GRAMMATICAL ASPECT IN CHILDREN

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Verb aspect is a subtle feature of language usage and comprehension that denotes a certain time frame within which an event occurs. Sensitivity to verb aspect may play a role in adult’s linguistic understanding by marking particular features of an event as salient. This study investigates whether verb aspect modulates both adults’ and children’s access to one particular event feature, the location at which the event occurs. English distinguishes between two aspects, the imperfective and the perfective. The imperfective aspect conveys that an event is ongoing, while perfective aspect conveys that an event is completed. Research with adults using semantic priming methods has shown that only verbs marked by imperfective aspect facilitate naming latencies for locations at which the events referred to by the verb typically occur. Verbs marked by perfective aspect do not result in such facilitation. This study extends previous research by replicating priming in adults for imperfective verb-location pairs using a modified, partly novel, stimuli set. By contrast, children aged 11-12 showed priming for locations following both imperfective and perfective verbs when tested with the same modified stimuli set.
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GRAMMATICAL ASPECT IN CHILDREN

Many types of information must be computed and integrated quickly in language comprehension. The role of event knowledge in this process recently has come under increasing examination. It appears that a significant role might be played in language processing by factors traditionally thought of as extra-linguistic, such as knowledge of event types and typical features of these events. While event knowledge has figured prominently in several areas of psychological research, such as autobiographical memory, situation modeling and discourse analysis, there has been less research examining its role in sentence processing and there currently exists no detailed theoretical framework for sentence processing based on event representations. This research is a step towards the goal of developing such a framework through empirical studies and may furthermore lead to a better understanding of normal language processing and the development of these processes. Specifically, this study will examine how a grammatical feature, verb aspect, interacts with event knowledge during language processing by both adults and children.

Part of adults’ linguistic knowledge in construing event representations is the use of grammatical aspect, also known as viewpoint aspect. Aspect is a formal property of a verb that conveys information about the time course and duration of an event or activity. Conceptually, aspect marks an event as ongoing or completed. Grammatically, this is indicated by a verb suffix that marks the completion status of an event. Aspect can be distinguished from tense. Both verb tense and aspect are indicated by grammatical markers that convey temporal information, but they do not convey exactly the same information. Tense indicates an event’s location in time relative to another point in time, such as whether the event occurred in the past or is occurring in the present. For instance, a past event can be denoted by the –ed verb ending, such as He...
listened, or the –ing ending, such as He was listening. A presently occurring event can be indicated in more than one way as well, such as He listens or He is listening. Fundamentally, tense indicates when in time an event happened.

Aspect can be indicated using these same verb suffixes, but aspect is a more subtle distinction that serves to focus attention on the time duration of an event, whether it is finished or ongoing. For example, She baked, in the past tense, indicates a completed event; the baking took place in the past and the baking is finished. By contrast, She was baking, which is also in the past tense, indicates that in this past time period of which we are speaking, she was in the process of baking – the baking event was not finished at the point in time to which we are referring. In principle, tense and aspect are independent of one another – an event can be portrayed as completed in the past, as in baked, or as still ongoing in the past, as in baking. In general, tense can be understood as when something happened, and aspect as how something happened (Wagner, 2001).

Two grammatical aspects can be distinguished in English, perfective and imperfective. Perfective aspect is indicated by the use of forms of to have plus the simple past or past perfect verb tense, as denoted by the –ed verb ending. The perfective aspect marks an event as completed. For example, had skated is in the perfective aspect and conveys that the activity is completed. Imperfective aspect is denoted by the use of forms of to be plus the progressive tense –ing verb ending. The imperfective aspect marks an event as ongoing or in-progress, such as was skating, which conveys that the activity has not yet been completed.

Additionally, aspect had been understood as imposing a perspective on an event that can affect its interpretation. The use of perfective aspect conveys an exterior or outside of the event viewpoint towards an activity. Thus the different stages of the event may not be available to
interpretation, only the single, completed event or resultant state. By contrast, the use of
imperfective aspect appears to facilitate an interior, within-the-event perspective, allowing access
to the internal structure or various stages of the ongoing event. (e.g., Comrie, 1976; Dowty 1977,
1984). One description of the practical effects of aspect characterized the perfective as allowing
the remembrance of past events, while the imperfective allowed the event to be relived or re-
experienced (Hopper, 1979).

Adults appear to use and understand the two aspectual forms with great facility and for
several functions, such as to convey the ongoing/completed distinction, and to foreground and
background different types of information in a narrative. Children can produce these verb
endings ( -ing, -ed) from an early age (Brown, 1973), and appear to understand the
ongoing/completed distinction that aspect marks by about age 5 or 6 (Wagner, 2002), though
some researchers claim an earlier age (Weist, 1991). There has been a lively debate in the child
literature as to whether young children use grammatical aspect strictly to indicate aspect or
whether they may be using it to mark tense (Weist, 1991; Weist et al. 1991, 1997; Wagner, 1997,
2001, 2002, 2003). As noted, both tense and aspect can be indicated by the same verb suffixes
and do overlap pragmatically. Therefore, the use of aspect to focus on components of an event
may be a subtle skill that develops in children gradually with age and increased linguistic and
world experience.

In this paper, I will review the role of verb aspect in adults’ language comprehension by
examining research using situation models and discourse analysis. Then, I will briefly review
some developmental considerations. Next, I will examine recent research on the application of
event knowledge to language processing. Finally, I will integrate the research on event
representations and verb aspect. This integration will focus on the interaction between verb
aspect and one feature of event representations, namely location. Location will be used because 1) it is assumed to be a salient feature of event knowledge; 2) inconsistent priming effects have been found between verbs and the typical locations at which the events they denote occur, suggesting this relationship is sensitive to aspect; 3) studies of the use of situation models in language comprehension have demonstrated an effect of verb aspect on location salience.

EVENT KNOWLEDGE AND LANGUAGE PROCESSING

Traditionally, the verb has been assumed to be the major organizing element in sentence processing, largely determining both sentence structure and meaning. While a strictly verb-based account of sentence processing may be possible, an account that reflects world knowledge may be more insightful and have greater explanatory power. It increasingly appears that world knowledge interacts with verbs during processing, which a strictly lexical-based account cannot easily explain. Such interactions would be difficult to encode solely within a verb’s representation in traditional models of language processing such as spreading activation (e.g., Collins & Loftus, 1975), which assumes limited semantic content. Recently, researchers have argued that semantic memory is organized so that relatively detailed knowledge of generalized events can be accessed quickly and easily (Lancaster & Barsalou, 1997; Vu, Kellas, Petersen, & Metcalf, 2003). This view incorporates event representations into semantic representations and assumes a much wider range of information is available and used at early stages of language processing than assumed by more traditional lexical-based approaches.

Evidence from Studies of Situation Models

Situation models are comprehenders’ constructions of mental representations of
described events (Madden & Zwaan, 2003). These representations may also be called mental simulations (Barsalou, 1999). Situation models are thought to incorporate such features as events, agents, causes, actions, locations, goals, and temporal setting. Further, these models may evolve as new information is encountered. Linguistic cues exert a strong influence on the construction of these models (Madden & Zwaan, 2003); thus changes in linguistic forms can alter these mental representations. Research examining the use of situation models has found an interaction between aspectual verb form and event representations. Specifically, verb aspect has been shown to influence the activation of relevant features of situation models during language comprehension.

Madden and Zwaan (2003) demonstrated the influence of verb aspect on readers’ interpretations of events in a series of experiments. In Experiment 1, participants were given one sentence written in either perfective aspect (e.g., The man made a fire) or imperfective aspect (e.g., The man was making a fire). Participants were asked to match the sentence to one of two pictures showing the action referred to in the sentence. Pictures showed the action in either a completed or in-progress stage. In the completed picture, a man was shown in front of a fire burning in a fireplace. The picture of the in-progress action showed a man in the process of building a fire.

Madden and Zwaan predicted that readers should form representations of completed events when the events were described in the perfective, and in-progress representations when events were described in the imperfective, and match the sentences to the corresponding pictures. Instead, participants were more likely to choose the picture showing a completed event after reading a perfective sentences (The man made a fire), but chose either picture after reading an imperfective sentence (The man was making a fire). That is, while use of perfective aspect
increased the probability that subjects would choose the picture of the completed event, use of imperfective aspect did not cause subjects to prefer the picture of the in-progress event – either picture was as likely to be chosen.

In order to investigate whether this result was a consequence of the forced-choice task employed, Madden and Zwaan (2003) measured response times between the reading of the sentence and the choice of the picture in Experiment 2. Participants were presented with one sentence, then shown either the completed or in-progress picture. Participants had to make a “yes/no” decision as to whether the picture matched the sentence. All experimental items were intended to elicit a “yes” decision. However, response times were expected to be longer when the grammatical aspect of the verb did not clearly match the completion stage of the picture. Results showed that participants were faster to respond to the completed pictures after they had read a perfective sentence. After subjects had read an imperfective sentence, they were just as fast to respond to either picture. This experiment thus replicated the basic findings of Experiment 1 with a more on-line measurement, reaction time.

Finally, Experiment 3 reversed the order of Experiment 1, so as to determine whether aspectual information in pictures of events could facilitate the construction of situation models when a sentence was subsequently presented. After viewing a picture, subjects read a sentence, and stated whether the picture matched the sentence. The dependent measure was the time needed to read the sentence and make a judgment about its relatedness to the picture. As in Experiment 2, subjects were faster to respond to perfective sentences if they had viewed the completed picture. However, imperfective sentences were responded to equally fast whether subjects had viewed the completed or in-progress picture.

Madden and Zwaan interpreted the results of Experiments 1 through 3 as pointing to the
same unexpected conclusion, namely that verb aspect exerts an inconsistent influence on readers’ constructions of situation models of events. Overall, subjects appeared to respond consistently to perfective sentences by choosing the completed picture, but inconsistently to the imperfective sentences by choosing either picture.

Madden and Zwaan (2003) interpreted readers’ lack of consistent responses to imperfective sentences as suggesting that each reader represents an in-progress event at varying stages of completion. Events denoted by a sentence in the imperfective aspect may be understood to be in various stages of completion or completed, whereas events denoted by perfective aspect are only understood as completed. Thus, the authors stated, the perfective aspect constrained event representations to a completed state, while the imperfective aspect did not seem to constrain representations to an unfinished stage of the described event. Therefore, imperfective sentences could be equally applied to finished or unfinished pictures.

The authors argued these results showed that readers used aspectual cues in constructing situation models, but only for those events denoted by perfective aspect. Madden and Zwaan suggested that comprehenders represented the imperfective sentences at various intermediate stage of completion. By contrast, the final stage of an event is better defined; it is easier to capture an endpoint. Thus, imperfective pictures may not have matched viewers’ individual event representations, which may have been more variable and idiosyncratic than the depiction portrayed. The authors concluded that viewers’ internal representations of the completed (perfective) events matched the provided pictures, but viewer’s representations of imperfective events did not match the pictures, because viewer’s representations may be more varied. Thus, the perfective aspect had a match benefit, while the imperfective did not.

However, Madden and Zwaan noted that each of the event features – location, agent, and
instrument – has been shown to be more available when events are described in the imperfective (e.g., Carrreiras, Carriedo, Alonso & Fernandez, 1997; Truitt & Zwaan, 1997; Ferretti et al., 2001):

These features help define imperfective event representations, whereas they do not seem to influence perfective event representations, which is consistent with the idea that the imperfective aspect allows internal access to the event, whereas the perfective aspect does not… The imperfective aspect does convey information about duration, specifically than an event is ongoing. However, it also incorporates the heightened importance of event features. The imperfective aspect acts as a linguistic cue for constructing an event representation that foregrounds the location, agent and instrument of the ongoing event, whereas the perfective aspect directs the reader to construct an event representation that foregrounds the resultant state (pp. 670-671).

The authors seem to be implying that each reader accesses idiosyncratic event features, such as location, agent, instrument, etc., when an event is portrayed in the imperfective, whereas a completed event may be represented more uniformly from person to person since it focuses on the resultant state only. When only one feature must be represented, upon which general agreement exists (e.g., a completed fire must be burning, but a fire in the process of being made may vary in many particulars), presumably situation models are more consistent across individuals.

This implies, therefore, that it is not that readers are utilizing aspectual cues only from sentences in the perfective aspect. Rather, the use of different aspects leads readers to foreground and background different types of event information. Since perfective aspect focuses on a completed event, comprehenders foreground this event in its resultant state, rather than focusing attention on the agent, his efforts to accomplish the task, and features of the task or event. By contrast, imperfective aspect, since it represents an event as in-progress, influences readers to foreground the agent, his attempts to accomplish the task, and other relevant features, rather than only the completed state. Different event features are thus more or less salient in each
representation.

Other work with situation models seems to support this assertion of greater consistency between comprehenders for resultant states, and for the salience of different features in each aspectual portrayal. Morrow (1985, 1990) investigated the influence of verb aspect on the activation of world knowledge pertaining to locations. Morrow (1990) had subjects memorize a floor plan of a house that illustrated the location of a kitchen, bathroom, living room and hallway. Subjects then read sentences such as John was walking from the kitchen to the bedroom or John walked from the kitchen to the bedroom, and were asked to indicate where they thought John was located at the time described by the sentence.

When imperfective aspect was used, as in the first sentence, readers were more likely to locate a representation of John somewhere on the unmentioned path between the kitchen and the bedroom. Multiple locations were named, such as just outside the kitchen, passing through the living room, or in the hallway. When the verb was in perfective aspect, as in the second sentence, subjects typically located the figure of John at the threshold or inside the bedroom. It appeared that readers used information provided by aspect and prepositions to infer the location of the figure in a mental model, and that the imperfective highlighted the salience of the path of motion, while the perfective highlighted the endpoint.

The evidence from these studies of the use of verb aspect in readers’ constructions of situation models seems to indicate an interaction between this grammatical feature and comprehenders’ resultant interpretations of the events portrayed. Specifically, the use of the two different aspects caused comprehenders to focus attention on different salient features in their mental reconstructions of events.
Evidence from Discourse Analysis

The previous studies of situation models examined the impact of verb aspect in individual sentences. Discourse studies examine the impact of verb aspect in a longer context. Similarly to the manner in which verb aspect is thought to foreground and background different features of event representations, it is also thought to play a role in the foregrounding and backgrounding of discourse information. The imperfective is typically used to provide background in a story, such as information about the setting, concurrent activities, the nature of the environment, the states of minds of the characters, and so on, as in the example She was baking a cake when the child demanded a cookie. Here, the primary plot event is not the fact that she was baking, but that the child demanded a cookie. Typically, the plot is momentarily suspended while this backgrounding occurs, as in this passage from the recent popular novel Sidewas in which the protagonist takes time out from his narration of activities to describe the setting: “I unhooked the golf towel from my bag and climbed down the hazard. I leaned my back against the face of the bunker and lazed there. In the distance, a fog bank was lowering on the horizon, slowly swallowing the mid-afternoon sun” (Pickett, 2004).

Perfective aspect, on the other hand, carries the action and moves the plot forward, as in this terse action sequence from the same novel: “I pulled back the cocking lever on the thirty-ought-six, then tickled Brad’s ear with the end of the barrel. I screwed the muzzle into the back of his head. Brad blubbered. Jack yelled at him…I shifted the gun away from his head and raised it to the air” (Pickett, 2004). In this sequence, the action does not let up for a moment.

In a narrative, an event described in the imperfective can serve as background for other events described in the perfective (e.g., Hopper, 1979). For instance, consider the following two sentences: Sam was flying a kite when the string broke vs Sam flew a kite and then the string
broke (examples from Wagner, 1997). In the first sentence, the kite flying is background information for the plot element of the breaking of the string. In the second sentence, the two events have more of less equal status. This reading follows an analysis by Dowty (1984), in which the imperfective is linked to readings of “overlap,” while the perfective lends itself to “succession” interpretations. In other words, the imperfective can be used to convey that events are concurrent, while the perfective conveys serial events.

Magliano and Schleich (2000) investigated how the differential use of aspect in a narrative context influenced readers’ construction of situation models. The authors performed a series of experiments to assess the impact of verb aspect on 1) the perception of the duration of an event in a narrative; and 2) the activation level of information in the story representation. In Experiment 1, subjects read short stories of approximately 10 sentences. After a brief introduction consisting of several sentences, a critical sentence appeared with the central event of the story portrayed in either perfective or imperfective aspect (e.g., Betty was delivering their first child vs. Betty delivered their first child). Subjects then read three more sentences, designated the post-aspect sentences, that continued the story but did not give clues as to whether the critical event had been completed or was still ongoing. Subjects were asked a “yes/no” question after one of these four sentences (the critical sentence plus the three post-aspect sentences) as to whether they considered the critical event to be completed. The dependent variable was the probability of answering the aspect question with a “no,” indicating that the event was perceived as ongoing.

Results indicated a significant main effect of aspect, such that activities described in the imperfective aspect had a higher probability of being considered ongoing than events described in the perfective. The authors concluded that aspect did influence the perceived duration of the
critical event, and that aspect was a cue that the event will be ongoing in the subsequent narrative context, in this case over the next few sentences.

Magliano and Schliech next investigated what they term the “tagging” function of aspect. Specifically, they hypothesized that imperfective aspect may tag information of ongoing importance and relevance to the subsequent context. This tagging may in turn lead to higher activation and increased availability of this information in story representations. Other research appears to support this tagging function. Schramm (1998) found that an action that may have later consequence was more available when conveyed in imperfective aspect, while Carreiras et al. (1997) found that a character whose activities are conveyed in imperfective aspect was more available subsequently.

Magliano and Schliech’s Experiment 3 added a recognition-priming task to the procedure from Experiment 1. In recognition priming, a previously encountered stimulus should be responded to more quickly, due to preactivation, than one that has not been previously encountered. Subjects read short stories as in the previous task, this time with the addition of a verb phrase after the critical aspect sentence and the third post-aspect sentence. These phrases were the untensed verb phrases from the critical sentence (e.g., deliver baby). Subjects were asked to determine whether the activity had occurred in one of the prior sentences. The dependent variable was the decision latency.

A significant main effect was found for imperfective vs. perfective sentences, such that an activity conveyed in imperfective aspect appeared to have a higher level of activation than the same activity conveyed in perfective aspect. That is, the activation level of deliver baby was higher after subjects had read was delivering than after subjects had read delivered. Response times were faster to the target both immediately after the sentence containing the event, and after
three intervening sentences, though slightly slower in this case.

However, the authors questioned whether aspect truly enhanced the activation level of information or instead caused information to decay at a slower rate over subsequent context. In Experiment 4, they addressed this issue by examining readers with high and low working memory spans. They reasoned that maintaining an event at a high state of activation consumed memory resources; therefore, readers with a high span should be better able to maintain high levels of activation, and their decay rate should be shallower than that of low-span readers.

Participants first completed the story question-and-answer procedure as in Experiment 3, then were tested for working-memory span. A significant working memory span x aspect x sentence position interaction was found, with aspect having a differential impact on recognition latencies for low- and high-span readers. Overall, the authors concluded that aspect does not enhance the activation level of information, but rather influences the rate of decay of activation over subsequent sentences. In-progress activities were maintained at higher levels of activation compared to completed activities, they said.

Results from this study, in conjunction with results from the other studies on the influence of verb aspect on situation models, suggest that different aspects cause different event features to be activated by comprehenders and for these feature activations to be maintained longer when they are presented in the imperfective aspect.

The preceding studies suggest, from a viewpoint that stresses the role of event representations in the organization and structure of semantic memory, that the imperfective facilitates access to event features, so that these features should be accessed more quickly and their activation maintained longer when an event is denoted in the imperfective aspect as compared to the perfective. This assertion can be tested with on-line priming studies.
SEMANTIC PRIMING

Semantic priming is a much used and well-accepted method to illuminate the structure of semantic memory (e.g., Plaut, 1995). Researchers have interpreted findings from priming studies as reflecting the basic organization of knowledge in semantic memory. Priming studies typically demonstrate that after the presentation of a semantically related word (the prime), a subsequently presented word (the target) will have a faster response time, demonstrating a higher activation level, than if the preceding word had been unrelated. Thus, if a reader is first presented with bread, then butter, their response time should be faster than if first presented with bread, then doctor. One account often invoked to explain priming results is spreading activation, which views semantic memory as a network of interconnected nodes. When one concept gets activated, it spreads activation across the links and activates related concepts (e.g., Collins & Loftus, 1972).

Several methodological variables can be manipulated in priming experiments. First, the stimulus onset asynchrony (SOA), the time between the presentation of the prime and the presentation of the target, can be varied. Short SOAs (below 250 ms) are believed to demonstrate automatic processes, while SOAs over 250 ms are thought to allow strategic processes to drive priming, such as expectancy generation or backwards checking (Neely, 1991). Prospective expectancy generation is hypothesized to occur when subjects notice some prime-target pairs are related and then subsequently generate possible related targets when presented with a prime. This amplifies priming effects, because subjects do sometimes generate the correct target. However, if the SOA is kept short, it is assumed that subjects do not have enough time to generate an expectancy set (Neely, 1977). Similarly, it is argued that retrospective processing occurs when subjects evaluate the relationship between the prime and target in the time between the presentation of the target and their response.
The second methodological variable that can be manipulated in priming experiments is the task used to measure response times to the target. Response times can be measured with a naming task, in which the target is simply said aloud, or with a lexical or semantic decision task. In a lexical decision task, the respondent must typically answer “yes” or “no” as to whether the target is a word by pressing a button. A semantic decision task might ask the respondent to determine whether the target is alive by choosing a “yes” or “no” button. These tasks are believed to reduce the use retrospective processing by shifting subjects’ attention from any apparent relationship between the prime and target to focusing on the relevant decision. Thus, the use of a short SOA in conjunction with either a naming or a lexical or semantic decision task is taken as tapping automatic, rather than strategic, processes.

Evidence from Semantic Priming Studies

Word-to-word semantic priming studies have demonstrated that event knowledge impacts processes used in understanding sentences and may guide expectancy generation. For instance, verbs have been shown to prime thematic role fillers such as agents, patients, and instruments typically involved in particular events (Ferretti, McRae & Hatherell, 2001). Priming also has been shown in the other direction, from nouns denoting typical agents, patient, instruments and locations of events to verbs (McRae, Hare, Elman & Ferretti, 2005). Finally, priming has been shown from nouns that denote events to different features of these events, such that sale primes shopper, locations prime objects commonly found there (barn – hay), and instruments prime things on which they are commonly used (key – door) (Hare, Thomson, Kelly, & McRae, submitted). These accounts emphasize the interaction of lexical and world knowledge, in which generalized everyday experience with entities, objects and events is drawn on during sentence
processing. A prediction following from this viewpoint is that as verbs are encountered, they should immediately activate specific knowledge about the events they encode.

Ferretti, McRae and Hatherell (2001) investigated whether reading or hearing a verb provided immediate access to a generalized event structure and activated information regarding typical agents and their features, patients, instruments and locations.

This study used a short 250 ms SOA priming task with both semantic and lexical decisions. Verbs were presented as the primes and nouns denoting agents, patients, locations and instruments were the targets. In the semantic decision task, participants had to determine whether the target was an animate noun by making a “yes/no” decision to a question such as “Does this word refer to something that is alive?” In the lexical decision task participants had to determine whether the target was a word.

Significant priming effects were found from verbs to typical agents (arresting-cop), features of the agents (investigating-suspicious), patients (arresting-crook) and instruments (shot-pistol). The authors concluded that these results demonstrated that memory is structured so that when a verb is read or heard, generalized situation knowledge is activated. A salient part of this knowledge is information regarding agents, patients, features and instruments.

No priming was found from verbs to locations (e.g., cooked-kitchen). Several explanations for the lack of priming for locations were offered. The authors considered that perhaps location roles are not as well defined as other roles for these verbs. If the situations described by the verbs can occur in a wide variety of locations and are not as mutually similar as may be the case with agents, patients, or instruments, then the lack of specificity of the locations may have led to lack of priming. For instance, one item was strolled-park. The authors point out that there are many locations where strolling can occur; one can stroll in a park, but one can
stroll in other locations as well. There may be less generality in verb pairings with agents, patients, instruments and features than with locations. For example, the verb-agent pair *arresting-cop* is quite specific because few people can arrest others. Additionally, the probability of *cop*, given *arrested*, may be higher than the probability of *park*, given *strolled*.

Ferretti et al. also suggested that the lack of priming may reflect the fact that the location at which an event takes place is not a salient part of its situation structure. Hence, location may be less frequently encoded as part of an episode. They further argued that locations may be important for specific autobiographical memories of events, but may not be sufficiently generalizable to form a structured class.

However, a closer examination of this study raises several points of interest. Different morphological verb forms were used across the experiments. Agents, their features, and patients were all paired with a verb in the present participle (*-ing* ending). Instruments and locations were paired with verbs in the simple past tense (*-ed* ending). While there were valid methodological reasons to do so (such as avoiding the creation of familiar sounding descriptions, like *serving platter*, by using a past form of the verb), this choice may have had implications for the results, as will be discussed below.

Additionally, a semantic animacy decision was used with agents and patients, while a lexical decision task was used for instruments and locations. This may have resulted in weaker priming effects for locations. It has been argued that a semantic decision task taps semantic activation better than a lexical decision or naming task (Jordens & Becker, 1997; de Groot, 1984; McRae & Boisvert, 1998). Again, the researchers had valid methodological reasons for this choice. The authors explained they used the lexical decision task due to their inability to devise a semantic decision task that they were confident would evoke unambiguous positive responses for
both instruments and locations, which were tested together in the same experiment.

Finally, in all experiments priming was from a verb to a noun. It is possible that changing one or all of these conditions – nature of decision task, verb form, or prime-target order – may result in priming of locations. In fact, a later study did find priming for locations when a different verb form was used and when priming proceeded from noun to verb.

Using a short SOA presentation with a naming task, McRae, Hare, Elman and Ferretti (2005) found significant priming when verbs were named aloud following agents, patients, instruments, and locations. This study differed from that by Ferretti and colleagues (2001) in several ways. First, prime-target order was reversed, with priming proceeding from nouns to verbs, e.g., *pen* − *writing*. Second, verb targets for agents, instruments and locations were presented in the present participle (-*ing* ending) form. By comparison, the study by Ferretti et al. used a past (-*ed*) verb form with locations.

It seems possible that the change in verb form, from simple past tense to the present participle, influenced these results. Recall that verb aspect is indicated by verb suffixes that can also mark tense, and that aspect is thought to provide a perspective on an event that can influence the interpretation of the event. Changing what appeared to be verb tense, from the simple past tense (-*ed*) to the present participle (-*ing*), may have also shifted aspectual interpretation, resulting in different features of the event becoming more or less salient depending on the aspect in which it was portrayed. Below I review a set of studies that might be taken as evidence for this position.

_Semantic Priming Studies and Verb Aspect_

In previous priming studies, priming between the locations at which events typically
occur and verbs denoting those events has only been found once. McRae et al. (2005) found priming when a typical location for an event preceded the verb and the verb was in the present participle form (-ing ending). However, priming was not found when the verb was in a past tense form (-ed ending) and preceded a location (Ferretti et al., 2001). Typically, in priming studies a particular verb form is chosen and used consistently as either the prime or target. For instance, agent-verb pairings may be constructed following a noun-present participle pattern, such as actor – performing and lawyer – defending. Similarly, patient-verb pairs may follow a noun-past tense pattern, such as ball – thrown or clothes – worn. An entire category of relationships is examined using a consistent verb form. This is what the priming research discussed previously did.

However, as suggested by situation model research and discourse analysis, changing the form of the verb may cause different event features to be activated. Thus, it is possible that verbs in the imperfective aspect might cause different event features to be seen as salient and differential priming effects might be observed between event features and the two differentaspectual verb forms.

Ferretti, Kutas and McRae (2007) investigated the effects of using different aspectual verb forms to prime the same target location. Ferretti et al. (2001) had found that verbs primed typical agents, patients, features and instruments, but did not prime locations. Hypothesizing that changing the verb form might result in priming for locations, Ferretti and collaborators used a naming task and a short SOA procedure with verbs in the imperfective and perfective aspects to assess this.

Their results showed that typical locations for events did prime following related verbs, but only if the verb was in the imperfective aspect (was skating), not if the verb was in the perfective aspect (had skated). The authors suggested this pattern of priming occurred due to the
different temporal event structures indicated by the aspectual verb forms. Presumably, location is a more salient feature of an ongoing activity than a completed one. Typically, once an activity is completed, a person moves on to something else that may be at a different location, therefore the location of a completed event may be less relevant. Earlier studies may not have found priming for locations because they used a past tense verb form (-ed ending), which uses the same suffix as perfective aspect, and thus may have caused the event to be interpreted as completed. The location at which an event occurs may not be considered a salient event feature when an event is portrayed as completed. This explanation dovetails with results from studies of situation models, in which locations were more prominent in comprehenders’ mental representations of events portrayed in the imperfective aspect. Thus, an interaction between the event representation and verb aspect appears to modulate the activation of salient information.

In Experiment 2, Ferretti et al. found that participants generated more location prepositional phrases in a sentence completion task when the event was presented in the imperfective aspect as contrasted with the perfective aspect. This finding highlights the role of verb aspect in directing activation to the salient characteristics of events, so that a location completion is more likely to be supplied for an imperfective sentence than a perfective sentence. Finally, using measurements of event-related potentials, Experiment 3 showed that readers were more likely to expect sentences marked with imperfective aspect to contain location information than sentences marked with perfective aspect.

In summary, research with situation models, discourse analysis and semantic priming appears to demonstrate an interaction between the aspectual form of the verb and generalized event knowledge in the activation of salient information. This research has focused on adults, and the question remains as to the influence of verb aspect in children. Will children be equally
sensitive to and responsive to verb aspect, or is there a developmental progression as in so many other areas of language acquisition? If verb aspect cues interact with event representations, it may be that children are not sensitive to these cues until they have acquired a certain critical mass of event knowledge. Thus, a developmental progression may be observed in children’s use and understanding of verb aspect.

DEVELOPMENTAL PROGRESSION

Support exists for a developmental progression in children’s use and understanding of verb aspect. Both Weist (1991, Weist et al., 1991, 1997) and Wagner (1997, 2001, 2002) found a clear developmental progression in children’s use and understanding of verb aspect to mark the ongoing/completed distinction from ages 1 through 5. However, this developmental progression may extend beyond the age of 5. Weist (2002) suggests that children may not have fully adult-like understanding of temporal concepts and sequencing until as late as age 8 or 10. This observation is echoed by Tomasello (2000), who suggests that children may not have adult-like competencies in many areas of language until at least age 8. In regard to verb aspect, Berman and Slobin (1994) argue that children before age 5 do not use the imperfective aspect to background information in narrative, and that they do not become proficient at using it to do so until age 9 or 10.

Research to date has only investigated the use and understanding of verb aspect in children through the age of 5. Wagner (1997) examined Berman and Slobin’s claims in a series of experiments designed to compare children’s and adults’ understanding of the role aspect plays in a narrative. Wagner provided the initial sentence of a story, written in either perfective or imperfective aspect, and asked children and adults to continue the story. Wagner’s expectation
was that if children and adults were sensitive to aspe\ntual cues, they should respond with
sentences that continued the narrative event in a consistent manner, as either completed or in-
progress.

Both adults and children (ages 4;3 to 5;11, mean age 5;0) were provided sentences such
as *Jill was carrying the heavy box to the table* (imperfective) or *Jill carried the heavy box to the
table* (perfective). Participants responded with sentences that continued the story, for instance,
“*Then she carried the light box to the table.*” Analysis of responses showed a significant effect
for adults for the aspect of the initial sentence. Adults consistently responded in the same aspect
as the initial sentence. By contrast, there was no significant effect of aspect for children, who
responded primarily in the perfective regardless of the aspect used in the initial sentence. Wagner
concluded that adults showed sensitivity to the backgrounding function of imperfective aspect,
but that children under the age of 6 showed no such sensitivity, thus confirming the claims of
Berman and Slobin.

However, children’s lack of sensitivity to aspect may have been due to a failure to
understand how aspect is used rather than a failure of comprehension. That is, children’s
language production may not show sensitivity to aspect, but their comprehension might.
Therefore, Wagner designed another experiment to examine children’s knowledge of aspect at
the sentence level.

In Experiment 2, children matched sentences to events. Two age groups were used, the
younger group ranging in age from 1;8 to 3;2 (mean age 2;6) and the older group ranging from
3;3 to 4;4 (mean age 3;7). Each child was presented with two versions of an event, one partially
completed, one totally completed. The child was then given two sentences that described the
scenes (as uttered by two stuffed animals), one in perfective aspect and the other in imperfective.
Children were asked to match the sentences to the two events, one at a time. The sentence children were asked to match first was counterbalanced across trials. To be correct, subjects needed to match the imperfective sentence to the in-progress event and the perfective sentence to the completed event.

The results showed a significant difference between the older (mean age 3;7) and younger (mean age 2;6) age groups. The older children had a mean score of .80 correct, while the younger children had a mean score of .59, which did not differ significantly from chance. Wagner concluded that from the age of about 3;7, children show an understanding of aspect in that they recognize the forms and use them to mark the correct instantiation of events as completed or ongoing, even though they may not be able to produce them correctly.

Wagner’s results contrast with those found by Weist (1991, Weist et al., 1991, 1997). In a series of picture-matching studies using similar methods, Weist found that children as young as 2;6 could reliably and consistently match an imperfective sentence to a picture of an incomplete event, and a perfective sentence to a picture of a completed event.

However, the pictures used by Weist in his picture-matching tasks portrayed the agents in addition to the objects of the events. For instance, in a picture that showed a half-drawn flower, a girl was also show busily working on her drawing. By contrast, in a picture that showed the completed event the girl is shown smiling, sitting back and apparently satisfied (Wagner 2002, p. 114). Wagner suggested that perhaps children succeeded in his tasks at younger ages because they could use information about the intentions of the agent to make their judgments.

To assess children’s use of agent information, as opposed to strictly asceptual information, Wagner (2002) designed a series of experiments that did not include information about agents’ intention in the event depictions. Rather than using pictures, scenes were created
with objects that focused only on the completion state of the event, such as a completed puzzle or a half-completed puzzle. Because the agent-information was absent, children could only rely on grammatical aspect and completion status (ongoing vs. completed) when they matched sentences to scenes.

A forced choice sentence-to-scene matching task was performed with two-, four-, five-year olds. Children were asked to match two sentences as uttered by toy stuffed animals, one sentence in perfective aspect and one in imperfective (e.g., *I filled in a puzzle, I was filling in a puzzle*), to two event depictions (e.g., a completed puzzle or a half-completed puzzle). For a trial to be counted as correct, the perfective sentence had to be matched to the completed event and the imperfective sentence to the incomplete event.

Children aged 2 and 4 performed at chance with sentences in both aspects. Only the 5-year-olds performed significantly above chance. Wagner’s results indicate that when agent information was absent, children younger than five could not consistently match sentences to the proper depictions. These results support the claim that children do not understand the completion entailments of grammatical aspect until about age 5. These results additionally suggest that the children in Weist’s tasks succeeded at a younger age by utilizing information regarding agent’s intentions rather than responding solely to aspectual cues.

These studies show a developmental progression in children’s understanding and use of grammatical aspect, such that younger children may understand the completed/ongoing distinction marked by aspect, but are not yet able to produce the proper forms when appropriate. Further, children younger than 6 do not yet seem to understand the narrative backgrounding function of aspect. Use and understanding of grammatical aspect therefore appears to be an especially subtle skill that may still be developing in late childhood.
CURRENT STUDY

Research shows that children’s understanding and use of verb aspect continues to develop at least until age 6. Berman and Slobin (1994) suggested that children may not be proficient at certain functions of aspect until age 9 or 10. However, little is known about children’s developing use and understanding of aspect, either grammatically or conceptually, in late childhood. This study investigates children’s sensitivity to aspectual cues between the ages 11-12, a time pinpointed by several researchers (Berman & Slobin, 1994; Tomasello, 2000) as one in which children may be approaching adult-like language competencies. Previous studies using semantic priming have found that children aged 11-12 respond similarly to adults (Kelley, Oswianiecki, and Hare, 2006), demonstrating priming of the same magnitude to the same stimuli. The current research question involves children’s use of aspectual cues in determining location salience for an event. Specifically, when presented with verbs in the imperfective (-ing ending), will children show priming for locations typical of the events denoted by the verb?

Priming with aspectual verb forms has only been demonstrated once in adults. Ferretti et al. (2007) found that adults showed naming facilitation for typical locations following imperfective verbs, but did not show naming facilitation when locations followed perfective verbs. Experiment 1 first replicates Ferretti et al. with a partially novel set of verb-location word pairs with adults. Having established that the novel stimuli do elicit priming in adults, I then test whether children aged 11-12 will prime similarly to adults when presented with the same stimuli and experimental paradigm.

EXPERIMENT 1

Ferretti et al. (2007) showed that naming latencies for locations were facilitated after
presentation of verbs in the imperfective aspect, but not facilitated for verbs in the perfective aspect. The verb-location pairs used in the study were originally devised and normed in Canada (Ferretti, McRae & Hatherell, 2001), and the priming study was performed on college undergraduates. It was judged that some of the verb-location word pairs might be unfamiliar or inappropriate for U.S. children (e.g., gamble-racetrack). Thus, the primary aim of this experiment was to develop and validate a list of verb-location pairs suitable for U.S. children and to replicate the results of Ferretti et al. (2007) with a modified stimuli set.

Method

Participants

Forty-eight undergraduates at Bowling Green State University enrolled in psychology courses participated for course credit. Students were recruited via Experimetrix, an online registration program. All were native English speakers who had normal or corrected-to-normal vision. The average age of the participants was 19.1 (SD = 0.95) and 60% were female. Forty (83%) of the participants reported their ethnicity as Caucasian, 6 (12.5%) reported African American ancestry, and 2 (4%) reported Asian ancestry.

Materials

The priming stimuli consisted of twenty-four verb-location pairs listed in Appendix A. Eight of these verb-location pairs were drawn without modification from Ferretti et al. (2007). Slight adjustments were made to 10 verb-location pairs in consideration of pre-adolescents’ age and word familiarity and to conform to colloquial American English (e.g., dance-ballroom replaced with dance-party). Six word pairs were deleted and replaced with novel verb-location
pairs that were judged to be more relevant to children’s interests (e.g., *browse-museum* replaced with *skate-park*). After development of the initial word list, several children of the targeted ages evaluated the list, identified unclear or unfamiliar words, and made recommendations for clarification.

Four word lists were created (see Appendix B). Across the lists, each verb was presented in two aspectual forms, the imperfective (*was skating*) and the perfective (*had skated*). In addition, each verb was paired with either a related (*was skating-arena*) or unrelated location (*was praying-arena*). Thus, there were four possible combinations of aspect and relatedness (imperfective/perfective x related/unrelated). Altogether, each list contained 6 related / imperfective verb-location pairs (*was skating – arena*), 6 related/ perfective verb-location pairs (*had skated – arena*), 6 unrelated / imperfective verb-location pairs (*was praying – arena*), and 6 unrelated / perfective verb-location pairs (*had prayed – arena*).

Unrelated verb-location pairs were formed by re-pairing the related verb-location combinations (e.g., *was skating-arena* and *was praying-church* were re-paired as *was skating-church* and *was praying-arena*). This allowed each target location to serve as its own control in the naming task. Each participant saw each verb in only one aspect-location pairing (e.g., a participant saw either *was skating-arena* or *had skated-arena*) and in either its related or unrelated pairing. That is, each participant saw only 1 of the 4 possible aspect x relatedness combinations. Across all lists, each verb-location pairing was seen in all 4 aspectual and relatedness forms.

Forty-eight filler items and 12 practice items consisting of unrelated verb-location pairs were added to each list. Fillers were included to prevent subjects from noticing a pattern and generating expectancies or using strategies. Half of the fillers used verbs in the imperfective
aspect, while the other half used verbs in the perfective aspect. The relatedness proportion between test items and fillers was 0.17. Typically a relatedness proportion of 0.25 or below is considered sufficient to prevent subjects from noticing patterns (de Groot, 1984; Stoltz and Neely, 1995). Altogether, each list consisted of 84 word pairs (12 practice, 48 fillers, and 24 verb-location pairings of interest). The priming task took approximately 10 minutes to complete.

Procedure

A 250 ms short stimulus onset asynchrony (SOA, the time between the onset of the prime and the onset of the target) naming task was used. Subjects were seated in front of a computer screen in a quiet room. Stimuli were presented using a Macintosh iBook computer with a 12” monitor running PsyScope software (Cohen, MacWhinney, Flatt & Provost, 1993). Each trial consisted of the following: a focal point (+) in the center of the screen for 250 ms; the prime (e.g., was skating) for 250 ms; then the target (arena) until the participant named the noun. The intertrial interval was 1500 ms. Participants were instructed to read the verb phrase silently to themselves and to read the location aloud into a microphone as quickly and accurately as possible. Latencies were recorded with millisecond accuracy via a Carnegie-Mellon University button box attached to the computer, which measured the time between the onset of the target presentation and the naming response. Testing sessions began with the practice trials, followed by a series of filler items before presentation of the test items, which were interspersed with the remaining filler items.

Results

Analyses of variance were conducted on the naming latencies. The two independent
variables of interest were aspect (perfective vs. imperfective) and relatedness (related vs. unrelated). Both relatedness and aspect were within subjects ($F_1$) and within items ($F_2$). List was included as a between-subjects dummy variable and item rotation group as a between-items dummy variable to stabilize variance that may result from rotating subjects and items over lists (Pollatsek & Well, 1995). Effects involving these dummy variables are not reported.

A trial was excluded from analysis if the response was incorrect or the equipment had malfunctioned. Pronunciation errors and microphone failures occurred on less than 1% of the trials. Response latencies greater than 3 standard deviations above the grand mean were replaced by the value that was 3 standard deviations above the mean. Less than 1% of the scores were replaced in this manner. Mean naming latencies by condition are presented in Table 1.

A significant aspect by relatedness interaction was observed, $F_1(1, 44) = 7.42, p = .009$; $F_2(1,20) = 7.33, p = .014$. This interaction reflects a 14-ms priming effect for locations when related verbs were marked with imperfective aspect ($M = 562, SE = 11.6$) but no priming effect when related verbs were marked with perfective aspect ($M = 576, SE = 11.8$). Collapsed across relatedness, naming latencies were shorter for imperfective ($M = 568, SE = 11.6$) than for perfective trials ($M = 573, SE = 11.9$). Latencies for related items ($M = 569, SE = 11.5$) were shorter than for unrelated items ($M = 573, SE = 12.2$) when collapsed across aspect. However, neither of the main effects of aspect or relatedness reached significance.

Summary

Experiment 1 replicates priming in adults for locations following events denoted by related verbs in the imperfective aspect, but not after following related verbs marked by the perfective aspect. Specifically, participants named locations more quickly when they were
preceded by related verbs marked with the imperfective aspect. Experiment 1 also confirms the
generalizability of Ferretti’s findings, in that the majority of the of the 24 verb-location pairs
used here were different from those in the Ferretti et al. (2007) study, with 10 (42%) of items
modified from the original and 6 (25%) novel. The current results support findings from situation
model and discourse studies that demonstrate the salience of event location when events are
portrayed by imperfective aspect. The imperfective aspect denotes that an event is ongoing; thus,
the location at which it occurs is likely to be relevant. By contrast, the perfective denotes that an
event is completed, thus location information may no longer be considered necessary.

EXPERIMENT 2

Young children around the age of 5 seem to have some awareness of the role that verb
aspect plays in conveying different features of events, such as the ongoing or completed
distinction (Wagner, 1997, 2001, 2002; Weist, 1991; Weist et al., 1991, 1997). However, young
children of this age do not appear able to use verb aspect for more subtle purposes, such as to
background or foreground specific types of information, which adults do easily. Therefore,
sensitivity to aspectual cues in denoting the salience of a location to an event may be a more
fine-grained distinction of which children may not yet be aware.

If use of grammatical aspect is a subtle skill that continues to develop over time, then
priming from verbs to related locations might be expected in older children when the verb is in
the imperfetive form, as is obtained with adults. However, children may be more sensitive to the
overall event-location relationship, and thus may demonstrate priming for all related verb-
location pairs, regardless of aspectual form. If priming is obtained in children for related
locations after both aspectual forms, this would indicate that children are responsive to the verb-
location relationship, but not to the more subtle focusing role of aspect. If no priming is found under any conditions, children may be unaware of the relationship between verbs and the locations at which the events denoted occur.

In order to assess children’s awareness of the verb-location relationship and to determine whether aspect plays a modulating role, we then tested children the same priming procedure used for adults in Experiment 1. Earlier work has found that children aged 11-12 respond similarly to adults in this task, such that objects typically found at a location are named faster following that location than an unrelated location. This work demonstrates that children are aware of the salience of location in regard to objects typically found at that location. However, the verb-location relationship may be less obvious, and the focusing role of verb aspect may be even less apparent.

In order to investigate the possible influence of children’s reading skills and vocabulary on their sensitivity to verb aspect and the verb-location relationship, we administered three additional measures. Two subtests from the Woodcock-Johnson Tests of Achievement III (WJR-III; Woodcock, McGrew & Mather, 2001) assessed children’s reading comprehension and ability to sound out novel words, and the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1981) assessed the extent of children’s vocabulary.

Method

Participants

Thirty-six children (14 males, 22 females) age 11-12 participated (mean age = 11.8, SD = 0.56). Thirty-five were Caucasian (1 was African-American), and all were native English speakers with normal or corrected-to-normal vision. All children had demonstrated normal
language development and normal hearing. Children were recruited from Bowling Green and Cincinnati, Ohio, and were paid $10 each for their participation.

Materials

*Priming Stimuli.* Materials were identical to those used in Experiment 1.

*Measures of Reading Skills.* Reading comprehension and word decoding skills were assessed using the Woodcock-Johnson Tests of Achievement Revised III (WJR-III; Woodcock, McGrew & Mather, 2001), a standard psychological and educational instrument. Vocabulary was assessed with the Peabody Picture Vocabulary Test-III (PPVT-III; Dunn & Dunn).

Procedure

The priming procedure was identical to that used in Experiment 1. After completing the priming tasks, children completed the reading comprehension, word decoding, and vocabulary assessments. The Woodcock-Johnson reading comprehension subtest requires children to read sentences in which a word is missing and to orally provide the missing word. The Woodcock-Johnson word attack subtest asks children to read aloud 31 nonsense words to assess their ability to sound out novel words. The PPVT presents children with an array of 4 drawings while the assessor pronounces a word; the child must identify the picture that matches the word. Standardized PPVT scores were computed for each child. The order in which children completed these tasks was randomly assigned. All together, testing sessions took approximately 45 minutes to complete.

Results

Analyses of variance were conducted following the same procedures as in Experiment 1.
Pronunciation errors and microphone failures occurred in less than 1% of the trials and were excluded from analysis. Due to the high rate of variability in mean response latencies between children (individual response times varied from less than 500 ms to more than 1000 ms), individual means and standard deviations were computed for each child. Any values more than 3 standard deviations above each child’s individual mean were replaced with the value that was three standard deviations above the mean. Less than 1% of the data were replaced in this manner.

A main effect of relatedness was observed, $F_1(1,32) = 4.94, p = .034; F_2(1,20) = 5.51, p = .028$. Naming latencies for related items ($M = 625, SE = 20.8$) were 12-ms faster than latencies for unrelated items ($M = 637, SE = 20.2$). However, naming latencies for items marked with imperfective aspect ($M = 631, SE = 20.6$) did not differ from latencies for items marked with perfective aspect ($M = 632, SE = 20.2$). Furthermore, relatedness and aspect did not interact (both $F_1$ and $F_2 < 1$). Mean naming latencies by condition are presented in Table 2.

These same analyses were conducted on a subsample ($n=32$) using children’s reading comprehension, decoding and vocabulary scores as covariates. No significant covariate effect was observed for any of these variables.

GENERAL DISCUSSION

Young adults (mean age = 19.1) demonstrated an interaction between verb aspect and relatedness on naming latencies for related locations, but pre-adolescents (mean age = 11.8) only showed a relatedness facilitation. Specifically, pre-adolescents were faster to respond to a location when a related verb preceded it (e.g., was skating-arena or had skated-arena) than when an unrelated verb (e.g., was praying-arena or had prayed-arena) preceded it. Verb aspect did not appear to modulate this relationship in pre-adolescents.
Three patterns of results had been possible for the pre-adolescents in Experiment 2. First, 11-12 year old children could have responded similarly to adults by demonstrating facilitated naming latencies for locations following related verbs marked with imperfective aspect, but not for locations following related verbs marked with perfective aspect. In this case, aspect would be modulating the effect of relatedness. Second, children could have demonstrated faster responding to locations after related verbs regardless of aspect. In this case, children would be demonstrating awareness of the relationship between the verb and a typical location for the event denoted, with no modulation by aspect. Third, children could have responded equally to all conditions, thus demonstrating no awareness of the verb-location relationship and no awareness of the role of verb aspect in focusing on certain features of events.

The second pattern of results, a main effect of relatedness with no modulation by verb aspect, was found for 11-12 year olds in this study. Pre-adolescents were equally as fast to name locations after seeing related verbs in both imperfective and perfective aspect, and slower to name locations after seeing unrelated verbs in either aspect. This response pattern differs from young adults, who name locations faster only after seeing related verbs marked with imperfective aspect, and do not show such facilitation when the related verb is marked by perfective aspect.

Since grammatical aspect does modulate the responses of young adults to related verb-location pairs, the 11-12 year olds in this study most likely are still developing awareness of the focusing role of verb aspect. This development may occur in the years between early and late adolescence. Pre-adolescents may be unaware of the focusing role of grammatical aspect for at least two reasons. First, pre-adolescents may not have acquired enough linguistic experience to note the subtle differences conveyed by verb aspect. Second, if verb aspect cues interact with event representations, pre-adolescents may not have yet acquired a critical mass of event
knowledge or enough diversity of experience on which to draw in making interpretations.

Developmental Progression

Recent studies demonstrate that adults access event-based knowledge quickly during language processing (McRae et al., 2005; Hare et al., submitted), and that this knowledge interacts with lexical knowledge and grammatical cues to produce priming (Ferretti et al., 2007). If this facilitation results partly as a function of experience with commonly occurring events and linguistic descriptions of them, it may be that priming resulting from the interaction of event knowledge and linguistic cues increases as a function of age and experience. The 11-12 year olds in this study simply may not have gained enough experience with language, diverse events, or both, in order to be able to utilize aspectual cues in accessing event representations.

Development of event knowledge. A priming study examining children’s development of event knowledge found that 11-12 year old children appeared sensitive to the same event relationships to which adults have demonstrated sensitivity. Kelley, Owsianiecki and Hare (unpublished) presented children between the ages of 9-10 and 11-12 with word pairs referring to a location and an object commonly found there. Children in both age groups responded faster to objects typically found at related locations. Priming was not found for objects that were preceded by unrelated locations. For instance, farm reduced response latencies to tractor, but not to gym. The results for the 11-12 year olds students were nearly identical to those found by Hare et al. (submitted) using adult participants with the same stimuli and a similar procedure. The results from Kelley et al. and Hare et al. suggest that the event representations of children and adults were structured similarly, so that event information was rapidly accessed by both groups when presented with the location prime and facilitated response time to the target. Pre-adolescents and
younger children appeared to have sufficiently developed event representations to prime similarly to adults for location-object pairs.

In the current study, 11-12 year old children’s event representations appeared sufficiently developed so as to yield facilitated naming latencies for locations following related verbs, but no facilitation for locations following unrelated verbs. Thus, as in the Kelley et al. and Hare et al. studies examining location-object priming, children appeared aware of the salient features of events and the relationships among these features, such as the relationships between a location and the events that occur there or the objects that are found there.

Linguistic experience. In contrast to adults, whose responses to locations were modulated by verb aspect, pre-adolescents seemed to be demonstrating primarily a lexical priming effect. That is, 11-12 year old children appeared to be accessing and responding to the basic verb (e.g., skate) and its relationship with a location (e.g., arena), without taking aspectual form of the verb into account. Pre-adolescents did not appear to be distinguishing the imperfective form, was skating, from the perfective form, had skated, and appeared to be accessing the same event features for both forms. Thus, results for the 11-12 year old children display a main effect of relatedness with no interaction by aspect. This lack of modulation by aspect could be occurring in pre-adolescents due either to a failure to detect the different aspectual markers or a failure to utilize these aspectual markers.

To better ascertain whether pre-adolescents are failing to detect or failing to use aspectual markers, a modified priming task could be used. Instead of a reading task, an auditory task could be used in which children would hear the verb phrase spoken through a headset (e.g., was skating or had skated), then respond to either a written or spoken target. Using an auditory task would ensure that all participants heard the different verb forms, and would provide all participants the
same amount of processing time before presentation of the target. Additionally, an auditory task would remove any variation in results due to reading skill or time required for reading. If children still displayed a main effect of relatedness for different aspectual forms using an auditory task, this result would more strongly support the suggestion that 11-12 year old children do not yet utilize aspectual cues to focus upon particular features of events.

Possible Methodological Explanations

There are several possible methodological explanations for the observed pattern of results. First, although attempts were made to recruit students with a range of language abilities, the standardized scores for the vocabulary screening showed that all the children scored at average or above-average (standardized scores ranged from 100-140, \( M = 116 \)). The reading comprehension and decoding skill measures similarly demonstrated small ranges. Researchers have suggested that students with average or above-average reading skills show less semantic priming facilitation than poorer readers (e.g., Plaut and Booth, 2000; Assink et al. 2004). The children in this study may simply have already been proficient readers; accordingly, children’s priming facilitation in this study may have been smaller than the facilitation a sample more varied in reading proficiency might have shown. Any slight differences in facilitation due to verb aspect may not have appeared due to the small overall priming facilitation. Young adults in Experiment 1 were not administered measures of vocabulary or reading skills. It is possible that the adults were a less homogenous group with more diverse skills, which resulted in larger overall gains due to semantic priming and modulation by verb aspect. However, children in this study did demonstrate semantic priming between verbs and locations, and this priming was of nearly the same magnitude as that shown by adults in Experiment 1 to the same stimuli.
Second, reaction times in children tend to show high variation both within and between subjects. The means of individual naming latencies varied greatly between children, with some children having means less than 500 ms, while a few had means near 1000 ms (range = 554, \( GM = 631, SD = 119 \)). By contrast, means in the adult study were much less varied, ranging from 454 ms to 779 ms (range = 325, \( GM = 571, SD = 82 \)). This increased variability may have effectively hidden or overridden any subtle facilitation due to aspect. However, a second analysis of variance for subjects using z scores for the reaction times (e.g., Balota, et al., 2004) was performed. This analysis produced similar results, a main effect for relatedness, \( F(1, 32) = 5.63, p = .024 \), but no main effect for aspect and no interaction between aspect and relatedness (both Fs < 1). Therefore, it seems unlikely that the higher variability in children’s reaction times affected the results.

Third, word frequency may have exerted an effect. Typically, high frequency words result in less priming facilitation than do low frequency words (e.g., Plaut and Booth, 2000). The prime-target pairs used were all fairly common words. In the current study, target locations had a median Kucera-Francis frequency score of 57 (range from 2 to 492, mean = 107), while target locations used in the study by Ferretti et al. (2007) had a median frequency score of 32 (range from 1 to 492, mean = 68). Kucera-Francis word frequency scores indicate the number of times a given word occurred in a million-word dataset. Thus, these scores indicate that the modified stimuli were words of slightly higher frequency than the original stimuli. However, the 11-12 year old children in this study did show semantic priming, and it is unclear how verb aspect would be expected to interact with word frequency effects.

Fourth, priming paradigms are exquisitely sensitive to small timing differences in stimulus presentation. While many picture priming studies have been done with children, fewer
semantic priming studies have been performed, and these methodological variables have not been well explored in children (e.g., Neely, 1991). Altering the time of presentation of the verb prime by as little as 50 or 100 ms may result in modulation of naming facilitation by verb aspect. For instance, an earlier adult pilot study I ran with an SOA 100 ms longer than that used in Experiment 1 did not produce priming in adults. However, children at a long SOA of 800 ms have been shown to perform similarly to adults with a short SOA of 200 ms (Plaut & Booth, 2000). Therefore, lengthening the SOA for children in this task may produce priming modulated by aspect.

Finally, naming tasks typically are less sensitive than lexical decision tasks in detecting priming facilitation (Neely, 1991). The current study used a naming task in order to replicate Ferretti et al. (2007). However, children might show greater facilitation using a lexical or semantic decision task rather than a naming task. Therefore, this feature of the task could be varied as well as timing variables.

CONCLUSION

The results of Experiments 1 and 2 suggest that when a verb is read or heard, situation-specific information is immediately made available. In adults, linguistic knowledge appears to modulate the activation of specific event knowledge, such that when events are portrayed as ongoing through the use of imperfective aspect, features of ongoing events are recalled. Similarly, when verbs are marked by the perfective aspect, the focus may shift to the resultant end state or completed event, with features more relevant to ongoing events such as location being less activated. However, children do not appear to use aspeical cues to modulate the activation of situation-situation knowledge. In children, both imperfective and perfective verb
forms activated similar event features, resulting in priming for locations after both aspectual forms.

Together, Experiment 1 and Experiment 2 support the assertion that children in late childhood and pre-adolescence may still be continuing to develop language competence, as suggested by Tomasello (2000) and Berman and Slobin (1994). Children between the ages of 11 and 12 did not appear to use aspectual cue to retrieve relevant features of events, while young college-aged adults did so. Pre-adolescents instead appeared to be responding to the undifferentiated verb form, without taking notice of aspectual markers. At some point between young adolescence and young adulthood, children must become attuned to the focusing role of verb aspect. Whether this is due to gaining linguistic experience or the acquisition of increased world knowledge and experience is unclear.

This work suggests several directions for future research. Future work could examine adolescents prior to age 18 to determine at what age verb aspect begins to play a role in focusing attention to locations typical of the event denoted by the verb. Currently, we are beginning to examine teens between the ages of 15 and 16 to determine if participants in this age range utilize aspectual cues in the same way that adults do. Finally, future work with young adults could include additional assessments and measures to determine if extent of language experience, range of event knowledge, or both, influences sensitivity to aspectual cues.
References


Table 1.

Mean Reaction Times (ms) by Condition for Adults, Experiment 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>Imperfective</th>
<th>Perfective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SE</td>
</tr>
<tr>
<td>Related</td>
<td>562</td>
<td>11.6</td>
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<tr>
<td>Unrelated</td>
<td>576</td>
<td>12.2</td>
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Table 2.

Mean Reaction Times (ms) by Condition for 11-12 Year Olds, Experiment 2

<table>
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<th>Condition</th>
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<tr>
<td>Facilitation</td>
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<td>12</td>
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Appendix A

<table>
<thead>
<tr>
<th>Verb-location paris from Ferretti et al. (2007):</th>
<th>Novel:</th>
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<tbody>
<tr>
<td>Cook-kitchen</td>
<td>Hike-trail</td>
</tr>
<tr>
<td>Sleep-bedroom</td>
<td>Run-track</td>
</tr>
<tr>
<td>Shower-bathroom</td>
<td>Ski-mountain</td>
</tr>
<tr>
<td>Fly-airport</td>
<td>Climb-cliff</td>
</tr>
<tr>
<td>Park-garage</td>
<td>Sled-hill</td>
</tr>
<tr>
<td>Act-theater</td>
<td>Shop-mall</td>
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<tr>
<td>Eat-restaurant</td>
<td></td>
</tr>
<tr>
<td>Learn-school</td>
<td></td>
</tr>
<tr>
<td>Fish-river</td>
<td></td>
</tr>
</tbody>
</table>

| Modified:                                      |       |
| Work-factory → work-office                     |       |
| Exercise- gymnasium → exercise-gym             |       |
| Wait-lineup → wait-line                       |       |
| Study-library → read-library                  |       |
| Dance-ballroom → dance-party                  |       |
| Swim-ocean → swim-pool                        |       |
| Drive-highway → drive-road                    |       |
| Pray-temple → pray-church                     |       |
| Skate-arena → skate-park                       |       |
Appendix B

Lists and Rotation Groups for Experiments 1 and 2

<table>
<thead>
<tr>
<th>Group</th>
<th>List 1</th>
<th>List 2</th>
<th>List 3</th>
<th>List 4</th>
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<tr>
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<tr>
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<td>Fishing-river</td>
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<td>Working-office</td>
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<tr>
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<td>Flying-airport</td>
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<tr>
<td>4</td>
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<tr>
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<td>Praying-church</td>
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<td>Prayed-unrelated</td>
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</tbody>
</table>
Notes

1 Grammatical, or viewpoint, aspect can be further distinguished from lexical, or situation, aspect. Lexical aspect is conveyed through the meaning of the verb and predicate phrase itself, specifically whether an event has an endpoint (is bounded) or not (is non-bounded). For instance, the predicate phrase *break a toy* specifies the end-point of the event: the event is finished when the toy is broken. Other events, such as *playing house*, may last indefinitely in time, ending at any point dependent upon the whims of the participants. The verbs describing bounded events with designated endpoints are *telic*; verbs describing non-bounded events with arbitrary endpoints are designated as *atelic* (both derive from the Greek word *telos*, meaning end).

2 Strictly speaking, imperfective sentences may be matched with either picture: the lack of an entailment of completion is not the same as entailing the lack of completion.