The Role of Caregivers’ Tense and Aspectual Distinctions on Children’s Later Acquisition

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1. Introduction

Grammaticalized expressions of time are found across languages. In particular, temporal information can be conveyed through tense morphology, which indicates an event’s location of time based on a referent event (Comrie, 1985) and through aspect morphology, which indicates “ways of viewing the internal temporal constituency of a situation” (e.g., is an event ongoing or completed; Comrie, 1976, p.3). How languages grammaticalize tense/aspect, however, can vary. For example, English marks both tense and aspect on verbs and auxiliaries, while Chinese marks only aspect, using particles (Wagner, 2012). Moreover, in languages such as English, there can be overlap between aspect/tense morphology; for example, the –ed morpheme marks past tense as in I baked a cake, and completed aspect in I had baked a cake.

Children acquiring their native language, then, must learn which markers refer to which time-relevant functions. Across comprehension and production studies, it has been demonstrated that children begin to acquire the tense/aspect morphology of English by two to two-and-a-half years old (Brown, 1973; de Villiers & de Villiers, 1973; Wagner, 2001; Wagner, Swensen, & Naigles, 2009). What remains unclear is how children come to learn the appropriate form to function mappings, especially given that the information conveyed by tense/aspect morphology is abstract in nature. The current study aimed to address this gap in the language acquisition literature by investigating sources of information that might facilitate children’s mapping of tense/aspect morphology to the appropriate meanings. In particular, we focused on the acquisition of tense/aspect in English.

Studies on children’s acquisition of tense/aspect have largely focused on when these forms emerge. In comprehension, children demonstrate understanding of tense/aspect beginning at two years old. Using an intermodal preferential paradigm (IPL), Wagner et al. (2009) found that toddlers were able
to match the past forms to completed renditions, and progressive forms to ongoing renditions, of familiar verbs by 26 months and of novel verbs by 30 months. Wagner (2001) also found that two-year-olds could appropriately match present progressive forms (i.e., is verb-ing) to ongoing events and past progressive forms (i.e., was verb-ing) to completed events. Additionally, two-years-olds in Valian (2009) were able to match depictions of past events with the past copula form was and depictions of current events with the present copula form is.

Production of tense/aspect morphology emerges at a similar age. In a longitudinal study of children’s spontaneous speech, Brown (1973) observed that the progressive marker –ing was one of the first grammatical morphemes to be produced reliably (between 21 to 34 months), with regular and irregular past tense forms emerging later (approximately 4 to 12 months later). De Villiers and de Villiers (1973) found a similar pattern in a cross-sectional study on the acquisition of various grammatical morphemes in children between the ages of 16 to 40 months. Additionally, using an elicited production task, Hohenstein and Akhtar (2007) found that two-year-olds were able to appropriately add and drop -ing and -ed affixes from novel verbs. These findings suggest that by the third year of life, children have begun to comprehend and produce tense/aspect forms appropriately.

While much is known regarding the emergence of these forms, the literature remains limited in its exploration of the methods by which children come to acquire tense/aspect morphology. First, we distinguish between children’s ability to extract the morphological forms from the input and their ability to learn the appropriate meanings for the forms; our ultimate focus is on the latter. With the former, a variety of studies have shown that such extraction emerges early. By 15-months of age, infants are sensitive to the statistical distribution of grammatical forms/categories and can readily extract such forms from their input (Gomez & Maye, 2005; Shi, 2014; Waxman, Lidz, Braun, & Lavin, 2009). For example, Mintz (2013) found that 15-month olds were able to segment –ing from the stem of novel words. Additionally, Santelman and Juscyk (1998) has found that 18-month olds were sensitive to non-adjacent dependencies related to the progressive, preferring to listen to grammatical sentences containing is ___ -ing compared to can ___ -ing. Thus, children are capable, early in development, of extracting the tense/aspect forms, likely via their statistical learning abilities (Naigles, 2002).

Much less is known about the methods by which children learn the meanings of these forms. That is, how do children eventually come to learn that –ed refers to the perfective/past while –ing refers to the progressive? Learning these mappings may be particularly difficult because the meanings of these morphemes are abstract (Kako, 1999; Naigles, 2002). There are no concrete attributes to which children could easily make the form-to-function mappings, unlike learning concrete nouns and verbs. For example, events described with the progressive (e.g., swimming, eating, sleeping) can vary vastly in their physical characteristics; thus, there is no clear “prototype” for which the
progressive –ing can map onto. Even within morphosyntax, tense/aspect may be relatively more abstract as there are fewer concrete attributes for the meanings to map onto when compared to, for example, argument structure of verbs, where the number of arguments and their relationship are influenced by the number of participants in the scene (Kako, 2006). Despite this challenge, children do come to acquire the semantics of tense/aspect morphemes.

One potential cue that might help children learn the semantic meanings of tense/aspect morphology is the relative timing between caregivers’ production of tense/aspect markers and the occurrence of the referenced events. Intuitively, it could be informative if caregivers used –ing while events were going on, and –ed once events were completed or in the past. Indeed, Ibbotson, Lieven, and Tomasello (2014) examined the contexts in which verbs marked with the progressive –ing vs. non-progressive (i.e., bare form and –ed) were used during the naturalistic interactions of two parent-child dyads. They found that parents used the progressive –ing more frequently concurrently with an event (i.e., as an event unfolded, the marked verb is produced) compared to verbs not marked with the progressive. The latter cases were typically produced before an event had begun or after the event had been completed. Thus, the tendency with which caregivers distinguish different tense/aspect morphemes based on the timing of their referenced events may serve as a potential cue to the semantic meanings of the markers for children.

However, Ibbotson et al.’s (2014) study was not conclusive: they had a very small sample size (i.e., n = 2); therefore it is unclear whether these cues are reliably found across parent-child dyads. Moreover, no child language data was assessed; therefore, whether the availability of these cues indeed impacts the acquisition process remains an open question. Finally, they did not target parental input for the past/perfective forms uniquely. In sum, the current study had two goals: a) to replicate the findings of Ibbotson et al. (2014) with a larger sample and b) to assess whether children might make use of these cues for learning the semantics of tense/aspect forms. To accomplish this, we employed a longitudinal design, wherein parental input was assessed through spontaneous interactions between parent-child dyads, carried out at Time 1. Children’s comprehension was then assessed via IPL 20 months later, at Time 2.

Importantly, in our study, the contexts assessing input and output differed. Previous studies examining the role of input on later language output have often utilized the same contexts (e.g., using a similar play session structure to assess role of parental input and children’s later acquisition of a particular language phenomenon; Kirjavainen, Theakston, & Lieven, 2009; Rowland, Pine, Lieven, & Theakston, 2003; Shirai & Andersen, 1995). Using the same context to assess both input and output, however, may reveal only context-specific relationships (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002). By varying the contexts of assessment, our study presents a novel and potentially more sensitive approach to capturing the relationship between parental input and children’s later language acquisition.
2. Methods

2.1. Participants

Thirty-five typically developing children between the age of 18 and 23 months ($M = 32.8$ months, $SD = 5.4$ months) participated in the study. All children were monolingual English learners and were recruited from the New England area. We present preliminary data of ten children from this group ($M = 19.97$ months; $SD = 1.30$ months). At the first visit, children’s average mean length of utterance (MLU) was 1.37 ($SD = 0.25$), with only two children producing the progressive –ing and any forms of the perfective/past. At the last visit, children ($M = 40.92$ months, $SD = 1.77$ months) averaged an MLU of 2.90 ($SD = 0.62$); all were producing progressive and past/perfective forms.

2.2. Intermodal Preferential Paradigm (IPL) Apparatus

The video was projected from an Apple Macbook Pro laptop via a digital LCD projector onto a portable 63”X84” projector screen. Audio was transmitted from the laptop to speakers located under the projector. A camera was centered below the projector screen to record children’s eye movements, which were then coded off-line (see Naigles & Tovar, 2012 for more details).

2.3. IPL Stimuli and Design

Four event types were evaluated: pick flowers, drink juice, wash the dolly, and draw the ball. For each event type, two six-second renditions were created, one in which the event was ongoing (e.g., a girl is washing a dolly throughout) and one in which the event was completed (e.g., a girl first washes the dolly for 2 seconds, then holds it up for the remaining 4 seconds).

For each event type, familiarization trials were first presented, in which ongoing and completed renditions were displayed sequentially, one on each side of the screen. These were paired with an audio labeling the actor (e.g., Look here, look at her!). A control trial was presented next, in which both renditions were displayed simultaneously, with a non-directing audio (Now we see her in both!). Finally, during the test trials, both renditions were again displayed simultaneously but with a directing audio containing the verb marked with either the progressive –ing or with the past/perfective form. Each trial was separated by a 3 second long interval of blackness with a centralized flashing red dot (see Table 1).

Trials were blocked such that the four verbs were presented in their past/perfective forms in the first block. The four verbs were then presented with the progressive -ing and in a different order in the second block. Blocks were separated by a six second screensaver. The side of the matching screen was also counterbalanced across participants (see also Tovar, Fein, & Naigles, 2015; Wagner et al., 2009).
Table 1. Example of layout for perfective/past trials involving the verb wash.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Video 1</th>
<th>Audio</th>
<th>Video 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Girl completes washing doll</td>
<td>Look here, look at her!</td>
<td>Black</td>
</tr>
<tr>
<td>ISI</td>
<td>Black</td>
<td>Oh, wow!</td>
<td>Black</td>
</tr>
<tr>
<td>2</td>
<td>Black</td>
<td>Look here, look at her now!</td>
<td>Girl washing doll</td>
</tr>
<tr>
<td>ISI</td>
<td>Black</td>
<td>Isn’t this fun?</td>
<td>Black</td>
</tr>
<tr>
<td>3</td>
<td>Girl completes washing doll</td>
<td>Now, we see her in both!</td>
<td>Girl washing doll</td>
</tr>
<tr>
<td>ISI</td>
<td>Black</td>
<td>Look, she washed the dolly!</td>
<td>Black</td>
</tr>
<tr>
<td>4</td>
<td>Girl completes washing doll</td>
<td>Look where she washed the dolly!</td>
<td>Girl washing doll</td>
</tr>
</tbody>
</table>

2.4. Procedure

This study was part of a larger longitudinal study spanning two years, where children were visited at home every 4 months. At the initial visit (Time 1), parents and children engaged in a 30-minute semi-structured played session. The first 15-minutes consisted of the Screening Tool for Autism (STAT, Stone et al., 2000), where parents were instructed to engage children in activities such as pretend and interactive play with dolls and blocks. The second half of the session consisted of free play, where parents were instructed to play as they usually would. The play session was recorded and later transcribed using CLAN (MacWhinney, 2000).

At the final visit (Time 2 for the current study), children were shown the tense/aspect video via the IPL as described above. Children were seated on their parent’s lap or on a small chair approximately 3 feet from the projector screen and camera. From the recording of the children’s faces, their eye movements were then later coded frame-by-frame. At this visit, children engaged in another 30-minute semi-structured play session with their parents, which was also recorded and transcribed.

2.5. Coding

Measures of parental input were extracted from the spontaneous speech produced during the play session of the initial visit. In particular, we were interested in investigating whether parents were consistent in how they used the progressive and perfective/past (i.e., did they use progressive utterances to refer to mostly one type of event). To accomplish this, parental utterances containing a verb marked with either the progressive –ing or perfective/past (both regular and irregular) were first extracted from the transcripts. Referring back to the video, researchers then coded each verb for when the utterance was produced.
and whether a corresponding action was produced. If there was a corresponding action, the start time and the end time of the action were marked to the hundredths of a second. For example, the utterance, “You knocked it down,” was coded for when the verb knocked was first produced, whether a knocking down event had occurred within the 30-minute play session, when the knocking down event had first started (e.g., when the hand first made contact with the blocks), and when it was completed (e.g., when the blocks landed on ground). These marked verbs were then designated as occurring before, during, or after the referenced event. We then categorized each individual event-utterance pair into one of three categories: utterances produced during an event (i.e., ongoing), utterances produced after the reference event had begun and ended (i.e., completed), and utterances produced before the event started (i.e., other).

Reliability between two coders on ~20% of the utterances yielded no significant differences in the coding of the start time of an event relative to the utterance of the verb ($t(58) = 1.45, p > .05$) and of the end time of an event relative to the utterance of the verb ($t(58) = -0.52, p > .05$).

After each utterance-event pair has been categorized into one of the three categories, four measures were then created for each parent to investigate the extent to which an individual parent was overall consistent with the progressive –ing and perfective/past forms: (a) the proportion of progressive utterances produced after completed events, (b) the proportion of progressive utterances produced with ongoing events, (c) the proportion of perfective/past utterances produced after completed events, and (d) the proportion of perfective/past utterances produced with ongoing events.

Our analysis then compared the proportions of ongoing vs. completed events for each tense/aspect type because this comparison provided information on the relative consistency of each tense/aspect type for a given parent. For example, a parent was said to be more consistent with the progressive when they had a higher proportion of progressive utterances co-occurring with ongoing events compared to occurring after completed events. A parent was said to be more consistent with the perfective/past when they had a higher proportion of perfective/past utterances occurring after events were completed compared to occurring with ongoing events.

To assess children’s comprehension of aspect/tense at Time 2, children’s direction (left, right, or center) and duration of eye gaze was coded during control and test trials, measured in hundredths of a second. Inter-reliability assessment between two coders for all videos revealed a correlation of .93 ($p < .001$).

Two measures of children’s comprehension of tense/aspect were calculated. The first was the proportion of looking to the matching screen during test trials compared to control trials (i.e., Test minus-Control) for all event types. A positive score (i.e., looking more to the matching screen during test trials compared to control trials) reflected good comprehension, while a negative score (i.e., looking more to the matching screen during control trials compared to test trials) reflected poor comprehension. The second measure was the
proportion looking to the *completed* screen during perfective/past trials compared to progressive \(-ing\) trials (i.e., Perfective/past minus Progressive). Children who heard the verb marked with the perfective/past should look longer to the completed screen during test trials compared to when they heard the verb marked with \(-ing\) during test trials. Thus, a positive score would indicate that children were able to distinguish between the perfective/past and progressive while a negative score would indicate a poorer distinction of the two forms.

3. Results

3.1. Parental consistency with tense/aspect at Time 1

A Wilcoxon matched pairs signed-rank test was first performed on the proportion of progressive and perfective/past utterances that had a corresponding action during the play session. No significant difference was found, \(Z = 1.76, p > .05\). Thus, neither tense/aspect type was more privileged compared to the other in terms of having referenced events being performed within the 30-minute play session.

To determine whether a parent was consistent with their use of the progressive and the perfective/past, a Wilcoxon matched pairs signed-rank test was performed on the proportion of ongoing and completed events for each aspect/tense type. Parents produced the progressive significantly more with ongoing events than after completed events, \(Z = -2.78, p < .01\) (Figure 1). Conversely, parents produced the perfective/past significantly more after completed events than with ongoing events, \(Z = 2.42, p < .05\) (Figure 2).

![Figure 1. Parents’ consistency with the progressive -ing.](image-url)
Figure 2. Parents’ consistency with the perfective/past.

3.2. Relationship between parents’ consistency and children’s later comprehension

Spearman’s rank correlations were performed between parents’ consistency measures at Time 1 and children’s later comprehension of –ing and the perfective/past at Time 2. With our first measure of comprehension (i.e., proportion looking to matching screen during test compared to control trials), a marginally significant correlation was obtained between parents’ consistency with the progressive and children’s later comprehension of the progressive, \( r_s = .62, p = .053 \) (Figure 3). That is, parents who produced progressive utterances more with ongoing events had children who later were better comprehenders of the progressive. No significant correlation, however, was found between parents’ consistency with the perfective/past and children’s later comprehension of the perfective/past, \( r_s = -.21, p > .05 \) (Figure 4).

With our second comprehension measure (i.e., children’s ability to distinguish between perfective/past and the progressive), a significant correlation was found between parents’ consistency with the progressive and children’s later tense/aspect comprehension, \( r_s = .75, p < .05 \). That is, parents who produced progressive utterances more with ongoing events had children who were later better at distinguishing between perfective/past and progressive markers. No significant correlation was found between parents’ consistency with the perfective/past and children’s later tense/aspect comprehension, \( r_s = -.39, p > .05 \). See Figures 5 and 6.
Figure 3. Relationship between parents’ consistency with the progressive at Time 1 and children’s comprehension of the progressive at Time 2

Figure 4. Relationship between parents’ consistency with the perfective/past at Time 1 and children’s comprehension of the perfective/past at Time 2.
Figure 5. Relationship between parents’ consistency with the progressive at Time 1 and children’s distinguishing of perfective/past and progressive at Time 2.

Figure 6. Relationship between parents’ consistency with the perfective/past at Time 1 and children’s distinguishing of perfective/past and progressive at Time 2.

3.3. Exploring alternative explanations

To assess whether relationships with other related variables could be driving the correlation found between parents’ consistency with the progressive and children’s later ability to distinguish the tense/aspect forms, additional
correlations were conducted. For the following analyses, children’s ability to distinguish the tense/aspect forms was operationalized as the difference in looking to the completed screen during perfective/past trials compared to progressive –ing trials.

The first possibility is that the correlation simply reflects a relationship between parental input and children’s tendency to distinguish ongoing versus complete events, irrespective of how they are designated linguistically. If this were the case, we would expect a significant correlation between parents’ consistency with the progressive and children’s ability to “distinguish” the two tense/aspect forms during control trials as well; that is, when the two alternatives were presented but no directing audio was given (see Table 1). However, no correlation was found between parents’ consistency with the progressive and children’s distinguishing of the events during control trials, \( r_s = .091, p > .05 \).

The second possibility is that the correlation found was driven by parents’ high frequency of use of the progressive and not necessarily their consistency of use of this morpheme. However, no relationship was found between the proportion of progressive –ing used by the parents (out of all utterances produced) and their children’s degree of distinguishing the tense/aspect forms during test trials, \( r_s = -.18, p > .05 \).

Lastly, it is possible that the relationship was driven by general improvements in the children’s language abilities and not by characteristics of their input. To assess this possibility, the children’s MLU was extracted from their spontaneous speech during the play session at Time 2. This was used as a measure of general language ability. No correlation was found between children’s MLU at Time 2 and their distinguishing of the tense/aspect forms during test trials at the same visit, \( r_s = .16, p > .05 \).

4. Discussion

The current study examined whether properties in the input might facilitate children’s learning of the meanings of tense/aspect morphemes. In particular, we focused on the timing of caregivers’ use of tense/aspect markers relative to their referenced events as a potential cue. Our findings reveal that such information is indeed present in children’s input. Moreover, it appears that children make use of at least some of these cues in their acquisition of the semantics of tense/aspect markers.

Consistent with Ibbotson et al. (2014), we find that caregivers vary in their use of tense/aspect markers depending on the timing of an event. More specifically, caregivers reliably produced the perfective/past forms after an event has been completed and reliably produced the progressive –ing while an event is occurring.

Having replicated a similar pattern as Ibbotson et al. (2014), we also further expanded on their study by examining whether the availability of such cues correlated with children’s later comprehension of these morphemes. We found that parental consistency with the progressive –ing marker was correlated with
children’s later comprehension. More specifically, caregivers who were more consistent in the use of the progressive marker had children who were better at distinguishing ongoing from completed events when they were exposed to the progressive and perfective/past markers. This relationship did not appear to be driven by general changes in the children’s language abilities nor simply by the frequency to which the progressive marker was found in the input. That is, children of caregivers who produced more progressive markers overall did not necessarily have better later comprehension. Rather, it appeared that it was specifically how the progressive marker was used that related to children’s later comprehension. This suggests that the acquisition of the meaning of grammatical morphemes is supported by the consistency of the caregivers’ input.

This is not to say that the acquisition of all tense/aspect morphemes is necessarily supported by parental consistency. We did not find a relationship between parents’ consistency with the perfective and any measure of children’s later comprehension, suggesting that the event-utterance timing may not be as helpful a cue in learning the semantics of perfective/past forms at this particular age. Interestingly, Ibbotson et al. (2014) reported that events described using the progressive –ing typically lasted longer than events described using non-ing markings (e.g., pushed, help, fallen). It is possible that such durational differences may serve as a cue for children to learn the meaning of perfective/past forms. However, preliminary analyses using the current dataset revealed no relationship between the duration of events marked with the perfective/past and either measure of children’s later comprehension. Thus, it remains unclear how children come to learn the perfective/past and what types of information may facilitate this acquisition.

In sum, we have demonstrated that children’s acquisition of the semantic meaning of abstract forms such as tense and aspect is, to an extent, facilitated by the consistency of particular features of the input. Moreover, as the measures of input and output were assessed with different contexts, this suggests that the role of parental consistency on children’s understanding of the semantic meaning of tense/aspect is not context-specific (e.g., limited to only play interactions; Huttenlocher et al., 2002). Rather, our findings reveal the influence of parental input on children’s broader understanding of tense/aspect, more specifically of the progressive. Thus, our study expands on the previous tense/aspect acquisition literature, which has largely focused on the emergence of the forms and less on how the appropriate form-to-function mappings are learned. Our findings also suggest that even within the same tense/aspect system, various forms may depend on different types of information from the input. While parents’ consistency with the timing between the production of the form and its referenced event appears to be helpful for acquiring the progressive –ing marker, it remains unclear what cues children exploit when learning the meaning of perfective/past forms. Future studies will further investigate this question by exploring other potential cues in the input, such as the duration from when the perfective/past form was produced relative to when the referenced action was completed— in other words, if it occurred in the immediate or distant past.
References


