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# Familiar verbs are not always easier than novel verbs: How German pre-school children comprehend active and passive sentences

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Word count = 9397

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**Acknowledgments**

Many thanks to Jana Jurkat, Elena Rossi and Linda Konnerth for assistance in testing and for organising appointments; to Claudia Salomo and Kinga Morsanyi for coding reliabilities; to Manuel Reinartz, Petra Jahn and Peter Froehlich for technical assistance. A special 'thank you' to the parents who brought their children into the lab and to the staff and caregivers of the following kindergartens: An der Lehde 12a, Coppistr. 19, Hannoversche Str. 50, Hans-Otto-Str. 2a, Kleiststr., 58, Kurt-Tucholsky-Str. 12, Louis-Fuernberg-Str. 19., Poetenweg 22, Reichelstr. 5., Richard-Lehmann-Str. 30, Schoenbachstr. 63, Stoetteritzer Str. 1, Theodor-Neubauer-Str. 18. Many thanks to four anonymous reviewers and to Aylin Kuntay, and to Evan Kidd, Danielle Matthews, Claire Noble and especially to Caroline Rowland for extremely helpful comments on previous versions of this paper.

**Abstract**

Many studies show a developmental advantage for transitive sentences with familiar over those with novel verbs. It might be that once familiar verbs become entrenched in particular constructions, they would be more difficult to understand (than would novel verbs) in non-prototypical constructions. We provide support for this hypothesis investigating German children using a forced-choice pointing paradigm with reversed agent-patient roles. We tested active transitive in Study 1. 2-year-olds were better with familiar than novel verbs while the 2½-year-olds pointed correctly for both. In study 2 we tested passives: 2½-year-olds were significantly below chance for familiar verbs and at chance for novel verbs, supporting the hypothesis that the entrenchment of the familiar verbs in the active transitive was interfering with interpreting them in the passive construction. The 3½-year-olds were also at chance for novel but above chance with familiar verbs. We interpret this as reflecting a lessening of the verb-in-construction entrenchment as the child develops knowledge that particular verbs can occur in a range of constructions. 4½ -year-olds were above chance for both familiar and novel verbs. We discuss our findings in terms of the relative entrenchment of lexical and syntactic information and to interference between them.

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## Introduction

All children have to learn the particular mechanisms which their language uses to express who is doing what in an event. English expresses this through word order, whereby the first noun of a sentence is typically the agent or 'doer' of an action (as in '*the fireman rescued the policeman*'). However, even English is more complex than this, as the same situation can be described using a 'passive' sentence structure or 'frame', where the first noun is actually the patient, or one affected by the action (as in '*the policeman was rescued (by the fireman)*'). The litmus test of whether children have learned an adult-like representation of the formal means by which their language conveys this type of sentential meaning has for the last couple of decades been the ability to use and comprehend such sentences with novel verbs (e.g., Berman, 1993).

Using novel verb comprehension tasks it has become clear that children learning English certainly seem to have acquired adult-like representations of the active transitive frame some time shortly after their second birthdays (Fernandes, Marcus, DiNubila, & Vouloumanos, 2006; Arunachalam & Waxman, 2010; Noble, Rowland, & Pine, 2011; Dittmar, Abbot-Smith, Lieven, & Tomasello, 2011) and perhaps even as early as 21 months (e.g., Gertner, Fisher, & Eisengart, 2006; although see Dittmar, Abbot-Smith, Lieven, & Tomasello, 2008b). The same appears to be true for certain types of active transitive frames in German (e.g., Dittmar, Abbot-Smith, Lieven, & Tomasello, 2008a), Italian (Abbot-Smith & Serratrice, in press) and Japanese (Matsuo, Kita, Shinya, Wood & Naigles, 2012). Similarly, children learning English seem to have acquired an adult-like representation of the passive frame (at least with case-marked pronouns) by 2;10 (Ibbotson, Theakston, Lieven, & Tomasello, 2011).

Thus, we know that young pre-school children can use the syntax of a sentence to access sentential meaning from very early on. In addition, we also know from a large body of literature on adult sentence processing that adults integrate both the syntax of a sentence and lexical information when calculating the likely sentential meaning (e.g. Garnsey, Pearlmutter, Myers, & Lotocky, 1997; Trueswell & Kim, 1998). To illustrate, if an adult (or even a five-year-old) hears '*Tickle the pig with....*'

he or she assumes that '*with*' is an instrument referring to the verb '*tickle*', whereas if the listener hears '*look at the pig with....*' he or she initially assumes that '*with*' modifies the noun '*pig*' in some way (Kidd, Stewart, & Serratrice, 2011). Young school-age children find it difficult to revise a particular initial sentential parse in the face of conflicting evidence which comes later in the same sentence (e.g. Choi & Trueswell, 2010; Snedeker & Trueswell, 2004). It is unclear, however, when exactly children start to integrate lexical and syntactic information in the way that adults do.

One way of investigating this question might be to look at studies which directly compare children's performance with familiar as opposed to novel verbs for the same sentence structure. For the active transitive frame there are a great many elicited production studies with two-year-olds (see Tomasello, 2003 for a review), two act-out comprehension studies (Akhtar & Tomasello, 1997; Chan, Meints, Lieven, & Tomasello, 2010) and even one preferential-looking study (Chan et al., 2010) which have found that children are initially better with familiar than with novel verbs (although see Kidd, Bavin, & Rhodes, 2001 for evidence that older two-year-olds look longer at the matching clips for novel than for familiar verbs in a preferential-looking task). However, these findings of the 'advantage-for-familiar-verbs' might not necessarily result from young pre-school children integrating their syntactic representations with their acquisition of the statistics for lexical biases of these verbs. Rather, the 'advantage-for-familiar-verbs' could simply result from the fact that familiar verbs are less burdensome to the processing system than are novel verbs and / or because novel verb conditions force the child to determine the verb's meaning (Naigles, 2002). Naigles (2002:187-188) for example, claims that even if familiar verbs are heard in ungrammatical frames, the task is inherently easier than a task involving novel verbs since the necessity of discerning the new lexical meaning is removed. As younger pre-school children have memory and other performance limitations, they should thus find any novel verb condition more difficult than a familiar verb condition.

Thus, to date it is not known whether the familiar verb advantage which is so prevalent in the literature on the acquisition of the active transitive (at least for English) is simply due to the fact that familiar verbs are less burdensome to the processing system (particularly an immature one) than are novel verbs, or whether the advantage is due to hearing a particular familiar verb in a particular frame (i.e., a frame which is highly associated with that verb). This is the question we are investigating in the

current study. To do this we compared performance by young two-year-olds with familiar versus with novel verbs for the active transitive (where all accounts would expect an advantage for the familiar verbs) with performance with the same verbs (in the same population) with the passive sentence frame. If the well-established familiar verb advantage for active transitives is due to the fact that here the familiar verb coincides with the frame which with it is most closely associated in the input, then with passive sentences, we should not see an initial familiar-verb advantage (and should perhaps even see an initial familiar verb disadvantage). If, however, the familiar verb advantage is simply due to the fact that they are not as burdensome to the system as novel verbs (as their meanings do not need to be determined etc), then we should still see a familiar verb advantage with passive sentences.

Before we proceed, it is worth asking whether a familiar verb advantage has been previously found with pre-school children for passive sentences. De Villiers and de Villiers (1973) found in an act-out task that children did go through a period in which they appeared to interpret passives with familiar verbs as actives. They interpreted their findings in terms of Bever's (1970) proposal that children initially interpret sentences using a NOUN-VERB-NOUN = AGENT-VERB-PATIENT schema, but they did not actually test this by using sentences containing novel verbs (which would have controlled for children's biases to interpret sentences relating to highly familiar events in certain ways). The only study which compared the same children on novel and familiar verbs in their comprehension of the passive was that of Pinker, Lebeaux and Frost (1987: Study 2) which found no difference between the two; 3;10-year-olds interpreted both at chance with action verbs (M = 56% for both) and 5;1-year-olds were above chance at both ( both = 88% correct). Thus, Pinker et al. (1987) appear to show no familiar verb advantage for passive sentences. However, there is reason to doubt that Pinker et al.'s study presents an accurate picture of pre-school children's abilities with passive sentences as other studies have found some evidence in three-year-olds of adult-like representations of the passive frame with two full noun phrases (e.g., Gordon & Chafetz, 1990) even as young as 3;2 in primed production (Bencini & Valian, 2008, although see Kidd, 2012, for critiques of this latter study).

One reason for the lack of clarity as to whether three-year-olds can or cannot comprehend passive sentences may be that the auxiliary used in the English passive (be) is homophonous with the adjectival copula 'be' and since the majority of passives in the input occur without by-phrases (Gordon

& Chafetz, 1990: Study 1), it could be that English children interpret many passive sentences through analogy to adjectives (e.g. 'the fence is (being) painted' through analogy to 'the fence is wet'). Therefore in the current study we chose to examine how German children comprehend the passive, as the German passive, although structurally very similar to the English passive, takes an auxiliary '*werden'* (= to become), as in example 1 below, which clearly identifies it as a dynamic event distinct from a stative adjectival phrase (which takes '*sein*' (= to be), see example 2 below). '*Werden*' can be used as a copula, but with clear dynamic (and not stative) meaning (see example 3 below and Abbot-Smith & Behrens, 2006 for further elaboration).

1) *Das Baby wird (vom Feuerwehrmann) gerettet*
   The baby is being saved (by the fireman)

2) *Das Baby ist nass*
   The baby is wet

3) *Das Baby wird nass*
   The baby is getting wet

Studies of spontaneous language production have shown that German children (Abbot-Smith & Behrens, 2006) like English children (Israel, Johnson, & Brooks, 2000) do start to use the passive during the 2-3 year age range. The four experimental studies investigating the acquisition of the German passive show rather diverse findings between studies, and none of these studies has reported findings for children under 3;0 (e.g., Grimm, 1975; Mills, 1977; Schaner-Wolles, 1989; Aschermann, Gulzow, & Wendt, 2004; although see Wittek & Tomasello, 2005: Study 1, in which 17% of the 2;10-year-olds produced at least one productive passive sentence).

For our study on the active transitive, we chose to use the case-marked, subject-initial, variant since this is the most common active transitive frame in German child-directed speech and the only variant which German 2½ -year-olds have been found to comprehend with novel verbs (Dittmar et al.,

2008a). Even German 21 month olds have been found to look significantly longer at the matching video clip when they heard this case-marked subject-initial variant of the active transitive, but only when previously primed with the same sentence frame using the same noun phrases with real verbs (Dittmar et al., 2008b). Because preferential-looking is not suitable for use with older children, whose comprehension of the passive frame we wished to assess, in the current two studies we used the forced-choice pointing paradigm which has been successfully used with German, English and Italian children aged 2;3 and over (Fernandes et al., 2006; Dittmar et al., 2008a; Abbot-Smith & Serratrice, in press; Arunachalam & Waxman, 2010; Noble, Pine & Rowland, 2011).

Therefore in the current two studies we adapted the pointing procedure used by Dittmar et al. (2008a) and Abbot-Smith and Serratrice (in press). The novel actions were identical to those used in these two studies but we also included a familiar verb condition. Study One compared how German 2;1- and German 2;6-year-olds comprehended novel versus familiar verbs in the case-marked, subject-initial, active transitive, illustrated in example 4 below, which is the construction which German 2;7-year-olds have been found to comprehend in Dittmar et al.'s (2008a: Study 3) pointing task. As in Dittmar et al.'s previous study (2008a), in addition to hearing the verb in the present tense whilst the clips were playing, the experimenter asked the pointing elicitation question in the past tense form, after the clips had finished playing.

4) *Wo* *hat der Elefant* *den Hund* *gekämmt?*
Where has the$^{+\text{nominative}}$ elephant the$^{+\text{accuative}}$ dog brushed?
(Where did the elephant brush the dog?)

5) *Wo* *wurde der Elefant* *vom* *Hund* *gekämmt?*
Where was the$^{+\text{nominative}}$ elephant by+the$^{+\text{dative}}$ dog brushed?
(Where was the elephant brushed by the dog?)

Study Two used exactly the same design and procedure, but with (full) case-marked, subject-initial, passive versions of the same sentences (illustrated in example 5 above) with German children at 2;3, 2;7, 3;7 and 4;7. To our knowledge, this is the first study which has examined child comprehension of the German passive using novel verbs.

Our first research question (for Study 1) was simply whether young German two-year-olds would fit with the well-established finding for English in showing better performance with familiar than with novel verbs when heard in active transitive sentences. Our second research question was whether these German children would comprehend active transitive sentences at an earlier stage in development (as one would predict from the relative input frequencies) or whether they would show very early comprehension of the passive construction (as has recently been claimed by Bencini & Valian, 2008; Crain, Thornton & Murasugi, 2009, for English). Our key hypotheses, however, concerned Study 2.

H1: If the established developmental advantage for familiar verbs in active transitive sentences is simply due to the fact that they are not as burdensome to the system as novel verbs (e.g. Naigles, 2002), then we should still see an initial familiar verb advantage with passive sentences.

H2: If, however, it is due to the fact that here the familiar verb coincides with the frame with which it is most closely associated in the input, then with passive sentences, we should not see an initial familiar-verb advantage, and we may in fact find that children pass through a period in which they perform worse with familiar than with novel verbs, as only with familiar verbs is there a conflict between the syntax (passive) and lexical frequency information regarding preferred argument structure (active transitive).

## Study 1

### Method

*Participants*

All children were monolingual speakers of German. They were brought by a caregiver to the child lab at the Max Planck Institute of Evolutionary Anthropology in Leipzig, Germany. Twenty-four 2;1-year-olds (mean = 24.75 months, range = 24 – 26 months; 10 girls, 14 boys) and twenty-four 2;6-year-olds (mean = 30.0 months, range = 29 – 31 months; 12 girls, 12 boys) participated in the study. A further 26 children were tested but excluded from the study due to either showing a side bias during the test trials

(four 2;1-year-olds and seven 2;6-year-olds)[1], fussiness (one 2;6-year-old), not willing to point (six 2;1-year-olds and three 2;6-year-olds)[2], failure to understand the task (two 2;6-year-olds)[3], bilingualism (one 2;1-year-old), experimenter error (one 2;6-year-old), or because the child could not see the films due to short-sightedness (one 2;1-year-old).

*Materials*

Three novel verbs and three familiar verbs were used in the study. All verbs referred to prototypical causative-transitive actions, involving direct contact between a volitional agent and an affected patient (Hopper & Thompson, 1980; Meints, 1999). All actions were reversible, involved direct contact between two animals and involved a patient which was affected by the action. The three novel verbs *wiefen*, *tammen* and *baffen* were used to describe three novel transitive actions that were performed with three novel apparatuses, which were identical to those used by Dittmar et al. (2008a: Study 3) and Abbot-Smith and Serratrice (in press). For all three, the causality of the new events was emphasised by some kind of change in the patient at the end of the scene. *Wiefen* referred to one animal rocking another animal which stood on a rocking-chair-like apparatus. It did this by hooking its head around the patient's head and then pulling the patient backwards with its head three times. With the third motion the agent forced the patient into a handstand. *Tammen* referred to an animal pushing down another animal which stood on a platform on top of a spring by jumping on its back. With the third motion the agent forced the patient to fall sideways. The third novel verb *baffen* referred to an animal spinning another animal around which stood on a spinning disk. With the third motion the location of the patient was changed from being next to the agent to being further away. We used three familiar verbs, namely, '*schubsen'* (= pushing), '*waschen'* (= washing) and '*kämmen'* (=brushing). Examples of all actions can be seen in Appendix B of Dittmar et al. (2011).

[1] Children who were excluded due to side bias pointed either always (e.g., six times) to the video on the left or always to the video on the right side of the screen during the six test trials. This could either mean that they do not understand the sentences or that they were just using a heuristic because they did not understand what the aim of the task was.
[2] These children were not willing to participate in the pointing task. They either refused to point during the word-comprehension warm up or during the first two test trials so we had to terminate the experiment.
[3] These two older children pointed to their own back instead of to one of the two videos to answer the test question. This response is not wrong because the agent animal indeed touched the back of the patient animal when acting on it but is difficult to analyze in terms of our research question.

Agents and patients of the presented events were animals which were all on the Bates-MacArthur Communicative Development Inventories (Fenson, Dale, Reznick, Bates, Thal, & Pethnick, 1994): *Bear* (*Bär*), *bunny* (*Hase*), *dog* (*Hund*), *elephant* (*Elefant*), *frog* (*Frosch*), *lion* (*Löwe*) and *monkey* (*Affe*). Four of the animals (*bunny*, *bear*, *dog* and *elephant*) appeared also on the ELFRA-1 (Grimm & Doil, 2001), a much shortened German version of the Bates-MacArthur CDI. All animals were of masculine grammatical gender in German, which takes distinctive case-marking on the definite article (and for some nouns also as a noun suffix in the accusative). Therefore, in all test sentences (see Appendix A) both NPs were case-marked in German; with the nominative (*der*) marked NP in initial position and the accusative (*den*) marked NP in second position.

*Design*

We tested each child with six different verbs (three familiar verbs and three novel verbs), in one trial each, in transitive sentence structures using a pointing task. During the session the children sat on their caregiver's lap in front of a 31 x 49 cm computer screen. For the test trials the child saw two film scenes on the computer screen, each starting simultaneously and lasting 6 seconds. Both involved animals enacting the same causative event and differed only in that agent and patient roles were reversed.

*Counterbalancing*

Half the children within an age group started with a familiar verb and the other half with a novel verb. Following this familiar (F) and novel (N) verb trials were alternated (either FNFNFN or NFNFNF). The order of the particular verbs which came in each familiar or novel slot was counterbalanced according to Latin squares. The target screen order for the test trials was counterbalanced so that each side (left or right) was correct 50% of the time for each child. The same side was never the correct choice more than twice in a row. No child experienced a condition in which the correct choice alternated regularly (e.g., LRLRLR). For half the children the first correct side in the first trial was left and vice versa. There were thus twelve possible orderings for correct side and these were distributed evenly over the children within each group. For each test trial scene pair we also

counterbalanced which particular scene correctly matched the test sentence (e.g., for the pair 'dog push lion' and 'lion push dog' half the children heard *the dog is pushing the lion* and the other half heard the reverse). The direction of the action (from left to right or from right to left) was also counterbalanced.

*Procedure*

A camera from behind the children recorded their pointing behaviour. The parents were asked to close their eyes during the test trials and they listened to music played through headphones so as not to influence their children.

Pointing practice training

To teach the children that the aim of the task was to point to one of two pictures on a computer screen we showed the child a series of object pairs, for example, 'dog' and 'duck' which appeared on the screen simultaneously. Then the children were asked to point to one of the two objects (e.g., '*Zeig mir: Wo ist der Hund*?' = Show me: where is the dog?). The pictures were from the vocabulary comprehension sub-test of the SETK-2 (Grimm, 2000). We repeated this task ten times with different objects and all children performed very successfully.

'Live' Word-learning Training

Prior to each test sentence each child was taught the name of each verb in the following manner. Using animals which take feminine gender in German (e.g. '*Kuh'* = cow and '*Ente'* = duck), every verb (novel and familiar) was presented to each child in a live act out by the experimenter in a variety of argument structures: in the citation form with no arguments (e.g. '*Das heißt wiefen'.* = This is called weefing.) as well as in transitive argument structure with two feminine pronouns in German (which are both identical for subject and object position) in three different tenses ('*Sie wird sie wiefen*.' = It's going to weef it.; '*Sie wieft sie*.' = It's weefing it.; '*Sie hat sie gewieft.'* = It weefed it.). The child was also asked to repeat the verb in the citation form (e.g., '*Kannst du das sagen: wiefen*?' = Can you say this: weefing?).

Film Familiarization trials

Following the live enactment, for each verb the child then saw a familiarization trial, in which s/he first watched each of the two film scenes individually and heard the experimenter describing them in the citation form, e.g., '*Guck mal, das heißt wiefen.'* = Look, this is called weefing., while the other half of the screen remained blank. The side where the children saw the first picture (left or right) was counterbalanced across and within subjects. Afterwards, a red centre point focused the child's attention on the centre of the computer screen. Then, s/he watched the same two scenes again but they appeared simultaneously the first time and were accompanied by a pre-recorded voice describing them in the citation form, e.g., '*Guck mal, das heißt wiefen.'* = Look, this is called weefing. We ran this trial to get the children used to watching two films simultaneously and to equalize the grade of novelty of both films before the test trial.

Test trial

Following this another red centre point centred the child's attention to the centre of the computer screen. Then, the test trial began. This was identical to the salience except that the child heard a pre-recorded linguistic stimulus with the target verb in transitive argument structure, e.g., '*Guck mal, der Löwe wieft den Hund'* = Look, the$^{+nominative}$ lion is weefing the$^{+accusative}$ dog.(x2). After the videos had stopped the experimenter asked the child to point to the correct still picture by asking, e.g., '*Zeig mir: wo hat der Löwe den Hund gewieft*!' = Show me: where did the$^{+nominative}$ lion weef the$^{+accusative}$ dog? If the child did not point the experimenter repeated the question a second time, but she never asked the child to point again once s/he had already done so (see Dittmar et al., 2011: figure 1, for a more detailed description of the procedure).

*Vocabulary production post-test*

After all test trials were over each child received the vocabulary production sub-test of the SETK-2 which has been standardized for German two- to three-year-olds (Grimm, 2000). The norm range for each age group is a score 40 – 60. In this test children are shown cards with pictures of objects which they have to name. The 2;1-year-old children who participated in the test had a mean score of 49 (range 31 - 70), and the 2;6-year-olds had a mean score of 52 (range 37 - 65).

*Coding*

For every pointing test trial, pointing to the target was assigned the value 1 and pointing to the distracter the value 0. All children were coded by the native German-speaking experimenter, and one additional (blind) coder coded 17% of all trials for reliabilities with high agreement with the first coder (Cohen's Kappa = 92.38%).

For our main analysis, we excluded those trials where a particular child did not choose either scene, i.e., some children pointed to both scenes. This was necessary for 34 out of 288 trials (20 out of 144 in the novel verb condition and 14 out of 144 in the familiar verb condition). Due to this we lost data from one 2;1-year-old in the novel verb condition. Additionally, we analysed our data in the way that we substituted those trials in which a child did not choose either scene with the value 0.5 (which is chance level) and thus included all trials in our final analysis. A third analysis only includes participants who always pointed without showing signs of doubt to one of the two pictures, i.e., we excluded all children who pointed to both pictures at least once (13 2;1-year-olds and ten 2;6-year-olds)[4]. Any relevant differences will be reported.

**Results**

Children's pointing behavior was analyzed using a 2 (Verb Condition) * 2 (Age Group) mixed factorial analysis of variance (ANOVA). We found a significant Verb Condition * Age Group interaction ($F$ (1, 45) = 5.086, $p$ = .029, $\eta_p^2$ = .102) and a marginal main effect for Verb Condition ($F$ (1, 45) = 4.031, $p$ = .051, $\eta_p^2$ = .082) but no main effect for Age Group ($F$ (1, 45) = 2.332, $p$ = .134, $\eta_p^2$ = .049)[5]. A post hoc test revealed that the interaction was due to the 2;6-year-olds ($M$ = 70.14%) pointing correctly more often overall than the 2;1-year-olds ($M$ = 47.83%) in the novel verb condition ($t$ (45) = 2.460, $p$ = .018) but not in the familiar verb condition ($M$ (2;6-year-olds) = 68.75%, $M$ (2;1-year-olds) = 70.83%, $t$ (46) = .271, $p$ = .787). Moreover, the 2;1-year-olds performed significantly better with the familiar

[4] Of the 23 excluded 'uncertain pointers' most of them (16) pointed to both options only in one trial (out of six) and performed well in the rest of the trials

[5] The substituted data ($F$ (1,46) = 5.600, $p$ = .022, $\eta_p^2$ = .109) and the data which includes only the certain pointers ($F$ (1,23) = 5.806, $p$ = .015, $\eta_p^2$ = .231) revealed a main effect for age.

verbs than with the novel verbs ($t$ (22) = 3.054, $p$ = .006, see Fig. 2). The same results were found when we excluded the uncertain pointers.

Because the chance level for our dependent variable was always 50%, we also investigated in which conditions and at which ages the children were above chance. The results reflect the previous analyses, namely the 2;1-year-olds were only above chance in the familiar verb condition ($t$ (23) = 3.315, $p$ = .003), whereas the 2;6-year-olds were above chance in both the familiar verb ($t$ (23) = 4.253, $p$ < .001) and the novel verb condition ($t$ (23) = 2.868, $p$ = .009). Exclusion of uncertain pointers revealed similar results but with slightly higher means (familiar verbs: $M$ (2;1-year-olds) = 75.76%, $M$ (2;6-year-olds) = 73.81%, novel verbs: $M$ (2;1-year-olds) = 51.52%, $M$ (2;6-year-olds) = 83.33%).

INSERT FIG. 2 HERE

An analysis of the individual differences (only certain pointers included) supports our above mentioned findings. We analyzed how many children pointed correctly two or three times (out of three trials) and how many children pointed correctly only one or zero times within a condition. The children who pointed at least two times to the correct scene have been categorized as above-chance-pointers. As shown in table 1 the majority of the 2;1-year-olds pointed to the correct scene in the familiar verb condition but not in the novel verb condition. The majority of the 2;6-year-olds pointed above chance in both verb conditions.

INSERT TABLE 1

Thus, German 2;6-year-olds comprehend active transitive sentences with novel verbs correctly, which replicates the results from Dittmar et al. (2008a) for the prototypical case-marked subject-initial active transitives. In contrast, 2;1-year-old German children interpret active transitive sentences correctly, if these contain familiar verbs but they fail with novel verb sentences. Therefore, they appear to show verb specific behaviour. The English 2;1-year-olds in Dittmar et al's (2011) study showed significant order effects (that is, they pointed correctly in the first novel verb trial 67% of the time and 65% of the time over the first two trials, but did not differ from chance level when considering their performance over all three trials). In our study, the German 2;1-year-olds showed no significant order effects ($p$ = .439, n.s.). Moreover, at no point did they show any indication that they were pointing above chance

with the novel verbs; they pointed at the correct clip 59% of the time on the first novel trial and 52% of the time over the first two trials.

While it is possible that our 2;1-year-olds might have misinterpreted the meaning of the novel verbs, this seems unlikely since the current visual stimuli were identical to those used by Dittmar et al. (2011) with the same age group. It should also be noted that the children carried out all the novel actions during the act-out phase and thus were highly familiar with the fact that these were causative actions, as opposed to non-causative interpretations of the novel verbs as having a meaning similar to 'annoy' or 'flee from' in which the theme would typically map onto the subject. It is also possible that being presented with exactly the same action in both the target and foil clips, might make the two clips difficult to discriminate, and it is possible that had we used two different novel actions, the German 2;1-year-olds would have performed above chance in the novel verb condition.

These issues over difficulties with novel action stimuli do however make it clear that it is easy to come up with numerous reasons why children, such as our German 2;1-year-olds, perform better in familiar than in novel verb conditions. For this reason, we would now like to turn the tables on this discussion by predicting that with passive sentences children might initially have more difficulty with familiar verbs than with the same novel verb stimuli.

**Study 2**

Study One showed as for English children, German children appear to pass through a stage where there is an advantage if the sentences contain a familiar (high frequency) causative verb as opposed to a novel causative verb. This is a new finding for German as to date no study has used novel verbs with children as young as 2;1 and no study has compared performance on novel with performance on familiar verbs with a pointing task (although see Chan, Lieven, & Tomasello, 2009; Dittmar et al., 2008a: Study 2 for act-out). However, almost all theories can account through some means for an advantage for familiar verbs when heard in active transitive sentences. Thus Study Two investigates comprehension of the passive with age groups which overlap with those from Study One, tested in the same German town.

## Method

### *Participants*

Half of each age group was tested in the child lab and half in kindergartens in the same German city as in Study One[6]. There were twenty-four 2;3-year-olds[7] (mean = 26.2 months, range = 25 – 27 months; 11 girls, 13 boys), twenty-four 2;7-year-olds (mean = 30.6 months, range = 30 – 32 months; 11 girls, 13 boys), twenty-four 3;7-year-olds (mean = 42.8 months, range = 41 – 44 months; 12 girls, 12 boys) and twenty-four 4;7-year-olds (mean = 54.6 months, range = 53 – 56 months; 10 girls, 14 boys) who participated in the study. All of these children were monolingual speakers of German, who fell within the normal range for their age on a standardized German language sub-test (Grimm, 2000, 2001). A further 17 children were tested but excluded from the study due to either showing a side bias during the test trials (four 2;3-year-olds, three 2;7 year-olds and one 3;7-year-old), fussiness (two 2;3-year-olds), bilingualism (one 2;3-year-old), experimenter error (four 2;7-year-olds), or technical failure (one 2;3-year-old and one 3;7-year-old).

### *Procedure*

The procedure followed that of Study One, except in terms of the linguistic models, which in the current study were passive and not active transitive. The linguistic models in the live act 'argument structure' models thus had the following forms: 1) '*Sie wird gleich von ihr gewieft'* = It's going to be weefed by it; 2) '*Sie wird von ihr gewieft'* = It's being weefed by it; 3) '*Sie wurde von ihr gewieft* = It was weefed by it.). The linguistic model in the test trials now involved the target verb in the passive, *e.g., 'Guck mal, der Löwe wird vom Hund gewieft'* (= Look, the$^{+\text{nominative}}$ lion is being weefed by the$^{+\text{dative}}$ dog.). Finally, the linguistic model for the test question (after the test video clips have finished playing and had paused on the still) was of the form: '*Zeig mir: wo wurde der Löwe vom Hund gewieft?'* Show me: where was the lion weefed by the dog?

[6] The means of correct points for the kindergarten-tested children (61%) and for the lab-tested children (59%) were identical.

[7] We piloted this experiment with 2;1-year-olds in order to have an age group comparable to the youngest group in Study One. However, when they heard passive sentences, German 2;1-year-olds tended to either refuse to point or to point to both pictures. Thus we moved our mean age up by two months.

*Coding*

For every test trial, pointing to the target was assigned the value 1 and pointing to the distracter the value 0. All children were coded by the native German-speaking experimenter and a (blind) second coder coded 17% of all trials with high agreement (Cohen's Kappa = 98.20%).

For our main analysis, we excluded those trials where a particular child did not choose either scene, i.e., some children pointed to both scenes. This was necessary for 69 out of 576 trials (35 out of 288 in the novel verb condition and 34 out of 288 in the familiar verb condition). Due to this we lost data from two 2;3-year-olds in the novel verb, and two (other) 2;3-year-olds and one 2;7-year-old in the familiar verb condition. We also repeated the analysis using the value 0.5 for substituting those trials, in which a child did not choose either scene and finally ran an additional analysis in which we excluded all uncertain pointers (14 2;3-year-olds, ten 2;7-year-olds, eight 3;7-year-olds, and two 4;7-year-olds)[8]. All relevant differences will be reported.

**Results**

Children's pointing behaviour was analyzed using a 2 (Verb Condition) * 4 (Age Group) mixed factorial analysis of variance (ANOVA). We found a marginal Verb Condition * Age Group interaction ($F$ (3, 87) = 2.548, $p$ = .061, $\eta_p^2$ = .081) and a main effect for Age Group ($F$ (3, 87) = 11.651, $p$ < .001, $\eta_p^2$ = .287) but no main effect for Verb Condition ($F$ (1, 87) = .346, $p$ = .558, $\eta_p^2$ = .004). The same effects are found if we exclude all uncertain pointers from our analysis. Post hoc tests with a Bonferroni correction for six comparisons between age groups revealed that the interaction was due to the 4;7-year-olds pointing correctly more often overall than all younger age groups in the novel verb condition (2;3-year-olds ($M$ = 46.97%) vs. 4;7-year-olds ($M$ = 81.94%), $t$ (44) = 4.057, $p$ < .001; 2;7-year-olds ($M$ = 56.94%) vs. 4;7-year-olds, $t$ (45) = 3.026, $p$ = .024 (corrected); 3;7-year-olds ($M$ = 59.72%) vs. 4;7-year-olds, $t$ (46) = 2.991, $p$ = .024 (corrected)) and better performance than the two youngest age groups in the familiar verb condition (2;3-year-olds ($M$ = 55.30%) vs. 4;7-year-olds ($M$ = 79.17%), $t$ (44) = 2.971, $p$ = .030 (corrected); 2;7-year-olds ($M$ = 38.41%) vs. 4;7-year-olds, $t$ (45) =

[8] Slightly more than the half of the 34 'uncertain pointers' (18) pointed to both scenes only in one trial but performed the rest of the task well.

5.146, $p < .001$; 3;7-year-olds ($M = 64.58\%$) vs. 4;7-year-olds, $t$ (46) = 1.884, $p = .396$ (corrected)). Furthermore, the performance of the 2;7-year-olds (M = 38%) and the 3;7-year-olds (M = 68%) differed significantly in the familiar verb condition ($t$ (45) = 2.953, $p = .030$ (corrected)). Finally, a comparison within each age group between the two verb conditions showed that the 2;7-year-olds' performance with the familiar verbs (M = 38%) differed significantly from their performance with the novel verbs (M = 57%) ($t$ (22) = 2.328, $p = .030$, see Fig. 3). We did not find such an effect within the other age groups (except when 'uncertain pointers' were removed from the analysis, the 3-year-olds performed significantly better in the familiar- than in the novel verb condition).

Because the chance level for our dependent variable was always 50%, we also investigated in which conditions and at which ages the children performed above chance. The results reflect the previous analyses, namely the 2;3-year-olds and 2;7-year-olds did not differ from chance in any condition whereas the 3;7-year-olds were only above chance in the familiar verb condition ($t$ (23) = 2.380, $p = .026$), and the 4;7-year-olds were above chance in both the familiar verb ($t$ (23) = 6.164, $p < .001$) and the novel verb condition ($t$ (23) = 6.511, $p < .001$).

Interestingly, if we score all cells in which a child pointed at both options as 0.5 (i.e. chance), and carry out the same analyses, we still find that the 2;7-year-olds point correctly significantly more often in the novel than in the familiar verb condition ($p = .049$) but we also find that the 2;7-year-olds pointed significantly below chance in the familiar ($p = .05$) but not the novel verb condition. We find the same below chance performance for the 2;7-year-olds with the familiar verbs when we exclude the uncertain pointers ($t$ (13) = -2,197, $p = .047$). Thus it appears that the 2;7-year-olds showed a tendency to interpret the passive sentences with familiar verbs, but not the passive sentence with novel verbs, as active transitive sentences.

An analysis of the individual differences (only 'certain pointers' included) supports our above mentioned findings. We analyzed, as in Study One, how many children pointed correctly two or three times (out of three trials, see Table 2). The imbalance between the novel and familiar verb conditions can be seen here for both the 2;7-year-olds and the 3;7-year-olds. That is, only 2 out of 14 2;7-year-olds showed a 'good' level of understanding of the passive sentences with familiar verbs, whereas 8 / 14 did so with the novel verbs. As in the above analyses, the 3;7-year-olds showed an imbalance in the

opposite direction: nearly all the 3;7-year-olds showed a 'good' level of understanding of the passive sentences with familiar verbs, whereas only 10/16 did so with the novel verbs.

INSERT TABLE 2 HERE

Finally, we investigated whether there might be order effects but the only order effects were in the 3;7-year-old age group. These children showed a significant main effect for trial order with the familiar verbs, i.e., they became better in pointing to the correct picture during the experiment ($F$ (2, 34) = 4.857, $p$ = .014, $\eta_p^2$ = .287). Although they did not perform above chance with the first familiar verb trial ($M$ = 41%, p = .406, n.s.) they performed significantly above chance with the second ($M$ = 75%, $t$ (19) = 2.517, $p$ = .021) and the third familiar verb trial ($M$ = 83%, $t$ (23) = 4.290, $p$ < .001).

INSERT FIG. 3 HERE

Thus, the results of our second experiment fit with H2 – namely, that children might pass through a stage (around 2;7 in our study) in which they perform worse with familiar than with novel verbs in the passive construction, if those verbs are heard frequently in the active construction.

**General Discussion**

Both current studies compared how German children understand sentences with novel verbs with how the same children comprehended sentences with familiar verbs. In Study One the sentences were heard in the active transitive and in Study Two the sentences were heard in the passive. Both studies included an age group of 2½ -year-olds (M = 30 months in Study One, 30.6 months in Study Two). When they heard active transitive sentences this age group pointed correctly above chance with both novel and familiar verbs. When they heard the passive variant, this age group was significantly more likely to point correctly for the novel ($M$ = 57%) verb than for the familiar verbs ($M$ = 38%). On two out of three coding systems, the 2;7-year-olds pointed significantly below chance with the familiar verbs but at chance for the novel verbs. Below the age of 2;6, the results were as follows. In Study One

(active transitive), the 2;1-year-olds were significantly more likely to point correctly in the familiar (*M* = 71%) than in the novel verb condition (*M* = 48%). In Study Two (passive), the 2;3-year-olds pointed at chance in both conditions. Finally, Study Two also tested two older age groups on their passive comprehension; the 3;7-year-olds pointed above chance only in the familiar verb condition (and were significantly more likely to point correctly in the familiar than in the novel verb condition when the 'uncertain' pointers were removed), whereas the 4;7-year-olds pointed correctly above chance in both the familiar and the novel verb conditions.

Before we move on to discuss our findings, we wish to emphasise that no matter how the data is analysed / coded (points to both screens included as 0.5 or excluded, 'uncertain pointers' excluded or included) we find the same basic story in terms of what German children are comprehending or not comprehending. That is, they are poor with the passive with familiar verbs at 2;7 (whether this comes out as significantly below chance, or significantly worse than the novel verb condition or both) and they are good with the passive with familiar (but not novel) verbs at 3;7. Analyses of performance by individual children support both these findings.

Thus, we can answer our first research question affirmatively; young German two-year-olds fit with the body of literature for English-speaking two-years-olds in showing an advantage for familiar over novel verbs with the active transitive. We can also answer our second research question affirmatively; the passive sentence frame is acquired later than the active transitive frame. This may seem to be an obvious outcome since German children do not hear the '*werden'* (eventive) passive with a high frequency (Abbot-Smith & Behrens, 2006, found only 84 tokens in 63 hours of maternal child-directed speech). However, it is important to state this since there have been some recent voices in the literature who have argued that the passive is acquired early in English and use this as evidence in support of universal access to categories such as 'grammatical subject' (e.g. Bencini & Valian, 2008; Crain, Thornton & Murasugi, 2009). More importantly, Study Two supports H2 over H1. That is, there is no initial developmental advantage for familiar verbs when processing passive sentences. Rather, children pass through a stage in their comprehension of passive sentences in which they show a

familiar verb DISadvantage. Thus, young two-year-olds do integrate both lexical and syntactic information when comprehending sentences.

The developmental story regarding the acquisition of the German passive looks to be as follows: at 2;3 the children are at chance with the passive with both familiar and novel verbs. This suggests that they are processing the passive morphology (e.g. '*wurde*' instead of '*hat*' as the auxiliary plus the by-phrase '*von dem*' or '*vom*') on some level, otherwise they would interpret at least the familiar verbs as active transitives and thus point significantly below chance with them. By 2;7 they have learnt enough about the passive AND enough about the frame usually associated with the familiar verbs (the active) to become completely confused. Like adults, the children are taking account of both the syntactic frame and the most likely syntax associated with the verb, but these two cues are pointing in different directions. In other words, the two constraints are competing, as they do in adults. Unlike in adults, though, the syntax does not win out and the children end up performing at (or below, depending on which analysis one takes) chance. By 3;7 the children's syntactic representations of the passive construction is robust enough for them, like adults, to choose syntax over the statistical probabilities associated with the particular familiar verbs.

Importantly, the overall group tendency for 2;7-year-olds to misinterpret passive sentences containing highly familiar verbs as active transitives was evident for both the 'uncertain pointers' and for the 'certain pointers'. That is, if the 'uncertain pointers' are completely removed from the analysis, the familiar verb condition for the 2;7-year-olds is significantly below chance. This also holds when the uncertain pointers are included in the analysis if we code (and thus include) the trials in which they pointed 'uncertainly' to both the target and distractor as 0.5. (It should be noted that it does not really make sense to argue that the 'uncertain pointers' are included in the analysis if one simply eliminates entirely from the analysis those trials on which they pointed uncertainly as these are the trials which determine their categorisation as an 'uncertain' pointer). Thus for all sub-groups of 2;7-year-olds it holds that in the familiar verb conditions they are significantly below chance at comprehending passive sentences. It is important to note while this tendency appears to hold for all sub-groups of 2;7-year-olds, it is only a group tendency and since the 2;3-year-olds appear to be showing some kind of implicit awareness that passive sentences differ in their meaning in some way to active transitive, the likelihood

is that this implicit awareness is even stronger at 2;7. The key point of these findings is, however, that only in the familiar verb condition (and not in the novel verb condition) do German 2;7-year-olds show a systematic tendency to be easily 'mis-led' in their passive sentence interpretation.

This interpretation of the data allows to account for our two major findings; firstly, that there is no initial familiar verb advantage for passives, but rather an initial familiar verb disadvantage; and secondly why the passive is more difficult than the active – not only is it less frequent as a construction in the input, it is also not statistically likely as an argument structure for the familiar verbs concerned. However, our finding that German 3;7-year-olds find it easier to comprehend full passives with familiar than with novel verbs does not naturally fall out of this (our preferred) interpretation. An alternative interpretation of our data might be simply that passives are more difficult than active transitive sentences and thus are simply acquired later and thus 2;7-year-olds struggle with passive sentences EVEN when they are heard with (the inherently easier) familiar verbs. This latter account would be able to easily explain why our 3;7-year-olds comprehended passive sentences better with familiar than with novel verbs. However, it would also predict identical comprehension of passives in the novel vs. familiar verb conditions by our 2;7-year-olds, which was not the case.

Thus, the more accurate account appears to be one in which from early in the third year of life, children access both syntactic and lexical information during sentence processing, but initially lexical information usually wins out over syntax, leading to initially poorer performance with familiar than with novel verbs when processing passive sentences, if those particular familiar verbs are frequently heard in a competing construction. However, it is possible that under neutral conditions, novel verbs (as proposed by Naigles, 2002) do constitute more of a processing burden than do familiar verbs. This could interact with children's gradually mastery of both active and passive constructions and the statistical probabilities of particular familiar verbs occurring in particular frames. As children become aware that the same verbs can occur in both frames, familiar verbs then lose their 'competing construction' disadvantage in comparison to novel verbs when heard in passive frames. Indeed, it is interesting that children's performance in comprehending passives with novel verbs appeared to plateau

between 2;7 and 3;7 years. This type of account is compatible with the constraint-based lexicalist nativist account.

In a constraint-based lexicalist nativist account children access both syntactic and lexical information from very early in development. In this perspective, the lexicon records frequency information regarding how often particular verbs are heard in the active transitive frame (e.g., Fisher, 2002; Snedeker & Trueswell, 2004). Thus for the passive frame in our familiar verb condition, the lexical information (e.g., the probability is that the verbs '*schubsen*', '*waschen*' and '*kaemmen*' predict an active transitive) and the syntactic information (e.g., auxiliary and by-phrase preposition) are in conflict, whereas in the novel verb condition there is no conflict (as there is no prior lexical information).

One particular early version of the usage-based account, the 'verb-island hypothesis', predicted exactly the opposite, as it viewed the acquisition of constructions to precede initially in a fairly independent manner from one another and to depend on the accumulation of 'familiar verb islands' prior to the point when 'productivity' or comprehension with novel verbs became possible. Brooks and Tomasello (1999:30) predict this clearly as follows: "*If children below 3 ….are not productive, then a verb-by-verb account would be supported, implying that it is only after children have learned to produce passive sentences with some number of verbs individually that their understanding of the construction becomes general enough to support productive usages*"

Currently prevailing usage-based accounts, however, would (like the constraint-based accounts) also posit interference from the active transitive when interpreting passive sentences, since both are potential candidates for 'capturing' the speakers' intended message and are alternative ways of conveying the same event (e.g., Tomasello, 2003; Ambridge, Pine, Rowland, Jones, & Clark, 2009; Langacker, 2000; Dabrowska & Street, 2006). This account predicts stronger interference for verbs which have a higher frequency of item-in-construction count for the active than for the passive. Thus, the argument is that the familiar verbs were so entrenched in the active transitive construction that the 2;7-year-olds preferred to interpret sentences containing these verbs as active (whereas they had no

such bias with novel verbs). It should be noted that this prediction was also made by older theories of child sentence comprehension, such as that of Bever (1970) who argued that children initially use a NOUN-VERB-NOUN schema, where the first noun is the agent of the action and that they pass through a period during which they overgeneralise this schema to passive sentences. However, the 'usage-based' account, unlike Bever's (1970) theory, can also account for the data from our first study from which we argue that, at 2;1, German children's representations of the prototypical (case-marked, subject-initial) active transitive construction are heavily dependent on their representations of the argument structure for particular familiar verbs.

The current findings could, however, be problematic for modular processing theories (e.g., Friederici, 2002). While these theories allow for the integration of lexical and semantic information at later processing stages (and also for revision of garden-pathing), it cannot easily account for the tendency of our 2½ -year-olds to interpret passive sentences as actives since in both studies the main verb in the elicitation questions occurred in sentence-final position, as is always the case with German main clauses containing an auxiliary verb (e.g., '*Wo hat der Hase den Affen gewaschen?*' lit: where has the$^{+\text{nominative}}$ rabbit the$^{+\text{accusative}}$ monkey washed? = Where did the rabbit wash the monkey? versus '*Wo wurde der Hase vom Affen gewaschen*?' lit: where became the$^{+\text{nominative}}$ rabbit from+the$^{+\text{dative}}$ monkey washed? = Where was the rabbit washed by the monkey?). Since the first phase of modular parsing theories involves the construction of purely syntactic tree structure on the basis of word category information, it is unclear why the structure corresponding to the passive should be revised in favour of one corresponding to an active transitive structure when the lexical information pertaining to the main verb is finally processed. That said, one possible come-back to this argument might be that the children in our study had already heard the test sentences in the present tense prior to the test trial AND our measures were offline, potentially allowing for lexical integration prior to the child's pointing choice (see also Ferreira & Patson, 2007; Townsend & Bever, 2001).

The developmental take on the modular approach to processing – namely the generative approach to syntactic development - would also find it difficult to account for the current findings. Bencini and Valian (2008) exemplify this type of theoretical framework with their argument that evidence of syntactic priming in English-speaking 3;2-year-olds indicates support for 'early

abstraction' views of syntactic development and their position that at least by this age, English-speaking children have acquired an abstract concept of 'grammatical subject'. At face value, Bencini and Valian's claims are not particularly radical; after all, by 3;2 children have had ample opportunity to derive implicit concepts of grammatical subjects, passive morphology and a variety of other things simply by using a combination of domain-general statistical learning mechanisms (see e.g. Saffran, 2001; Kirkham, Slemmer & Johnson, 2002) with perhaps the additional help of a conceptual understanding of animacy, goal-directed behavioural and other components of agent-hood (see e.g. Chang, Dell & Bock, 2006). However, in referring to 'early abstraction', Bencini and Valian (2008) are indirectly referring to the very strong nativist position of generative theories such as those of Valian (2009) and Crain et al., (2009). The latter researchers make their position on the acquisition of the passive more explicit. They interpret their own findings that English-speaking 3-5-year-olds can produce full passives (with familiar verbs) as follows: "*We argue that our findings support a simple version of the innateness hypothesis which supposes that children have early knowledge of many grammatical facts, which far outstrips what they could be expected to have mastered on the basis of their linguistic experience*."

We would argue that our data do not fit with generative views of syntactic development for two reasons. Firstly, the generative (whether it predicts early acquisition a la Valian, 2009, and Crain et al., 2009, or whether it predicts late acquisition, a la Wexler, 2004; Hirsch & Wexler, 2006) cannot account for poorer performance with familiar than with novel verbs at 2;7. Secondly, although by 2;3 German-speaking children are showing some awareness of the presence of additional morphological items in passive sentence, they do not demonstrate that they are aware of how these morphological items map onto sentential semantics. The learning of associations between the forms of particular morphological items can be accounted for by mere statistical learning (or transitional probabilities to be precise, Mintz, 2003; see also Kidd, 2012, for evidence of the relationship between statistical learning abilities and the acquisition of the English full passive). Whether one prefers a constraints-based or a usage-based view, the current study clearly establishes a major finding about the development of sentence comprehension abilities; that is, that young two-year-olds clearly do integrate lexical and syntactic information. In addition, it also establishes the following facts about development; German children are

able to successfully interpret passive sentences with familiar verbs at 3;7 and can do this with novel verbs at 4;7. At 2;7, there is clearly some interference from the active transitive when they attempt to interpret passive sentences, at least with familiar verbs. We also established that German 2;1-year-olds are above chance at pointing correctly when interpreting prototypical (case-marked, subject-initial) active transitive sentences with familiar verbs, although they were at chance with novel verbs, and showed no order effects for this.

These findings fit into the previous developmental literature as follows. At 1;9 German children look significantly longer at the matching clip when they hear case-marked subject-initial active transitive sentences with novel verbs, but only in the condition in which they have just been primed by the same sentence structure with the same nouns with real verbs (which mimics the original study with English-speaking children, Gertner et al., 2006) and not when the scenes with real verbs are simply heard described with the translation equivalent of 'Look. This is called washing' (Dittmar et al., 2008b). At 2;1, the current study found that they point correctly when they hear the case-marked subject-initial active transitive, but only with familiar verbs. At 2;3 they point at chance with both familiar and novel verbs when heard in the passive. At 2;6 German children point above chance with both familiar and novel verbs in the case-marked, subject-initial, active transitive, but are only correct 38% of the time when interpreting familiar verbs heard in the passive (and at chance with the non-case-marked active transitive and case-marked OVS active transitive, Dittmar et al., 2008a: Study 3). At nearly five years, German children point above chance for case-marked full passives heard with novel verbs (although it should be noted that it is of course possible that German children, like English-speaking children, see e.g. Messenger, Branigan & McLean, 2012, would still have difficulties relating the structure of the passive to semantic roles in contexts where they had not been primed for this, as they were in our study). At seven years they point above chance with case-marked active OVS-transitives heard with novel verbs (Dittmar et al., 2008a).

One interesting question for further research might be to compare how English and German (and indeed children learning other languages) learn the passive construction. To date, those direct comparisons which exist do not clarify whether the passive is learnt earlier in German or in English;

while Aschermann et al. (2004) found via an act-out task that English children appeared to comprehend the full passive nearly one year later than German children, Wittek & Tomasello (2005) found that many more English-speaking 2;10-year-olds produced full passives with novel verbs than did German children the same age.

Another interesting topic for future research is thus to further explore how and when two-year-olds integrate lexical and syntactic information by using online measures with sentences in which the verb occurs in different positions. This could be particularly interesting to carry out with German since the lexical verb occurs in sentence-final position in the passive. Choi and Trueswell (2010) found in an eye-tracking study with (older) preschoolers learning a different verb-final language (Korean) that because the verb-specific information occurred sentence-finally, the 4-5-year-olds did not take account of this information but simply followed their parse based on the sentence initial and medial syntax. An eye-tracking methodology, in particular, might be able to tell us whether and when the passive markers '*wurde'* and '*vom'* disrupt young children's biases for interpreting sentences with familiar verbs in particular ways. It would also be interesting to examine the development of comprehension of German passive sentences between 2;7 and 3;7. Since Bencini and Valian (2008) found some evidence in (primed) production for non-verb-based representations of the English passive at 3;2 (although notably their participants performed at chance in comprehension), it is possible that German children have also reached a similar level of development at this age.

Whatever the future holds, we hope that the current two studies indicate that it is important to use novel verbs in order to test whether and when children have acquired a representation of a particular sentence frame or construction since performance with familiar verbs may potentially be influenced by a number of non-syntactic factors.

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**Appendix**

A. Test sentences for Study 1 (Half of the children heard the sentences with changed agent and patient. The test sentences for experiment 2 were the passive equivalents).

a. with familiar verbs:

Study 1 (active)

*Der Löwe schubst den Bären.* (=The lion is pushing the bear.)

*Der Affe wäscht den Hasen.* (=The monkey is washing the bunny.)

*Der Elefant kämmt den Hund* .(=The elephant is brushing the dog.)

b. with novel verbs:

Study 1 (active)

*Der Hund wieft den Löwen.* (=The dog is weefing the lion.)

*Der Bär tammt den Elefanten.* (=The bear is tamming the elephant.)

*Der Frosch bafft den Affen.* (=The frog is baffing the monkey.)

**Figure captions**

Figure 1: Mean proportion of pointing to the correct scene in the active transitive task

Figure 2: Mean proportion of pointing to the correct scene in the passive task

Fig.1:

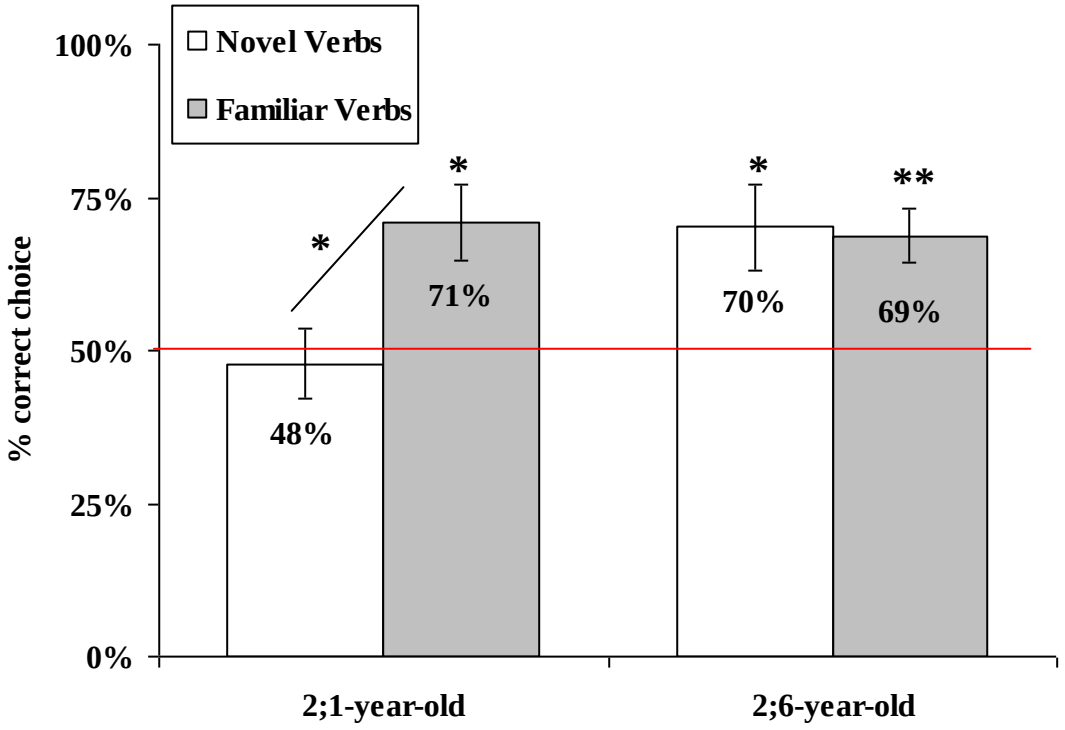

Fig. 2:

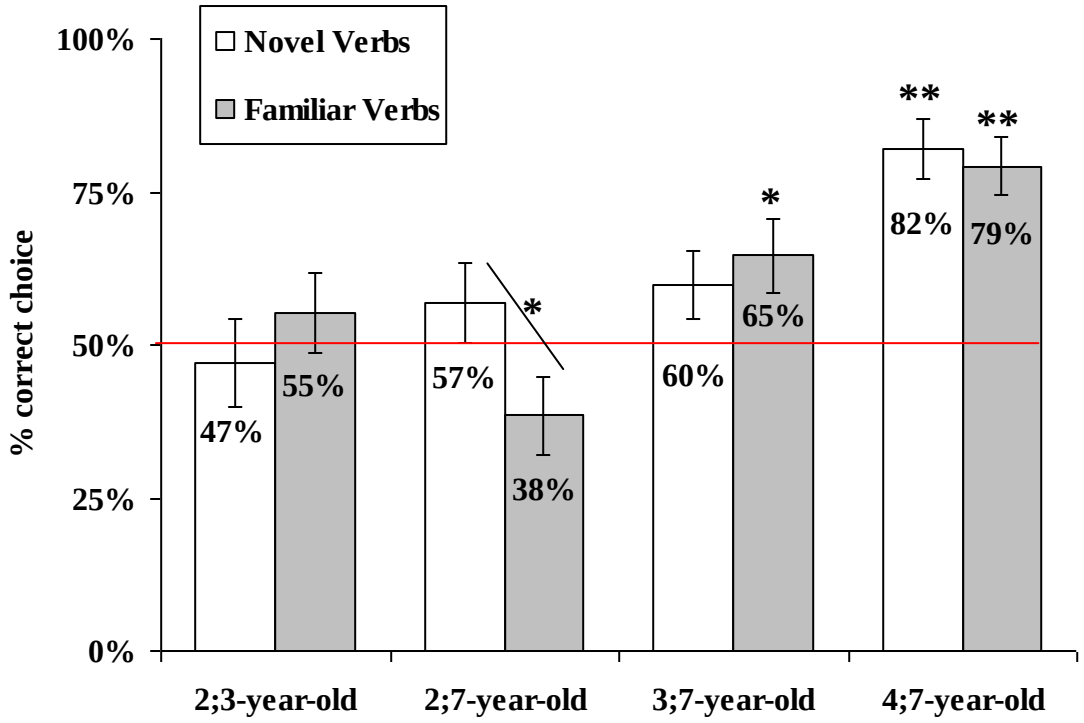


Table 1: *Number of children choosing the correct scene two or three times (out of three trials) for each condition and age group in study 1 (statistical analyses based on binomial tests)*

| Age group: | 2;1-year-olds (N = 11) | | 2;6-year-olds (N = 14) | |
|---|---|---|---|---|
| Condition: | Familiar | Novel | Familiar | Novel |
| No. children | 10 (p = .012) | 6 (n.s.) | 12 (p = .013) | 13 (p = .002) |

Table 2: *Number of children choosing the correct scene two or three times (out of three trials) for each condition and age group in Study Two (Statistical analyses based on binomial tests)*

| Age group: | 2;3-year-olds (N = 10) | | 2;7-year-olds (N = 14) | | 3;7-year-olds (N = 16) | | 4;7-year-olds (N = 22) | |
|---|---|---|---|---|---|---|---|---|
| Condition: | Familiar | Novel | Familiar | Novel | Familiar | Novel | Familiar | Novel |
| No. children | 5 (n.s.) | 7 (n.s.) | 2 (p = .013) | 8 (n.s.) | 15 (p = .001) | 10 (n.s.) | 20 (p < .001) | 19 (p = .001) |