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Children's early productivity with verbal morphology

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ABSTRACT

Three studies using the intermodal preferential looking paradigm examined onset of productive comprehension of tense/aspect morphology in English. When can toddlers understand these forms with novel verbs and novel events? The first study used familiar verbs and showed that 26–36-month olds correctly matched a past/perfective form (*-ed* or irregular past) to a completed version of an event and a present/imperfective (*is V-ing*) to the ongoing version of the same event. The second study used novel verbs and events and found that 33-month olds failed to use tense/aspect morphology to choose between completed and ongoing versions of the same event. The third study also used novel verbs and events but simplified the processing demands of the task in several ways (using initial priming of the events and classes of meaning, using different events within test pairs). This study found that 30-month olds successfully used tense/aspect morphology to choose between ongoing and completed novel events. The results demonstrate that children have productive command of tense/aspect morphology by 30 months and have therefore begun the process of creating an abstract grammar containing this element.

1. Introduction

This article examines children's early productivity in the domain of verb morphology. When do children understand tense and aspect morphology in English well enough to interpret them creatively

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with novel verbs? A great deal of work has been conducted looking at children's productive understanding of sentence-level grammatical elements, such as argument structure and word order (Fisher, 2002; Gertner, Fisher, & Eisengart, 2006; Naigles, 1990, 1996), but comparatively less attention has been paid to children's developing productivity in the morphological domain (although see Akhtar & Tomasello, 1997; Behrend, Harris, & Cartwright, 1995; Berko, 1958). Morphology is an important part of a grammatical system, but it differs from sentence-level grammar in a variety of ways. At the level of form, morphemes can often be bound to lexical items, which may make it more difficult for children to be productive with them independently of those words. At the level of meaning, morphemes typically link to a different class of meanings than sentence-level elements, and productivity may depend on children's facility with the particular meanings involved. The current experiments focus on English-learning children's productivity with tense/aspect morphology. In particular, they address children's ability to interpret both simple past tense forms (*V-ed*) and present tense forms (*is V-ing*) as they are applied to nonsense verbs. The intermodal preferential looking (IPL) paradigm was used, allowing the investigation to focus on children at the onset of productivity with these items.

1.1. What needs to be learned?

In English, tense and aspect are coded through a combination of periphrastic and bound morphemes. The past/perfective form consists of a bound morpheme (*-ed*) added to the verb (or an irregular change to the verb stem). Semantically, the *-ed* form conveys both past tense and perfective aspectual meaning. As a past tense form, it signals that the event described happened at some point in the past (before the time of utterance). As a perfective aspect form, it further signals that the speaker has adopted a closed perspective on the event: the event is completed. The present/imperfective form consists of a bound morpheme (*-ing*) added to the verb in combination with the present auxiliary form (*is*/*am*/*are*). Semantically, the tense and aspect meanings are separated in this construction: the auxiliary conveys tense information and the progressive *-ing* is an imperfective marker and signals that the speaker is taking an open perspective on the event: the event is ongoing. Thus, the imperfective marker need not appear only with the present tense, but in English it must appear with some auxiliary that independently conveys the tense information. (For a more complete discussion of the main tense/aspect contrasts in English, see Comrie, 1976, 1985; Klein, 1994; Smith, 1991.)

This pattern of aspectual form-meaning mapping is not universal. In fact, there is wide cross-linguistic variation in how tense/aspect meanings get mapped onto morphology, and even in the extent to which they will be mapped onto overt morphology at all (Comrie, 1976, 1985; Slobin, 1985, 1992). For example, in the sentence "Beverly was hugging Gregory," English marks tense (*was*) separately from the imperfective aspect (*ing*), but French combines them into a single verb (in the imparfait form), and Mandarin marks the imperfective with an unbound particle (*zai*) and leaves the tense information to be inferred from context. From the perspective of language acquisition, therefore, tense/aspect morphology poses a variety of learning challenges to the child, including identifying a range of forms, finding a range of meanings and combinations of meanings, and combining the two in a language-specific mapping. These challenges may lead to a relatively long path toward productivity.

1.2. The development of tense/aspect morphology knowledge

Children appear to be facile from an early age with respect to command of the forms involved in tense/aspect. In production, Brown (1973) found that the progressive *-ing* was among the earliest morphemes to be used by children to his 90% correct criterion, with the past *-ed* form following some 4–12 months later (see also Santelmann & Jusczyk, 1998). Moreover, Hohenstein and Akhtar (2007) found that 2-year olds could segment both the *-ing* and *-ed* morphemes from lexical verbs. That is, children who were given the item *meeking* produced *meek*, demonstrating that they could correctly strip the morphology from verbs in their production. Further, these children also distinguished between *-ing* as a verbal inflection and *-ing* as simply the phonological end of a noun (as in the word *pudding*), consistently omitting the *-ing* only as a verbal inflection. In addition, around age 3 years, children begin over-regularizing the past tense forms (e.g., "goed"), suggesting that they have abstracted a rule regarding application of this form (Maratsos, 2000; Marcus et al., 1992).

It is far less clear when children become truly productive with the meanings associated with these forms. Weist, Atanassova, Wysocka, and Pawlak (1999) found that by age 3 years, children could correctly match a sentence in the imperfective form ("The girl was drawing a flower") to an ongoing depiction of the event and could similarly match a perfective form ("drew") to a completed depiction. Moreover, Valian (2006) showed that even 2.5-year-old children could correctly choose between a past and present version of a scene based on the use of a past or present copula ("Show me the bucket that is/was full"). And both Valian (2006) and Wagner (2001) found that 3-year olds could use the tense of an auxiliary verb to choose between past and present versions of an event ("Show me where she is/was sleeping"; see also Wagner, 2009).

Despite these successes, there is also a body of work suggesting that children are not very productive with tense/aspect morphology until around age 3 years or even later. Examinations of children's early productions of tense/aspect morphology have shown that children systematically under-extend their use, tending to use *-ing* only with verbs that are lexically atelic, such as activities, and *-ed* only with verbs that are lexically telic, such as result oriented accomplishments (Bloom, Lifter, & Hafitz, 1980; Shirai & Andersen, 1995). That is, children under the age of 3 years tend to say *riding* (atelic and imperfective) and *broke* (telic and perfective) while avoiding *rode* and *breaking*. Furthermore, experimental studies using nonsense verbs have found limited productivity, developing primarily between the ages of 3 and 4 years. Akhtar and Tomasello (1997) asked children to produce tense/aspect morphology in a Wug-style task ("Mary meeks every day. What did she do yesterday?/What is she doing now?"). They found that about half of the 2-year olds produced the *-ing* form but none produced the past tense form. It was not until children were almost 4 years of age that they reliably produced both forms (see also Behrend et al., 1995).

This inability to use tense/aspect morphology with novel verbs, combined with the restrictive use with familiar verbs, suggests that children may not have a productive understanding of the independent contribution of tense/aspect morphology until the late pre-school years. No previous work, however, has directly investigated the question of when children become productive with tense/aspect morphology in their comprehension.

1.3. *Prospectus*

To assess children's early productivity with tense/aspect morphology, three elements are critical. First, children must be tested with nonsense verbs (Berko, 1958; Tomasello, 2000) to insure that they can interpret the morphology without the assistance of familiar lexical items; they must be able to extend their understanding to new situations and novel lexical items. Second, some dimension of meaning must be tested. Tense/aspect morphology is meaningful, and simply being able to segment or produce the morpheme itself misses the central dimension along which children should be productive in this domain. For example, neither Akhtar and Tomasello (1997) nor Hohenstein and Akhtar (2007) provided a strong test of children's understanding of the meaning of the tense/aspect forms. Beyond general lexical cues (e.g., *yesterday* was used to suggest pastness), children were not asked to directly interpret the morphology with respect to specific phases of an event. Work by Behrend (1990) and Behrend et al. (1995) comes closer in this respect as children in that study were asked to generalize meanings to different events. However, it is unclear in that study if children were really being presented with the true meanings of the tense/aspect morphemes, as the generalization trials also involved substantial changes to the components of the events themselves (such as the actions and results). Finally, we take it for granted that eventually children will become productive with this morphology; certainly we assume that adults have productive command of it. The question is, *when* do children become productive? To the extent that success with known verbs provides some boundaries concerning the emergence of productivity, the relevant age to test is between 2 and 3 years of age.

The three studies reported here meet all of these criteria. Studies 1a and 1b test children with familiar verbs to validate the general approach. Studies 2 and 3 test children with nonsense verbs (used to describe unusual actions) to ensure children can generalize their knowledge to novel verbs. Moreover, the basic dimension of productivity tested is comprehension of the meaning of the tense/aspect morphology. Because we are examining both children's comprehension knowledge and their ability to productively generalize that knowledge to novel verbs, we call what we are investigating children's 'productive comprehension' (Crain & Lillo-Martin, 1999).

To test children younger than 3-years old, we used the intermodal preferential looking (IPL) paradigm. In IPL, children are shown two videos side by side while they hear an audio that matches only one of them (Hirsh-Pasek & Golinkoff, 1996). Children demonstrate their knowledge by looking longer at the video that matches the audio. This method has been used to investigate children's knowledge of tense/aspect morphology (most notably by Weist et al., 1999), but our method differs in several ways. First and foremost, as noted previously, we test children with novel verbs while Weist et al. used familiar ones. Moreover, in Studies 1 and 2, we compare looking times to the test videos to a baseline control that establishes children's interest in the different videos. In addition, we test children on both forms for each event, making sure that they can interpret both the *-ing* form and the *-ed* form for each verb. One large advantage of using the IPL method is that it enables us to work with young children who may find explicit responding difficult. However, in an effort to bring this task to the youngest children who might succeed, in Study 3 we adapted a presentation method that has been shown to work well even with toddlers as young as 18 months (Gertner et al., 2006). The details of this 'priming' presentation are presented in Study 3.

The three experiments presented here demonstrate 2- and 3-year olds' ability to comprehend tense/aspect morphology with familiar words, and, with the priming presentation, further show that 2.5-year olds can productively generalize their knowledge of tense/aspect morphology to nonsense verbs.

2. Study 1a

This study examined children's ability to understand tense/aspect morphology with four conventional and familiar English verbs.

2.1. Methods

2.1.1. Participants

Nine American English speaking children were included in the final sample. Their mean age was 36.0 months (SD = 0.43); four were girls. Nearly all were of European heritage. All were reported to be developing normally. Participants were recruited through files of newspaper birth announcements and contacted by telephone. Two additional children were not included in the final sample, one because he did not sit through at least half of the video and the other because she looked at the left screen more than 80% of the time.

2.1.2. Apparatus

The children watched videos on side-by-side monitors while buckled into a booster seat; their parent sat behind them. A centering light illuminated when both screens were blank, and a camcorder between the monitors filmed the children's faces. The video presentations were controlled by two synchronized VCRs. Parents were explicitly instructed not to distract the children while watching the videos, not to point to the videos, and not to produce the verbs; all parents complied.

2.1.3. Stimuli and design

The four events were: (a) pick flowers, (b) drink juice, (c) wash dolly, and (d) draw ball. Two versions of each event were filmed, one in which the event was ongoing (e.g., the actor is picking flowers throughout the trial) and one in which the event began and was completed (e.g., the actor picks flowers for 2 s, then holds up the resulting bouquet for 4 s). The stimuli were prepared with digital equipment using a Reeltime program which allowed frame-by-frame accuracy in timing. Six-second clips were made of each action, and the clips were arranged according to the layout in Table 1. Trial 4 was the test trial, in which each pair of actions was presented with the directing audio of the verb presented with either the *-ing* suffix or past suffix. Three-second intervals of blackness were inserted before each trial; the audio for each trial was first produced during these 3 s and then repeated when the trial appeared.

Table 1
Partial layout of Studies 1a and 1b.

Trial	Video 1	Audio	Video 2
ISI	Black	See the girl?	Black
1	Girl picking flowers	Look at the girl!	Black
ISI	Blank	Oh, see her now?	Blank
2	Black	Look at her now!	Girl completes picking flowers
ISI	Black	Oh, look now!	Blank
3	Girl picking flowers	We see her on both screens!	Girl completes picking flowers
ISI	Blank	She's picking the flowers!	Blank
4	Girl picking flowers	Look! She's picking the flowers!	Girl completes picking flowers

This layout was presented in two blocks; the first block presented all four verbs with the *-ing* suffix and the second block presented all four verbs in the *past* form (*picked, washed, drank, drew*). A colorful screensaver separated the blocks. The side of the matching screen was counterbalanced across participants. The side of the matching screen was also counterbalanced within participants so that the match occurred equally on the left and right sides.

2.1.4. Procedure

Children spent a few minutes in the laboratory playroom getting accustomed to the new situation, then entered the IPL room with a parent and viewed the test videos. The experimenter left the room during the session. The children were videotaped while watching the videos; their eye movements were coded from the tapes frame-by-frame.

2.1.5. Coding and analyses

The children's direction and duration of looking was coded for each event during the control (trial 3 in Table 1) and test trials, measured in hundredths of a second. Trials where the child did not look at the center light for a minimum of 0.3 s, and where the child had not looked at either screen (once the events appeared) for a minimum of 0.3 s, were excluded. A total of 3.4% of the trials were unusable and so excluded; these empty cells were filled with the group mean for that verb and inflection. Reliability assessments with 10% of the data (1 child coded by two different coders) yielded an r of .997 ($p < .001$). The dependent measure was proportion of looking time to the matching action during the test trials compared with proportion of looking time to the matching action during the control trial, for each action.

2.2. Results and discussion

Our major question concerned whether the children demonstrated differential comprehension of the *-ing* and *past* inflections, by looking longer at the ongoing version of the event when hearing the verb with the *-ing* suffix and looking longer at the completed version of the event when hearing the verb with the *past* inflection. Preliminary analyses revealed no effects or interactions with counterbalanced order or gender; therefore, those variables were omitted from further analysis. One three-way analysis of variance (ANOVA) was performed, with Audio (*-ing* vs. *past*), Verb (*pick, drink, wash, draw*), and trial (control, test) as within-subject variables.

Fig. 1 displays the findings. When tested on the verbs with the *-ing* suffix, children looked longer at the ongoing action and when tested on the verbs with the *past* inflection, children looked longer at the completed action. An ANOVA yielded a significant effect of trial, $F(1,8) = 5.73$, $p = .042$, Cohen's $d = 2.31$, a significant effect of audio, $F(1,8) = 27.02$, $p = .001$, Cohen's $d = 1.67$, and no other significant effects or interactions. The significant effect of audio emerged because the children looked overall (i.e., during both control and test trials) longer at the matching screen during the *-ed* block than during the *-ing* block – M (*ed*) = 59.03%, M (*ing*) = 42.24% – thus preferring the completed version of the events overall. Even so, these children demonstrated the ability to map verbs with progressive

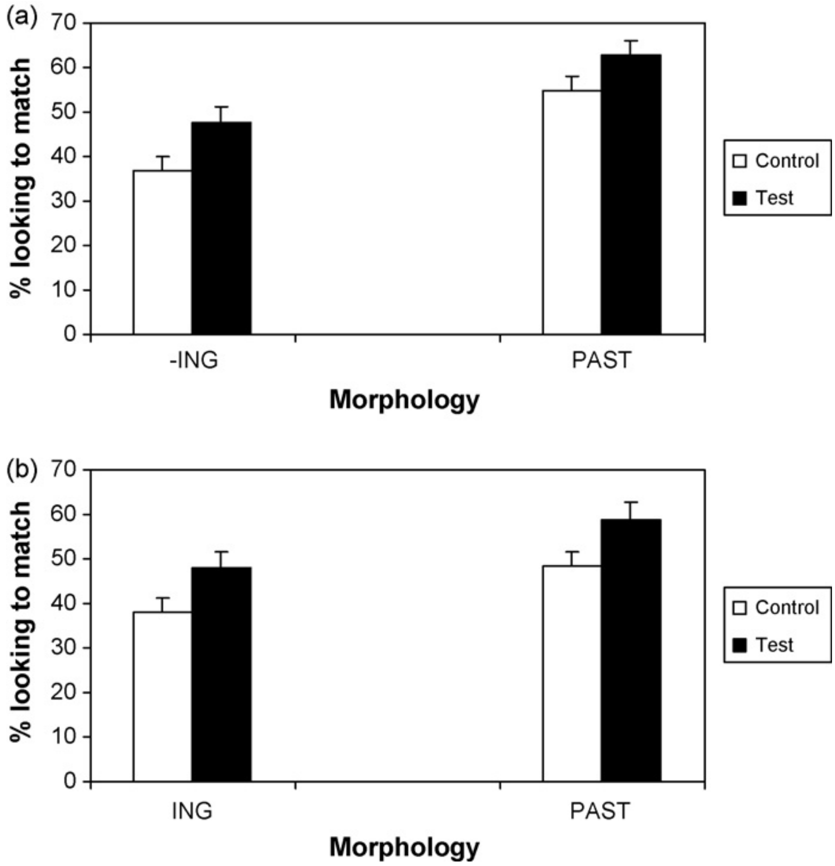

Fig. 1. (a) Percent looking to control and test trials by inflection type in Study 1a: familiar verbs, 3-year olds. (b) Percent looking to control and test trials by inflection type in Study 1b: familiar verbs, 2-year olds.

morphology onto ongoing events and verbs with past morphology onto completed events. They also demonstrated the ability to *distinguish* the two types of morphology: If the dependent variable is recast as percent looking to the completed version of the event, the corresponding three-way ANOVA reveals a significant interaction of audio and trial, $F(1,8) = 13.95$, $p = .006$, Cohen's $d = 1.15$, and no other significant effects.

3. Study 1b

Study 1b is a replication of Study 1a, using younger children and a slightly different apparatus and set of procedures.

3.1. Methods

3.1.1. Participants

Ten American English-speaking children were included in the final sample. Their mean age was 25.1 months (SD = 0.31); six were girls. Nearly all were of European heritage. All were reported to be developing normally. They were recruited as in Study 1a. Their parents filled out the MacArthur Communicative Development Inventory: Toddlers (CDI; Fenson et al., 1994); the children's mean production vocabulary size was 306.7 words (SD = 152.98), which is 45% of the total possible.

3.1.2. Apparatus

The child was seated approximately three feet in front of a large screen either on a small chair or on a parent's lap. The same stimuli were used as in Study 1a, now edited on an Apple G4 Powerbook into the side-by-side configurations described earlier, played from an Apple G3 Powerbook, and projected onto a screen via an LCD projector. The linguistic stimulus was shunted from the Powerbook to a speaker centered below the screen. Lights centered between the event videos attracted the children's attention to the center between trials.

3.1.3. Stimuli

The stimuli were identical to those used in Study 1a, with the one exception that the first block presented the verbs in the past tense form and the second block presented the verbs in the progressive form.

3.1.4. Procedure

Children were tested in their homes, in a quiet room. The IPL apparatus was set up and the children were invited to view the test videos. Some of the children needed to sit in the parent's lap to ensure cooperation; however, parents were instructed not to direct the child in any way (and none did in any overt way). The experimenter sat behind the child during the session. Children were videotaped while watching the videos; their eye movements were coded from the tapes frame-by-frame.

3.1.5. Coding and analyses

Coding and analyses were carried out as in Study 1a. Reliability assessments with 10% of the data (1 child coded by two different coders) yielded an r of .998, $p < .001$.

3.2. Results and discussion

Preliminary analyses revealed no effects or interactions with counterbalanced order or gender; therefore, those variables were omitted from further analysis. One three-way ANOVA was performed, with Audio (*-ing* vs. *past*), Verb (*pick, drink, wash, draw*), and trial (control, test) as within-subject variables.

Fig. 1b displays the findings. When tested on the verbs with the *-ing* suffix, the children looked longer at the ongoing action, and when tested on the verbs with the *past* inflection, the children looked longer at the completed action. An ANOVA yielded a significant effect of trial [$F(1,9) = 6.84$, $p = .027$, Cohen's $d = .78$], a significant effect of audio [$F(1,9) = 5.44$, $p = .04$, Cohen's $d = 1.13$] and no other significant effects or interactions. The significant effect of audio emerged because the children looked overall (i.e., during both control and test trials) longer at the matching screen during the *-ed* block than during the *-ing* block (M (*ed*) = 53.73%, M (*ing*) = 42.15%), thus preferring the completed version of the events overall. Even so, these children demonstrated the ability to map verbs with progressive morphology onto ongoing events and verbs with past morphology onto completed events. They also demonstrated the ability to *distinguish* the two types of morphology: If the dependent variable is recast as percent looking to the completed version of the event, then the corresponding three-way ANOVA reveals a significant interaction of audio and trial, $F(1,9) = 7.78$, $p = .02$, Cohen's $d = 1.33$], a significant main effect of verb, $F(3,27) = 5.60$, $p = .004$, and no other significant effects. The main effect of verb occurred because, while the children overall preferred to look at the completed versions of the *pick, drink,* and *draw* events, they preferred to look at the ongoing version of the *wash* event. The interaction of audio and trial indicates that the children looked reliably differently when hearing the different audios. When they heard the *-ed* audio, they shifted toward the completed version and when they heard the *-ing* audio they shifted away from the completed version.[1] We also compared children's performance with the regular versus irregular past forms and found that the children shifted equivalently for both types of forms. For *pick* and *wash*, they shifted on average 8.45% toward the matching screen, whereas for *drink* and *draw,* they shifted on average 12.58% towards the matching screen, $t(9) = .23$, ns.

[1] To support the validity of these findings, we investigated whether children's good performance could be attributed to those children who sat on their mothers' laps (lap-sitters, potentially influenced by mother) rather than alone in a chair (chair-sitters). In fact, both lap-sitters (LS) and chair-sitters (CS) showed similar shifts to the match during the test trial: the LSs shifted, on average, 11.8% toward the matching screen whereas the CSs shifted 6.3% in the same direction, $t(8) = 0.77$, ns. Thus, there was no general tendency for the lap sitters to perform better than the chair sitters.

4. Study 2

This study examined children's ability to comprehend tense/aspect morphology productively with novel verbs.

4.1. Methods

4.1.1. Participants

Seventeen American English-speaking children were included in the final sample. Their mean age was 32.73 months (SD = 3.32); nine were girls. Nearly all were of European heritage. All were reported to be developing normally. They were recruited as in Studies 1a and b. Three additional children were not included in the final sample because of more than 80% side bias ($n = 1$), inability to sit through at least half of the video ($n = 1$), and experimenter error ($n = 1$).

4.1.2. Apparatus

The apparatus and procedure were the same as in Studies 1a and b.

4.1.3. Stimuli and design

The four 'novel' or unusual events included (a) ladle dry noodles into a cylinder, (b) cover a cake with blue frosting, (c) push a soup pot into a hockey net using a broom, and (d) hurl red paint onto a big cardboard box using a bucket. Two versions of each event were filmed, one in which the event was ongoing (e.g., the actor is 'brooming' the pot throughout the trial) and one in which the event began and was completed (e.g., the actor 'brooms' the pot into the net, then holds up her arm in triumph for 4 s). Each event was paired with a nonsense verb that ended in an alveolar stop, so that the resulting past tense form would encompass an entire syllable (*geed, krad, pode, vood*). The layout was identical in structure to that of Study 1a, as shown in Table 2. This layout was presented in two blocks; the first block presented all four verbs with the *-ing* suffix, and the second block presented all four verbs with the *-ed* suffix. A colorful screensaver separated the blocks. The side of the matching screen was counterbalanced across participants. The side of the matching screen was also counterbalanced within participants so that the match occurred equally on the left and right sides. These stimuli were pretested with adult college students ($n = 9$), who were 100% consistent in matching the ongoing movie version to the *-ing* form and the completed movie to the *-ed* form.

4.1.4. Coding

Coding and analysis were carried out as in Studies 1a and b. A total of 1.5% of the trials was unusable and so excluded; these empty cells were filled with the group mean for that verb and inflection. Reliability assessments with 10% of the data (2 children each coded by two different coders) yielded an r of .96, $p < .001$.

Table 2
Partial layout of Study 2.

Trial	Video 1	Audio	Video 2
ISI	Black	See the girl?	Black
1	Girl brooming pot towards net	Look at the girl!	Black
ISI	Blank	Oh, see her now?	Blank
2	Black	Look at her now!	Girl brooms pot into net
ISI	Black	Oh, look now!	Blank
3	Girl brooming pot toward net	We see her on both screens!	Girl brooms pot into net
ISI	Blank	She's vooding the pot!	Blank
4	Girl brooming pot toward net	Look, she's vooding the pot!	Girl brooms pot into net

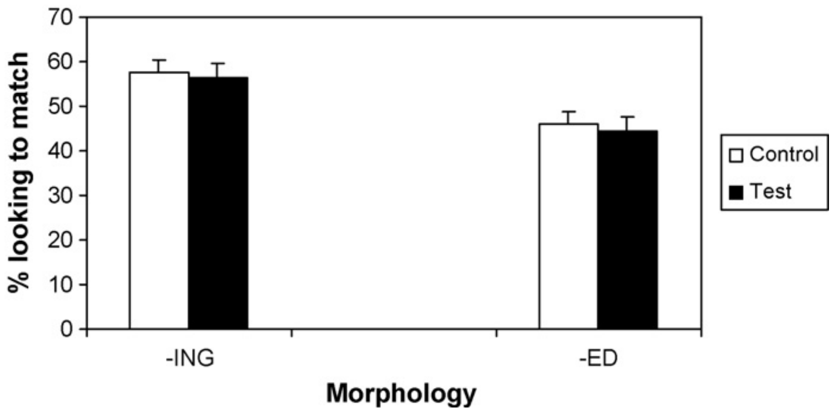

Fig. 2. Percent looking to control and test trials by inflection type in Study 2: novel verbs.

4.2. Results and discussion

Preliminary analyses revealed no effects or interactions with counterbalanced order or gender; therefore, those variables were omitted from further analysis. One three-way ANOVA was performed, with Audio (*-ing* vs. *-ed*), Verb (*geed, krad, pode, vood*), and trial (control, test) as within-subject variables.

Fig. 2 displays the findings. The children showed no shifts in looking preferences by trial for either audio relative to the ongoing versus completed versions of the novel events. An ANOVA yielded a significant effect of audio only, $F(1,15) = 11.23$, $p = .004$, Cohen's $d = 1.24$, in that the children looked longer at the matching screen during both control and test trials of the *-ing* block than of the *-ed* block (*M*s = 57.59% and 45.90%, respectively). Thus, they preferred the ongoing version of the events, overall. No other significant effects or interactions were found.

This study thus failed to find evidence for children's productivity with tense/aspect morphology. This failure could be attributed to at least three aspects of the current design. First, the familiarization trials only directed the children to the actor (i.e., trials 1–3 in Table 2), not to her actions. It is possible that, in the 18 s provided, the children did not attend to the girl's actions but instead focused on other salient properties such as her face. Second and relatedly, there were only 3 familiarization trials per verb, so that even if the children did look at the actions, they might not have fully grasped the ongoing/completed contrast. The completed versions did contain a dramatic completion gesture (i.e., the actor held up her hands in triumph) which lasted for 2/3 of each completed-action clip, but nevertheless, the two versions were, of necessity, quite similar. Third, even if the children had extracted the ongoing/completed contrast of the event pairs, it would not be transparent which *linguistic* contrast they could reasonably anticipate. At this stage of development, children may capture this semantic distinction via adverbs such as *all done*, auxiliaries such as *is*/*was*, and general verb forms such as *do*/*did*/*doing*. We gave the children no hints about the sort of linguistic contrast we were going to test. In sum, we were asking the children to do a lot of linguistic and conceptual processing in a short period of time, and so perhaps it should not be surprising that they failed. The aim of the next study was to simplify the processing demands for children and thereby facilitate their ability to demonstrate their productive knowledge, if they possess it.

5. Study 3

In this study, the video included 3 blocks of trials. The *Priming* block was introduced to address all three of the concerns mentioned above. In this block, a series of ongoing and completed events were presented sequentially to highlight the ongoing/completed contrast. Novel actions were included in this block so as to familiarize the children with the general nature of these events. Also, the descriptions in this block included the dummy verb *do* in its present/imperfective and past forms, to highlight the relevant linguistic contrast. The *Familiar* and *Novel* test blocks were adapted from Gertner et al.'s (2006) design. Following Gertner et al., we first tested children's ability to contrast *-ing* and *-ed* with familiar verbs and only subsequently did we present and test the two novel events and verbs. Also like Gertner et al., these blocks presented different actions, rather than different renditions of the same action, to test the relevant linguistic contrast (in their case, SVO word order; in our case, *-ing* vs. *-ed*).

5.1. Methods

5.1.1. Participants

A total of 55 American English-speaking children were included in the final sample. Their mean age was 29.1 months (SD = 1.73); 26 were girls. Nearly all were of European heritage. All were reported to be developing normally. They were recruited as in the previous studies. Most of their parents filled out the MacArthur Communicative Development Inventory: Toddlers, either Long or Short forms (CDI; Fenson et al., 1994). For those children for whom the Long Form was available, mean production vocabulary size was 465.96 words (SD = 160.88), which is 68.5% of the total possible. A combined score (Long and Short Forms) was also generated by averaging the percent of words produced for each child (dividing by 680 for the Long Form and 100 for the Short Form); these children produced, on average, 73.43% of the words on the checklists (SD = 22.36%). Three children were not included in the final sample: two because of experimenter error, and one who did not sit through at least half the video.

5.1.2. Apparatus and procedure

Approximately one-third of participants were tested with an apparatus and procedure similar to that used in Study 1a. The remainder were tested with apparatus similar to that used in Study 1b, but were tested in a university laboratory instead of in their homes. All children were accompanied by a parent who sat behind them while viewing the videos.

5.1.3. Stimuli

The same video clips were used as in Study 1a and Study 2; however, the layout of these clips was quite different from those studies. The video was composed of three blocks of events. In the *Priming Block*, four familiar events (two ongoing, two completed) and four novel events (two ongoing, two completed) were presented sequentially such that all four familiar events were presented followed by all four novel events; the ongoing events were always presented on one side and the completed events were always presented on the other side. Only one event was presented at a time (see Table 3). The exact pattern of presentation in this block varied by condition, as shown in Table 4. These events were paired with the verb *do* in either its progressive ("See what Becky is doing?") or past tense ("See what Becky did?") form. In the *Familiar Test Block*, two pairs of familiar events were presented simultaneously, with an ongoing version on one side and a completed version on the other side. These were not the ongoing and completed versions of the same events; instead, they were the ongoing and completed pairs of the events that had been shown in the Priming Block. For example, *girl is washing dolly* was shown in the Priming Block and *girl washed dolly* was shown in the Familiar Test Block. Across all conditions, *wash-completed* was paired with *drink-ongoing* and *pick-completed* was paired with *draw-ongoing*. The audio for one of these *familiar event test trials* was presented in the progressive form and the audio for the other was presented in the past form; the order by condition is shown in Table 4.

In the *Novel Test Block*, two pairs of novel events were presented simultaneously, with an ongoing version on one side and a completed version on the other side. Again, these were not the ongoing and completed versions of the same events; instead, they were the ongoing and completed pairs of the novel events that had been shown in the Priming Block. For example, *broom-pot-ongoing* was shown in the Priming Block and *broom-pot-completed* was shown in the Novel Test Block. As shown in Table 5, *hurl-paint-completed* was paired with *frost-cake-ongoing* and *broom-pot-completed* was paired with *fill-cylinder-ongoing*. The audio for one of these *novel event test trials* was presented in the progressive form and the audio for the other was presented in the past form; the order by condition is shown in Table 4 and the specific pairings of inflection and test event by condition is shown in Table 5. There were thus a total of 8 priming events, 2 familiar test trials and 2 novel test trials.

Table 3
Layout of Study 3 video, Condition 1.

Video 1 (ongoing version of events)	Video 2 (completed version of events)	Audio	Match
Blank	Blank	Let's watch Becky! Let's see what Becky's gonna do. Let's see what Becky's doing. Let's see what Becky did!	
B drinking juice	Blank	Oh look! See what Becky's doing?	
Blank	Blank	Now what's Becky gonna do?	
Blank	B washed dolly	Oh, look what Becky did!	
Blank	Blank	What's Becky gonna do now?	
B picking flowers	Blank	Wow, look what Becky's doing!	
Blank	Blank	Let's see what Becky's gonna do!	
Blank	B drew ball	Oh lookI See what Becky did?	
Blank	Blank	Let's watch Becky!	
B throwing paint	Blank	Wow, see what Becky's doing?	
Blank	Blank	Now what's Becky gonna do?	
Blank	B finished frosting cake	Oh, see what Becky did?	
Blank	Blank	Let's see what Becky's gonna do now!	
B brooming pot	Blank	See what Becky's doing?	
Blank	Blank	Look at Becky now!	
Blank	B filled trays	See what Becky did!	
Blank	Blank	Look at Becky now! She's gonna wash it!	
B washing dolly	B drank juice	Becky's washing it! She's washing it! Find washing!	Video 1
Blank	Blank	Oh, look now! Becky's gonna pick it!	
B drawing ball	B picked flowers	Becky picked it! She picked it! Find where she picked!	Video 2
Blank	Blank	What's Becky gonna do now? She's gonna KRAD it!	
B frosting cake	B finished throwing paint on box	Becky's kradding it! She's kradding it! Find kradding!	Video 1
Blank	Blank	Now Becky's gonna do something different! She's gone GEED it!	
B filling tray	B broomed pot	Becky geeded it! She geeded it! Find where she geeded!	Video 2

5.1.4. Design

In all conditions, ongoing events were always presented on one screen (the left for half of the children) and completed events were always presented on the other screen (the right for half of the children). The conditions varied according to the pattern of the presentation of the priming events

Table 4
Conditions in Study 3.

Priming events orders		
Condition 1	Completed, ongoing, completed, ongoing (×2)	ABAB
Condition 2	Completed, ongoing, ongoing, completed (×2)	ABBA
Condition 3	Completed, ongoing, completed, ongoing (×2)	ABAB
Condition 4	Completed, ongoing, completed, ongoing (X 2)	ABAB
Familiar events orders		
Condition 1	Washed, drawing	AB
Condition 2	Washed, drawing	AB
Condition 3	Washed, drawing	AB
Condition 4	Drawing, washed	BA
Novel events orders		
Condition 1	Geeded, kradding	AB
Condition 2	Geeded, kradding	AB
Condition 3	Kradding, geeded	BA
Condition 4	Kradding, geeded	BA

Note: A refers to completed events, B refers to ongoing events.

Table 5
Audios by condition, Study 3.

	Novel events		
Event pair 1	Hurl-paint-completed	vs.	Frost-cake-ongoing
Condition 1	Geeded		
Condition 2	Geeded		
Condition 3			Kradding
Condition 4			Kradding
Event pair 2	Broom-pot-completed	vs.	Fill-cylinder-ongoing
Condition 1			Kradding
Condition 2			Kradding
Condition 3	Geeded		
Condition 4	Geeded		

Note: Children saw the same video pairs in all conditions, but heard only a single verb. Conditions varied in terms of particular verb (and its morphology) and order of presentation.

and the test events. 'A' designates completed events/*-ed* tests and 'B' designates ongoing events/*-ing* tests. In condition 1, both the priming and test events followed an ABAB pattern—the completed and ongoing priming events alternated, and then the *-ed* and *-ing* test trials alternated. In condition 2, the priming events followed an ABBA pattern – completed, ongoing, ongoing, completed – but the test trials followed an ABAB pattern – *-ed,-ing, -ed, -ing*. In condition 3, the priming events followed an ABAB pattern and the test trials followed an ABBA pattern. In condition 4, the priming events followed an ABAB pattern and the test trials followed a BABA pattern (*-ing, -ed, -ing, -ed*). Conditions 3 and 4 also differed from Conditions 1 and 2 in which novel test event was designated by the audio, as shown in Table 5. A complete layout of the video for Condition 1 appears in Table 3.

5.1.5. Coding and analyses

Coding was performed as in earlier studies. A total of 2% of the trials were unusable and so excluded; these empty cells were filled with the group mean for that verb and inflection. Reliability assessments with 10% of the data (6 children each coded by two different coders) yielded an r of .983, $p < .001$. The dependent measure was the amount of time children spent looking at each screen (match, nonmatch) during each test trial.

Following Gertner et al. (2006), the critical test pairs were only presented once; unlike the previous studies, there was no separate baseline evaluation trial. This change influenced the way we analyzed the data; within each condition, success was evaluated relative to chance looking of 50%. To address the possibility that children may have had intrinsic preferences for some of the videos, it was critical to examine cross-condition comparisons. Across the various conditions, the same video pairings were always used but the audio direction changed. Thus, real success required that the children succeed in multiple conditions, showing that their looking preferences were in fact a function of the audio differences—that is, the differences in morphology.

5.2. Results and discussion

We first present the results from the two familiar test trials, *washed* and *drawing*. Preliminary analyses revealed no effects or interactions with counterbalanced order or gender; therefore, those variables were omitted from further analysis. A three-way mixed ANOVA (Condition (4) by verb (2: *washed, drawing*) by screen (2: match, nonmatch)) yielded a significant main effect of screen, $F(1,51) = 196.82$, $p < .001$, Cohen's $d = 3.57$, a significant interaction of condition and screen, $F(3,51) = 3.83$, $p = .015$, a significant interaction of verb and screen, $F(1,51) = 14.81$, $p < .001$, and no other significant effects or interactions. As Fig. 3 shows, children looked longer at the matching screen for both verbs. Planned comparisons revealed that children looked significantly longer at the matching screen for each condition; however, the effect sizes for some conditions were larger than for others: Condition 1: $F(1,51) = 12.69$, $p = .001$, Cohen's $d = 1.59$; Condition 2: $F(1,51) = 63.47$, $p < .001$, Cohen's $d = 3.39$; Condi-

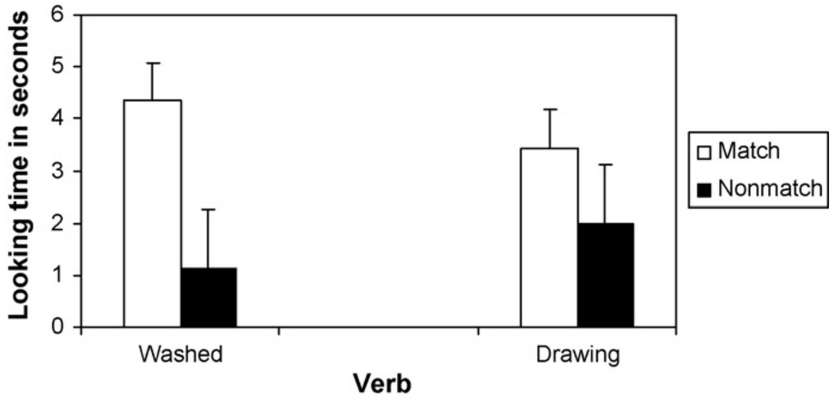

Fig. 3. Visual fixation to the matching versus nonmatching screen in Study 3: familiar verbs.

tion 3: $F(1,51) = 95.13$, $p < .001$; Cohen's $d = 5.13$; Condition 4: $F(1,51) = 60.55$, $p < .001$, Cohen's $d = 6.89$. Planned comparisons also revealed that children looked significantly longer to the matching screen for both verbs, but the effect was stronger for *washed* than for *drawing*—*Washed*: $F(1,51) = 182.36$, $p < .001$, Cohen's $d = 5.22$; *Drawing:* $F(1,51) = 20.42$, $p < .001$, Cohen's $d = 1.24$.

The key comparison, however, is between the two trials with novel verbs, past/perfective *geeded* and present/progressive *kradding*. We conducted three sets of analyses to explore this comparison. (a) We collapsed across order and ask whether children looked longer to the matching actions overall. (b) We further asked if children in the same condition look differently when they heard 'geeded' versus 'kradding' (i.e., across event pairs). (c) Finally, we asked if children viewing the same event pair looked differently when they heard 'geeded versus 'kradding' (i.e., across conditions). This analysis corrects for any *a priori* preferences children might have for any specific movie, and is the critical test of children's ability to use the morphology in the audio to guide their looking in this task. Preliminary analyses revealed no effects or interactions with counterbalanced order or gender; therefore, those variables were omitted from further analysis.

To investigate whether children looked longer at the ongoing action when they were told to look 'where she's kradding', and longer at the completed action when told to look 'where she geeded,' we conducted a three-way mixed ANOVA (condition (4) by verb (2: geeded, kradding) by screen (2: match, nonmatch)). This analysis yielded a marginally significant main effect of screen, $F(1,51) = 3.37$, $p = .068$, Cohen's $d = 0.39$, a significant interaction of condition and screen, $F(3,51) = 5.55$, $p = .002$, a significant interaction of verb and screen, $F(1,51) = 20.24$, $p < .001$, and no other significant effects or interactions. As Fig. 4 shows, children looked longer at the matching screen for *kradding*, but not for *geeded*. Planned comparisons revealed that children looked significantly longer at the matching screen for Conditions 1 and 2—Condition 1: $F(1,51) = 6.89$, $p = .01$, Cohen's $d = 1.39$; Condition 2: $F(1,51) = 10.15$, $p = .003$, Cohen's $d = 1.18$); but not for Conditions 3 and 4 (both ns). Planned comparisons also revealed

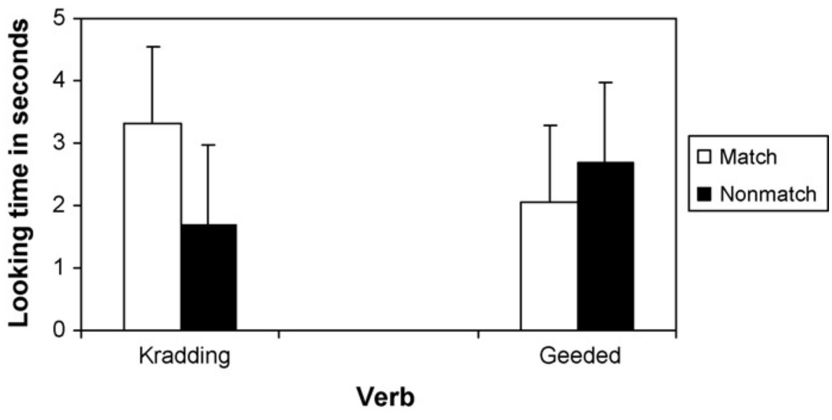

Fig. 4. Visual fixation to the matching versus nonmatching screen in Study 3: novel verbs.

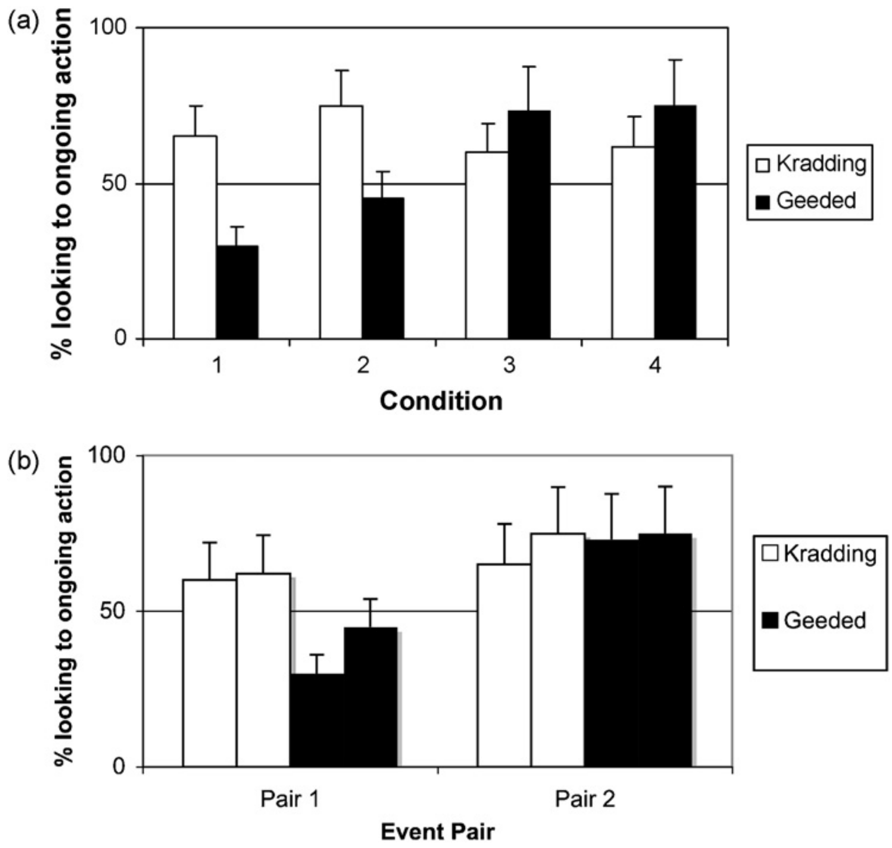

Fig. 5. Percent looking to the ongoing screen by verb/morphology in Study 3. (a) Novel verbs by condition. For conditions 1 and 2, the past/perfective morpheme ("geeded") was paired with the 'completed throwing paint on box' and the 'ongoing frosting cake' events and the present/imperfective morpheme ("kradding") was paired with the 'ongoing filling cylinder' and 'completed brooming pot into net' events. For conditions 3 and 4, the audio tracks were switched so that the morphemes ("geeded" and "kradding") were paired with the other set of movies. (b) Novel verbs by event pair. Event pair 1 contrasted the 'completed throwing paint on box' and the 'ongoing frosting cake' events; the present/imperfective morpheme ("kradding") bars come from conditions 3 and 4 and the past/perfective morpheme ("geeded") bars come from conditions 1 and 2. Event pair 2 contrasted the 'ongoing filling cylinder' and 'completed brooming pot into net' events; the "kradding" bars come from conditions 1 and 2 and the "geeded" bars come from conditions 3 and 4.

that children looked significantly longer at the matching screen for *kradding* ($F(1,51) = 17.88$, $p < .001$, Cohen's $d = 1.08$), but not for *geeded* (ns).

We next investigated whether children in the same condition looked *differently* when they heard "geeded" versus "kradding." Fig. 5a presents the data by condition and shows that children in Conditions 1 and 2 did choose significantly differently depending on the tense/aspect marker of the verb: They looked longer at the ongoing action (more than 50%) when they heard "kradding" and longer at the completed action (less than 50% to ongoing) when they heard "geeded"—Condition 1: $t(9) = 2.68$, $p = .01$, 1-tailed; Condition 2: $t(16) = 2.61$, $p = .009$, 1-tailed). In contrast, the children in Conditions 3 and 4 showed no differences by tense/aspect marker; they looked longer at the ongoing action, regardless.

A possible explanation for why children in Conditions 3 and 4 performed more poorly than those in Conditions 1 and 2 concerns the order in which the tense/aspect markers were presented for the novel verbs. As shown in Table 3, children in Conditions 1 and 2 heard the '-ed' form followed by the '-ing' form, whereas children in Conditions 3 and 4 heard the '-ing' form followed by the '-ed' form. Given previous findings that children produce verbs with '-ing' earlier than with the past form (Brown, 1973), it is reasonable to suppose that hearing the '-ing' form first led to an ongoing action preference that 'leaked' into the 2nd novel verb trial. To test this possibility, we conducted a follow-up study (Condition 5) in which all presentations were similar to Condition 4 except that children ($n = 12$, mean age = 30.8 months) heard the '-ed' test before the '-ing' test. Contrary to our expectations, these children, too, looked longer at the ongoing action for both novel verb test trials—*M* (geeded) = 71.5% to ongoing, SD = 24.0; *M* (kradding) = 55.7% to ongoing, SD = 31.8). Thus, the order of 'ing' versus 'ed' trials does not seem relevant.

Finally, a third analysis investigated how the children in different conditions performed with the same event pairs. Because this analysis focuses on the event pairs, success cannot be driven by any preferences children might have for one member of a specific pair. Fig. 5b shows the same data from (a), but rearranged now to illuminate the event analysis. The first event pair contrasted the 'completed throwing paint on box' event with the 'ongoing frosting cake' event; the '-ed' audio comes from Conditions 1 and 2 and the '-ing' audio data comes from Conditions 3 and 4. An independent-sample *t*-test revealed that, for this pair, children who heard "geeded" looked significantly differently (60% at the completed action) from children who heard "kradding" (55% to the ongoing action), $t(46) = 1.79$, $p = .04$, 1-tailed. Thus, this event pair succeeded in eliciting significantly different looking patterns depending on the tense/aspect marker heard. The second event pair contrasted the 'completed brooming pot into net' event with the 'ongoing filling cylinder with macaroni' event; the '-ed' audio comes from Conditions 3 and 4 and the '-ing' audio comes from Conditions 1 and 2. An independent-sample *t*-test for this pair yielded no significant differences between children across the different audios. Indeed, all children who viewed this event pair seemed to prefer the ongoing action.

In sum, the difficulty that children in Conditions 3 and 4 had with using the tense/aspect markers to distinguish ongoing from completed events seems traceable to problems with the 2nd event pair we used, in which the ongoing event was simply much more salient than the completed event. Note that a preference for the ongoing event was also found, overall, with these stimuli by children in Study 2.

6. General discussion

The goal of these studies was to determine when children initially become productive with tense/aspect morphology using a comprehension task. Comprehension was chosen as the relevant measure for two reasons. First, comprehension typically leads production (Swensen, Kelley, Fein, & Naigles, 2007), comprehension tasks allow us to find the onset of children's ability to abstractly represent the morphology. Second, tense/aspect morphology codes a variety of distinctive meanings; comprehension measures allow us to be certain that children's productivity centers on (some subset of) the right semantic features. Study 1 showed that 26–36-month olds understand and contrast tense/aspect morphology when used with familiar verbs. Studies 2 and 3 introduced stronger tests of productivity, requiring children to understand the morphology when used with nonsense verbs and novel events. In Study 3, 30-month olds demonstrated productive understanding of tense/aspect morphology, correctly linking the past-perfective marker to a completed event and the present-imperfective marker to the ongoing event.

Thus, by around two-and-one-half years of age, children are capable of productively using both the forms and meanings of English tense/aspect morphology. This is at least 6 months younger than what has been found previously; children's past tense overgeneralizations usually appear after 36 months of age (Marcus et al., 1992) and their consistent production of novel forms in elicitation tasks appears between their 3rd and 4th birthdays (Akhtar & Tomasello, 1997). Nonetheless, our 2.5-year olds appear to be at the cusp of this competence. Their success required substantial reduction in the ancillary processing demands of the task. In Study 3, in which children succeeded with novel verbs, we eased the processing demands in three main ways, following Gertner et al. (2006), who used similar techniques in investigations of word order comprehension in toddlers. First and foremost, we did not require children to choose between two phases (ongoing or completed) of the same event. Instead, children were shown the completed version of one event paired with the ongoing version of a different event. Because these unfamiliar events were described with nonsense verbs, it is still the case that the only way for children to know which event they were being directed toward was through comprehension of the tense/aspect morphology. However, the overall similarity between the two event streams was dramatically reduced.

Beyond this greater differentiation between test videos, children were also initially primed for elements of the task, the events, and the general meanings of the morphemes. To aid with the task itself, familiar verbs and events were tested first. Moreover, each side of presentation was consistently aligned with a single event phase—for example, for some children the left side of presentation always showed the ongoing versions of events and the right side always showed the completed version. The priming phase was used to introduce the event types themselves. Children saw versions of each event, including the novel ones; these versions were not the ones they were tested on, but their opposing phase. Finally, the general meanings of the morphemes were primed through light verbs (*did* and *is doing*).

It is critical to note that none of these priming elements, either singly or collectively, is sufficient to allow a child to succeed at the paired nonsense test items. They provide substantial scaffolding support for children's knowledge, but they do not constitute a complete answer. Beyond them, children must also know the regular forms of the tense/aspect morphology tested and be able to parse them out of naturalistic speech; they must know how to link inflected auxiliary forms to inflected main verbs—that is, they must know that *did* is like *kradded* and *doing* is like *geeding*; they must also know what general class of meaning each morpheme independently encodes; and finally, they must be able to apply their knowledge to a novel verb describing a novel event. The success in Study 3 indicates that children know these elements as well.

Because so many factors were changed between Experiment 2 (in which children failed) and Experiment 3 (in which children succeeded), we cannot be certain which changes were critical to children's success. Further experimentation will be needed to tease apart the effects of these various factors. Some of the priming elements may have been absolutely necessary for children to succeed, while others may simply have additionally facilitated their abilities. Moreover, additional experiments will be needed to determine if children's performance can in fact be strengthened. Recall that in Experiment 3, children succeeded robustly with only one of the pair of novel items; in the other pair, they showed a more general bias toward the ongoing depiction. It is possible that children at this age found the amount of novelty in this study (combined with a difficult linguistic task) to be overwhelming and thus they could generally only perform well with a single novel item. Alternatively, it is possible that children's knowledge is a bit more limited that we are suggesting. For example, the pattern of data described in Experiment 3 might plausibly be the product of children having solid knowledge of one of the tense/aspect markers we examined, and partial knowledge of the other (e.g., the children may have known that *-ing* was used to describe ongoing events and that *-ed* was used to describe another type of event that was not ongoing, but they may not have been certain that *-ed* was used to describe completed events). Our results do not identify the exact nature of children's knowledge of tense/aspect morphology; what they do is show that there must be some relevant productive knowledge present, at least in nascent form.

In conclusion, the present results support the view that children are creating an abstract grammar from an early age. By 30 months, children are at least somewhat facile with using the abstract meanings of tense/aspect morphology to help them focus on the right dimensions of an event, and they have assigned at least a subset of the correct (adult) meanings to these morphemes. Future studies will be needed to disentangle the *specific* temporal information (e.g., tense vs. aspect) being used. Nevertheless, these data show that children at two-and-one-half years have made an abstract mapping in the tense/aspect domain that is independent of specific lexical items, and so they have already begun to create an abstract grammar that includes abstract morphology.

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References

Akhtar, N., & Tomasello, M. (1997). Young children's productivity with word order and verb morphology. *Developmental Psychology*, *33*(6), 952–965.

Behrend, D. A. (1990). The development of verb concepts: Children's use of verbs to label familiar and novel events. *Child Development*, *61*, 681–696.

Behrend, D. A., Harris, L. L., & Cartwright, K. B. (1995). Morphological cues to verb meaning: Verb inflections and the initial mapping of verb meanings. *Journal of Child Language*, *22*, 89–106.

Berko, J. (1958). The child's learning of English morphology. *Word*, *14*, 150–177.

Bloom, L., Lifter, K., & Hafitz, J. (1980). Semantics of verbs and the development of verb inflection in child language. *Language*, *56*(2), 386–412.

Brown, R. (1973). *First language*. Cambridge: Harvard University Press.

Crain, S., & Lillo-Martin, D. (1999). *An introduction to linguistic theory and language acquisition*. Oxford: Blackwell Publishers Ltd.

Comrie, B. (1976). *Aspect*. Cambridge: Cambridge University Press.

Comrie, B. (1985). *Tense*. Cambridge: Cambridge University Press.

Fenson, L., Dale, P., Reznick, J., Bates, E., Thal, D., & Pethick, S. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development*, *54*, 14–24.

Fisher, C. (2002). Structural limits on verb mapping: The role of abstract structure in 2.5-year-olds' interpretations of novel verbs. *Developmental Science*, *5*, 56–65.

Gertner, Y., Fisher, C., & Eisengart, J. (2006). Learning words and rules: Abstract knowledge of word order in early sentence comprehension. *Psychological Science*, *17*, 684–691.

Hirsh-Pasek, K., & Golinkoff, R. (1996). *The origins of grammar*. Cambridge: MIT Press.

Hohenstein, J., & Akhtar, N. (2007). Two-year-olds' productivity with verbal inflections. *Journal of Child Language*, *34*(4), 861–873.

Klein, W. (1994). *Time in language*. London: Routledge.

Maratsos, M. (2000). More overregularizations after all: new data and discussion on Marcus, Pinker, Ullman, Hollander, Rosen & Xu. *Journal of Child Language*, *27*(1), 183–212.

Marcus, G., Pinker, S., Ullman, M., Hollander, M., Rosen, T., & Xu, F. (1992). Overregularizations language acquisition. *Monographs of the Society for Research in Child Development*, *57*(4).

Naigles, L. R. (1990). Children use syntax to learn verb meanings. *Journal of Child Language*, *17*(2), 357–374.

Naigles, L. R. (1996). The use of multiple frames in verb learning via syntactic bootstrapping. *Cognition*, *58*, 221–251.

Santelmann, L. M., & Jusczyk, P. W. (1998). Sensitivity to discontinuous dependencies in language learners: Evidence for limitations in processing space. *Cognition*, *69*, 105–134.

Shirai, Y., & Andersen, R. (1995). The acquisition of tense-aspect morphology: A prototype account. *Language*, *71*(*4*), 743–762.

Slobin, D. I. (1985, 1992). *The crosslinguistic study of language acquisition, Vols. 1 and 3*. Mahwah, NJ: Lawrence Erlbaum Associates.

Smith, C. S. (1991). *The parameter of aspect*. Dordrecht: Kluwer.

Swensen, L., Kelley, E., Fein, D., & Naigles, L. (2007). Processes of language acquisition in children with autism: Evidence from preferential looking. *Child Development*, *78*(*2*), 542–557.

Tomasello, M. (2000). Do young children have adult syntactic competence. *Cognition*, *74*, 209–253.

Valian, V. (2006). Young children's understanding of present and past tense. *Language Learning and Development*, *2*(4), 251–278.

Wagner, L. (2001). Aspectual influences on early tense interpretation. *Journal of Child Language*, *28*, 661–681.

Wagner, L. (2009). I'll Never Grow Up: Continuity in Aspectual Representations. *Linguistics, 47*(5), in press.

Weist, R. M., Atanassova, M., Wysocka, H., & Pawlak, A. (1999). Spatial and temporal systems in child language and thought: A cross-linguistic study. *First Language*, *19*, 267–311.