first trial in the experiment (for a full listing of the trial scenarios, see 'Appendix B'). After initially presenting the rules of the game, the first

meaning alternatives to the subject within each trial, the incorrect subject reading was expected to be unlikely.

experimenter (E1) introduced the job which the animal, a lion in this case, should perform:

- (3) E1: Der Löwe soll eine Banane und einen Apfel essen.
'The lion should eat a banana and an apple.'

All jobs involved an activity with two different objects, which were placed in front of the animal. The animal, played by the second experimenter (E2), then suggested:

- (4) E2: Ich versuch das mal lieber in meinem Haus.
'I'd rather try to do this inside my house.'

The second experimenter took the animal and the two objects and disappeared behind a puppet theatre; they were no longer visible to the child and the first experimenter. After a while, the animal reappeared at the window of the puppet theatre and the first experimenter expressed her supposition in (5) about the animal's performance behind the puppet theatre by saying:

- (5) E1: Oh, da ist der Löwe wieder. Ich frag ihn mal, was er gemacht hat:
Löwe, Du hast bestimmt die BANANE gegessen!
'Oh, there's the lion again. I'll ask him what he did:
Lion, you've surely eaten the BANANA!'

The animal, played by the second experimenter, responded in one of two different ways: by uttering the test sentence with *auch* in (6a) in version 1 of the experiment or the sentence without a particle in (6b) in version 2:

- (6) a. E2: Weißt Du was? Ich hab auch den APFEL gegessen.
'Guess what? I've also eaten the APPLE.'
b. E2: Weißt Du was? Ich hab den APFEL gegessen.
'Guess what? I've eaten the APPLE.'

Next, the first experimenter rephrased the animal's statement for the child and then asked the child about her rewarding decision, as demonstrated in (7):

- (7) E1: Der Löwe hat auch/___den APFEL gegessen.
Kriegt er eine Belohnung oder kriegt er keine Belohnung?
'The lion has also/___eaten the APPLE.
Does he get a reward or does he get no reward?'

Participants were expected to reach the decision to give a reward only if the interpretation of a sentence containing *auch* considers its presuppositional and asserted content. In this case, a higher proportion of rewards was expected for sentences with *auch* compared to the corresponding sentences without the particle. However, if a sentence with *auch* is interpreted without taking its presuppositional content into account, we expected a proportion of rewards comparable to the proportion of rewards after

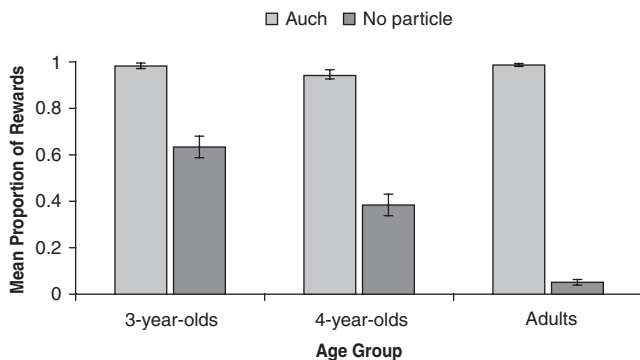


Fig. 1. Mean proportion of rewards after sentences with *auch* and after sentences without a particle in Experiment 1. Error bars indicate ± 1 SE.

sentences without a particle because both types of sentences assert the same proposition.

RESULTS AND DISCUSSION

For inferential statistics, we calculated generalized linear mixed models (GLMMs) using the *lme4* package (Bates, Maechler & Dai, 2008) provided in the R environment (R Development Core Team, 2010). This analysis corresponds to a logistic regression, taking into account correlations due to participants and items.

Figure 1 displays the mean proportions of rewards after sentences containing *auch* and after sentences containing no focus particle for the three-year-olds, four-year-olds and adults. As can be seen in the figure, the proportion of rewards was higher after sentences with *auch* than after sentences without a focus particle in adults (98.90% vs. 4.93%), as well as in three-year-olds (98.18% vs. 63.64%) and four-year-olds (94.55% vs. 38.18%). Linear mixed models estimating the proportion of rewards depending on the condition in each age group confirmed this pattern by revealing higher probabilities of rewards after sentences with *auch* than after sentences without a focus particle in adults ($b=9.701$, $SE=0.887$, $z=10.937$, $p<0.001$), in three-year-olds ($b=5.780$, $SE=1.152$, $z=5.018$, $p<0.001$) and in four-year-olds ($b=5.114$, $SE=0.661$, $z=7.732$, $p<0.001$).

In order to determine age differences, linear mixed models using age group as a predictor of the probability of rewards in each condition were calculated. For the *auch*-condition, the model revealed no significant differences in the proportion of rewards between adults and three-year-old children ($b=0.733$, $SE=5.268$, $z=0.139$, $p>0.05$) and adults and

four-year-olds ($b=1.364$, $SE=4.658$, $z=0.293$, $p>0.05$). In addition, the proportion of rewards after *auch*-sentences in three- and four-year-old children did not differ from each other ($b=0.632$, $SE=5.271$, $z=0.120$, $p>0.05$).

A different pattern was shown after sentences without a particle, in which case no rewards were predicted. As indicated in Figure 1 (dark bars), the proportion of rewards in this condition decreased with age. GLMMs revealed a lower proportion of rewards in adults than in three-year-olds ($b=8.749$, $SE=1.756$, $z=4.984$, $p<0.001$) and four-year-olds ($b=4.727$, $SE=1.802$, $z=2.623$, $p<0.001$). Post-hoc comparisons showed a lower proportion of rewards in four-year-old than in three-year-old children ($b=4.021$, $SE=1.688$, $z=2.383$, $p=0.0172$).

Our results revealed that three- as well as four-year-olds gave more rewards after hearing sentences with *auch* than after sentences without a particle. In fact, children of both age groups rarely decided against rewarding the animal after hearing sentences containing *auch*. In addition, the number of rewards given after sentences with *auch* by the children of both age groups was comparable to the number of rewards given by the adults. Therefore, even three-year-olds' reactions to sentences containing the additive particle were already on an adult-like level: they not only correctly interpreted the asserted proposition of a test sentence with *auch* (e.g. *I've eaten the apple*), but, in addition, they correctly grasped the presupposition that, for example, the lion has also eaten something else. Therefore they were able to use the particle as a strong cue to put the proposition of the test sentence in an additive relation to the proposition of the context sentence that was expressed by the preceding guess of the first experimenter (e.g. *You've surely eaten the banana*). To put it differently: children succeeded in using the additive particle as marking that the claim expressed by the carrier sentence (e.g. *I've eaten the apple*) is compatible with a different claim about the same topic (e.g. *You've surely eaten the banana*).

In addition to this finding, children's responses to the sentences containing no particle revealed a gradual approximation toward adult-like reactions. The fact that the adults in our experiment rarely rewarded the animal in this condition suggests that they consistently interpreted the sentences without a particle as a correction of the guess made by the first experimenter, although there was no overt lexical material in the sentence (e.g. a restrictive focus particle, a negation) contradicting the guess that was brought up in the preceding context sentence (e.g. *You've surely eaten the banana*). Accordingly, adults did not treat the test sentences without a particle as an additional claim about the same topic, although such an addition interpretation is possible in sentences without an explicit lexical marking of addition (e.g. *Peter painted a ball. Peter painted a flower*) and

does happen in many contexts automatically.⁶ In contrast to the adults, the children obviously did not consistently interpret sentences without a particle in a corrective and thus exhaustive manner; they showed a pattern that is approaching the adults' performance between the ages of three and four years.⁷

Based on this observation, the question arises as to why the children did not get the same interpretation as adults for the sentences without a particle. One possible explanation for this could be that children at the age tested still have problems with the concept of exhaustivity. There is evidence that the exhaustive reading of English *it*-clefts is subject to developmental change with children starting out in a non-exhaustive stage. Heizmann (2007) found that while adults interpret cleft sentences like *It was the football that Cookie Monster threw into the trash can* in an exhaustive manner by rejecting them as a good description of an event in which Cookie Monster threw a football and a hat into the trash can, children up to the age of five years accept the sentences significantly more often than adults do. In her data a clear developmental pattern appeared with a continuous increase in adult-like rejections from age three to age five. The pattern of the developmental change in performance in our task with the sentences without a particle corresponds to the time course observed by Heizmann: a significant increase in child answers that reflect an exhaustive interpretation from age three to age four but not yet adult-like performance at the age of four.

We cannot (and did not intend to) determine the exact reasons for the children's pattern of performance with sentences containing no particles in our first experiment here. Rather, the responses to sentences with no particles in Experiment 1 might serve as a valuable starting point to be able to demonstrate children's interpretation of the restrictive particle as well. That is, taking children's performance on sentences without a particle as a baseline, would children of the same age be more effective in assigning a corrective and thus exhaustive interpretation to the test sentences in our experimental paradigm if this interpretation is explicitly triggered by the use of a lexical element – in this case by the use of a restrictive particle? This is a legitimate question to address, because considering the results from Paterson *et al.* (2006), the sole effect of the restrictive particle on

[6] We appreciate a reviewer's pointing out this second kind of interpretation to us.

[7] We asked children to motivate their decision about rewarding in each trial in both experiments. For the present purpose, we were interested in the trials in the no particle condition when children gave a reward. Due to missing data in 5% of these trials, we could only look at 67 out of 70 trials in three-year-olds and 40 out of 42 trials in four-year-olds. Three-year-olds motivated their responses in an additive manner (e.g. *Because the lion did both things/Because the lion has eaten the banana and the apple*) in 92.5% of the cases and four-year olds in 87.5% of the cases. These data substantiate the assumption that children interpreted the sentences without a particle non-exhaustively when giving a reward.

sentence interpretation cannot easily be revealed under experimental conditions. Thus, we conducted a second experiment using the same procedure and material as in Experiment 1 except that the sentences with no particles were replaced with sentences including the restrictive particle *nur*.

EXPERIMENT 2

METHODS

Participants

Twenty-two three-year-olds and twenty-two four-year-olds were tested in this experiment; none of them had already participated in Experiment 1. Again, all children finished the experiment and were taken into account for analysis. The children were distributed equally between the two versions of the experiment, which followed the same design as in Experiment 1. This time, the group of three-year-olds consisted of eleven girls and eleven boys with a mean age of 3;6 (range: 3;0–3;11). The group of four-year-olds consisted of eleven girls and eleven boys with a mean age of 4;6 years (range: 4;0–4;11).

Materials and procedure

The experimental procedure was the same as used in Experiment 1. The only difference to Experiment 1 was the replacement of the sentences without a focus particle with sentences containing the focus particle *nur* in post-finite position. That is, in the current experiment, if the first experimenter exclaimed (8):

- (8) E1: Löwe, Du hast bestimmt die BANANE gegessen!
 ‘Lion, you’ve surely eaten the BANANA!’

the second experimenter, speaking as the animal, could respond in two different ways, either by uttering a sentence containing *auch* as in (9a) or by uttering a sentence containing *nur* as in (9b):

- (9) a. E2: Weißt Du was? Ich hab auch den APFEL gegessen!
 ‘Guess what, I’ve also eaten the APPLE!’
 b. E2: Weißt Du was? Ich hab nur den APFEL gegessen!
 ‘Guess what, I’ve only eaten the APPLE!’

Hence, in Experiment 2 five test sentences with *auch* and five test sentences with *nur* were presented to the participants.

As in Experiment 1, we predicted that children would give a high number of rewards after sentences with *auch* if they take their presuppositional component into account for interpretation. Therefore, the proportion of rewards was expected to be significantly higher than for sentences with *nur*.

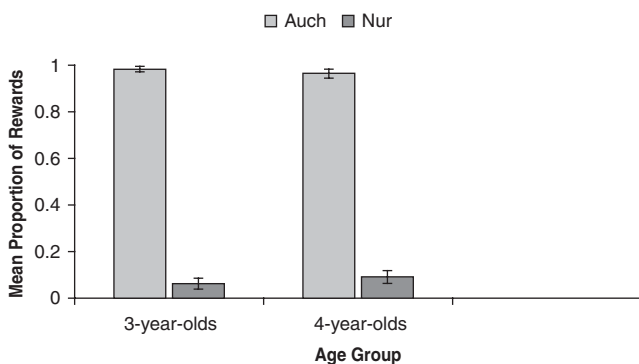


Fig. 2. Mean proportion of rewards after sentences with *auch* and after sentences with *nur* in Experiment 2. Error bars indicate ± 1 SE.

On the other hand, we expected a very low proportion of rewards – lower than for the sentences without particle in Experiment 1 – after sentences with *nur* if children incorporate the particle *nur* into their interpretation of the sentences containing this particle, thereby interpreting them exhaustively.

RESULTS AND DISCUSSION

Figure 2 gives the mean proportions of rewards after sentences with *auch* and after sentences with *nur* for three-year-olds and four-year-olds. There was a higher proportion of rewards after sentences with *auch* than after sentences with *nur* in three-year-olds (98.18% vs. 6.36%) and four-year-olds (96.36% vs. 9.09%).

GLMMs estimating the probability of rewards depending on condition, age and the condition*age interaction were calculated. There was a main effect of condition arising from a higher proportion of rewards in the *auch*- than in the *nur*-condition ($b=8.144$, $SE=0.773$, $z=10.539$, $p<0.001$). However, there was no effect of age ($b=0.063$, $SE=0.889$, $z=0.07$, $p>0.05$) and no interaction between condition and age ($b=0.394$, $SE=0.772$, $z=0.51$, $p>0.05$).

In order to capture differences in performance between the experiments, GLMMs were calculated to test the impact of experiment, age (three- vs. four-year-olds) and their interaction on the proportion of rewards. With respect to the sentences with *auch*, there were no significant effects, indicating that the proportion of rewards did not differ between the two experiments ($b=0.236$, $SE=3.439$, $z=0.069$, $p>0.05$) or between three- and four-year-old children ($b=0.404$, $SE=3.439$, $z=0.117$, $p>0.05$). Concerning sentences containing the particle *nur* or no particle,

there was a significant effect of experiment ($b=6.440$, $SE=1.502$, $z=4.287$, $p<0.001$) resulting from more rewards in Experiment 1 than in Experiment 2. The effect of age ($b=0.9733$, $SE=1.5001$, $z=0.649$, $p>0.05$) and the interaction between age and experiment ($b=1.347$, $SE=1.4997$, $z=0.898$, $p>0.05$) did not reach significance.

In sum, in Experiment 2 we could replicate the findings for children's correct interpretation of *auch* from Experiment 1: children as young as three years again performed as expected with sentences containing *auch*, once more indicating a target-like interpretation of sentences containing the additive particle. In addition, we found that three- and four-year-olds also performed well with sentences containing *nur*. In both age groups, incorrect rewarding after sentences with *nur* occurred less than 10% of the time. In addition, when comparing the results from the two experiments, children gave significantly fewer rewards after sentences with *nur* than after sentences without a particle. Therefore, making the exclusion of the alternative set more explicit by the lexical means of the particle *nur* helped children to establish an exhaustive interpretation and treat the animal's utterance as a correction of the experimenter's guess, a performance that is clearly different from the one the children displayed with sentences containing no particle in Experiment 1. This also suggests that in Experiment 1 the high number of rewards after the presentation of sentences both with *auch* and without a particle may not result from a general rewarding preference in children: they could easily reject rewarding the animals after hearing sentences with *nur* in Experiment 2.

GENERAL DISCUSSION

In two experiments conducted with different children we found that three- and four-year-olds show a high performance in the interpretation of sentences with the additive focus particle *auch* as well as with the restrictive focus particle *nur*. The results from Experiment 1 clearly indicate that children respond differently to sentences with the focus particle *auch* than to sentences without a focus particle. Furthermore, in Experiment 1 the proportion of appropriate responses after the presentation of a sentence with *auch* given by the children of both age groups did not differ significantly from the level shown by adults. This suggests that the children have already mastered the interpretation of the additive particle in our task. Experiment 2 provided further evidence that children are able to consider the contribution of the two focus particles in their interpretation of the sentences because clear differences appeared in their responses to sentences with *auch* and to sentences with *nur*. The proportion of appropriate responses was comparably high for the sentences with *auch* and *nur*. As for *auch* in Experiment 1, the sole effect of *nur* on sentence interpretation could

also be demonstrated: children responded differently to sentences containing the particle *nur* in Experiment 2 than to sentences without any particle in Experiment 1.

Hence our experiments show that three-year-old German-speaking children are already able to take the particle-triggered presupposition into account when interpreting sentences with *auch*. This interpretation of sentences with the additive particle requires the ability to take the presupposition and the asserted content of the sentence into account. The meaning contribution of the particle *auch* requires that the property that is asserted of the focus constituent holds of its presupposed meaning alternatives as well. Our results suggest that children from three years on can do this computation. This is an important new finding because data from previous studies in German, Dutch and Japanese indicated or explicitly showed rather poor performance in interpreting sentences with this particle, even in much older children (Bergsma, 2006; Hüttner *et al.*, 2004; Matsuoka, 2004; Matsuoka *et al.*, 2006; for contrary results, see Höhle *et al.*, 2009).

As cited above, Bergsma (2006) interpreted her findings for Dutch-speaking children as evidence that children initially ignore the presuppositional contribution of the additive particle in sentence interpretation. The performance of the German-speaking children in our task does not support this conclusion. Children's higher performance in our study is unlikely to be due to language-specific differences: the use of the additive particles *ook* and *auch* in Dutch and German is highly similar across the two languages. The better performance in the task that we adopted from Papafragou and Tantalou (2004) is rather likely to be due to specific aspects of the task demands imposed on the children in the different experiments. As outlined above, the children in Bergsma's study (2006) had to select a picture that they considered an adequate match to a sentence. The three pictures displayed a scene that expressed the content of the presupposition and assertion of the subject-associated *ook* (e.g. a boy and a girl petting a dog for the Dutch counterpart of a sentence like *The boy is also petting a dog*), a scene expressing the content of the presupposition and assertion of the object-associated *ook* (e.g. a boy petting a dog and a cat), and a scene expressing merely the content of the sentence assertion (e.g. a boy petting a dog). If children – as shown for adults by Hornby (1974) and Kim (2008) – paid more attention to checking the fulfilment of the assertion than the fulfilment of the presupposition when they compared a sentence with a picture, then they should basically end up with a random selection across the three pictures in Bergsma's (2006) picture selection task, as all three pictures were logically compatible with the sentence assertion. But this was not what happened in Bergsma's experiment: many children consistently selected only the picture that displayed the content of the

assertion of the test sentences but did not display anything else apart from this information.

A similar effect can even be observed in adults in data presented by Paterson *et al.* (2006). They presented adults and children from age six on with sentences without focus particles and pictures that depicted only what was explicitly mentioned in the sentences (e.g. for the sentence *The woman is walking a dog* only a woman who is walking a dog) and pictures that showed additional elements not mentioned in the sentence (e.g. a woman walking a dog and a cat or a woman walking a dog and throwing a ball). Paterson *et al.* found that children as well as adults accepted the picture showing only the woman walking the dog as matching the sentence more often than the pictures displaying additional entities or events – even though logically all pictures presented the asserted content of the sentence.

Furthermore, Müller *et al.* (2011) found a gradual decrease in adults' and six-year-olds' acceptance rates for a sentence like *The fireman is holding a hose* when it was compared with pictures showing increasing amounts of additional information. This suggests that the fulfilment of the asserted proposition was not the only criterion for finding the optimal match between sentence and picture in the study by Bergsma (2006): rather, children's selection was also guided by a pragmatic preference for the picture that displayed the information provided in the sentence assertion in a 1:1 correspondence. This preference is in accordance with Grice's (1975) Maxim of Quantity.

Concerning the current study, as already outlined in the 'Introduction', one aspect of our experimental task that can be considered as being relevant for the children's rather good performance with the sentences with *auch* is the fact that children's responses did not have to be based on the detection of presupposition failure. It was not observable for the child what the animals were really doing behind the puppet theatre, thus the satisfaction or violation of the sentence presupposition did not have to be verified or falsified against this scene. Instead, the propositions expressed in the presupposition and the assertion of the animals' utterances could both be assumed to be true by the participant of the experiment. This is in line with the status of presuppositions in natural conversation, the fulfilment of which, according to Stalnaker (1973; 2002), is taken for granted by the interlocutors.

A second factor contributing to children's good performance with the *auch*-sentences in our study could be that the meaning alternative to the focused expression (e.g. *BANANA*) was made highly salient and was clearly defined by the preceding utterance of the first experimenter (e.g. *Lion, you've surely eaten the BANANA*). According to Stalnaker (2002), in using an utterance with an additive focus particle a speaker should be sure that the information required to interpret the utterance is available

to the hearer. Hence, the utterance by the first experimenter provided a verbal context in which the use of a particle in the following sentence would be highly natural. Therefore children were provided in an optimal way with the information that was necessary to interpret the sentence. Hüttner *et al.* (2004), in contrast, presented test sentences with *auch* out of the blue, which does not constitute an adequate conversational setting for the use of the particle. The information necessary to license the use of the focus particle *auch* and to interpret it was not available from any preceding discourse but had to be inferred from the visual context, i.e. the three pictures presented with each sentence. This may have put additional non-linguistic demands on the hearer, which may in turn have resulted in weak performance, particularly when carrying out those tasks that require the detection and evaluation of presupposition failures.

Von Fintel (2008) assumed that uttering a sentence like *SAM is having dinner in New York tonight, too* (example taken from Kripke, 2009: 373), without having some salient person other than Sam around in the context who has dinner in New York, leads to a conversational breakdown. Although it would be likely (and the hearer would know this) that millions of people other than Sam who are having dinner in New York do exist, this knowledge would not be sufficient to make the utterance containing the additive particle appropriate in this context. Von Fintel stressed the importance of the conversational context the utterance occurs in and assumed it to be crucial that the context preceding the utterance has made such persons having dinner in New York salient. If this does not happen, hearers find sentences containing the additive particle odd, because the particle-triggered presupposition cannot be accommodated easily here.⁸ In Bergsma's (2006) picture selection task, the context story in the beginning of each trial verbally provided the meaning alternative (e.g. ... *I wonder who will be petted: the cat, the dog, or both?* ...). However, children still performed poorly when tested on sentences with *ook* (e.g. *The boy has also petted the dog*) because they concentrated on the asserted proposition when carrying out the task. This might be due to the fact that although the content of the presupposition was made salient (verbally mentioned) at some point in the preceding course of the ongoing trial, uttering the sentence containing *also* was still odd. Obviously an appropriate use of a sentence containing *also* requires the unique and relatively prompt presentation of a proposition the content of which will be the presupposition of the following sentence with *also*. This is plausible for pragmatic reasons: explicitly expressing only one of the elements in a sentence for which the predicate holds while referring to the other element only implicitly by using *also* is an informative way to communicate only under

[8] Kripke (2009) therefore characterizes *too* as a presuppositional anaphor.

specific contextual restrictions. The pragmatic requirements for an appropriate utterance with *also* were obviously fulfilled in the contexts provided in the current study (see also Papafragou, 2006, for a discussion of the pragmatic characteristics of the task).

Compared to a sentence containing *also*, the utterance of a sentence containing *only* is pragmatically less restricted. Consider example (10):

- (10) A: What did you eat?
 a. B: I've also eaten an APPLE.
 b. B: I've only eaten an APPLE.

The utterance of speaker B in (10b) seems to be a much more appropriate response to A's question under discussion in (10) than the response in (10a). Given that *I've eaten an APPLE* is the presupposition of (10b), the presupposed information is at least conveyed at the same time (within the same sentence) as the asserted information that the sentence (10b) conveys. In (10a), however, the immediate conversational context does not guarantee that the presupposition that B has (already) eaten some other thing is part of the common ground at all when (10a) is uttered. Since the presupposed as well as the asserted information are typically mentioned in sentences with the particle *only* while the presupposed information is not necessarily mentioned in sentences with the additive particle *also*, children's interpretation of the latter type of sentences may be much more dependent on the contextual appropriateness of the sentences than it is the case for sentences with *only*. These conversational considerations may also account for children's better performance with restrictive than with additive particles found in previous studies.

Our assumption that the specific characteristics of the task used in our study may be better suited to reveal children's competence in using presuppositional information in sentence interpretation than other tasks is supported by the fact that performance with sentences with *auch* was not worse than performance with sentences with *nur* in the current study. Again, these data are not in line with previous data on the Japanese particles *dake* and *mo* (Matsuoka *et al.*, 2006) and the Dutch particles *alleen* and *ook* (Bergsma, 2002; 2006) that have been collected in truth value judgement tasks and picture selection tasks.

In addition to the good performance with *also*, children's performance with sentences with the focus particle *only* was clearly enhanced compared to the studies by Bergsma (2002) and Matsuoka *et al.* (2006) and to other studies that report problems in interpreting sentences with *only* up to school age (e.g. Crain *et al.*, 1994; Gualmini *et al.*, 2003; Müller *et al.*, in press; Paterson *et al.*, 2003; Szendrői, 2004). In contrast to these studies, our task was not set up to test whether children associate the particle with the correct sentence constituent. First, in the current study we only tested the

interpretation of sentences containing object- but not subject-associated *auch* or *nur*. Second, our experimental material for testing children's interpretation of object-associated particles was not constructed in such a way that children had to decide between different possible associations of the particles depending on the position of the particle or the accent placement. Although both of the particles appeared in post-finite position and could in principle associate to either the subject or the object in German SVO-sentences, the set-up of our experiment did not provide a context in which a set of alternatives was present that could have triggered a subject-association of the two particles. A set of different animals was introduced at the beginning of the experiment, but in each trial only one animal was focused, which made it clear that all the other animals occurring over the whole experiment could not serve as a salient alternative set within a single trial. With respect to the restrictive particle *nur*, Müller *et al.* (in press) found a preference for object-association in SVO-sentences in four- and six-year-old children. They even displayed such a preference in sentences in which *nur* appeared in pre-subject position, which is an impossible interpretation for German adults. Thus, for *nur* the possible default object-association described in the literature is in line with the correct responses in the current study. The missing of a salient alternative set for the subject of the sentence in our task is especially relevant when addressing the interpretation of the sentences with *auch*, given that Hüttner *et al.* (2004) observed a preference for a subject-association for post-finite *auch* in children in ambiguous contexts. Accordingly, the good performance of the children in our task compared to others can additionally be ascribed to the fact that no context ambiguities were involved. Such context ambiguities might have put an additional demand on children when carrying out the tasks in previous studies testing their interpretation of *also* and *only*.

Our main concern, rather, is to point out that children do not ignore the information provided by the focus particles, as is clearly shown by their different responses to sentences with and without focus particles. Although children treated the sentences without a focus particle differently than adults in not understanding a corrective reading, we could clearly show that including the restrictive particle in test sentences boosted such a reading in children by marking exhaustivity. Comparing the performance with the sentences with *auch* to that of the sentences without a particle showed that the insertion of *auch* led to a consistent additive sentence interpretation, which clearly reflects the function the particle has in standard language.

To summarize, our data with the German-speaking children make it clear that the different semantic status of the meaning conveyed by the two focus particles under consideration (i.e. presupposed vs. asserted content) does not necessarily lead to differences in children's ability to interpret sentences

that include these particles. However, these findings do not allow the general conclusion that presupposed information is as easy to process for children as asserted information. Rather, the findings show that children can in principle take presupposed information triggered by the focus particle *auch* into consideration in sentence interpretation and that they also consider the presupposition when carrying out an experimental task if the task closely meets the requirements of the use of this focus particle in natural conversation. Overall, children's treatment of presuppositions seems to be comparable to the performance of adults, who seem to grasp the presuppositional proposition when listening to sentences but to treat this information differently from the asserted proposition when it comes to checking its validity. Adults take the fulfilment of the presupposed proposition for granted and do not necessarily check for its satisfaction within the context while interpreting sentences, whereas they do tend to do so for asserted sentence content (Hornby, 1974; Kim, 2008; Stalnaker, 1973; 2002). Clearly more research has to be done to be able to specify the exact nature of experimental conditions in which the consideration of presupposed information in sentence interpretation can be made transparent – for children as well as for adults.

APPENDIX A

Experiment 1: Distribution of auch- and no particle-trials in versions 1 and 2.

Trial	Character occurring in trial	Version	
		1	2
1	lion	auch	no P
2	dinosaur	no P	auch
3	parrot	no P	auch
4	bunny	auch	no P
5	chicken	no P	auch
6	monkey	auch	no P
7	cat	auch	no P
8	squirrel	no P	auch
9	duck	no P	auch
10	Bear	auch	no P

APPENDIX B

Job descriptions, context sentences and test sentences in the auch-condition (Experiments 1 and 2), the nur-condition (Experiment 2) and the no particle-condition (Experiment 1) (translated from German).

Condition	animal's job	context sentence	test sentence <i>Guess what! ...</i>
auch nur no particle	<i>The tiger should eat a banana and an apple.</i>	<i>Tiger, you've surely eaten the BANANA!</i>	<i>I've also eaten the APPLE! I've only eaten the APPLE! I've eaten the APPLE!</i>
auch nur no particle	<i>The dinosaur should paint a chair and a ladder.</i>	<i>Dinosaur, you've surely painted the CHAIR!</i>	<i>I've also painted the LADDER! I've only painted the LADDER! I've painted the LADDER!</i>
auch nur no particle	<i>The parrot should wash some pants and a sweater.</i>	<i>Parrot, you've surely washed the SWEATER!</i>	<i>I've also washed the PANTS! I've only washed the PANTS! I've washed the PANTS!</i>
auch nur no particle	<i>The bunny should wrap a brick and a ball.</i>	<i>Bunny, you've surely wrapped the BRICK!</i>	<i>I've also wrapped the BALL! I've only wrapped the BALL! I've wrapped the BALL!</i>
auch nur no particle	<i>The chicken should cook a carrot and a potato.</i>	<i>Chicken, you've surely cooked the CARROT!</i>	<i>I've also cooked the POTATO! I've only cooked the POTATO! I've cooked the POTATO!</i>
auch nur no particle	<i>The monkey should colour a star and a circle.</i>	<i>Monkey, you've surely coloured the STAR!</i>	<i>I've also coloured the CIRCLE! I've only coloured the CIRCLE! I've coloured the CIRCLE!</i>
auch nur no particle	<i>The cat should clean a cup and a plate.</i>	<i>Cat, you've surely cleaned the CUP!</i>	<i>I've also cleaned the PLATE! I've only cleaned the PLATE! I've cleaned the PLATE!</i>
auch nur no particle	<i>The squirrel should brush a dog and a horse.</i>	<i>Squirrel, you've surely brushed the DOG!</i>	<i>I've also brushed the HORSE! I've only brushed the HORSE! I've brushed the HORSE!</i>
auch nur no particle	<i>The duck should fix a car and an alarm clock.</i>	<i>Duck, you've surely fixed the ALARM CLOCK!</i>	<i>I've also fixed the CAR! I've only fixed the CAR! I've fixed the CAR!</i>
auch nur no particle	<i>The bear should feed a pig and a cow.</i>	<i>Bear, you've surely fed the PIG!</i>	<i>I've also fed the COW! I've only fed the COW! I've fed the COW!</i>

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