I. INTRODUCTION

Language knowledge in the adult is not a memorized list of words and sentences paired with the situations in which they have been experienced. Adult speakers use the words in their vocabularies flexibly—in novel settings and in reference to newly encountered instances of the categories that their words label. They can combine their words to form grammatical sentences that they have never heard. A central question in the study of language acquisition is when children achieve the context independence, extendability of meaning, and productivity of form that are the hallmarks of human linguistic competence.

One possibility is that children are avid generalizers who extend words to new referents and produce novel sentences very early in the course of language development. For example, a child who hears the verb jump in the imperative sentence Don’t jump on the bed would without further linguistic experience also be able to use jump in declarative sentences, in reference to jumping done by other people, and even in reference to actions as different from the original as jumping up to reach something or jumping into the pool. Furthermore, the child would be able to use jump in other structures, such as I jump, he jumped, and Granny jumped into the pool. An alternative possibility is that children are initially conservative language learners who stay close to the examples of language use they have already experienced. A child who has heard jump only in Don’t jump on the bed would not use jump to refer to a variety of other sorts of jumping, by a variety of different jumpers, or in a range of syntactic constructions. These two positions define a space that includes multiple possible descriptions of the child as language learner. In this monograph, we present new data on children’s first uses of their first verbs and ask what theoretical positions within this hypothesis space are consistent with that evidence.

The view that children generalize beyond their experience in their very earliest productions yields the prediction that children’s first uses of newly acquired verbs should be flexible, conveying a range of meanings and appearing in a variety of structures. The view that children are initially
conservative language learners yields the prediction that children’s first uses of newly acquired verbs should be very repetitious in terms of the events they refer to and the structures they participate in because they are used only in contexts and/or structures similar to those in which they were first encountered.

Verbs are the focus of this investigation of the process of early language development for two reasons. First, verb acquisition has been less studied than noun acquisition. Thus, the rapid-generalizer and conservative-learner views of lexical development have been tested more frequently against data on the acquisition of nouns than verbs, and questions about the degree to which noun learning and verb learning are similar processes have been raised (e.g., Gentner & Boroditsky, 2002; Maguire, Hirsh-Pasek, & Golinkoff, 2006; Sandofer & Smith, 2000). Second, the development of verb use is also the development of grammar, by many accounts, because sentence structure is essentially defined in relation to the verb (Bloom, 1993). Thus, studying the acquisition of verbs provides a test of the rapid-generalizer and conservative-learner views with respect to grammatical development as well as lexical development.

Eight mothers kept detailed records of their children’s first 10 uses of their first verbs over a period ranging from 3 to 13 months. Those first verb uses were coded for the pragmatic, semantic, and grammatical flexibility they evidenced, and competing accounts of the child as language learner were evaluated against those data. In the remainder of this introductory chapter, we present the theoretical and empirical background to this study in some detail, first considering work that addresses the extendability of verb meaning, second considering work that addresses the flexibility of verb grammar, and third, considering the theoretical and empirical background that yields predictions regarding relations among verb vocabulary growth, flexibility of verb meaning, and flexibility of verb grammar.

LEARNING VERB MEANING

Theories of Early Word Meanings

The child first encounters a new word used in a single utterance and a single situation, and he or she must somehow figure out both what the word refers to in that situation and what it can refer to in other situations. Current accounts of word learning differ in their descriptions of how the child makes that word-to-referent mapping and in how, and when, the child maps words not just to a single referent but to an entire category.

One view is that the child enters the word-learning task equipped with linguistic understandings that guide the mapping and extension processes.
Children understand, for example, that words refer, and this understanding guides them to seek a referent for newly encountered words (Golinkoff, Hirsh-Pasek, Mervis, Frawley, & Parillo, 1995; McShane, 1980). They also understand that words refer to kinds of things or events, which allows them to extend words to new instances of the same kind (Golinkoff et al., 1995; Naigles & Hoff, 2006; Poulin-duBois & Forbes, 2006). Children also bring syntactic competence to the word-learning, especially verb-learning, task. They use the correspondences between syntax and meaning to guide interpretation of the newly encountered verbs. For example, hearing a novel verb in a structure such as \textit{X verbed Y}, yields, via syntactic bootstrapping, the interpretation that the verb is a causative verb (like \textit{hit} or \textit{kicked}) rather than a verb like \textit{sing} or \textit{laugh} (Gleitman, 1990; Naigles & Swensen, 2007).

Other theories attribute less initial linguistic sophistication to the language learning child and predict limited generalizations from experience in children’s early word use. A child who does not understand that words refer may associate a new word with the entire context of its use (e.g., “open” applies only to what one’s mother does to the refrigerator door; Dromi, 1982; Mervis, 1987). A child who understands only that words refer but not that they refer to kinds will construe meanings very narrowly. On some accounts, children, at some early point, tend to map words onto what is most salient in the concurrent context and to extend words to other things or events with similar perceptual properties (e.g., “open” may apply to lateral motions of doors but not of vertical motions of doors, lids, or containers; Hollich, Hirsh-Pasek, & Golinkoff, 2000; Maguire et al., 2006; Smith, 1999, 2000). All theories acknowledge that children eventually use reference, extendability, and syntactic information in their word learning, but some models hold that these biases and useable sources of information for word mapping and extension are not all available when word learning begins (Golinkoff et al., 1995; Hollich et al., 2000; Maguire et al., 2006). In this model, early verbs (those learned during the 2nd year of life) are likely to be used in specific contexts or extended limited ways based on perceptual similarity to the original exemplar. Only during the 3rd year of life can the child use social and linguistic sources of information for mapping and extension of verbs. Crucial to this Coalition-Emergentist model is the assertion that word-learning principles emerge earlier for nouns than for verbs and may not transfer directly from noun learning to verb learning (Golinkoff et al., 1995; Maguire et al., 2006).

These different models of word learning make different predictions about the degree to which children will extend their first verbs to new contexts of use and to new actions. A model that attributes to the verb-learning child sufficient syntactic knowledge to identify new verbs as verbs and sufficient lexical understanding to map new verbs onto categories of actions predicts that children will use their new verbs in utterances that
serve a range of pragmatic functions and will extend the verbs they acquire to actions by a variety of actors or agents. A model that attributes less linguistic knowledge to the 1-year-old child predicts less extension of word use. The emergentist model (Golinkoff et al., 1995; Maguire et al., 2006) predicts initial conservative verb use followed by later flexible verb use. One way of testing these predictions is by looking at children’s multiple uses of their first verbs. Do children first restrict the use of a new verb to a specific setting, or do they use the verb in a variety of settings?

Evidence From Studies of Word Learning

Questions about the extendability of newly acquired words have more frequently been addressed with data on nouns than verbs. Children between 12 and 18 months do sometimes underextend nouns, restricting their use to a single context (e.g., Dromi, 1987; Harris, Barrett, Jones, & Brookes, 1988). After 18 months, children’s use of nouns in spontaneous speech is not context bound (Barrett, Harris, & Chasin, 1991), and in word-learning experiments children older than 18 months routinely extend novel nouns to more than one exemplar, even after only one presentation (Hirsh-Pasek, Golinkoff, Hennon, & Maguire, 2004; Markman, 1989).

If verb use also shows initial underextension, children might restrict newly acquired verbs to refer to a single addressee, actor, action type, or affected object. For example, a child might use the verb blow only when talking to Mom or only in reference to blowing out a candle, but not to refer to blowing one’s nose. A child might know sit with reference to the dog’s sitting but no one else’s, or eat only in reference to eating pizza.

There is evidence of early verb meaning restricted by actor or affected object. Children’s earliest uses of conventional verbs have been found to refer primarily to their own rather than another’s actions (Childers & Tomasello, 2006; Huttenlocher, Smiley, & Charney, 1983; Smiley & Huttenlocher, 1995; but see Tomasello, 1992). Twenty-month-olds taught novel verbs via video were unsuccessful in understanding the extension of these verbs to similar actions performed by new actors (Maguire et al., 2006; Poulin-Dubois & Forbes, 2002). Diary studies have revealed other kinds of initial idiosyncratic verb use, such as cut used solely when using a knife, watch used solely when watching television, push used solely in a game of pushing in the pool, and cry used solely in reference to a pacifier (Braunwald, 1995; Smith & Sachs, 1990; Tomasello, 1992).

Evidence of extendable verb meanings during the 2nd year of life also exists. Children have been observed to use the same verb (rock and ride) to refer to the movements of both objects and people over the 6-month period from 13 to 19 months (Smiley & Huttenlocher, 1995). Laboratory assessments of children’s understanding of familiar verbs have consistently found
that toddlers demonstrate comprehension of a wide range of English verbs performed by unfamiliar actors (Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987; Huttenlocher et al., 1983; Naigles, 1997; Naigles & Hoff, 2006), although other studies have found that extendability of verbs in comprehension is limited to children who had reached either a certain age or vocabulary level. Only children over 19 months and/or with high vocabulary counts extended familiar verbs to actions by unfamiliar actors (Forbes & Poulin-Dubois, 1997; Naigles & Hoff, 2006); further extensions of a verb to both new agents and new manners of action were found only at 26 months of age (Forbes & Poulin-Dubois, 1997). Exposure conditions also appear to matter. Twenty-one-month-olds who were taught two novel transitive verbs in a playroom setting with two different actors—they themselves and the researchers—were able to distinguish those two verbs when presented on video with a disembodied hand as the only visible actor (Naigles, Bavin, & Smith, 2005), and the children in Naigles et al. (2005) may have been more accepting of yet another actor at test than children in other studies because the verbs had been taught with at least two actors.

Questions to Be Addressed Regarding Children’s Acquisition of Verb Meanings

The previous literature suggests some early limits on the extendability of verb meanings and some increases in extendability as a function of age or level of language development achieved. There are suggestions in the data from Forbes and Poulin-Dubois (1997) that, in comprehension, extendability to new agents is an earlier achievement than extendability to new manners and outcomes. The existing literature leaves unanswered, however, several basic questions about the extendability of verbs as they enter children’s lexicons:

1. How early in the process of learning verbs in general and/or how early in the course of learning individual verbs, does extendability emerge? The current study was designed to track children’s extendability of verbs from the beginning of verb use in the child and from its first use for individual verbs to address this question.

2. Are some kinds of extendability earlier developmental achievements than others? If children use their verbs with different patients, affected objects, or different but still appropriate actions (e.g., eating cereal and eating a carrot; opening a door and opening a jar) it would indicate that the basis of their meanings is not closely tied to perceptual similarity (Golinkoff et al., 1995; Goodman, McDonough, & Brown, 1998; Maguire et al., 2006).

It is important to acknowledge, relative to both questions 1 and 2, that we will not be investigating when children can extend their verbs to novel
actors, affected objects, contexts, and actions. Because we do not have access to all the verbs uses the children have experienced, we will be unable to specify the extent to which their demonstrated extendability goes beyond the input given. However, by noting when flexible use emerges in relation to their age and number of uses of a given verb, we will be able to address whether children’s early verb use is more restricted than their later verb use.

3. What is the source of individual differences, among children and among verbs in the scope of verb extension? The comprehension data suggest age and vocabulary size as candidate factors with respect to individual differences among children. Differences among verbs seem more idiosyncratic. Across all of the experimental studies of verb comprehension, few verbs are reliably understood by all children at a given age. As discussed in more detail by Naigles and Hoff (2006), such a cross-study inconsistency is symptomatic of a deeper issue with respect to early verb acquisition: the order in which children acquire particular verbs seems quite idiosyncratic, probably because children’s input is idiosyncratic in the particular verbs it illustrates. Diary studies of production overcome this problem by casting a wide net to capture whatever verbs children learn. Analyses of individual children’s developing verb uses also avoids assuming that there is a single course of verb development that can be found by studying data averaged across many children.

LEARNING VERB GRAMMAR

Theories of Early Verb Grammar

When verbs first appear in children’s speech, they frequently appear in multiword utterances. The nature of the representations that underlie these first combinations of verbs with other words is a point of conflict among accounts of verb development and is also a central issue with respect to the broader question of how children achieve grammar. The view that has been standard in linguistics for decades is that word combination reflects the operation of a productive grammar that operates over abstract categories, which are independent of function or meaning (Chomsky, 1975, 1981, 1995; Crain & Lillo-Martin, 1999). Children combine their verbs because they know something about the syntactic properties of items in the category VERB (e.g., that all verbs in English require subjects, that some verbs require objects while others prohibit them, that many verbs appear with the “-ing” suffix to indicate ongoing activity) and they recognize the verbs in their lexicons as belonging to that category.
An alternative view, consistent with the child as a conservative learner who stays close to experience in production, is that children’s combinations of verbs with other lexical items reflect the operation of lexically specific rules. According to this view, there is no abstract category VERB to which individual verbs belong (Tomasello, 1992, 2000, 2006). A child who has discovered that one verb can appear with a subject, direct object, “-ing” suffix, and/or prepositional phrase thus will have no basis for extending this discovery to other verbs at the same point in time (MacWhinney, 2004; Pine, Lieven, & Rowland, 1998; Theakston, Lieven, Pine, & Rowland, 2001).

Most of these latter theorists agree that children eventually attain an abstract grammar, although they may still disagree with formal generative accounts concerning the exact nature or level of the abstraction. Thus, these theories need to include an account of how children’s verbs and verb combinations are transformed from lexically based to abstract.

Evidence From the Study of Verb Learning

Evidence for Early Abstract Grammar

The claim has been made from several quarters that structural regularities in children’s earliest combinations are evidence that children have abstract grammatical categories, including the category VERB (Borer & Wexler, 1987; Fisher & Gleitman, 2002; Gleitman & Newport, 1995; Pinker, 1984; Valian, 1990). Two kinds of evidence from comprehension studies also argue that young children know more about verb syntax than just the combinatorial possibilities of individual verbs. First, 21–28-month-old children who have been taught a novel verb in one syntactic frame show they can distinguish that verb from another when both are presented in a new syntactic frame (Naigles et al., 2005). Second, children know a great deal about sentence frames, independent of any verb they contain, which also suggests that frames are not just represented as properties of specific verbs. For example, 1-year-old children understand the subject–verb–object (SVO) word order of simple English sentences when given noun–verb–noun (NVN) sequences with novel verbs (Gertner, Fisher, & Eisengart, 2006). That is, they infer the first noun of an NVN sequence (e.g., “The duck gorps the bunny”) is the agent of a novel action presented in a video clip. Moreover, 2-year-olds map novel verbs in NVN sentences onto causative actions (in which the duck is doing something to the bunny), and they map novel verbs presented in NNV sentences (e.g., “The duck and the bunny are gorping”) onto noncausative actions (in which the duck and bunny are doing the same independent action, side by side)—again, as evidenced by the scenes they prefer to look at when such sentences with
novel verbs are presented to them (Fisher, 1996; Hirsh-Pasek, Golinkoff, & Naigles, 1996; Naigles, 1990).

Further evidence that 2-year-olds represent meanings with frames and not just with lexical items comes from studies in which children are asked to act out sentences in which frame meaning and verb meaning conflict. So, given a sentence such as *the zebra goes the lion*, 2-year-olds infer a causative meaning from the NVN frame and have the zebra do something to the lion, but given a sentence such as *the zebra brings*, children infer a noncausative meaning (despite the causative meaning of bring) and have the zebra do something without any affected object (Naigles, Gleitman, & Gleitman, 1993). Finally, Naigles et al. (2005) also found that 21- and 28-month-olds could recognize novel verbs in unattested frames; that is, verbs taught in the transitive frame were reliably recognized when presented in an intransitive frame (see also Fernandes, Marcus, Di Nubila, & Vouloumanos, 2006).

These findings, taken together, support the existence of abstract-level transitive and intransitive frames in the linguistic knowledge bases of 1- and 2-year-old English learners. They do not, however, indicate the range of flexibility (i.e., how much or how early) that toddlers are capable of, nor do they tell us about the level of flexibility that children will muster in their own productions. And yet production matters, because production flexibility is the hallmark of adult language use in all theories (Chomsky, 1975; H. Clark, 1996; Pinker, 1994; Tomasello, 2000). We therefore turn to data from children’s production of verbs and sentences.

**Evidence for Early Lexically Specific Grammar**

In contrast to the evidence from comprehension studies that young children possess abstract grammatical knowledge that allows them to interpret verbs flexibly, the evidence from studies of production yields a picture of limited flexibility, which has been taken as support for the view that early grammar is lexically based. Tomasello (1992) argued for this view on the basis of his diary records of his daughter’s verb uses during her 2nd year of life. This 1-year-old child tended to use her verbs in only one construction type per verb (i.e., one frame); for example, she might say “Mommy break” and “Daddy break” but not “Break cup” or “Break with stick.” Fewer than one third of her verbs were used in more than two construction types over the span of her 2nd year. Likewise, the child was uneven in her production of lexical subjects and morphological markers; lexical subjects were produced consistently for some verbs (take, get) but not for others (put), and some verbs received tense markers, others aspect markers, but very few received both (see also Tomasello, 2000). Studies involving more children have also found limited productivity of early verb use (e.g., Matthews, Lieven, Theakston, & Tomasello, 2005; Pine et al., 1998; Theakston,
Lieven, & Tomasello, 2003; Theakston et al., 2001). These latter findings are not independent, however, because much of these data come from the same Manchester corpus, in which 12 children’s spontaneous speech during lunchtime and toy play was recorded monthly for 6 months, beginning at the onset of multiword speech.

Across all of these studies, productivity was “counted” if a child used a given frame or morphological marker with different lexical items and/or the same lexical item in different frames or with different morphological markers. Using these criteria, these researchers have found evidence for productivity of the marker of the present progressive (-ing), but not for the past tense, third person singular, auxiliaries, SV, or SVO frames (see also Armon-Lotem & Berman, 2003, for similar findings from Hebrew learners). Also arguing for limited productivity, Theakston, Lieven, Pine, and Rowland (2004) discovered, when analyzing children’s uses of go, that different forms were used in nonoverlapping contexts, suggesting different forms were associated with different meanings (i.e., The train goes choo-choo and Mommy went to work) rather than productive use of one meaning (i.e., Mommy went to work/outside and Johnny likes going to the park). The flexibility that was observed (with individual verbs and/or children) seemed attributable to imitations of varied uses in the maternal input (Theakston et al., 2001), or emerged piecemeal via one-word additions or deletions to previously produced phrases (e.g., from “I want a W” to “I want a book”) (Lieven, 2006; Lieven, Behrens, Speares, & Tomasello, 2003). Finally, McClure, Pine, and Lieven (2006) compared the children’s verb use at Stage I (MLU < 2.0) and Stage II (MLU between 2.0 and 2.5), finding that “old” verbs (those used at both stages) appeared in more complex structures than “new” verbs (those first observed at Stage II). Thus, it appears from these data that children’s ability to use verbs in more complex structures is related to the length of time they have known the verbs and hence children’s ability to use a verb in a given frame is not predictable if all verbs are treated as full members of the same abstract category .

Experimental studies of elicited speech have yielded similar findings: Children under 2.5 years who were taught novel verbs for novel actions rarely if ever used a just-learned verb in an unattested frame. That is, children taught a verb in the intransitive (e.g., Ernie chams) did not use it spontaneously in the transitive (Ernie is chamming Bert) (Akhtar & Tomasello, 1997; Brooks & Tomasello, 1999; Olguin & Tomasello, 1993; see Tomasello, 2000, for a summary, also, Naigles, 2002, 2003; Tomasello & Akhtar, 2003). Only older children, and especially those taught novel verbs in frames distributed over several sessions rather than massed in a single session, were able to use the novel verbs in unattested frames (Ambridge, Theakston, Lieven, & Tomasello, 2006).
In sum, research on children's early productive verb use (i.e., before 2.5 years) has found that young verb users do not routinely use their verbs in multiple grammatical forms and sentence frames, nor do they routinely use grammatical forms and frames with multiple verbs. The research that yields these findings is limited, however, by four major factors:

First, Tomasello’s (1992) verb diary study included only one participant; thus, the extent to which those findings can be generalized is unknown (but will be investigated in the current research).

Second and more importantly, studies with larger sample sizes have only sampled the children's speech, with the consequence that the full flexibility of verb use is unlikely to have been represented in the speech available for analysis. Given that the recorded utterances comprise just a very small portion of the speech the child produced, it seems unwarranted to draw conclusions about those words, morphemes, and syntactic constructions that did not appear in the sample because these could have been used by the child while not being recorded (Demuth, 1996; Naigles, 2002; Stromswold, 1996; Tomasello & Stahl, 2004). Many of the speech samples were also restricted in context (i.e., recording the same setting at each visit, Lieven, 2006; Lieven et al., 2003) as well as time, thereby limiting the objects, actions, and people that could be the topics of conversation. For example, if a child is consistently recorded during breakfast and after-breakfast free play, then the conversation is likely to involve expressions of wanting things (food, toys) and suggestions for action (“let’s . . . ”). Over time, the same types of conversations would recur, with the child adding on more words as, perhaps, her vocabulary grows and her working memory/production system continues to develop (Lieven et al., 2003). But very novel utterances would not necessarily be seen, unless the child is also recorded at different times of the day and different settings. As Naigles and Hoff (2006) have reported, the verbs used by mothers, at least, vary dramatically according to setting; it is unlikely that children’s verb use would be any different. And given that mothers do not even always use every word and frame flexibly in their sampled speech (Lieven et al., 2003; Theakston et al., 2003), when they, unarguably, have full command of productive grammar, it is unwarranted to attribute children’s lack of flexibility to a less-than-full command of the same. Because children talk less than their mothers, they would, in fact, demonstrate less flexibility in their sampled speech by base rates alone.

Third, the “conservative-child” argument assumes that when children’s verb uses omit a subject or object, such omissions reflect limited grammatical knowledge. However, Matthews, Lieven, Theakston, and Tomasello (2006) and Valian, Prasada, and Scarpa (2006) have recently demonstrated that toddlers’ production of subjects and objects in elicited production tasks varies systematically according to discourse and processing constraints (e.g., toddlers use fewer full NPs when the referents of those NPs have just been
labeled, and they imitate full NPs less frequently when these are part of longer target sentences). Allen and Schroder (2003) have also found that toddlers’ spontaneous production of lexical subjects and objects is highly constrained by the discourse context. Because the linguistic and discourse context affects whether or not children produce NPs, children’s production of a given verb with only one NP is not good evidence that the child thinks that verb has only one argument. Such utterances may reflect pragmatic sensitivity on the child’s part, rather than limited grammatical knowledge.

Fourth, the import of the experimental findings that suggested limited grammatical flexibility associated with verbs is itself limited by the fact that most of the types of frame productivity that have been tested have involved meaning changes as well as frame changes. That is, the use of specific verbs in specific frames is partially governed by each verb’s semantics; for example, causative verbs do not usually appear in intransitive frames, motion verbs do not appear with sentence complements, and so on (Fisher, Gleitman, & Gleitman, 1991; Jackendoff, 1983, 1990; Levin, 1993). As described in more detail by Naigles (2002), children’s reluctance to use a novel verb in an unattested frame could be traced to their uncertainty about whether the verb’s meaning was suitable for the frame, rather than their not knowing the frame independently of the verbs already used in it (see also Tomasello & Akhtar, 2003; Naigles, 2003).

Thus, even when children’s verb uses truly show less grammatical flexibility than a fully productive system would support, there are two possible interpretations: One is that toddlers’ knowledge of simple sentence frames is abstract, but they use a limited range of grammatical options in their verb uses because they use their verbs to express only a limited range of meanings. On this account, it is the limited understanding of verb meaning that underlies the limited grammatical flexibility of verb use. An alternative interpretation is that toddlers’ initial knowledge of simple sentence frames is indeed lexically specific. For example, a child might know both drop and move can be causal, but having heard move but not drop in the transitive frame thus far, he only produces move in this frame. On this account, it is limited syntactic knowledge causes that initial conservative verb use.

A Mechanism of Transition From Lexically Specific to Abstract Grammar

Thus far we have been considering the evidence regarding when children have an abstract grammar that allows newly acquired verbs to be recognized as instances of a category and freely combined with inflectional morphemes and syntactic frames. Another question, which is crucial to a full account of verb development, is how the child achieves such a grammatical system. According to the strongest generativist position, the grammatical categories themselves, and the configurations they could possibly appear in,
are innate (Chomsky, 1975, 1995; Crain & Lillo-Martin, 1999). At least some aspects of this innateness may be rendered unnecessary if it could be shown that children discover grammatical categories and/or language-specific syntactic configurations from their input before combinatorial speech begins, and studies of infant learning of language structure make this a plausible suggestion (see Brent, 1993; Gerken, 2007; Gomez 2002; Mintz, 2003; Naigles, 2002). However, rejection of such innateness is also a central tenet of positions that attribute little syntactic competence to young children. According to the lexically specific grammar view, children begin to combine verbs with other words before they have achieved grammatical categories and/or abstract syntactic patterning (MacWhinney, 2004; Tomasello, 2000). Thus, a full account consistent with an early lexically specific grammar requires an account of how children move from that state to having an abstract grammar.

A set of influential suggestions revolves around the idea that a subset of verbs, verbs that are frequent in input and have general meanings, called “light” verbs, serve as the child’s entry into abstract grammatical forms and their meanings (Chenu & Jisa, 2006; E. Clark, 1987, 1996, 2003; Goldberg, 1999; Goldberg et al., 2004; Goodman & Sethuraman, 2006; Ninio, 1999; but see Campbell & Tomasello, 2001). This proposal that light verbs provide entry into the grammatical system comes in several forms, three of which we summarize here.

The proposal of Goldberg and her colleagues (2004) focuses on the meanings of the frames or constructions to be acquired and relies on both frequency and general semantic attributes of light verbs. Essentially, Goldberg hypothesizes that children’s hearings of the high-frequency verb go followed by a prepositional phrase or locative—go to the store, go around the table, go outside—(+ PP frame or verb+locative [VL] construction) and the high-frequency verb put in the +NP PP frame (or V+object+L [VOL] construction)—put the bowl on the table, put the bowl there—enables them to associate the general meanings of go and put (inchoative motion and caused motion, respectively) with the VL and VOL frames (Goldberg, 1999; Goldberg & Casenhiser, 2006; Goldberg et al., 2003; Goodman & Sethuraman, 2006). Thus, the children’s meanings of the light verbs are “transferred” to the meanings of the frames or constructions that they typically appear in so that the light verbs enable the frames’ meanings to be acquired (see Casenhiser & Goldberg, 2005, for supporting evidence from grade schoolers’ acquisition of nonsense verbs). This theory does not predict, though, that light verbs should be the first verbs to appear in child speech in a given frame—light verbs do their work during comprehension. They are considered to be the engine of learning about construction meaning, but not necessarily the first consequence of this learning observable in children’s productions (Goldberg et al., 2004). And the theory is silent on how the frame or construction forms, themselves, are acquired.
A second version of the light verb proposal does address children's acquisition of syntactic form, hypothesizing that each frame is first learned with a single light verb, and only later extended to other verbs (E. Clark, 1987, 2003; Chenu & Jisa, 2006; Ninio, 1999). These researchers’ rationale for this special role for light verbs is similar to Goldberg’s: Light verbs most closely encode the meanings of specific frames or constructions (i.e., \textit{go} is the canonical motion verb, exemplifying the +PP frame, \textit{make} is the canonical causal/acting on verb, exemplifying the transitive frame, and \textit{put} is the canonical transfer verb, exemplifying the +NP PP frame). The specific hypothesis is that light verbs should be the first to appear in a given frame because the form–meaning relation is so transparent. \textit{Go} is learned to be used with a PP or L because \textit{go} transparently encodes motion, so any accompanying arguments must involve locatives (\textit{go home/to the store}). Then children’s use of \textit{go} with a variety of PPs or Ls enables them to abstract a more general +PP or VL frame, which they can then transfer for use with more specific verbs such as \textit{run} and (eventually) \textit{cry}. The idea is that the first verb used in a given frame is that frame’s \textit{pathbreaker} (Ninio, 1999), which, by virtue of its general meaning, facilitates children’s formalization of that frame and thus their use of other verbs in that frame.

Further predictions from this light-verbs-as-pathbreakers hypothesis include that light verbs should be used in ways both more grammatically complex and more grammatically flexible than heavy verbs learned at the same time (E. Clark, 1987; Ninio, 1999; Theakston et al., 2004). Both of these predictions follow from the semantic generality of light verbs: Because verbs such as \textit{go} and \textit{put} can apply to any type of inchoative or caused motion (respectively), specifics about which entities are participating in these motions are not always recoverable from the context. For example, \textit{eat} usually only involves eatable things, whereas \textit{put} can involve a wide range of things put, and \textit{run} usually only involves animates engaged in forward horizontal motion, whereas \textit{go} can involve either animates or inanimates engaged in motion in any direction. Thus, in response to the communicative pressure to be as clear as possible (Grice, 1989), \textit{go} and \textit{put} should be more likely to appear with overt arguments than \textit{run} and \textit{eat}. Furthermore, semantically general verbs are more syntactically diverse in the adult language (Levin, 1993; Naigles & Hoff-Ginsberg, 1995, 1998) because their general meanings allow them to fit into a wider variety of sentence frames (Snedeker & Gleitman, 2004). For example, \textit{bring} can be used both with and without a PP, depending on whether the speaker chooses to focus on the action or goal of bringing (e.g., \textit{What’s Molly doing? She’s bringing the pizza/Where is Molly going so quickly? She’s bringing the pizza to the library}), and \textit{go} but not \textit{run} can be used with a preverbal P (e.g., \textit{Up you go!} but not \textit{Up you run!}—for most speakers).

The current evidence for light verbs as “pathbreakers” to an abstract grammar is mixed: Ninio (1999) and Chenu and Jisa (2006) report, based
on spontaneous speech samples from children learning Hebrew, English, and French, that many children first used a given frame with only one verb; moreover, they took from 43 days (Ninio, 1999) to several months (Chenu & Jisa, 2006) to produce that frame with a second verb. However, Ninio (1999) and Theakston et al. (2004) have also found that these pathbreaking verbs were not always light verbs. Ninio (1999) has reconciled this divergent finding with the light-verbs-as-pathbreakers hypothesis by maintaining the “pathbreaking” notion but broadening what counts as a light or “canonical” verb for a given frame. In particular, *want*, a frequent first verb in SVO frames, is included as a canonical/general transitive verb even though it does not encode “highly transitive” senses such as change of state or position (i.e., Hopper & Thompson, 1980; Thompson & Hopper, 2001). Theakston et al. (2004) also point out, though, that because semantic generality and input frequency are confounded, it is not clear which factor contributes more heavily to children’s acquisition of grammatical forms. They found no difference between light and heavy verbs in their numbers of different frames, percent of utterances with subjects, nor percent of utterances with objects, once input frequency was partialled out. Apart from the mixed nature of the evidence, a problem with evaluating the light-verbs-as-pathbreakers hypothesis is that all of the relevant data thus far have been drawn from samples of spontaneous speech of limited duration and limited contextual range; such findings are tenuous for the sampling reasons discussed earlier. Moreover, almost all of the research thus far has investigated the behavior of light verbs as a class, even though the light-verbs-as-pathbreakers proposal really targets several individual light verbs as pathbreakers for specific frames (i.e., *go* for the VL/+ PP frame and *put* for the VOL/+ NP PP frame), and furthermore, the particular light verb serving the pathbreaker function could be different for different children.

Snedeker and Gleitman (2004) propose that light verbs are the products of syntactic acquisition rather than its engines. They argue that light verbs do not have specific meanings that could be inferred from observation as, for example, the meaning of *eat* could be inferred from observing eaters. Thus, light verbs are more dependent on syntax for their acquisition than heavy verbs. This argument receives support in findings from their Human Simulation Paradigm (Gillette, Gleitman, Gleitman, & Lederer, 1999), in which adults are given video clips of mother–child conversation and told to guess what verb is produced when a tone sounds. Light verbs (e.g., *go* and *put*) required more syntactic information to be accurately guessed than the “heavy” verbs (e.g., *run* and *throw*) (Snedeker & Gleitman, 2004). One prediction for children’s speech that follows from this view is that light verbs should appear less frequently than heavy verbs in verb-only phrases and more frequently with sentence frames because the light verbs should be acquired after (and because of) the sentence frames.
Questions to Be Addressed Regarding Children’s Acquisition of Verb Grammar

Understanding when and how children become grammatically productive users of their verb lexicons is central to understanding when and how children become adult-like language users. The foregoing review of the existing literature reveals the following questions about early verb productivity, and thus about the flexibility of children’s early verb use, that form a focus of the present study:

1. How early in the course of verb learning does grammatical productivity—or at least flexibility—emerge? Prior studies have demonstrated that 1- and 2-year-old children can understand novel verbs in SVO frames and distinguish novel verbs in transitive versus intransitive frames (Gertner et al., 2006; Naigles, 1998). Still, the existing studies of children of that age have not found good evidence of such productivity in their spontaneous speech (Pine et al., 1998; Theakston et al., 2003). A big gap in the literature, which the current study was designed to fill, results from the fact that no studies have tracked several children’s productivity in spontaneous speech in a way that includes all uses of their very first verbs.

It is important to delineate, though, how much of the gap in the literature the current study can fill. The productivity that is the hallmark of human language is the capacity to produce and understand utterances one has never heard before. The most unambiguous evidence of this capacity in spontaneous speech is the production of errors—utterances such as “don’t fall that on me” (Bowerman, 1973)—because the child is not likely to ever have heard such an utterance. Comprehension studies can elicit unambiguous evidence that children understand utterances they have never heard by testing children with experimenter-created utterances using nonsense words, such as “the duck is gorping the bunny” (Naigles, 1990). Because our study relies on children’s spontaneous productions of verbs in their conventional uses, without a comprehensive analysis of their input, we will not be able to make claims about this level of productivity. However, many researchers have looked at spontaneous speech for evidence of productivity by taking flexibility of use as indicating, albeit indirectly, underlying productivity (Ingram, 1989; Shirai, 1998; Tomasello, 1992). If a child can use a single verb in multiple frames or a single frame with multiple verbs, this suggests a productive system at work. Without knowing the child’s input, it is always possible that these multiple uses are all input-based rather than generated anew, but the greater the flexibility the child demonstrates the less plausible that account becomes. Using a metric that the production of three to five verbs in a given frame displays some amount of productivity,
various researchers have reported productivity in 1- to 2-year-old children with frames such as V-ing, SV, VO, SVO (Ingram, 1981; Pine et al., 1998; Shirai, 1998; Tomasello, 1992). In the present study we similarly adopt the three-verbs-per-frame and five-verbs-per-frame measures of productivity as less unambiguous but still valuable indicators of the children’s ability to use their frames flexibly and independently of specific verbs.

In this study we also introduce several additional measures, which we argue index the productivity of the underlying system. We investigate children’s ability to use their verbs with multiple frames, which we term grammatical flexibility. That is, Tomasello (1992) claimed that Travis’s “inability” to use break with both Ss and Os illustrated limitations in her grammar; therefore, we investigate the extent to which our child subjects did use their verbs—within the first 10 instances—with the appropriate grammatical arguments and morphemes. We also investigate the degree to which these latter two types of flexibility are related to each other: Does it automatically follow that a child who uses eat with both Ss and Os might also use the SV or VO frame with multiple verbs?

2. If children do not initially have adult-like productivity, what is the process by which they achieve it? Several studies have found evidence of “pathbreaking” verbs in children’s speech; that is, verbs that seem to lead the way to productivity with a given frame. The view that some verbs serve as the child’s entry into abstract grammatical frames suggests that there should be differences among verbs when they first appear in children’s speech in the degree to which they show grammatical flexibility and complexity. Moreover, whether the same verbs serve this function for all children, and whether light verbs, specifically, serve this function and are the earliest verbs to show grammatical productivity, are all questions still unanswered, which will be addressed in the current study. Because our onset of data collection was verb driven rather than frame driven, though, we will not address whether the children’s first uses of a frame occur with light verbs but rather whether children’s first uses of light verbs demonstrate more grammatical flexibility than their first uses of heavy verbs.

Relations Among Different Aspects of Early Verb Growth and Use

Some of the contrasting theoretical positions on the nature of early verb development yield empirically distinguishable predictions regarding the relations between flexibility of meaning and flexibility of grammar as they develop and the relation of the development of both types of flexibility of verb use to growth in the verb lexicon. According to generativist theories,
the grammar is formal, abstract, and autonomous (Chomsky, 1995, 1998; Borer & Wexler, 1987). Therefore, acquisition of a verb lexicon, development of semantically flexible uses of those verbs, and development of grammatically flexible uses of those verbs should all be unrelated, aside from the obvious necessity that children who have more words at their command would be able to produce longer sentences.

Other theories predict there will be relations among lexical size, semantic flexibility, and grammatical flexibility. There are many arguments that language development is the product of domain-general learning mechanisms (Bates, Bretherton, & Synder, 1988; Elman, et al., 1996; Saffran & Thiessen, 2007), and these predict that all the measures of development—the number of verbs acquired and the semantic and grammatical flexibility with which they are used—should be at least loosely related. A stronger prediction of relatedness comes from the view that grammar emerges from the lexicon. According to this view lexical development must precede grammatical development, because a certain threshold or “critical mass” of vocabulary must be achieved before grammatical patterns can be abstracted (Childers & Tomasello, 2006; Marchman & Bates, 1994; Plunkett & Marchman, 1993; Robinson & Mervis, 1998) and, in some accounts, grammar continues to develop as a result of reorganizational processes caused by a growing lexicon (Conboy & Thal, 2006). These views yield the prediction that grammatical flexibility should be positively correlated with children’s number of verbs. The syntactic bootstrapping hypothesis also yields the prediction that the size of the verb lexicon should be positively related to the flexibility and overall grammatical complexity of verb use because grammar is the source of meaning-relevant information that contributes to learning verbs. Both the shared mechanism and syntactic bootstrapping hypotheses predict a positive relation between semantic and syntactic flexibility of verb use. The shared-mechanism hypothesis predicts that the relation between semantic and syntactic flexibility should be across children—children who show more semantic flexibility should also show more grammatical flexibility. The syntactic bootstrapping hypothesis additionally predicts a relation between grammatical flexibility and semantic flexibility across verbs, because it is knowledge of a particular verb’s structural possibilities that supports its semantically flexible use.

Numerous studies support the conclusion that the size of children’s vocabularies and the grammatical complexity of their speech are related (Bates & Goodman, 1999; Caselli, Casadio, & Bates, 1999; Jackson-Maldonado, Thal, Marchman, Bates, & Guierrez-Clellen, 1993; Maital, Dromi, Sagi, & Bornstein, 2000; Marchman & Bates, 1994; Marchman, Martinez-Sussman, & Dale, 2004; Ogura, Yamashita, Murase, & Dale, 1993; Robinson & Mervis, 1998). More specific predictions are less well supported. The claim that lexical development initially proceeds ahead of
grammatical development and that grammatical development is paced by the preceding lexical development is largely based on studies that used the Words and Sentences form of the MacArthur–Bates Communicative Development Inventory (CDI; Fenson et al., 1994). The CDI includes a checklist of over 600 words plus a section in which pairs of phrases (one closer to the adult form than the other; e.g., *two shoe* vs. *two shoes*) are listed; the parent checks off the phrase that is closer to the child’s current level of speech. These studies have reported a curvilinear relation in which children who produce more words are also reported to produce more complex grammatical forms, with smaller changes in grammatical complexity associated with early increments in vocabulary size and larger changes in grammatical complexity associated with later, equal-sized increments in vocabulary.

There are, however, a variety of reasons to think that the statistical relations observed in these data do not necessarily imply that grammatical development depends on lexical development. First, measurement issues abound. In the studies of spontaneous speech (Bates et al., 1988; Robinson & Mervis, 1998), MLU was used as the measure of grammatical development, and MLU is not a pure measure of grammar apart from the size of the lexicon. Indeed, as Rollins, Snow, and Willett (1996) reported in their study of children’s sampled spontaneous speech, the MLU growth between 14 and 32 months for a substantial percent of the children was accounted for by growth in content words alone, not in morphological or other grammatical items. Thus, a relation between vocabulary size and MLU does not necessarily reflect a relation between lexical development and grammatical development. Rather it may reflect the greater expressive possibilities afforded by a larger vocabulary.

Two problems particularly apply to the many studies that have used the CDI. Because the measures of vocabulary and grammar are taken from the same parental report instrument, they may share the same parental bias. Most critically, the ordering interpretation of the observed curvilinear relation between the vocabulary and grammar measures depends on the assumption that the measurement of vocabulary and the measurement of grammar were equally sensitive measures of change across the range of development studies. Dixon and Marchman (2007) have argued that this assumption is demonstrably false. They performed nonlinear function analyses which revealed that, while the vocabulary section of the CDI mapped linearly onto the underlying lexicon (i.e., increases in vocabulary are uniformly related to increases in underlying lexicon), the grammar section mapped nonuniformly, such that early changes in grammar are underrepresented in the CDI, relative to later ones. The curvilinear relation observed between lexical development and grammatical development is, they argue, an artifact of the differences between the measures of lexical and grammatical development in their sensitivity to early growth.
Finally, to the extent that the observed (linear) correlations are real, they still do not reveal the source or direction of causality. The possibility that vocabulary knowledge supports the induction of grammar and the alternate possibility that grammatical knowledge supports the induction of word meaning are different language learning mechanisms that would both be reflected in a correlation between vocabulary size and grammatical usage. Also, neither the CDI nor the previous analyses of spontaneous word use have assessed what children know about the words they use—only that they use them—nor have they assessed children’s use of argument structure or sentence frames—only that words appear in combination and some inflections are present. Thus, to the degree that vocabulary knowledge may support the achievement of grammatical understandings, it is not clear just what about vocabulary knowledge is doing the supporting and what about grammatical understanding is being supported.

Previous studies have not examined the semantic flexibility of children’s verb use, and thus have not captured possible differences among children and among verbs in what children know about the meanings of the verbs they use. A revised version of the grammar-from-lexicon hypothesis might suggest that children who know more about the words that they use (i.e., are more flexible with them), as opposed to knowing more words, might be able to achieve grammar or productivity sooner. Some support for this revised version comes from an experimental study that assessed toddlers’ extendability of verbs’ grammatical form as well as their extendability of the verbs across situations (Naigles et al., 2005). As described earlier, the 21-month-olds in this study were shown to be able to recognize verb–referent pairings, which had been taught in a playroom setting, when they were presented on video, thus demonstrating one form of extendability. Moreover, the children were also shown to recognize the verb–referent pairings that had been taught in the transitive frame but tested in the intransitive frame (e.g., children were taught you’re gorping the ball and tested on the ball is gorping). Strikingly, it was the children who could distinguish (i.e., had learned) the verb–referent pairings in the transitive who were more likely to be able to extend them to the intransitive. These findings suggest there is some threshold of semantic learning required before grammatical flexibility could be demonstrated.

The current study was designed to investigate these issues in more detail, asking whether children who use verbs more flexibly in terms of their semantics also use them more flexibly in terms of their grammar. We will also examine the relations among types of flexibility as a characteristic of verbs. That is, we ask whether verbs that are used more flexibly in terms of their semantics also more likely to be used more flexibly in terms of their grammar.
THE PRESENT STUDY

The foregoing review of the theoretical and empirical literature on children’s acquisition of verbs makes it clear that a central and unanswered question is when in the course of verb development children extend their verbs beyond the functions, referents, and morphosyntactic structures in which they have heard them used. The question is as yet unanswered because the research methodologies that have been brought to bear are limited in several ways. Sampling naturalistic parent/child interactions (e.g., collecting 3 hours of data per week for 4 months) is likely to miss situation-specific language use. Children use verbs in particular contexts that may not be recorded, such as washing in the bathtub, splashing in the pool, sleeping at night, and riding in the shopping cart at the grocery store (Naigles & Hoff, 2006; Naigles & Hoff-Ginsberg, 1998). Sampling also does not capture the full range of uses to which children put the verbs they use, thus rendering questions about the scope of meanings and forms of verb use unanswerable. Diary studies conducted with one child (e.g., Dromi, 1987; Mervis, 1987; Tomasello, 1992) may solve the sampling problems but at the cost of making it impossible to untangle evidence of processes common to all children from uses that are idiosyncratic to the single child under study.

An ideal data set for addressing the issue of when and to what degree children go beyond their input would include a record of all of the verb uses of many children in addition to a record of all of those children’s verb input. If, however, we make the assumption that verbs that are used in a variety of different ways are more likely to reflect productive and extended use than verbs that are used in only a single way, then we can begin to address some of these as yet unanswered questions with a record of children’s verb uses that does not include their input (e.g., E. Clark, 2003; Ingram, 1981; Shirai, 1998)—provided the record overcomes the sampling issues discussed above.

In this study, we overcome many of the sampling issues that limit the utility of the existing evidence by returning to the diary method for capturing children’s earliest uses of verbs, incorporating in the method the positive attributes of a diverse set of previous diary studies (e.g., E. Clark, 1993; Dromi, 1987; Harris et al., 1988; Robinson & Mervis, 1998; Tomasello, 1992). We included more than a single child, asking the parent participants to record their children’s uses of only 34 common verbs and only the first 10 uses of those verbs. In this way, we were able to track early changes in verb use without exhausting our parent participants’ capabilities. We targeted 34 of the most common verbs produced by children early in language acquisition (Goldin-Meadow, Seligman, & Gelman, 1976; Marchman & Bates, 1994; Tomasello, 1992; Tomasello & Kruger, 1992). In the next chapter we present the method in detail. In the results chapters that
follow the method, we present the description of early verb development that these data suggest, and we address the questions we have outlined with respect to the pragmatic, semantic, and grammatical nature of children’s first verb uses. In a concluding chapter we consider what the data imply with respect to the nature of children’s early linguistic understandings.