Sleepy vs. Sleeping: Preschoolers' Sensitivity to Morphological Cues for Adjectives and Verbs in English and French

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1. Introduction

> Twas brillig and *the* slith*y* tove*s*
> *Did* gyre and gimble in the wabe
> – Lewis Carroll

This nonsense verse sounds authentic because of the recognizable endings *–y*, *–s*, and the function words *did* and *the*. Sensitivity to these elements enables adults to infer something of the meanings of these words through their forms. As young children often encounter sentences with novel words, perhaps such elements contribute to the rapid word mapping researchers have observed (Carey, 1978; Golinkoff, Hirsh-Pasek, Bailey, & Wenger, 1992). Children do use multiple cues in learning words (e.g., Hollich, Golinkoff, & Hirsh-Pasek, 2000). Linguistic cues such as syntax and morphology can signal syntactic category membership (e.g., –ing follows verbs while –y is a common adjective ending). In turn, these word classes are probabilistically associated with respective semantic categories (e.g., verbs are events or processes; adjectives are modifiers). Thus, there are reliable, though not perfect, correlations between word form and meaning (e.g., Bloom, 1994; Brown, 1957; Gleitman, 1990; Mintz, 2003). Computational research confirms that this distributional information is available in the input to children, and that the patterns are sufficiently informative to allow an initial categorization of novel words (Mintz, 2003). Are young children sensitive to the syntactic and morphological cues that signify a word's grammatical class? Two questions guided this research: First, are preschoolers sensitive to the correlation between linguistic cues and word meaning? Second, can they use these cues – specifically, the morphological cues – to categorize novel adjectives versus novel verbs? Sensitivity to these elements would be a tool to identify the form class and find the meaning of novel words.

Adjectives and verbs have distinct characteristics. First, both word classes are inherently relational. Adjectives describe properties of entities while verbs require an entity to perform the action or process. Second, both classes appear relatively late in children's lexicons compared to nouns (Fenson et al., 1994; Gentner, 1982; but see Tardif, 1996). Third, both classes are harder to learn than nouns in the laboratory. While young children's ability to fast-map and extend

novel nouns in laboratory settings is quite robust (e.g., Golinkoff et al., 1992), the mapping and extension of novel adjectives and verbs appears more effortful (Golinkoff, Jacquet, Hirsh-Pasek, & Nandakumar, 1996; Hall & Waxman, 1993; Imai et al., 2008; Kersten & Smith, 2002; Seston, Golinkoff, Ma, & Hirsh-Pasek, 2009; Smith, Jones, & Landau, 1992). Finally, both adjectives and verbs show significant cross-linguistic differences in the meanings they encode (Dixon, 1982; Gentner & Boroditsky, 2001; Talmy, 1985).

1.1. Adjective and Verb Learning

Although children become sensitive to adjectives early (Waxman, 1999), the ability to map novel adjectives to meanings after limited exposure takes longer to develop. In word learning experiments, children often exhibit a "noun bias" – interpreting a novel word as the name of the novel object, regardless of whether it is a noun, an adjective, or a verb. Up to 4 years of age, children are strongly biased to interpret a novel word as a basic level label (a count noun) (Hall & Waxman, 1993), rather than as referring to the individual (a proper name), or material (a mass noun), or a property (an adjective) (e.g., Hall, 1991). Smith et al. (1992) taught 3-year-olds a novel adjective (e.g., "This is a dax one") or a novel count noun (e.g., "This is a dax") for an unfamiliar object. In both conditions, children extended it to objects sharing a similar shape, a feature strongly correlated with object kind, rather than the property.

Nevertheless, preschoolers can learn novel adjectives in the laboratory with support. For example, children are more successful at mapping and extending novel adjectives if the objects involved are familiar or from the same basic-level category (Hall, Waxman, & Hurwitz, 1993; Klibanoff & Waxman, 2000), or if children are provided with an opportunity to contrast the target and non-target properties (e.g., "This is not blickish," Waxman & Klibanoff, 2000).

Research on verb learning reveals a similar story in that children seem to recognize verbs as a class early (Gerken, Landau, & Remez, 1990; Golinkoff, Hirsh-Pasek, & Schweissguth, 2001; Shi & Marquis, 2009) but even preschoolers have difficulty learning and extending novel verbs, compared to nouns (Seston et al., 2009; see also Hirsh-Pasek & Golinkoff, 2006). Kersten and Smith (2002) taught 44-month-old children novel nouns and verbs using animated novel figures and motions. At test, the figure and/or the motion were changed and participants were asked whether the novel noun or verb still applied. In the noun condition, children accepted the novel noun as long as the figure remained the same regardless of the change in motion. In the verb condition, however, children only accepted the novel verb when both the figure and the motion remained the same, suggesting that they under-extended the verb.

Even children who are learning "verb-friendly" languages such as Chinese and Japanese (verbs appear in sentence-final position in Japanese, Chinese does not have verb morphology, and both languages allow pro-drop) find verb learning challenging. Imai and collaborators (2008) taught novel nouns ("This is an X") and verbs ("She is X-ing it") to 3- and 5-year-old American, Japanese

and Chinese children by presenting them with videos of novel objects and novel actions. They found that even Japanese and Chinese 3-year-olds had difficulty mapping and extending novel verbs. Yet all children succeeded in learning the novel nouns at age 3. Thus, verb learning is slower than noun learning and requires that verbs be presented in familiar syntactic structures for learning to occur by age 5.

1.2. Morphological Cues in Interpreting Adjectives and Verbs across Languages

The adjective- and verb-learning literatures lead to a central question: How do children build a lexicon containing relational terms such as adjectives and verbs? Perhaps, given the noun advantage, linguistic cues are especially instrumental in learning the meaning of relational terms. In all prior studies, multiple linguistic cues such as morphology, prosody and syntax were available simultaneously (Waxman, 1999). However, there is an opportunity to examine children's knowledge of morphology more specifically, as adjectives and verbs can be embedded in the same sentence frame (e.g., *Mike is blicky/blicking* in English and *Regarde ce monstre pazin/pazir* in French), thereby neutralizing the effect of syntax. Our target in this research is whether preschoolers use the morphemes associated with these word classes when interpreting novel adjectives and verbs. In Study 1 we ask whether English-learning children can use morphological cues *alone* (when other cues are held constant) to disambiguate adjectives and verbs. In Studies 2 and 3 we ask whether French-learning children also show sensitivity to morphological cues in the same task.

Any examination of children's language learning must take into consideration the variability across languages. Take the morphological cues for adjectives and verbs in English and French, for example. In both languages morphological cues alone can signal whether a target word is an adjective or a verb. However, there are considerable differences between the two languages. In particular, morphological cues clearly distinguishing adjectives from verbs appear to be more frequent in English than in French. In English, verb endings such as –ing and adjective endings such as –y and –ish are highly productive and very frequent. In French, the most productive verb ending is –er, which is however homophonous to the adjective ending –é. Although other morphemes are less ambiguous (e.g., –ir and –oir for verbs, –in for adjectives), they are not as frequent as –ing and –y in English. Given these cross-linguistic differences in morphological cue strength, we investigate in Study 2 how French-learning children use morphological cues to assign new words to syntactic categories. If children are sensitive to the *strength* of linguistic cues, French-learning children should perform less well than English-learning children in a task that rests solely on morphological sensitivity. In addition, in Study 3, we ask what additional cues can help French children categorize novel adjectives and verbs.

2. Study 1. Can English-learning Preschoolers Use Morphological Cues Alone to Categorize Novel Adjectives and Verbs?

English-learning 3- and 4-year-olds were asked to identify the referents for either four novel adjectives or four novel verbs in a between-subjects design. These ages were selected as prior research suggested that around this time children become capable of learning novel adjectives and verbs in the laboratory (e.g., Hall et al., 1993; Imai et al., 2008). For each novel word, children were presented with three novel animated figures (e.g., starfish): One was the labeled "standard" figure and two were test item alternatives (see Table 1). The labeled standard had a novel property (e.g., a colorful pattern) and performed a novel action (e.g., side-bending). One alternative matched the standard's *property* but performed a different action (property-match), while the other alternative matched the standard's *action* but differed in property (action-match). In the adjective condition, the experimenter labeled the standard with a novel adjective (e.g., *blicky*) and asked children to find which one of the two alternatives can also be labeled with the same word. In the verb condition (e.g., *blicking*), the target choice should be the action-match alternative. Because novel properties and actions were involved in all three animations, children could not make a choice based on animacy or perceptual salience of the figures. Nor could they rely on any other linguistic cue than the morphological marker on the novel word. To succeed, children must realize that words ending in –y are related to object property and words ending in –ing are related to actions.

An *extension test* in which the labeled standard was kept the same but the two alternatives were members of a *different* category (e.g., robot-like figures) was also conducted. The inclusion of an extension trial served as a stringent test of children's initial word mapping, allowing us to assess whether the novel word was truly mapped to a property or an action.

Lastly, another group of children were tested in a *control condition* in which no novel words were offered. Children were simply asked to choose which one of the alternatives they preferred. The question was whether children would be at chance without linguistic information or whether they would reveal a spontaneous preference to choose a property-match or an action-match.
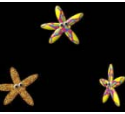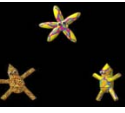
2.1. Method
2.1.1. Participants

Thirty-six 3-year-olds (*M* = 36.21, *SD* = 1.57; 16 boys) and 36 4-year-olds (*M* = 48.80, *SD* = 1.64; 16 boys) participated. There were 12 children randomly assigned to each of the three conditions: adjective, verb, and control.

2.1.2. Stimuli and Apparatus

Snapshots of the animations, presented on a black background in a PowerPoint slideshow on a 17 in computer screen, are shown in Table 1.

Table 1. Warm-up, Mapping and Extension Trial Examples in Studies 1-3

Types of trial	Participants see		Participants hear
Warm-up		A green bird flying (Standard)	**En:** Look, this bird is **green** (pointing at the standard)! See? It's green! Do you see another bird that's also **green**? **Fr:** Regarde, cet oiseau **vert** (en pointant l'oiseau du haut)! Tu vois cet oiseau vert! Est-ce que tu vois un autre oiseau **vert**?
		A green bird standing and flapping its wings vs. A blue bird flying (Alternatives)	**En:** Look, this bird **flies**. See? It flies. Do you see another bird that also **flies**? **Fr:** Maintenant regarde, cet oiseau **voler**. Tu vois cet oiseau voler. Est-ce que tu vois un autre oiseau **voler**?
Mapping		A colorful starfish side-bending (Standard)	**En:** Look, Mike is **blicky/blicking**! **En Control:** Look, this is Mike! **Fr:** Regarde ce monstre **pazin/pazir**! **Fr Control:** Regarde ce monstre. **Fr Syntax:** Regarde ce monstre qui est [très **pazin**]/[en train de **pazir**!]
		A leopard-printed starfish side-bending vs. A colorful starfish twirling (Alternatives)	**En:** Look, these are Mike's friends. Which one of them (pointing at the alternatives) is also **blicky/blicking**? **En Control:** Look, these are Mike's friends. Which one of them do you like? **Fr:** Maintenant, regarde en bas, est-ce que tu vois un autre monstre **pazin/pazir**! **Fr Control:** Maintenant, regarde en bas, est-ce que tu peux me montrer le monstre que tu préfères? **Fr Syntax:** Maintenant, regarde en bas, est-ce que tu vois un autre monstre qui est [très **pazin**]/[en train de **pazir**!]
Extension		A colorful starfish side-bending (Standard)	**En:** Here's Mike again! Look, Mike is **blicky**/**blicking**! **En Control:** Here's Mike again! **Fr:** Maintenant, regarde encore le monstre **pazin/pazir**! **Fr Control :** Maintenant, regarde encore ce monstre. **Fr Syntax:** Maintenant, regarde encore le monstre qui est [très **pazin**]/[en train de **pazir**!]
		A leopard-printed robot side-bending vs. A colorful robot twirling (Alternatives)	**En:** And look, two robots! Which robot is also **blicky/blicking**? **En Control:** And look, two robots! Which robot do you like? **Fr:** Et regarde en bas les deux robots! Est-ce que tu vois un robot **pazin/pazir**? **Fr Control:** Maintenant, regarde en bas, est-ce que tu peux me montrer le robot que tu préfères? **Fr Syntax:** Et regarde en bas les deux robots! Est-ce que tu vois un robot qui est [très **pazin**]/[en train de **pazir**!]

2.1.3. Procedure

Each child was asked to play a game on the computer with the experimenter who sat to the children's right. The experimenter used a dog puppet to engage children during the game and always said "Thank you" to children's responses. No other feedback was provided.

Warm-up trials. Children were asked to help Fido, the dog, to learn some new words. Then, children were shown three animations of familiar animals and probed with *both* familiar adjectives and verbs. Crucially, the familiar adjectives and verbs did *not* contain the target morphemes, –y and –ing. Children had little difficulty with these trials.

Test trials. Each of 4 mapping trials was followed by an extension trial. In the adjective condition, children were taught 4 novel adjectives ending in –y. In the verb condition, all target words were in the present participle form (e.g., *is blicking*). For extension trials, children had to extend the novel adjectives or verbs to objects of a new category. All factors were counterbalanced.

The control condition was identical to the experimental conditions except for two differences. First, the experimenter asked children to help Fido meet some new friends, instead of learning new words. Second, the experimenter simply named the standard (e.g., Mike or ce monstre) and asked the children which one of the alternatives they liked.

2.1.4. Coding

Children's responses in each trial were coded as target or non-target. Non-target responses included pointing at the non-target, pointing at both alternatives after explicit prompting, and no response at all. In the control condition, we designated the property-matches to be the "target" and the action-matches to be the "non-target," even though there was no true target.

2.2. Results and Discussion

Preliminary analyses showed no effect of gender; thus, data were collapsed across boys and girls. The correct rates of the mapping and extension trials are shown in Table 2. One-sample t-tests comparing the correct rates against chance performance (.50) indicated that both age groups performed better than chance in both mapping and extension trials in the adjective and verb conditions, suggesting that these English-learning preschoolers were sensitive to the correlation between the morphological cues and meaning. The rates of "target" choices in the control condition did not differ from chance for either age group, establishing that the alternatives were equally salient on average and that the novel words were motivating children's choices.

Table 2. Children's Responses in Studies 1-3

		Mapping	Extension
Study 1: English			
3-year-olds			
	Adjective	.79***	.77**
	Verb	.69*	.67*
	No-Label Control	.48	.50
4-year-olds			
	Adjective	.81**	.83**
	Verb	.71*	.75*
	No-Label Control	.56	.56
Study 2: French			
3-year-olds			
	Adjective	.88***	.56
	Verb	.54	.52
	No-Label Control	.46	.52
4-year-olds			
	Adjective	.73*	.79**
	Verb	.48	.44
	No-Label Control	.46	.52
Study 3: French with syntactic cues			
3-year-olds			
	Adjective	.77**	.75**
	Verb	.77**	$.65^{\dagger}$
4-year-olds			
	Verb	.90***	.81**

Note. *** $p < .001$, ** $p \leq .005$, * $p < .05$, $^{\dagger} p < .06$

A repeated-measure ANOVA was conducted, with the correct rate of the mapping and extension trials as the dependent measure and age (3 versus 4) and condition (adjective, verb, and control) as the independent variables. The only significant result that emerged was a main effect of condition. Tukey post hoc tests revealed that across the two age groups, the correct rate in the control condition was significantly lower than those in the adjective and verb conditions which were not significantly different from each other. Notably, children performed equally well in the extension trials as in the mapping trials. Moreover, although the correct rates appeared to be higher in the adjective condition than in the verb condition, and higher for the 4-year-olds than for the 3-year-olds, these differences were not statistically significant. However, in an additional analysis evaluating performance on the first and last mapping trials, an advantage of adjectives appeared more clearly: Children in the adjective condition were already successful on the first trial, while a marked improvement was found from the first to the last mapping and extension trials in children's performance in the verb condition at both ages.

3. Study 2. Can French-learning Preschoolers Use Morphological Cues Alone to Categorize Novel Adjectives and Verbs?

Would French-learning children also use the morphological cues available in their language to assign new words to syntactic categories? As mentioned earlier, while such cues are present in French, they are not as productive and frequent as in English, which might lead to delay in using these cues.

3.1. Method
3.1.1. Participants

Monolingual French-learning preschoolers were tested: 36 3-year-olds ($M = 42.33$, $SD = 3.29$; 22 boys) and 36 4-year-olds ($M = 55.07$, $SD = 3.73$; 24 boys). Twelve children participated in the adjective, verb, and control conditions.

3.1.2. Procedure

The procedure was identical to that in Study 1. The French version of the script is shown in Table 1. Although –é and –er are highly productive adjective and verb morphemes in French, they are homophones and therefore could not be used in the present study. Instead, we chose –in as the adjective ending and –ir as the verb ending. These endings, although less frequent which might put French children at a disadvantage relative to English children, were selected as pilot data established that adults interpret these endings correctly, and French CDI data (Nazzi, 2005; Nazzi, Floccia, Moquet & Butler, 2009) showed that children produce words with these endings by 20 to 30 months of age, suggesting that they have at least some knowledge of the endings.

3.2. Results and Discussion

Results are shown in Table 2. In the adjective condition, while the 4-year-olds' correct rates were greater than chance (.50) for both mapping and extension, the 3-year-olds succeeded only in the mapping trials. In the verb condition, neither age group performed better than chance for either mapping or extension. A repeated-measures ANOVA was conducted with the correct rate of the mapping and extension trials as the dependent variable and age group (3 versus 4) and condition (adjective, verb, and control) as the independent variables. A significant main effect of condition emerged. Tukey post hoc tests indicated that across the age groups, children performed significantly better in the adjective condition than in the verb or control conditions, which were not different from each other. The chance result in the control condition suggests that the differential results in the adjective and verb conditions were unlikely to be a result of an a priori preference for selecting property matches. The ANOVA also revealed a significant interaction of trial by age group by condition, suggesting that the 3-year-olds performed significantly worse than the 4-year-

olds in the extension trials in the adjective condition. Thus, we found an age-related improvement in children's performance.

These results are in line with our prediction that French-learning children would perform less well than English-learning children (despite their older ages) in a task that hinges on the use of morphology to assign syntactic category to new words, as the French morphological cues used in this study are less salient compared to the English cues used in Study 1. Alternatively, it might be that French children have difficulties with the present task, or are delayed in terms of their development of word learning mechanisms. In order to evaluate these possibilities, Study 3 presented French children with the same task to the notable difference that we provided them with both morphological and syntactic cues.

4. Study 3. Can French Preschoolers Use a Combination of Morphological and Syntactic Cues to Categorize Novel Adjectives and Verbs?

We provided another group of French preschoolers with both morphological and syntactic cues. We predicted that if failure in Study 2 was due to morphological cues not being strong enough for French children at 3 and 4 years rather than due to delay of some sort, then the French children should be able to categorize the novel adjectives and verbs with the combined cues.

4.1. Method
4.1.1. Participants

Monolingual French-learning preschoolers participated. There were 24 3-year-olds ($M = 44.03$, $SD = 3.28$; 14 boys), 12 in the adjective condition and 12 in the verb condition, and 12 4-year-olds in the verb condition only.

4.1.2. Procedure

The script now with syntactic cues also is shown in Table 1.

4.2. Results and Discussion

Results are shown in Table 2. In contrast to Study 2, French 3-year-olds could now map novel adjectives and verbs. Successful extension is found at 3 years for adjectives and 4 years for verbs. These results indicate that French children's weaker performance in Study 2 was not due to task difficulty or delay in acquisition skills. Rather, children appear sensitive to the strength of the morphological cues. The French morphemes we selected, although known by children, are relatively infrequent. The lower frequencies may have resulted in children's uncertainty about the link between the morphological cues and the word classes and their respective meanings. Alternatively, morphological cues to syntactic category assignment in general might be given less weight in French than in English. With the additional help of syntax, however, children were able

to categorize the novel adjectives and verbs with high accuracy. These results suggest that children at these ages can cull information from a variety of linguistic cues including morphology and syntax to interpret novel words.

5. General Discussion

We investigated preschoolers' knowledge of morphological cues to syntactic category assignment. As languages differ in the salience of their morphological cues, we compared English and French. The results of Study 1 indicate that by age 3, English-learning children recognize that the adjective morpheme –y signals a class of words that is associated with an object's property and that the verb morpheme –ing signals another class of words associated with motion or action. While children selected the alternatives at random when asked which one they liked in the control condition, they chose the correct alternative significantly more often when asked to identify the referent for a novel adjective or verb. Knowledge of adjectival and verbal morphology not only allowed children to map a novel adjective or verb to an object of the same category, but also to *extend* the word to novel examples of a different category. This is the first evidence that children can use morphology *alone* to map and immediately extend novel words. As sentence structure was identical in both conditions, children had only the morphological cues to rely upon to make their choices.

Study 2 explored what happens when the morphological cues were less salient in a language. When morphology was the only cue to word meaning, French-learning preschoolers performed worse than English-learning children. However, the French children were just as capable of interpreting novel adjectives and verbs if syntactic cues were also provided (Study 3). These results demonstrate that children are aware of the utility of linguistic cues available in their language. When the cues are weaker, or more ambiguous, children must wait for additional information (in this case, syntactic in nature) to decide the class of a novel word. Thus, any generalization about the use of linguistic cues must be conditioned by the properties of the particular language. Note however that French children are sensitive to morphological cues in domains other than adjective/verb category assignment, such as subject-verb agreement by 30 months (Legendre et al., in press).

In this, the first study to compare adjective and verb learning directly, the data suggest that verbs are more challenging than adjectives. Despite the fact that –ing appears much more frequently than –y, English-learning preschoolers performed relatively well with mapping and extension trials when interpreting novel adjectives, but were not equally successful with the verbs in Trial 1. As the experiment continued, children became better at interpreting the novel verbs and achieved success in the final trials. The null results of the control condition rendered an a priori preference to select the property-match unlikely. An advantage for adjectives over verbs was also found for French. The results suggest that adjectives that refer to surface properties are easier to learn than

verbs that refer to actions, even though the referents for both categories were perceptually accessible. Further research is needed to understand why verbs are more difficult than nouns (Imai et al., 2008) and now than adjectives to fast map. In any event, these findings offer a more nuanced view of the differences between classes of relational terms.

In summary, in three well-controlled experiments, preschoolers' ability to use linguistic cues – morphology and syntax – to interpret novel adjectives and verbs was found to be language dependent. This ability is crucial to language development, enabling children to quickly build a lexicon.

References

Bloom, Paul (1994). Possible names: The role of syntax-semantics mappings in the acquisition of nominals. *Lingua, 92,* 297-329.

Brown, Roger W. (1957). Linguistic determinism and the part of speech. *Journal of Abnormal & Social Psychology, 55,* 1-5.

Carey, Susan (1978). The child as word learner. In J. Bresnan, G. Miller and M. Halle (Eds.), *Linguistic theory and psychological reality* (pp. 264-293)*.* Cambridge, MA: MIT Press.

Dixon, Robert M. W. (1982). *Where have all the adjectives gone?: And other essays in semantics and syntax.* Berlin: Mouton.

Fenson, Larry, Dale, Philip S., Reznick, Steven, Bates, Elizabeth, Thal, Donna J., Pethick, Stephen J. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development, 59.*

Gentner, Dedre (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. A. Kuczaj (Ed.), *Language development, Vol. 2: Language, thought, and culture* (pp. 301-334). Hillsdale, NJ: Erlbaum.

Gentner, Dedre, & Boroditsky, Lera (2001). Individuation, relativity and early word learning. In M. Bowerman & S. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 215-256). Cambridge, UK: Cambridge University Press.

Gerken, LouAnn, Landau, Barbara, & Remez, Robert E. (1990). Function morphemes in young children's speech perception and production. *Developmental Psychology, 26,* 204-216.

Gleitman, Lila (1990). The structural sources of verb meanings. *Language Acquisition, 1,* 3-55.

Golinkoff, Roberta M., Hirsh-Pasek, Kathy, Bailey, Leslie M., & Wenger, Neill R. (1992). Young children and adults use lexical principles to learn new nouns. *Developmental Psychology, 28,* 99-108.

Golinkoff, Roberta M., Hirsh-Pasek, Kathy, & Schweisguth, Melissa A. (2001). A reappraisal of young children's knowledge of grammatical morphemes. In J. Weissenborn & B. Hoehle (Eds.), *Approaches to bootstrapping: Phonological, syntactic and neurophysiological aspects of early language acquisition* (pp. 176-188). Amsterdam-Philadelphia: John Benjamin.

Golinkoff, Roberta M., Jacquet, Roberta C., Hirsh-Pasek, Kathy, & Nandakumar, Ratna (1996). Lexical principles may underlie the learning of verbs. *Child Development, 67,* 3101-3119.

Hall, D. Geoffrey (1991). Acquiring proper nouns for familiar and unfamiliar animate objects: Two-year-olds' word-learning biases. *Child Development, 62,* 1142-1154.

Hall, D. Geoffrey, & Waxman, Sandra R. (1993). Assumptions about word-meaning: Individuation and basic-level kinds. *Child Development, 64,* 1550-1570.

Hall, D. Geoffrey, Waxman, Sandra R., & Hurwitz, Wendy M. (1993). How two- and four-year-old children interpret adjectives and count nouns. *Child Development, 64,* 1651-1664.

Hirsh-Pasek, Kathy, & Golinkoff, Roberta M. (Eds.) (2006). *Action meets word: How children learn verbs.* New York: Oxford University Press.

Hollich, George, Hirsh-Pasek, Kathy, & Golinkoff, Roberta M. (2000). Breaking the language barrier: An emergentist coalition model of the origins of word learning. *Monographs of the Society for Research in Child Development, 65.*

Imai, Mutsumi, Li, Lianjing, Haryu, Etsuko, Okada, Hiroyuki, Hirsh-Pasek, Kathy, Golinkoff, Roberta M., & Shigematsu, Jun (2008). Novel noun and verb learning in Chinese-, English-, and Japanese-speaking children. *Child Development, 79,* 979-1000.

Kersten, Alan W., & Smith, Linda B. (2002). Attention to novel objects during verb learning. *Child Development, 73,* 93-109.

Klibanoff, Raquel S., & Waxman, Sandra R. (2000). Basic level object categories support the acquisition of novel adjectives: Evidence from preschool-aged children. *Child Development, 71,* 649–659.

Legendre, Géraldine, Barriere, Isabelle, Goyet, L., & Nazzi, T. (in press). Comprehension of infrequent subject-verb agreement forms: Evidence from French-learning children. *Child Development.*

Mintz, Toben H. (2003). Frequent frames as a cue for grammatical categories in child directed speech. *Cognition, 90,* 91-117.

Nazzi, Thierry. (2005). Use of phonetic specificity during the acquisition of new words: differences between consonants and vowels. *Cognition, 98,* 13-30.

Nazzi, Thierry, Floccia, Caroline, Moquet, Bérangère, & Butler, Joseph (2009). Bias for consonantal over vocalic information in French- and English-learning 30-month-olds: crosslinguistic evidence in early word learning. *Journal of Experimental Child Psychology, 102,* 522-537.

Seston, Rebecca, Golinkoff, Roberta M., Ma, Weiyi, & Hirsh-Pasek, Kathy. (2009). Vacuuming with my mouth?: Children's comprehension of novel extensions of familiar verbs. *Cognitive Development, 24,* 113-124.

Shi, Rushen, & Marquis, Alexandra (2009). Mechanisms of segmentation and morphological learning in infants. In J. Chandlee, M. Franchini, S. Lord, and G-M. Rheiner (Eds.), *Proceedings of the 33rd annual Boston University Conference on Language Development* (pp. 480-491). Somerville, MA: Cascadilla Press.

Smith, Linda B., Jones, Susan S., & Landau, Barbara (1992). Count nouns, adjectives, and perceptual properties in children's novel word interpretations. *Developmental Psychology, 28,* 273-286.

Talmy, Leonard (1985). Lexicalization patterns: Semantic structure in lexical forms. In T. Shopen (Ed.), *Language typology and semantic description, Vol. III: Grammatical categories and the lexicon* (pp. 57-149). Cambridge: Cambridge University Press.

Tardif, Twila (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental Psychology, 32,* 492-504.

Waxman, Sandra R. (1999). Specifying the scope of 13-month-olds' expectations for novel words. Cognition, 70, B35-B50.

Waxman, Sandra R., & Klibanoff, Raquel S. (2000). The role of comparison in the extension of novel adjectives. *Developmental Psychology, 36,* 571-581.