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Brief article

Predicted errors in children's early sentence comprehension

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ABSTRACT

Children use syntax to interpret sentences and learn verbs; this is syntactic bootstrapping. The structure-mapping account of early syntactic bootstrapping proposes that a partial representation of sentence structure, the *set of nouns* occurring with the verb, guides initial interpretation and provides an abstract format for new learning. This account predicts early successes, but also telltale errors: Toddlers should be unable to tell transitive sentences from other sentences containing two nouns. In testing this prediction, we capitalized on evidence that 21-month-olds use what they have learned about noun order in English sentences to understand new transitive verbs. In two experiments, 21-month-olds applied this noun-order knowledge to two-noun intransitive sentences, mistakenly assigning different interpretations to "The boy and the girl are gorping!" and "The girl and the boy are gorping!". This suggests that toddlers exploit partial representations of sentence structure to guide sentence interpretation; these sparse representations are useful, but error-prone.

1. Introduction

Syntactic knowledge guides sentence interpretation and verb learning; this is syntactic bootstrapping (Gleitman, 1990). Here we explore how syntactic bootstrapping begins. We have proposed a structure-mapping account of the origins of syntactic bootstrapping, on which a partial analysis of sentence structure guides initial sentence interpretation, and provides a useful abstract format for new learning (Fisher, 1996; Lidz, Gleitman, & Gleitman, 2003).

This account makes two assumptions: First, children begin with an unlearned bias toward one-to-one mapping between nouns in sentences and participant-roles in events. Given this bias, children treat the *number of nouns* in a sentence as a cue to its semantic predicate-argument structure. Second, learners represent sentences and their possible interpretations in an abstract format. That is, children are biased toward representations that permit useful linguistic generalizations, such as *noun*, *verb, agent*, and *patient*, as opposed to word-specific representations (cf. Braine, 1963; Tomasello, 2003). These abstract representations make syntactic bootstrapping possible, giving children access to the proposed innate bias to align nouns with participant-roles (Yuan, Fisher, & Snedeker, in press), and promoting rapid learning and generalization of language-specific patterns (Gertner, Fisher, & Eisengart, 2006; Pinker, 1984).

To illustrate, suppose a toddler first encounters *tickle* in "The boy is tickling the girl", given the scene context of Fig. 1. This scene offers many candidate meanings: for example, a boy tickles a girl; she giggles; both are playing. Via structure-mapping, a partial sentence representation constrains choices among these construals. As soon as children can represent this sentence as containing two nouns, they could map the sentence onto a construal involving two core participant-roles (with luck, tickling). Such experiences provide data about *tickle* and about English sentences. For example, assuming children represent the nouns in order, this sentence provides a data point suggesting that the first of two nouns names an agent (as opposed to a patient). Given the proposed abstract representations, learning via *tickle* sentences should transfer

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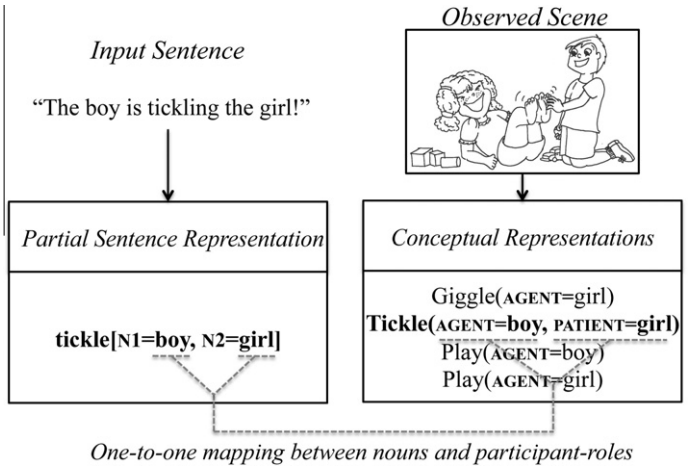

Fig. 1. Schematic diagram of early syntactic bootstrapping via the structure-mapping account.

quickly to other verbs. In this way, even partial sentence representations guide initial interpretation, and provide a preliminary format for further learning.

The structure-mapping account predicts early success in distinguishing transitive from intransitive verbs, and rapid transfer of language-specific learning to novel verbs. As predicted, 19- and 21-month-olds assigned appropriately different interpretations to novel verbs in simple transitive ("He's gorping him!") versus intransitive sentences ("He's gorping!"; Yuan et al., in press), and 21-month-olds used noun-order in transitive sentences to interpret novel verbs, correctly mapping sentence (1) to an event in which the first of two nouns named the agent (Gertner et al., 2006; cf. Dittmar, Abbot-Smith, Lieven, & Tomasello, 2008).

(1) The boy is gorping the girl.

However, this account also predicts telltale errors. Not all two-noun sentences are transitive. Sentence (2) shows an invented verb in an intransitive sentence with two nouns conjoined in subject position. Before learning much about English syntax and morphology, children should be unable to tell this sentence from transitive sentence (1), because both contain two nouns.

(2) The boy and the girl are gorping.
(3) The girl and the boy are gorping.

Armed with these partial sentence representations, young children should err in two ways with two-noun sentences. First, as just noted, they should be unable to tell sentence (2) from transitive sentence (1), because both contain two nouns. This is an *error of omission*, failing to distinguish sentences that require distinct interpretations. Second, if toddlers begin learning about English sentences via such partial (but abstract) sentence representations, they should use noun-order to assign semantic roles in any two-noun sentence, leading them to assign different roles to the boy and girl in intransitive sentences (2) and (3). This is an *error of commission*, assigning distinct interpretations to sentences with the same meaning. Adults assign the same semantic role to conjoined nouns, resulting in simultaneous-action (*John and Mary ran*) or reciprocal-action interpretations (*John and Mary kissed*), depending on the verb (Gleitman, Gleitman, Miller, & Ostrin, 1996; Patson & Ferreira, 2009).

Relatedly, Slobin and Bever (1982) and Bates and MacWhinney (1982) proposed that children learn to link canonical word-order patterns, such as a noun–verb–noun sequence, with a characteristic agent-action-patient interpretation. Such schemata promote errors with passive sentences (*Billy was bumped by the cart*), generating reversed interpretations (Bever, 1970; de Villiers & de Villiers, 1973; Maratsos, 1974). Our account resembles these in suggesting that children exploit even partial representations of sentence-structure in learning to interpret sentences. However, we focused on conjoined-subject intransitives (2–3) because these sentences permit us to test our account of the origins of syntactic bootstrapping. These sentences, unlike passives, do not contain a noun–verb–noun sequence. If children interpret the order of conjoined nouns as information about agent–patient roles, then this will suggest that the set of nouns occurring with a verb guides early sentence interpretation, and therefore that some of what toddlers first learn about English sentences is encoded in these simple terms.

At what age should children make the predicted errors? By about 2 years, children typically distinguish conjoined-subject intransitive from transitive sentences, avoiding the error of omission (Bavin & Growcott, 2000; Hirsh-Pasek, Golinkoff, & Naigles, 1996; Kidd, Bavin, & Rhodes, 2001; Naigles, 1990; Noble, Rowland, & Pine, 2011).[1] For example, Naigles (1990) showed 25-month-olds a causal event in which a duck acted on a bunny, and a simultaneous-action event in which the duck and bunny acted independently. Children who heard transitive sentences (*The duck*

[1] Not all of the cited reports directly compared the transitive and intransitive conditions. However, inspection of the means in each report suggests their results are similar, showing that 2-year-olds assigned different interpretations to transitive versus two-noun intransitive sentences.

Event-Pair Accompanying Novel Verb 1

Simultaneous-action event

Causal event

Transitive: The boy is gorping the girl!
Agent-first: The boy and the girl are gorping!
Patient-first: The girl and the boy are gorping!

Event-Pair Accompanying Novel Verb 2

Causal event

Simultaneous-action event

Transitive: The girl is pilking the boy!
Agent-first: The girl and the boy are pilking!
Patient-first: The boy and the girl are pilking!

Fig. 2. Event-pairs and critical sentence contexts for the novel-verb items.

is kradding the bunny!) looked longer at the causal event than did children who heard conjoined-subject intransitive sentences (*The duck and the bunny are kradding!*). Younger children did not succeed in this task, providing preliminary evidence for the predicted error of omission (Hirsh-Pasek et al., 1996; Naigles & Swensen, 2007). However, as noted above, 21-month-olds already show sensitivity to noun-order in English transitive sentences (Gertner et al., 2006). We therefore sought evidence for the predicted errors in 21-month-olds.

We presented 21-month-olds with the event-pairs shown in Fig. 2. Each pair included a causal and a simultaneous-action event, accompanied by a novel verb in one of three sentence contexts. One group of children heard Transitive sentences, with word-order appropriate for the causal event. Two other groups heard intransitive sentences with two nouns conjoined in subject position. In the Agent-first condition, the two nouns appeared in the same order as in the transitive sentence. In the Patient-first condition, the two nouns appeared in the opposite order. (These condition-names reflect the predicted errors, not the adult interpretation of conjoined-subject intransitives.) We assessed interpretation by measuring looking-times to the events (e.g., Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995).

If 21-month-olds are guided by partial sentence representations based on the set of nouns, they should make the predicted errors. Children in all three conditions should identify their test sentences as two-argument (transitive) sentences, and use what they have learned about noun-order in English to interpret those sentences, attempting to assign an agent's role to the first of two nouns. In the Transitive and Agent-first conditions, this interpretation should promote attention to the causal event; children in the

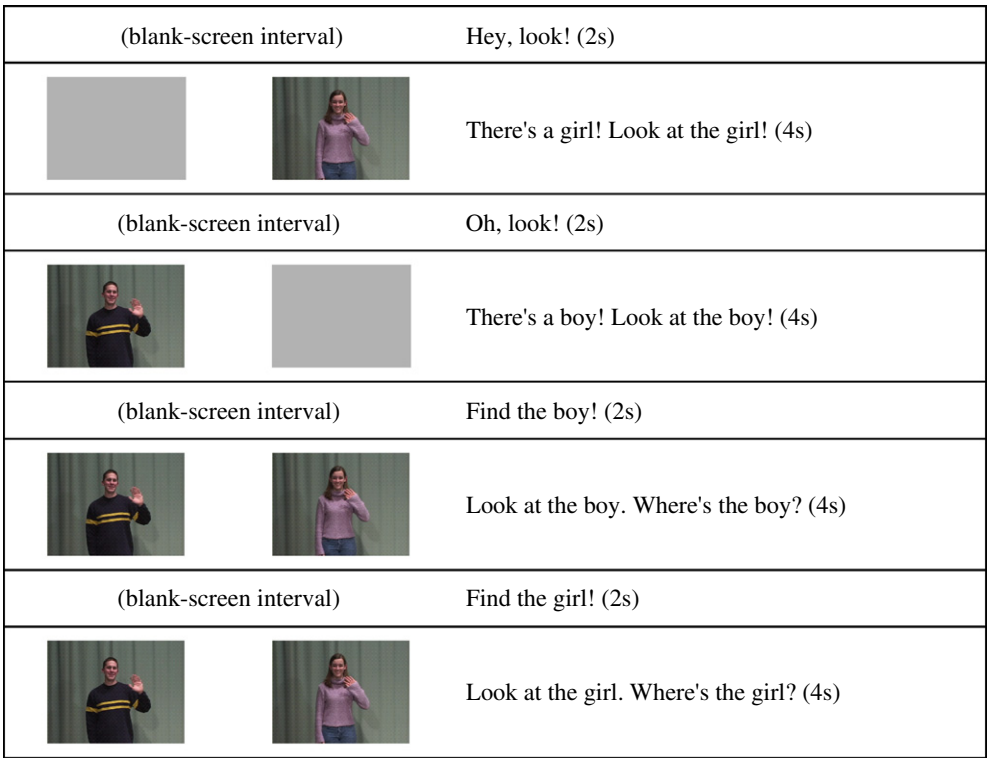

Fig. 3. The sequence of events within the character-identification item.

Agent-first condition should therefore look at the causal event about as long as children in the Transitive condition (the error of omission). In the Patient-first condition, this interpretation procedure should *not* promote attention to the causal event, because the first noun does not name the agent in this event; children in the Agent-first condition should therefore look at the causal event reliably longer than children in the Patient-first condition (the error of commission).

2. Experiment 1

2.1. Methods

2.1.1. Participants

Twenty-four 21-month-olds (20.0–22.0 months, M = 20.6; 12 girls) participated, 8 in each sentence condition (Transitive, Agent-first, Patient-first). Eight additional children were eliminated due to side bias (5), inattentiveness (2), or scores in the test phase more than 2.5 *SD*s from the mean of their condition (1). Productive vocabularies, measured using the short form of the Bates-MacArthur CDI-A (Fenson et al., 2000), ranged from 7 to 69 (median 28). Vocabularies did not differ across conditions ($F < 1.2$).

2.1.2. Apparatus

Children sat on a parent's lap facing two 20″ TV-screens 30″ away. The TV-screens were at eye level, 12″ apart. Soundtracks were presented centrally; a hidden camera recorded children's eye-movements. Parents wore opaque sunglasses.

2.1.3. Materials

Children watched a synchronized pair of videos depicting people referred to as a boy and girl. The soundtracks were recorded by a female native English speaker. Sentence condition was counterbalanced with the left–right position of video events.

2.1.4. Procedure

The experiment began with a character-identification item (Fig. 3). The girl was introduced alone on one screen, waving, and labeled twice while the other screen remained blank (4 s). After a 2 s interval, the boy was introduced in the same way on the other screen. Next, in two 4 s trials separated by a 2 s interval, the girl and boy appeared simultaneously, and children were exhorted to look at the boy, then the girl.

Next, children received two familiar-verb items (*eat*, *hug*) with the same trial structure as the later novel-verb items. The first familiar verb was *eat* (Fig. 4a): In the target event both boy and girl ate; in the distracter they slept. Each event was previewed alone on one screen (5 s), accompanied by neutral language, while the other screen remained blank. Next, during a 6 s blank-screen interval, children heard "The boy and the girl are gonna eat!" Both events then played simultaneously (8 s), accompanied by *eat* in two additional sentences. *Eat* was presented again during a 6 s blank-screen interval and during a second

Fig. 4. (a) The sequence of events during the first familiar-verb item. The second familiar-verb item followed the same structure, but presented the events and target sentence shown in (b).

presentation of the 8 s event-pair ("The boy and the girl are eating! Find eating!"). This procedure was repeated with the second familiar verb ("The girl is hugging the boy"; Fig. 4b); the distracter video showed the girl washing the boy.

These items familiarized children with the characters and informed them that one video matched the soundtrack on each trial. The familiar-verb items also familiarized children with the wording of the transitive and intransitive test sentences. This ensured a conservative test of the predicted errors, by providing practice trials that in principle could prompt children to link conjoined-subject intransitive sentences with events in which both characters play the same role (both eating versus both sleeping), and transitive sentences with events in which the characters play distinct roles (the girl hugs versus washes the passive boy).

Finally, two novel-verb items were presented as described for the familiar-verb items (Fig. 5). For the verb *gorp*, the causal event showed the boy swiveling the girl in a chair; the simultaneous-action event showed the boy and girl twirling ribbons. For the verb *pilk* (Fig. 5b), the causal event showed the girl tipping the boy sideways in a rocking-chair; the simultaneous-action event showed the girl and boy bouncing on balls. There were four novel-verb test trials, two for each verb.

We pretested our materials with a small group of older children, to ensure that they readily distinguished transitive and two-noun intransitive sentences given our events. Twelve 2.5-year-olds (mean 30.9 months; 30.2–31.9; 6 girls) participated, half in the Transitive and half in the Agent-first conditions. Consistent with prior findings (e.g., Kidd et al., 2001; Naigles, 1990), children in the Transitive condition looked reliably longer at the causal event ($M = .56$, $se = .03$) than did those in the Agent-first condition ($M = .35$, $se = .05$; $t(10) = 3.76$, $p = .004$, effect-size $r = .74$), thus readily avoiding the error of omission with our materials. With these findings in hand we went on to test whether 21-month-olds made the predicted errors.

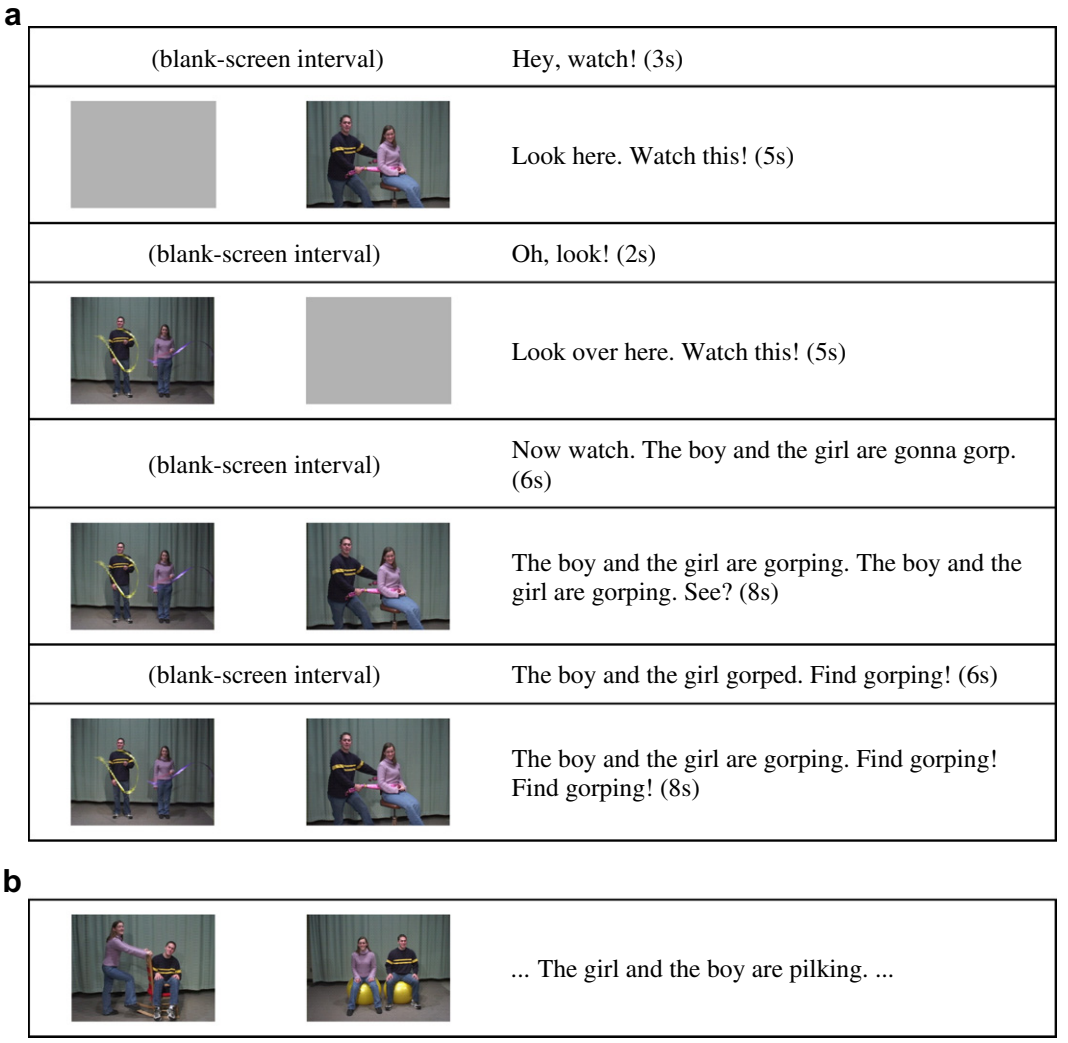

Fig. 5. (a) The sequence of events for the first novel-verb item. The second novel-verb item followed the same structure, but presented the events shown in (b). The sentences shown in the figure are taken from the Agent-first condition.

2.1.5. Coding

We coded where children looked (left, right, away) during the 8 s test trials, frame-by-frame from silent video. Another person re-coded 5 children's data; the coders agreed on 99% of video frames. We analyzed looking-time to the causal event as a proportion of looking-time to either event, averaged across the four 8 s test trials. Six trials (5%) were replaced with the condition mean because the child looked away for half or more of the trial.

2.2. Results and discussion

Looking patterns differed across conditions, supporting both error predictions (Fig. 6). An ANOVA revealed an effect of condition on looking-time to the causal event ($F(2,21) = 4.07$, $p = .032$). Children in the Agent-first and Transitive conditions looked about equally at the causal event ($t(14) < 1$, $r = .07$), suggesting that children interpreted these sentences similarly; this is the error of omission. In contrast, children in the Agent-first condition looked reliably longer at the causal event than did those in the Patient-first condition ($t(14) = 2.88$, $p = .012$, $r = .58$), suggesting they interpreted noun-order in these conjoined-subject intransitive sentences as signaling agent–patient role information; this is the error of commission. Inspection of means revealed that this pattern held across trials: in all four novel-verb trials, children in the Agent-first and Transitive conditions looked numerically longer at the causal event than did those in the Patient-first condition. These errors suggest that toddlers are influenced by partial sentence representations based on the set of nouns, and thus represent some of what they learn about English sentences in these simple terms.

3. Experiment 2

In Experiment 2 we began to probe the robustness of the striking errors documented in Experiment 1. On the

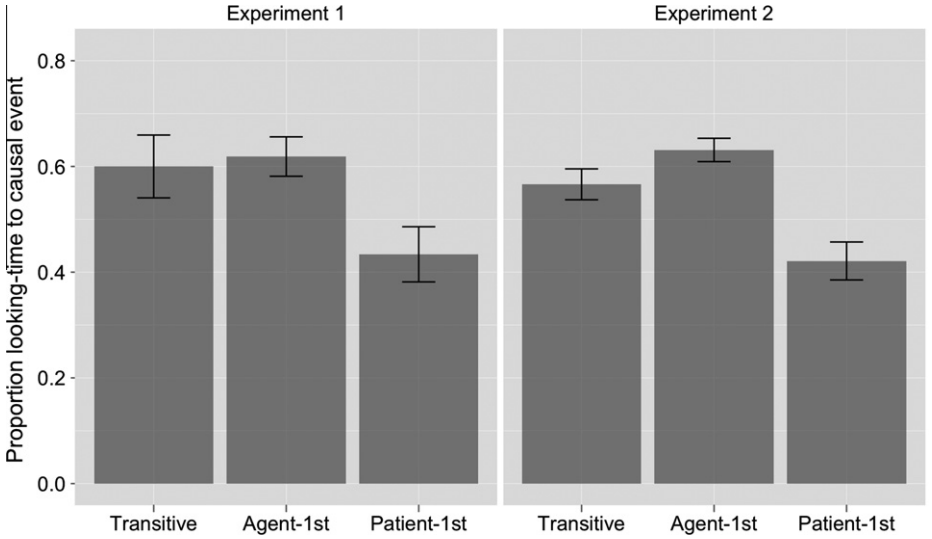

Fig. 6. Mean (se) proportion of time spent looking at the causal event, as a proportion of time spent looking at either the causal or simultaneous-action event, averaged across the four 8 s test-trials, Experiments 1 and 2.

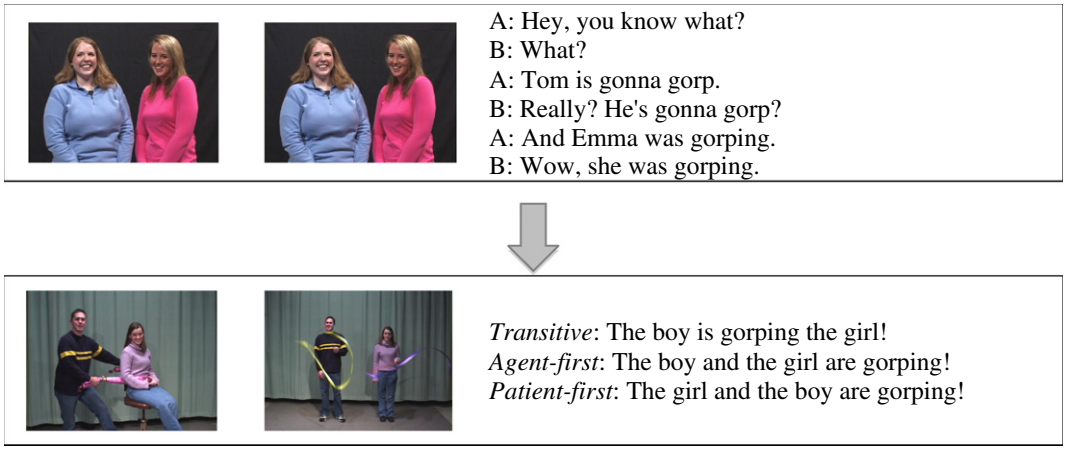

Fig. 7. Sample of dialogue preexposure, Experiment 2. Each novel-verb item was preceded by four dialogue-clips (each 15–18 s long), separated by 2 s intervals. Each dialogue clip included four simple intransitive sentences containing the novel verb, with two proper-name and two pronoun subjects, as shown here. The four dialogue clips were followed by the novel-verb test item, presented as in Experiment 1 in Transitive, Agent-first, or Patient-first sentences.

structure-mapping account, these errors should be difficult for toddlers to avoid. Equipped with partial sentence representations, toddlers should strongly identify all of our two-noun test sentences as two-argument (transitive) sentences, and therefore exploit what they have learned about noun-order in English to interpret them. An alternative possibility, however, is that these errors instead reflected a weaker tendency to misinterpret two-noun intransitive sentences as transitive, due to intermittent difficulties parsing unusual sentences. Conjoined-subject sentences are rare in child-directed speech (Tager-Flusberg, deVilliers, & Hakuta, 1983); this rarity might make them difficult to parse accurately, causing children to mistake them for more common sentence-patterns. If so, then toddlers might avoid errors with two-noun intransitive sentences if given additional hints that the novel verbs are intransitive.

We already gave children one such hint in Experiment 1. As noted earlier, the familiar-verb items provided experiences that in principle could prompt children to distinguish the transitive and intransitive test sentences. Children nonetheless made the predicted errors, supporting the hypothesis that children were strongly guided by partial sentence representations.

In Experiment 2 we gave children another hint, by providing preexposure to the novel verbs in simple intransitive sentences. Toddlers can learn about the transitivity of novel verbs via such listening experiences (Arunachalam & Waxman, 2010; Yuan & Fisher, 2009). For example, Messenger, Yuan, and Fisher (2011) showed 22-month-olds

dialogue-videos in which two interlocutors discussed unseen events using an invented verb in transitive ("Anna blicked the baby") or simple intransitive ("Anna blicked") sentences. When later encountering this verb in isolation ("Find blicking!"), children who had heard transitive dialogues looked longer at a causal (as opposed to simultaneous-action) event than did children who had heard intransitive dialogues. We adapted this procedure: before each novel-verb item, children watched dialogues in which interlocutors used the novel verb in simple intransitive sentences ("Emma was gorping!"; Fig. 7). The novel-verb item then proceeded as in Experiment 1. Children in all three sentence conditions (Transitive, Agent-first, Patient-first) heard the same intransitive dialogues.

Children in the Transitive condition should not be greatly affected by preexposure to the novel verbs in intransitive sentences. A verb presented in a transitive sentence-frame requires an interpretation involving two participant-roles, whether or not the verb can also be intransitive. Many verbs are both transitive and intransitive (e.g., *She ate it; She ate*), and such verbs are common in child-directed speech (e.g., Scott & Fisher, 2009). Toddlers use and comprehend verbs in multiple sentence-structures (e.g., Naigles, Bavin, & Smith, 2005; Naigles, Hoff, & Vear, 2009). Thus, children in the Transitive condition should interpret their test sentences like their peers in Experiment 1.

In contrast, children in the Agent- and Patient-first conditions might be assisted by dialogue preexposure. If the errors of Experiment 1 reflected occasional errors in parsing unusual sentences, then prior linguistic evidence that the new verbs are intransitive might aid children in identifying the conjoined-subject test sentences as intransitive. If so, then the errors should disappear. But if 21-month-olds are strongly guided by the proposed partial sentence representations, then children in the Agent- and Patient-first conditions (like those in the Transitive condition) should be essentially unaffected by preexposure to the novel verbs in simple intransitive sentences: As before, children in all three conditions should interpret their two-noun test sentences as two-argument sentences, applying what they have learned about English noun-order to do so. This should reproduce the striking errors of Experiment 1.

3.1. Methods

3.1.1. Participants

Twenty-four 21-month-olds (19.9–21.8 months, mean 20.8; 13 girls) participated, 8 in each of three sentence conditions (Transitive, Agent-first, Patient-first). Another 18 children[2] were eliminated because of side bias (11) or inattentiveness (7). Productive vocabularies, measured as in Experiment 1, ranged from 3 to 100 (median 29.5). Vocabularies did not differ across conditions ($F < 1$).

3.1.2. Procedure

The procedure was as in Experiment 1 except that dialogue-videos preceded each novel-verb item. In all three sentence conditions (Transitive, Agent-first, Patient-first), each novel-verb item was immediately preceded by dialogues in which two women used the novel verb in 16 simple intransitive sentences with proper-name or pronoun subjects. The dialogue for each item comprised four different 4-sentence video-clips (15–18 s each), separated by 2 s intervals. Fig. 7 shows a representative dialogue-clip. Dialogues were designed to avoid implying direct reference to upcoming events (see also Messenger et al., 2011; Yuan & Fisher, 2009). The last dialogue sentences described past rather than future events (e.g., Fig. 7), and no dialogues preceded the familiar-verb items, so as to avoid cueing children to treat dialogue sentences as references to impending action (cf. Tomasello & Barton, 1994). Thus we asked, not whether children could interpret the dialogue sentences themselves, but whether dialogue experience might aid comprehension of two-noun intransitive sentences containing the same verbs.

Coding was done as in Experiment 1. Another person recoded 6 children's data; the coders agreed on 99% of video frames.

3.2. Results and discussion

Despite dialogue preexposure, looking-times to the causal event differed across conditions as in Experiment 1 (Fig. 6; $F(2,21) = 13.19$, $p < .001$). Children in the Agent-first and Transitive conditions looked about equally at the causal event ($t(14) = -1.78$, $p = .10$,[3] $r = -.41$), suggesting they interpreted these sentences similarly. In contrast, children in the Agent-first condition looked reliably longer at the causal event than children in the Patient-first condition ($t(14) = 4.98$, $p < .001$, $r = .78$), suggesting they interpreted noun-order in conjoined-subject intransitives as conveying semantic-role information. Inspection of means revealed that this pattern was roughly uniform across trials: in three of the four novel-verb test trials, children in both the Transitive and Agent-first conditions looked numerically longer at the causal event than did those in the Patient-first condition. Thus, the errors persisted despite preexposure to the novel verbs in simple intransitive sentences. These findings suggest that 21-month-olds' sentence interpretation is strongly guided by the proposed partial sentence representations.

4. General discussion

In previous experiments, 21-month-olds used noun-order in transitive sentences to interpret novel verbs (Gertner et al., 2006). Here we showed that 21-month-olds mistakenly used noun-order to interpret conjoined-subject intransitive sentences, assigning an agent's role to the first of two nouns.

First, children made errors of omission: those who heard Agent-first intransitive and Transitive sentences interpreted them similarly. Both sentences equally drew

[2] The higher elimination rate in Experiment 2 presumably reflected the greater length of the task.

[3] Note in Fig. 6 that the marginal difference between the Transitive and Agent-first conditions in Experiment 2 is in the wrong direction to suggest that children correctly distinguished these two sentence-types following dialogue preexposure.

attention to a causal event in which the first-mentioned character acted on the second-mentioned character. Second, children made errors of commission, assigning different interpretations to Agent-first and Patient-first intransitive sentences. Noun-order in conjunctions does not convey agent-patient role information, but the 21-month-olds behaved as if it did. These findings suggest that toddlers are influenced by partial sentence representations grounded in sets of nouns, and therefore some of what they learn about English word-order is encoded in these terms.

Computational modeling of early sentence interpretation suggests that these simple representations are useful for learning to interpret sentences. Connor, Gertner, Fisher, and Roth (2008) designed a system for automatic semantic-role labeling (SRL) that received representations of child-directed sentences consisting simply of words, and the number and order of nouns in each sentence. Equipped with these representations, the SRL learned to interpret the first of two nouns as an agent and the second as a patient. Despite the variability of casual speech, the first of two nouns tends to be an agent; detecting this pattern yields a powerful initial guide to sentence interpretation.

The errors documented here suggest that 21-month-olds are influenced by representations of sentence structure even less complete than a noun–verb–noun sentence schema. Why would children represent knowledge about word-order in terms of an ordered set of nouns, rather than (or in addition to) a noun–verb–noun schema? One possibility is that the noun–verb–noun schema is more complex, requiring more elements to be identified and represented in position during sentence processing. Children's sentence representations may sometimes preserve noun order but not the verb's position. Moreover, early vocabularies are dominated by nouns (Gentner, 2006; Maratsos, 1990). When children hear sentences containing an unknown verb, they might have difficulty accurately representing the verb's position.

In principle, 21-month-olds' errors could arise from still simpler representations. Children might interpret the *first noun* in the sentence as an agent, independent of the second noun (Chang, Dell, & Bock, 2006; see also Bates & MacWhinney, 1982). However, 21-month-olds' sentence interpretations reflect more than the first noun: As noted earlier, toddlers assign different interpretations to novel transitive ("He's gorping him!") and intransitive ("He's gorping!") verbs (Yuan et al., in press), showing sensitivity to the number of nouns in the sentence. These findings, together with the present results, suggest that 21-month-olds interpret the order of two nouns as conveying agent-patient role information.

How do children escape these errors? First, several English-specific features mark "The girl and the boy are pilking" as intransitive, including the verb's position, the word "and", and the auxiliary "are". As children learn more about these features, this learning will support the construction of more sophisticated sentence-structure representations, permitting recovery from error. However, these errors do not require that 21-month-olds be entirely ignorant of the relevant cues. Even adults make errors in interpreting non-canonical sentences despite their possession of syntactic knowledge that should prevent these errors, suggesting that partially-identified sentence representations continue to influence parsing in the mature system (Ferreira, 2003; Tabor, Galantucci, & Richardson, 2004; Townsend & Bever, 2001). Toddlers, like adults, may be influenced by partial structural representations even as they acquire more sophisticated syntactic knowledge.

Second, toddlers might occasionally escape these errors even before learning much about English syntax, by exploiting distributional cues to the grouping of words into phrases, such as pronominalization or movement patterns across adjacent sentences. Such sequences, with partial repetitions reflecting major sentence constituents, provide valuable data about sentence structure (Hoff-Ginsberg, 1986; Onnis, Waterfall, & Edelman, 2008; Thompson & Newport, 2007). Recent evidence suggests that 21-month-olds sometimes understand two-noun intransitive sentences when such cues are provided (Arunachalam, Escovar, Hansen, & Waxman, 2011): 21-month-olds encountered a novel verb in dialogues, in transitive or intransitive sentences. The intransitive dialogues included conjoined-subject and simple intransitives ("*The man and the lady* are gonna moop. *They*'re gonna moop."). When children reencountered the verb in isolation ("Find mooping"), those who heard transitive dialogues looked longer at a causal event than did those who heard intransitive dialogues, avoiding our error of omission. Informative pronominalization patterns in the dialogues (*The man and the lady ... They*) may help to explain children's success. In this case, pronominalization might cue toddlers to treat "the man and the lady" as a single constituent, therefore a single argument of the verb. Future adaptations of this dialogue-and-test method can provide a route for investigating the development of sentence representations, by separately manipulating the linguistic input and the referential options.

In two experiments, young children interpreted a two-noun sequence as conveying agent–patient role information, even when that sequence appeared in an intransitive sentence. This is strong evidence that children use partial representations of sentence structure to guide sentence interpretation. These sparse representations are error-prone, but make sentence interpretation structure-sensitive from the start.

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