



# Language and conceptual development

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Linguistic and conceptual development converge crucially in the process of early word learning. Acquiring a new word requires the child to identify a conceptual unit, identify a linguistic unit, and establish a mapping between them. On the conceptual side, the child has to not only identify the relevant part of the scene being labeled, but also isolate a concept at the correct level of abstraction—the word ‘dog’ must be mapped to the concept *DOG* and not to the concepts *PETTING* or *COLLIE*, for example. On the linguistic side, the child must use the syntactic context in which the word appears to determine its grammatical category (e.g., noun, verb, adjective). But she also uses syntactic information, along with observation of the world and social-communicative cues, to make guesses at which concept the word picks out as well as its level of abstraction. We present evidence that young learners learn new words rapidly and extend them appropriately. However, the relative import of observational and linguistic cues varies as a function of the kind of word being acquired, with verbs requiring a richer set of conceptual and linguistic cues than nouns. © 2010 John Wiley & Sons, Ltd. *WIREs Cogn Sci* 2010 1 548–558

In decades past, language and conceptual development were treated as distinct research enterprises, but with the advent of the cognitive sciences, this ‘silo’ approach has been replaced. In recent years, a genuine focus on the relation between language and conceptual development has emerged, elucidating how this relation unfolds from infancy through adulthood. Research on word learning has served as a cornerstone in this integrative approach, primarily because word learning requires, by its very nature, precise coordination between the linguistic and conceptual systems.<sup>1–6</sup> To learn the meaning of a novel word, the learner must identify a linguistic element (e.g., ‘dog’), identify a referent (e.g., the dog she is currently petting), and establish a mapping between the two. But successful word learning requires more: The learner must be able to extend the novel word in a systematic and principled way beyond the particular situation in which it was initially introduced. That is, she must be able to extend ‘dog’ beyond the particular dog she has just seen, or even all the dogs she has ever seen, to the abstract concept dog.

Moreover, even a cursory consideration reveals another wrinkle: Many different kinds of words can be applied to the very same scene, and each picks out a different aspect of the scene. When seeing a dog running at the park, for example, a child might hear, ‘Look! A dog!’ ‘Dog’, a noun, can be applied to that individual, but may also be extended to all other instances of the concept dog. Discovering the limit of its application (*DOG?* *collie?* *mammal?*) requires coordination of the linguistic and conceptual systems. But the child might also hear, ‘Look! She’s so fluffy!’ ‘Fluffy’, an adjective, applies not to the object itself but to a property of it, and is extended to other entities sharing that property, regardless of object kind (e.g., fluffy pillows). The child might also hear a label for the dog’s action, ‘See? She’s running!’ Of course, she might also hear something generally exclamatory, like, ‘Wow!’ Amidst this richness and variability, the infant must determine which kind of description she has heard and its range of application.

Research on early word learning has uncovered a great deal about infants’ and toddlers’ linguistic and conceptual capacities, and how these change over the course of development. Until recently, one kind of word (noun) and one kind of concept (object categories or kinds) have taken center stage. This is fitting given that nouns (or words that are categorized as nouns in the adult lexicon) predominate

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in children's early vocabularies (e.g., Refs 7,8 and also see Refs 4, 6 for reviews). But, of course, nouns are not the only words that children acquire, and object concepts are not the only concepts they entertain. Other kinds of words and concepts are equally important even in infancy (e.g., hug, kiss, dirty, wet). Moreover, nouns may not be the paradigmatic case for word learning: As we will see, learning different kinds of words requires different kinds of information. Studying the acquisition of other kinds of words (e.g., adjectives, verbs) is therefore not just a simple extension of noun learning.<sup>4,9,10</sup>

We begin by outlining some recent findings documenting the conceptual capacities that preverbal infants have at their command even before they begin mapping concepts to words. Then we move on to consider how these kinds of concepts are mapped to different kinds of words. Because our interest is in the interface between conceptual and linguistic development, we focus on the acquisition of content words (including nouns, adjectives, and verbs) and not function words or other functional aspects of language.

We note two important points as background assumptions. First, the conceptual knowledge we will describe in infants does not represent the sum total of adult conceptual understanding. Surely over development, the conceptual representations available to infants become more elaborate. We focus here on early conceptual knowledge in order to examine early word learning processes. Second, we assume that although there are strong relations between language and conceptual development, these systems are not entirely dependent on one another. Language may highlight some concepts over others and may shape some category boundaries, but pre-linguistic infants and nonlinguistic creatures also have conceptual representations.

## CONCEPTS

Even as they cross the threshold into productive language use, infants have established an impressive repertoire of concepts. Preverbal infants are adept at perceiving the kinds of entities described by nouns; they parse the perceived environment into cohesive entities<sup>11</sup> and by 3 months, readily form object categories.<sup>12,13,14</sup> But they are also sensitive to the kinds of concepts underlying verb and adjective meaning. Infants are powerfully drawn, for example, to the ways in which things move and the changes that actions bring about. They distinguish among these kinds of events and form distinct event-based categories based on relations like

cause, containment, and support.<sup>15–20</sup> By the second year of life, infants distinguish between manners and paths of motion<sup>21,22</sup> and have expectations about the number of participants that will be involved in an event.<sup>23</sup> They are also sensitive to concepts that are expressed by adjectives—perceptual properties (e.g., temperature, texture, and color), salient changes of state (e.g., dirty, wet), and emotional valence (e.g., happy, sad). These conceptual underpinnings equip them well for word learning, providing a range of candidate hypotheses about the meanings of the words they will encounter and eventually acquire.

This rich conceptual foundation has implications for word learning. If infants appreciate such a broad range of concepts, how do they discover which kind of concept is relevant for the meaning of a new word? As we will see, the answer to this question may differ for different kinds of words. Infants learn some kinds of words (e.g., nouns labeling object categories) more easily than others (e.g., verbs labeling kinds of relations). Because the evidence reveals that they appreciate event-based concepts, it stands to reason that their difficulty acquiring verbs must lie in the process of mapping words to those concepts.

## A BROAD INITIAL WORD-CONCEPT LINK

Infants learning their first words begin with a strong conceptual foundation; however, even thus conceptually armed, vocabulary acquisition is not a simple matter of mapping words onto a fully articulated category structure. Hearing new words invites babies to focus on particular categories, highlighting commonalities and differences among distinct objects that might otherwise have gone unnoticed.<sup>24–33</sup> In the first demonstration of this phenomenon, Waxman and Markow<sup>31</sup> familiarized 12- to 14-month-old infants to four objects from a given object category (e.g., four animals). Infants were assigned to one of three auditory conditions. Infants in the Noun condition heard, e.g., 'See the fauna?', those in the Adjective condition heard, 'See the faunish one?', and those in the No Word condition heard, 'See here?'. Next, in the test phase, all infants saw the same two new objects: (1) a different member of the familiar object category (e.g., another animal), and (2) an object from a new category (e.g., a fruit). All infants heard, 'See what I have?' Infants in the Noun and Adjective conditions showed a novelty, preference at test, favoring the object from the new category (the fruit) over the object from the familiar category. In contrast, infants in the No Word condition showed no preference between the objects.

Thus, infants detect novel words in fluent speech, and words have consequences on their conceptual organization. Providing a shared name for a set of objects promotes categorization, an effect that holds up for both novel and familiar objects.<sup>34</sup> Although other auditory stimuli are also engaging to infants (e.g., melodies), these do not exert any facilitative effect on categorization.<sup>24,26–28,33,35</sup> Furthermore, not just any word will promote categorization. Infants are more likely to map words to objects when the words are presented in a social communicative context such that the words have clear referential status.<sup>36–38</sup>

## NOUNS

The evidence thus far indicates that for infants up to 12 months of age, novel words presented as either nouns or adjectives promote categorization. Later, infants form more precise correspondences between distinct kinds of words and kinds of concepts. By approximately 14 months, they assign object categories specifically to nouns. By approximately 21 months, they assign property-based commonalities specifically to adjectives, and by approximately 24 months they assign event-related commonalities specifically to verbs. To achieve these more precise mappings for particular grammatical categories, infants must pay attention to the relation between the novel word and other linguistic elements (including articles, determiners, and morphological and prosodic elements) in the sentence, distinguishing, e.g., ‘This one is a dax’ (noun) from ‘This is a dax one’ (adjective) (e.g., Refs 39–41).

As infants begin to distinguish among kinds of words, they first tease apart the grammatical category noun, and map nouns to objects and object categories.<sup>42–44</sup> In this series of studies, Waxman and Booth familiarized infants to four distinct objects, all of which were drawn from the same object category and shared a salient property (e.g., four purple animals). The objects were presented in pairs. In the Noun condition infants heard, ‘These are blickets. This one is a blicket and this one is a blicket’. In the Adjective condition, infants heard, ‘These are blickish. This one is blickish and this one is blickish’. In the No Word control condition, they heard, ‘Look at these. Look at this one and look at this one.’ In the test phase, infants saw two new objects. One was a member of a different object category, but shared the salient property (e.g., a purple spatula). The other was a member of the familiar object category, but did not share the salient property (e.g., a blue horse). Infants were asked, ‘Can you give me the blicket?’

(Noun condition), ‘Can you give me the blickish one?’ (Adjective condition), or ‘Can you give me one?’ (No Word condition). Although 11-month-olds treated nouns and adjectives identically, 14-month-olds mapped nouns specifically to category-based (but not property-based) commonalities, choosing the test object from the now-familiar object category (e.g., the blue horse). But they mapped adjectives more broadly, to both category- and property-based commonalities. By 18 to 21 months, infants mapped adjectives specifically to property-based commonalities, choosing the test object with the now-familiar property (e.g., the purple spatula).

## Conceptual and Linguistic Consequences of Noun Learning

Even before infants produce many words on their own, they have honed their expectations about the links between kinds of words and meaning. In this developmental process, nouns hold a privileged place; infants begin by first identifying nouns and mapping them specifically to object categories, with expectations about adjective and verb meanings emerging months later. Moreover, infants’ early links between nouns and object categories are more than simple word-object associations. Recall that infants map nouns to object categories, abstracting beyond the particular objects that have been named. In addition, the fact that 14-month-olds map nouns specifically to object categories—and not to object properties—reveals that their mappings are more than mere associations. After all, in these studies, the novel noun co-occurred perfectly with both the category- and the property-based commonality; yet, infants mapped the noun specifically to the former, and not to the latter. Moreover, the object categories that infants form in the context of hearing a novel noun have inductive strength. By 16 months, infants expect that members of the same named category will share deeper, nonobvious commonalities as well, including common functions and internal parts.<sup>29</sup> On the conceptual side, then, acquiring noun labels for object categories provides the child with a rich basis for categorization and reasoning.<sup>45</sup> As we will see in the next section, noun acquisition also provides a foundation for acquisition of verbs and adjectives.

These findings and others (e.g., Refs 5,46) reveal that although infants attend to perceptual information as they map words to meaning,<sup>47–50</sup> perceptual information alone cannot account sufficiently for word learning.<sup>51–54</sup> Infants are sensitive to different kinds of words, attending not only to the novel word itself, but also to its surrounding linguistic elements.

## VERBS

We noted earlier that although even preverbal infants have a rich repertoire of concepts, including the kinds of concepts that underlie verb meaning, they do not begin to produce verbs in appreciable numbers until roughly 24 months, well after they have begun to produce nouns.<sup>55</sup> Moreover, several laboratory-based studies have reported that difficulties in verb learning persist into the preschool years.<sup>56,57</sup> In Imai et al.<sup>57</sup> for example, children watched scenes of an actor performing a novel action (e.g., twirling) on a novel object (e.g., a novel toy). Some heard the scenes labeled with a novel noun (e.g., 'It's a blicket'), and others with a novel verb (e.g., 'She's blicking it'). At test, children were asked to choose between (1) a scene depicting the now-familiar action but with a new object, and (2) a scene depicting a new action but the now-familiar object. Surprisingly, although they successfully mapped the nouns to the object, 3-year-olds had difficulty mapping the novel verbs to the actions.

In contrast to these failures, we have recently demonstrated successful verb learning in 24-month-olds in laboratory tasks.<sup>58,59</sup> This is important because it provides a demonstration proof that toddlers can indeed learn new verbs, and can do so in a laboratory setting. Furthermore, a careful look at the procedures offers insight into the kinds of information toddlers require in learning novel verbs.

Waxman et al.<sup>59</sup> demonstrated that 24-month-olds not only successfully mapped nouns to object categories, but also mapped novel verbs to action categories (see also Ref 60). Toddlers were first familiarized to scenes in which an actor performed a simple action on an object (e.g., waving a balloon). Toddlers saw four instances of this type of scene. What varied was the linguistic information toddlers heard in conjunction with these scenes. Those in the Noun condition heard, 'Look! The man is waving a pilker!', those in the Verb condition heard, 'Look! The man is pilking a balloon!', and those in the No Word condition heard, 'Wow! Look what's happening here!' Then, they viewed a contrast phase, in which the actor was performing a very different action with a very different object (e.g., playing a toy saxophone), and heard, 'Uh-oh, that's not a pilker' (Noun condition), or 'Uh-oh, he's not pilking that' (Verb condition), or 'Uh-oh, look at that' (No Word condition). At test, toddlers in all conditions saw two scenes side-by-side: in one, the actor was performing the now-familiar action on the familiar object (waving the balloon), and in the other, he was performing a new action on the same object (tapping the balloon). Toddlers were asked, 'Which one is a pilker?' (Noun condition),

'Which one is he pilking?' (Verb condition), or 'What do you see now?' (No Word condition). The results indicate that 2-year-olds can successfully map novel verbs to event categories (e.g., waving events).

In a subsequent study, we asked whether the toddlers were able to map the novel verb beyond the particular event with which it had been introduced. For example, could they extend 'pilk' to waving events in general, whether it was a rake or a balloon that was being waved? Arunachalam and Waxman<sup>58</sup> demonstrated that 24-month-olds are indeed able to represent verbs in this abstract fashion. We used a method patterned closely after Waxman et al.<sup>59</sup> but at test, we showed toddlers one scene in which the actor performed the familiar action on a new object (e.g., waving a rake), and another in which the actor performed a new action, but on the familiar object (e.g., tapping the balloon). Notice that to succeed at this task, toddlers in the Verb condition had to accept an event that preserved the action, despite a change in objects, and those in the Noun condition had to accept an event that preserved the object, despite a change in the action in which it was involved. Toddlers succeeded, demonstrating that their initial representations of the meaning of these novel nouns and verbs were sufficiently abstract to permit them to extend the words appropriately. Converging evidence lends additional support to our interpretation that 24-month-olds map verbs successfully to actions, and that their representations are sufficiently abstract to extend beyond the particular events with which the verb was initially introduced.<sup>61,62</sup>

Together, these recent demonstrations of successful verb learning in toddlers contrast with previous work documenting difficulties at age 3 and beyond. But still, their success at 24 months is later than their success in noun learning (which has been documented as early as 14 months). Of course, further advances in experimental techniques may uncover successful verb learning in infants younger than 24 months, but we suspect that even with the most sensitive methodological tools, verb acquisition will always trail behind noun acquisition. We suggest that this is not because infants fail to represent the kinds of concepts linked to verb meanings. If the problem is not one of entertaining the concepts linked to verb meanings, then why should verb learning be relatively delayed? We suggest that the delay is related to the process of mapping those concepts to words. Establishing a mapping for verbs involves more, and perhaps different, information than is required for establishing a mapping for nouns.<sup>4,10</sup>



Mapping verbs to concepts requires the child to solve two problems: the reference problem—determining which part of a complex scene the verb describes, and the frame problem—determining how the verb construes the event or state it describes. Solving the reference problem entails isolating the relevant component of a cluttered environment. For example, when learning the verb ‘catch’ while observing a game of catch at a park, the adult and child have to coordinate their attention on the relevant participants (the two players and the ball, to the exclusion of a nearby dog or tree), and the relevant action (the action involving the ball toss, not that the players are talking, laughing, standing, etc.). The reference problem is common to learning any kind of content word, but it is particularly acute for verb learning. Once the relevant part of the scene has been identified, the child has to determine how it is being described. For example, ‘throwing’, ‘catching’, ‘palming’, ‘giving’, and ‘playing’ are all reasonable descriptions of the same event (i.e., a game of catch). The frame problem is most striking with verb pairs like ‘throw’ versus ‘catch’, ‘chase’ versus ‘flee’, or ‘buy’ versus ‘sell’, where the two verbs describe simultaneously occurring parts of the same larger event. The child will require more than an observation of the scene to disentangle which meaning is most fitting. In the next section, we consider the power of observational and linguistic information in the acquisition of nouns and verbs.

## OBSERVATIONAL AND LINGUISTIC INFORMATION IN NOUN AND VERB LEARNING

### Learning from Observation Alone

Children seem to learn some kinds of words, and nouns in particular, when they are provided with observational information. Children’s earliest vocabularies contain many names for very familiar objects, such as ball and bottle. But children must also acquire words for unobservable concepts, such as idea and thought. And even for observable cases, there are many cases in which observation alone is insufficient. The same individual, for example, can be described as a girl, or as someone’s sister. For relational nouns like these, as for verbs, observation alone does not provide sufficient information to establish meaning.

Gillette et al.<sup>63</sup> provided a striking demonstration of the limits of observation using a method known as the Human Simulation Paradigm (see also Ref 64). Adults viewed soundless videos of naturalistic scenes, and were asked at various points to guess the word that they imagined had been uttered by the participants in the scenes. This task was designed to mimic

the problem of learning words from observation alone. Adults had difficulty guessing verbs, despite the fact that they already possessed the conceptual and linguistic representations of the words in question. Although they had more success with nouns, they nonetheless had trouble with some of these as well. In fact, the more ‘image-able’ the referent, regardless of whether it was a noun (e.g., *chair* vs *sister*) or verb (e.g., *hit* vs *think*), the better participants’ performance. Their performance with the hard-to-image words illustrates the limits of observation; it also illustrates the value of including linguistic information. When adults were offered linguistic information in conjunction with observation, their performance improved. For example, if they were offered either the syntactic structure in which the word appeared, or a list of the other content words that appeared in the sentence, adults’ ability to identify the mystery word improved. This result provides a strong in-principle demonstration of the importance of linguistic information (content words or structure). Recent work shows important parallels with 3- and 7-year-old children in the Human Simulation Paradigm task.<sup>65,66</sup> When provided with visual scenes alone, children performed better with nouns than verbs. But within these grammatical classes, relational nouns (e.g., friend) yielded poorer performance than concrete nouns (e.g., book), and mental verbs (e.g., want) yielded poorer performance than action verbs (e.g., sit).

The Human Simulation findings from adults and children point to the importance of linguistic information, especially when observation alone proves insufficient. Why might linguistic information be required more for some kinds of words than others? Although most nouns (especially non-relational nouns) pick out roughly the same object category regardless of the other elements in the sentence, other kinds of words interact more heavily with the linguistic contexts in which they appear. The adjective ‘small’, for example, means something quite different in the phrase ‘the small mouse’ than it does in the phrase ‘the small elephant’. Verbs also interact heavily with linguistic context. Verb meaning is intimately connected to the syntactic structures in which the verb can appear.<sup>67,68</sup> For example, verbs that describe a manner of motion typically appear in intransitive sentences (e.g., ‘The birds flew’), whereas verbs describing an object’s change of state (e.g., a glass breaking) generally appear in transitive or intransitive sentences (e.g., ‘Al broke the glass’/‘The glass broke’). Because there are links between what a verb means and the structures it appears, syntactic information is not only useful in helping children determine whether a new

word labels an object or action category, but also in determining its meaning.<sup>69–71</sup>

## Learning from Syntax

Infants as young as 26 months of age are sensitive to precise aspects of the syntactic information they receive when seeking to establish verb meaning.<sup>72–76</sup> In a landmark study, Naigles<sup>75</sup> familiarized 26-month-olds to scenes in which two actors were simultaneously engaged in two kinds of action: one actor (dressed as a duck) was pushing the other (dressed as a bunny) repeatedly into a squatting position, while both actors simultaneously circled one of their hands in the air. As they viewed these scenes, toddlers heard either a transitive sentence, ‘The duck is gorging the bunny’, or an intransitive sentence, ‘The duck and the bunny are gorging’. In the immediately following test phase, the two actions were uncoupled: one screen depicted just the duck forcing the bunny to squat, and the other depicted the duck and bunny waving one of their own hands. Naigles predicted that toddlers who had heard the transitive sentence would look longer at the scene in which the duck was acting on the bunny, because the transitive sentence structure is not compatible with an event in which two actors are acting independently. As predicted, toddlers hearing the transitive sentence looked longer at the forcing-to-squat scene than did toddlers hearing the intransitive sentence.

In recent work, we demonstrated that what is instrumental in their success in this kind of learning situation is the syntax. In fact, even in the absence of any concurrent visual information, toddlers take advantage of syntactic information.<sup>77</sup> Using an innovative new method developed by Yuan and Fisher,<sup>78</sup> we presented toddlers (age 27 months) with scenes depicting two actors having a conversation. The dialogue featured a novel verb in either transitive (e.g., ‘Guess what? The girl mooped her sister!’), or intransitive sentences (e.g., ‘Guess what? The girl and her sister mooped!’). Immediately following this linguistic familiarization, they viewed two scenes, one in which one actor acted on another (e.g., by spinning her in a swivel chair), and one in which the two actors performed the same simultaneous action (e.g., bending at the waist). We asked toddlers to point to the scene depicting mooping, but using the verb in a neutral syntactic context (‘Find mooping!’). In order to succeed, children had to use the linguistic information they had heard earlier in the dialogues. Toddlers did succeed; those in the transitive condition pointed to the causative spinning scene significantly more often than did those in the intransitive condition. These studies document the relation between syntactic and semantic information across the course of verb acquisition.<sup>10</sup>

The fact that toddlers can use purely syntactic information (e.g., whether a verb appears in transitive or intransitive sentences) to draw inferences about verb meaning is exciting, but it does not mean that they do not use other cues as well. Infants and toddlers also recruit other linguistic cues, including the content of the other words in the sentence.<sup>79,80</sup> A toddler who knows the word ‘eat’ but not the word ‘papaya’ can infer that a papaya is a kind of food from hearing the phrase ‘eat some papaya’. For verbs and adjectives, too, the content words in the sentence serve as clues to meaning. For example, 24-month-olds map novel verbs more successfully when the verbs are presented in full noun phrase contexts (e.g., ‘The man is pilking the balloon’) than when they are surrounded by pronouns (e.g., ‘He’s pilking it’).<sup>60,81</sup> Mintz and Gleitman<sup>82</sup> and Klibanoff and Waxman<sup>83</sup> find similar results for adjective learning.

The kind of linguistic information available to children will differ across languages, and this may affect the relative ease or difficulty of learning different kinds of words. In languages like Mandarin Chinese, for example, nouns may be freely dropped if their referents are recoverable from the discourse or environmental context.<sup>84</sup> Given that young learners of English rely heavily on the surrounding nouns to successfully interpret novel adjectives and verbs,<sup>60,82,83</sup> it could be the case that verb learning is more difficult in Mandarin, in which learners have less access to rich surrounding linguistic contexts.<sup>85</sup> Another possibility, though, is that the relative salience and frequency of verbs as compared to nouns in the child’s input aids verb learning.<sup>86,87</sup> More experimental work is needed in this area to tease apart these possibilities.

Of course, children also use nonlinguistic information, including their observation of the world. After all, linguistic information narrows the set of candidate hypotheses for a new word’s meaning, but it does not settle the matter on its own. For example, the verbs ‘roll’ and ‘slide’, along with several other verbs, occur in the same set of syntactic structures.<sup>88,89</sup> Thus, on the basis of the sentence, ‘The girl blicked down the hill’, a learner cannot determine, without observation, in precisely what manner the girl moved. Children also attend to social and referential cues, such as eye gaze and the inferred intentions of the event participants, to discover the meaning of novel words.<sup>36,90</sup>

Clearly, if they are to succeed in the task of word learning, infants and young children must coordinate several sources of linguistic and nonlinguistic information. Moreover, the relative import of these informational sources may vary as a function of the kind of word being acquired. Syntactic information

may be more important for verb learning than noun learning, and for learning names for unobservable concepts more than for observable concepts. But syntax and observation have different consequences within the acquisition of any given lexical item as well. Although syntactic information is crucial for learning that a word is a noun or a verb, observational information is crucial for determining other aspects of meaning; for example, the difference between a chihuahua and a poodle, or rolling and sliding.

## CONCLUSION

Word learning stands at the crossroad of language and conceptual development. Even before they produce words on their own, infants are sensitive to relations between words and concepts. Within the first year, they map words to commonalities among objects. In the second year, they establish more precise mappings between kinds of words (e.g., noun, verb, adjective) and kinds of concepts (e.g., categories of objects, properties of objects, relations among objects). These mappings evince different developmental trajectories, with the mapping for adjectives and verbs emerging later than the mapping for nouns. This is because there are different informational requirements for these mappings. Verbs are more heavily dependent on particular features of the linguistic and observational context available during exposure. Acquiring verbs requires a richer set of linguistic and conceptual cues than noun learning. Thus, word learning is

a dynamic process, one that is influenced by whatever innate principles undergird the conceptual and linguistic systems, and is tuned by the learners' experience with the objects, events and native language they encounter.

We have focused on evidence from infants and young children acquiring English, but to identify which aspects of acquisition are universal, and which will vary as a function of the structure of the ambient language, cross-linguistic evidence is also essential.<sup>91–94</sup> Another promising avenue for investigation is the interface between early word learning and language processing. Although previous work on language processing focused almost exclusively on adults, researchers have recently focused on this interface in infants and young children. By presenting them with a visual scene and tracking the time-course underlying their eye movements as they hear concurrent speech,<sup>44,61,95–98</sup> researchers have begun to shed light on the real-time processes of establishing representations for new words. Finally, recent work has provided insight into infants' and young children's conceptual and social/interactive capacities and how these are influenced by language. So far, words have been implicated not only in object categorization, as reviewed above, but also object individuation,<sup>32</sup> induction,<sup>29</sup> understanding actors' intentions,<sup>99</sup> and apprehending social convention.<sup>37,53,100–102</sup> These new directions are especially fitting because as they acquire language, infants gain not only words, but a powerful capacity to influence the minds of others, and a nuanced ability to understand their goals and intentions.

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