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East and West:

A Role for Culture in the Acquisition of Nouns and Verbs

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### East and West: A Role for Culture in the Acquisition of Nouns and Verbs

How do verb learning and noun learning differ? The consensus in the early word learning literature is that children acquire nouns earlier and more rapidly than verbs (e.g., Bates et al., 1994; Benedict, 1979; Gentner, 1982; Huttenlocher & Smiley, 1987; Macnamara, 1972; Nelson, 1973). This pattern has been widely interpreted as an indication that verb learning relies on a more sophisticated apprehension of the semantic and syntactic structure of language than does noun learning. Two versions of this argument have been put forth: one is based on a syntactic bootstrapping view of verb learning and focuses primarily on the different linguistic requirements of learning nouns and verbs; the second is based on a natural partitions account of the differences between nouns and verbs and addresses the perceptual and conceptual differences in the concepts labelled by nouns and verbs. Both views make similar predictions about the course of early noun and verb learning.

According to the syntactic bootstrapping account (e.g., Gleitman, 1990; Gleitman & Gleitman, 1992; Landau & Gleitman, 1985; Naigles, 1990), the acquisition of verbs is delayed relative to the acquisition of nouns because nouns (particularly those with concrete, imageable referents) can be acquired through direct observation of the real world contexts in which they are heard. This contextual information is available from the beginning of lexical development; however, it does not provide adequate support for verb learning. Acquiring verbs depends not just on direct observations of the world, but also on the linguistic information that is conveyed through the argument structures in which verbs occur. This linguistic information is not available to young children until they have developed some understanding of the relationship between sentence structure and verb meaning in the particular language they are acquiring. By this

account, the delay in verb learning is a logical consequence of relying on argument structure to infer the meaning of a novel verb.

The natural partitions and relational relativity hypotheses (Gentner, 1982; Gentner & Boroditsky, 2001) also predict a delay in the onset of verb learning, but focus on different issues. At stake here is the observation that there is a real world distinction between the concepts labelled by nouns and those labelled by verbs. Relatively speaking, the referents of nouns come in tidy preindividuated packages that are easy to pick out and serve as good candidates for word learning. The relational concepts labelled by verbs are more nebulous and (even for concrete, observable actions) the mapping between verbs and the particular aspects of the world that they encode is highly variable across languages (e.g., in some languages verbs of motion encode manner of motion while others encode path of motion; Papafragou, Massey, & Gleitman, 2002). By this account, the mapping between nouns and their referents is relatively stable and straightforward and should, therefore, be accessible to the youngest word learners; however, the variable nature of the mapping between verbs and their referents across languages implies that children need to discover the language-specific semantic patterns of verbs in their particular language before they can start acquiring verbs.

On one hand, all is well. Two distinct theories of word learning, addressing the problem from different perspectives, both converge on the same prediction: noun learning should precede verb learning in development. There is good empirical evidence in support of the prediction: children do show the expected noun bias in their early word learning. On the other hand, something is missing. Logically, according to the syntactic bootstrapping story, once learners begin to recover and utilize argument structures to arrive at verb meaning—once the problem has been solved—verb learning should surge ahead. Similarly, according to the natural partitions

story, once learners begin to unravel the language-specific semantic patterns of verbs, verb learning should advance dramatically. Yet this does not seem to be the case. Despite the fact that children have at least some of the necessary verb learning structures in place by their second birthday, noun learning seems to outstrip verb learning from the outset of lexical acquisition until the third birthday (Gentner, 1982). For example, Naigles (1990; 1996) has shown that by two years of age, toddlers can use syntactic structure to draw suitable inferences about the meaning of a novel verb. As well, Choi, McDonough, Bowerman, and Mandler (1999) have shown that, by 18 months, children have worked out some of the important language-specific semantic patterns associated with relational terms. If children can solve the problems associated with verb-learning by the age of two, why then does verb-learning lag behind noun-learning for at least another full year?

Before addressing this question, let us first consider the current status of the “noun bias” in the study of early word learning. The position that all children learn many nouns and few verbs early in their word learning careers has been the subject of some controversy. A number of researchers have argued that early word learning is not *universally* characterized by an early emphasis on nouns. On the other hand, several researchers have argued that the noun bias is, in fact, a universal feature of early word learning. Choi and Gopnik (1995; Gopnik & Choi, 1995; Gopnik, Choi, & Baumberger, 1996) have collected data showing that children acquiring Korean as their first language learn nouns and verbs at an equivalent rate. Similarly, Tardif and her colleagues (Tardif, 1996; Tardif, Gelman & Xu, 1999; Tardif, Shatz & Naigles, 1997) have shown that children acquiring Mandarin do not show a delay in verb learning relative to noun learning. These findings suggest that children can proceed with efficient verb learning at or around the time that noun learning takes off. However, a number of studies have yielded

contradictory findings showing that children acquiring a wide variety of languages, including Dutch, French, Hebrew, Italian, Japanese, Kaluli, Korean, Mandarin, Navajo, Spanish and Turkish, do show a delay between noun and verb learning that is similar to the pattern seen in English-learning children (Au, Dapretto, & Song, 1994; Bornstein et al., in press; Fernald & Morikawa, 1993; Gentner, 1982; Gentner & Boroditsky, 2004; Kim, McGregor, & Thompson, 2000).

On the surface, the question of the universality of the noun bias in early word learning appears to be a relatively straightforward empirical one. If it is clear that children acquiring English show a noun bias, it should be equally clear that children acquiring other languages either do or do not show a noun bias, whichever the case may be. However, the introduction of crosslinguistic comparisons into the study of early word learning raises a number of difficult methodological issues. The core issue revolves around the problem of discovering and counting all the words in any child's vocabulary. That is, in order to determine whether a child acquiring a particular language shows a noun bias in her word learning, one must first determine how many nouns and verbs she has in her vocabulary. This already difficult problem is further complicated by the fact that different approaches to measuring early vocabulary have produced different results and by the fact that any crosslinguistic differences may be either exaggerated or obscured through interactions with different methods of assessing vocabularies.

Two general approaches to measuring early vocabularies have been used, and the differences in the results of different studies are likely the result of biases in these approaches. One method involves gathering naturalistic samples of children's productive speech and extrapolating on that basis the relative proportions of nouns and verbs in children's vocabularies. The second method uses maternal reports (e.g., MCDI checklists) to gather information from

mothers about their children's vocabularies. Studies that rely on speech samples usually indicate that children acquiring some languages (e.g., Korean or Mandarin) do not show a noun bias in their early word learning, while those relying on maternal reports tend to report a universal noun bias.

Why might these measures yield such different outcomes? Both approaches have systematic biases that can distort estimates of the words in children's vocabularies. On the one hand, checklist measures inflate the proportion of nouns in children's vocabularies (Pine, Lieven, & Rowland, 1996): mothers seem to be more exhaustive in their reports of the nouns their children know than of the verbs. To make matters worse, this exaggeration is particularly pronounced for American mothers compared to Chinese mothers (Tardif et al., 1999). On the other hand, children's speech samples are not unproblematic either, because the type and number of words children produce vary widely as a function of several factors, including the context in which the sample is gathered. Children tend to emphasize nouns during book reading sessions and verbs during play sessions (Tardif et al., 1999). These differences become particularly problematic in the context of crosslinguistic research because the available evidence indicates that American children produce relatively more nouns during book reading and Chinese children produce relatively more verbs during play sessions (Tardif et al., 1999). One solution to these methodological problems is to combine several methods of assessing vocabularies. It is not clear, though, that composite measures would resolve the matter because the systematic biases of each measure seem to play out differently for children acquiring different languages. Thus, there is no guarantee that the various means of counting vocabulary items will balance each other out to provide a cleaner index of word learning.

Despite these concerns, one clear point does emerge from the crosslinguistic research: regardless of which language is studied and which vocabulary measure is used, verb learning never outstrips noun learning. Although a noun bias may not be a universal feature of word learning, there is no evidence for a verb bias. This state of affairs suggests that the predictions made by the syntactic bootstrapping and natural partitions hypotheses are widely borne out. On the other hand, though the advantage for noun over verb learning is never reversed, it does appear to vary across children who are learning different languages. Because these crosslinguistic differences in the relative rates of noun and verb learning cannot be accounted for by either syntactic bootstrapping or natural partitions, it is important to investigate other factors that may influence the course of noun and verb learning.

One step in this direction, is to avoid entirely the problematic task of counting words in children's vocabularies and to opt instead for a laboratory-based word learning task. This approach would allow us to investigate factors that influence the *process* of word learning rather than relying on some measure of its *outcome*. Several factors relevant to the acquisition of nouns and verbs have already been given considerable attention, including features of the language and social/pragmatic cues to word meaning. With respect to languages, typically, the emphasis is on structural features, like word order, morphology, or noun ellipsis, that differ across languages. For example, for children exposed to English, nouns might be more salient or more frequent than verbs in the input; for children exposed to languages like Mandarin or Korean, verbs might be more salient or more frequent than nouns (e.g., Gentner, 1982; Tardif et al., 1997). However, although there is some evidence that the distribution of words in the input influences the pattern of lexical development (e.g., Naigles & Hoff-Ginsberg, 1998), children's vocabularies clearly

reflect more than just the frequency and salience of words in the input (Gentner, 1982)—otherwise, children’s first words would consist of items like “the” and “you”.

With respect to social/pragmatic factors, there is a growing consensus that lexical development is a multiply determined process (e.g., Hall & Waxman, 2004; Hollich et al., 2000; Woodward & Markman, 1998)—that word learners exploit a variety of sources of information—and, in particular, that social-pragmatic cues can be (one of several) reliable guides to the meaning of novel words (e.g., Clark, 1997; Tomasello, Kruger, Ratner, 1993). Recent work has focused on children’s understanding of intentional cues as guides to meaning (e.g., Baldwin et al., 1996; Poulin-Dubois & Forbes, 2002; Tomasello & Barton, 1994); however, many other aspects of the social contexts in which children acquire novel words can potentially provide reliable information about word meaning. Recent work in cultural psychology suggests that in different cultures, social cues may emphasize different sources of information and, in particular, some cultures may highlight information that supports noun learning and others may highlight information that supports verb learning.

Evidence that different cues to word learning might be more or less salient in different cultures comes from research showing that members of Eastern cultures tend to engage preferentially in a holistic style of reasoning, while members of Western cultures tend to engage in more analytic reasoning. These differences have been demonstrated in a variety of domains (Markus & Kitayama, 1991; Nisbett, Peng, Choi, & Norenzayan, 2001). Two lines of research—one focussing on categorization and the other involving memory and attention—suggest that, as a consequence of their analytic reasoning style, members of Western cultures may be particularly attentive to sources of information that are helpful in acquiring nouns, while members of Eastern



cultures, as a consequence of the holistic reasoning style, may be more attentive to verb-relevant sources of information.

In categorization tasks, Easterners have shown a preference for relational categories while Westerners show a preference for taxonomic categories (Ji, Zhang, & Nisbett, in press). For example, when shown pictures of a monkey, a panda, and a banana and asked to choose two items that form a category, Chinese participants are more likely to choose the monkey and the banana (focusing on the relation “eat”) and Americans are more likely to choose the monkey and the panda (forming a taxonomic category like “mammals” or “animals”). In memory tasks, Easterners seem to be attentive to relationships between objects, while Westerners are more attentive to the objects themselves, especially salient focal objects. For example, Masuda and Nisbett (2001) showed Japanese and Americans animated underwater scenes and later asked participants to describe what they had seen. The Japanese made more references than the Americans to relationships between different objects in the scene and between objects and the background. The Americans focussed more on describing individual objects.

This difference in focus could be relevant to the acquisition of nouns and verbs. Individual objects and taxonomic categories are usually labelled with nouns while thematic relations are generally captured by verbs. If Westerners are particularly attentive to the kind of information that is most useful in learning nouns and Easterners are more attentive to information useful for learning verbs and if these cultural differences are in place early enough in development to play a role in the initial stages word learning, then we should expect to find systematic cultural differences in early lexical development. Western children should be more focussed on learning nouns and Eastern children should be more focussed on learning verbs. As a result, Western children may acquire many more nouns than verbs in the early stages of word

learning—not simply because of the learning requirements of nouns and verbs, but because noun-relevant information is more salient in Western cultures. Eastern children may show more of a balance between noun learning and verb learning because their cultural experiences make them more attuned to verb-relevant information, which may reduce the impact of the more stringent requirements imposed on verb learning.

In recent work, we have extended an experimental task developed by Gillette, Gleitman, Gleitman, and Lederer (1999) to explore the role of cultural factors in word learning. The task involves simulating, for adult participants, some of the conditions of early word learning. In particular, participants view spontaneous mother/toddler interactions from which all linguistic information has been deleted—on the assumption that linguistic information is unavailable to very young word learners. The question is: what information can participants recover from the nonlinguistic contextual information? Gillette et al. (1999) hypothesized that when faced with these conditions in typical early word learning scenarios, children can learn nouns but not verbs, for which they need more linguistic information. If this is true, then adults should also be able to learn nouns but not verbs when faced with a simulation of these conditions—according to the logic of the task.

The simulation of early word learning is accomplished by showing adults short videos of mothers interacting with their toddlers. The videos are presented without sound so that participants are provided with rich contextual information but no linguistic information. The videos depict scenarios in which mothers use particular target words, and the participants' task is to determine what those words are. Some of these target words are nouns and the others are verbs. Although identifying an already acquired word for an adult is undeniably different from learning *de novo* a novel word for a toddler, the task does offer information concerning the

differences involved in learning a noun versus a verb for a learner armed only with contextual information as a guide to meaning.

As predicted, Gillette et al. (1999) found that participants were more successful in identifying the target words that were nouns (45% of targets correctly identified) than those that were verbs (15% of targets correctly identified). These results were interpreted as showing that adults in a simulated vocabulary learning task, just like children engaged in real word learning, can successfully identify nouns on the basis on nonlinguistic contextual information but they need more information in order to correctly identify verbs. Under this interpretation, these findings provide support for a syntactic bootstrapping view of verb learning. There is, however, an alternative interpretation: it is also possible that the (Western) participants in the Gillette et al. (1999) study performed especially well in the identification of target nouns because they were particularly attentive to noun-relevant information. This alternative could not be explored within the Gillette et al. (1999) design because all of the participants were Westerners; however, we have used a modified version of the same design to address just this possibility.

We adapted the simulated vocabulary learning task in two ways to consider the role of cultural factors. First, we included both Eastern and Western participants. If Easterners are more attentive than Westerners to verb-relevant information, then they should show better success with verbs in the simulated vocabulary learning task. Second, we modified the procedure so that we would be able to gain more insight into the question of whether Easterners and Westerners do, in fact, attend to different kinds of information. Unlike Gillette et al. (1999), we did not provide participants with any information concerning the lexical categories of target words. As a result, we expected that participants who were more attentive to noun-relevant information

would include relatively more nouns among their responses, and that participants who were more attentive to verb-relevant information would include relatively more verbs.

Except for these two modifications, our simulated vocabulary learning task was very similar to the procedure developed by Gillette and her colleagues (1999). Participants watched video clips of Western, English-speaking mothers interacting with their toddlers. They saw silent video clips of mothers using particular target words while interacting with their toddlers. The participants' task was to guess what those words were. The scenes were drawn from video footage of four mothers interacting with their 18- to 25-month-old toddlers. Each of the mother/toddler pairs was videotaped in their own home while engaging in a naturalistic free play session. Sixteen target words (8 nouns and 8 verbs) were selected from among the most frequently occurring words in the transcripts of the mothers' speech during the free play sessions, and video clips in which the mothers used those words were selected from the video footage. We selected six token utterances of each target word with only one of the target words occurring in each clip. The clips were roughly 40 seconds long, with 30 seconds of (silent) footage before and 10 second after the target word utterance. In some cases, the target word was used more than once within a 40-second window: in those cases, there was 30 seconds of footage before the first utterance and 10 seconds following the last utterance. As a result of these repetitions, the six token utterances for a given target word were spread over three to six separate video clips (depending on how many of the clips contained multiple token utterances).

Participants were told that they would see short videos of mothers interacting with their toddlers. They would not be able to hear what the mothers and toddlers were saying because the soundtrack had been removed. Instead, they would hear a tone whenever the mothers used particular words, and their task was to guess what those words were. We told them that they

would see six different instances in which the words were used and so they would have more than one opportunity to gather information about the word and to guess what it was. Finally, we told them they would see all the clips for a given word in succession and that they should provide a response at the end of each clip. Participants were instructed to provide their current conjecture at the end of each video clip; therefore, they provided between three and six guesses for each target word. No mention was made of the fact that some words were nouns and others were verbs, but some participants did ask what kinds of words they should consider. We simply told them they were the kinds of words mothers use when speaking to their toddlers.

We presented these video clips to three groups ( $n = 24$ ) of undergraduate participants. The *Western* participants were native English speakers who had lived in Canada all their lives and whose parents were also native-born Canadians. The *Eastern* participants were Japanese students enrolled in an exchange programme at the University of British Columbia. They were native Japanese speakers who had lived in Japan until coming to Canada six to eight months previously and whose parents were native-born Japanese. The *Second Generation* participants spoke English but had not necessarily acquired it as their first language: 12 of them reported that English was their first language and 12 indicated that they acquired their parents' language as their first language<sup>1</sup>. The Second Generation participants were native-born Canadians, but their parents were born in Asia; thus, they had had significant exposure to both Eastern and Western cultures.

In analyzing the results, we looked at two different measures: first, the lexical categories of participants' responses (i.e., nouns vs. verbs) and second, the accuracy of their guesses. Recall that participants provided up to six responses for each target word: for both measures, we

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<sup>1</sup> The Second Generation participants who reported that English was their first language may also have acquired their parents' native language, but they had acquired English from infancy (e.g., from English-educated parents) and felt more fluent in English than in any other language.

considered the full set of responses provided by participants. As a result, a participant could include far more than 16 words among their responses and could be credited with up to six accurate guesses for a single target word.

### Lexical Categories

We began by looking at the lexical categories of the responses and compared the numbers of nouns and verbs provided by participants in each group. These numbers are illustrated in Figure 1. If Westerners do pay particular attention to objects and other noun-relevant information, then they should be more likely to guess that the target word is a noun than a verb. If Easterners pay attention to relational and other verb-relevant information, they should be likely to include relatively more verbs than nouns among their guesses. Finally, Second Generation participants, who have had exposure to both Eastern and Western cultures, should be expected to fall somewhere between those two patterns.

We first conducted a linear trend analysis to test for the general pattern of findings that should result from these predictions. We used a contrast model based on the expectation that the difference between the number of nouns and the number of verbs guessed would be greatest for Westerners, smaller for Second Generation participants, and smallest for Easterners. This contrast was significant,  $t(69) = 2.65, p = .005, \eta^2 = .092$ , indicating that there were group differences among the numbers of nouns and verbs provided by participants and that these differences fell in the predicted direction.

We next tested the specific predictions for each group, comparing the numbers of noun versus verb guesses. As predicted, Westerners provided more noun guesses than verb guesses,  $F(1, 69) = 8.37, p = .005, \eta^2 = .074$ . This is consistent with the prediction that Westerners would be particularly attentive to noun-relevant information in the stimulus videos. Also as predicted,

for the Second Generation participants there were no significant differences between the numbers of noun and verb guesses,  $F(1, 69) = .37, p = .545$ , suggesting that they were equally attentive to both noun- and verb-relevant information. Easterners, like Second Generation participants, provided similar numbers of noun and verb guesses,  $F(1, 69) = .73, p = .394$ . Apparently these participants were not particularly attentive to noun-relevant information, but neither were they disproportionately attentive to verb-relevant information.

The analyses based on the numbers of nouns and verbs among participants' responses indicate that participants from different cultural groups do pay attention to different aspects of the mother/toddler interactions depicted in the stimulus videos. The results further show that Westerners are attentive to those aspects of the scenes that are relevant to identifying nouns; Second Generation and Eastern participants do not seem to direct any special attention to this noun-relevant information. These group patterns should result in different levels of success with respect to correctly identifying the target words. We next looked at the accuracy of participants' responses to investigate this possibility.

### Accuracy

We predicted that Westerners would be more accurate in identifying the target nouns and less so in identifying the target verbs, and that this noun advantage would be attenuated, if evident at all, among Easterners and Second Generation participants.

To test this hypothesis, we tallied the numbers of accurate guesses for target nouns and verbs (see Figure 2) made by each participant and submitted these data to a linear trend analysis to investigate the overall pattern of findings for all three groups. We used a contrast model based on the prediction that Westerners would correctly identify more nouns than verbs, and that this

noun/verb difference would be smaller for Second Generation participants and smallest for Easterners. This model was supported by a significant contrast,  $t(69) = 2.21, p = .015, \eta^2 = .066$ .

We next compared the accuracy of guesses for target nouns and verbs within each group. As predicted, Westerners did show a significant noun advantage: they were significantly more likely to be accurate on noun targets than on verb targets,  $F(1, 69) = 32.17, p < .001, \eta^2 = .127$ . This accuracy advantage for nouns was also significant for both the Second Generation group,  $F(1, 69) = 8.65, p = .004, \eta^2 = .034$ , and the Eastern group,  $F(1, 69) = 6.51, p = .013, \eta^2 = .026$ ; however, an inspection of effect sizes indicates that the noun advantage was substantially larger for Westerners than for either of the other two groups.

How can we integrate the results of the analyses based on the lexical categories of responses with those based on the accuracy of responses? Consider first the results for Westerners. These participants included many nouns and significantly fewer verbs among their responses, with the apparent result that they successfully identified more nouns than verbs. Now consider the Second Generation and Eastern participants. These participants were less captured by the noun-relevant information, as evidenced by the fact that their guesses were more evenly distributed across the noun and verb categories. This more balanced pattern of guessing was associated with a more even distribution of *accurate* guesses: compared to Westerners, Second Generation and Eastern participants showed a significantly weaker noun advantage, as indexed by the accuracy of their guesses for noun and verb target words.

Perhaps, then, Westerners showed a stronger noun advantage in identifying target words because they were so attentive to noun-relevant information (and non-Westerners showed a weaker noun advantage because they were less captured by this information). To evaluate this possibility, we re-examined the accuracy scores, factoring out the effects derived from attending



preferentially to noun- or verb-relevant information. Doing so allowed us to distinguish between two different factors that may produce a noun advantage in the simulated vocabulary learning task. One factor stems from the requirements of syntactic bootstrapping and should apply equally to all participants. Here we expect that the nonlinguistic information available in the simulated vocabulary learning task is more conducive to identifying nouns than verbs. In addition, we propose that a second factor, resulting from cultural differences, also plays a role in the identification of nouns and verbs. Unlike the first factor, this one should vary across participants. Here we expect that attending preferentially to noun-relevant information should result in a higher number of accurate guesses for nouns than for verbs. We argue that this second factor is responsible for the finding that Westerners showed a stronger noun advantage than did Second Generation or Eastern participants. If we can compensate for the effect of this cultural factor, then the relatively stronger noun advantage among Westerners should disappear. All participants should still show some degree of noun advantage—as a result of the syntactic bootstrapping factor—but the advantage should be no stronger for Westerners than for the other two groups.

For each participant, we calculated *proportion correct* scores for both nouns and verbs: these scores are illustrated in Figure 3. For nouns, these scores were calculated by dividing each participants' total number of noun target matches by their total number of noun guesses; similarly for verbs. The resulting numbers denote the proportion of responses from either lexical category that resulted in successful target matches. For example, a score of one (the highest possible score) would indicate that, for each noun (or verb) response the participant gave, a noun (or verb) target match was successfully identified. A score closer to zero (the lowest possible score) would indicate that few of the noun (or verb) responses resulted in target matches.

Participants could achieve high or low scores regardless of how many nouns or verbs they included in their responses.

We then compared the proportion correct scores for nouns and verbs within each of the three cultural groups and found support for both factors. First, noun scores were still higher than verb scores; second, when we compensated for different attentional patterns, we found that the group differences largely disappeared. That is, proportion correct scores were higher for nouns than for verbs for all three groups (though the effect was marginal for Second Generation participants), but the effect was no greater for Westerners,  $F(1, 69) = 7.27, p = .009, \eta^2 = .034$  than for the other two groups: Second Generation,  $F(1, 69) = 3.46, p = .07, \eta^2 = .016$ ; Eastern,  $F(1, 69) = 31.72, p < .001, \eta^2 = .146$ . Though the group differences were attenuated in this analysis, there were still clear differences in accuracy on target nouns versus target verbs, indicating—as predicted by the syntactic bootstrapping hypothesis—that nouns are more easily identified than verbs in the simulated vocabulary learning task. That is, given that participants were attending appropriately to either noun- or verb-relevant information, if that non-linguistic information were helpful then they should have a reasonably good chance of correctly identifying the target word. According to the requirements of syntactic bootstrapping, we would expect the noun-relevant information to be more helpful than any verb-relevant information. And that is, in fact, what we can conclude from the finding that noun proportion correct scores were higher than verb proportion correct scores.

We return now to our motivating question, how can we account for the gap between noun learning and verb learning in early lexical development? Consider first our account of the gap between noun identification and verb identification in the simulated vocabulary learning task. Participants from all three cultural groups were more successful in identifying target nouns than

target verbs and we argue, following Gillette et al. (1999), that this is a result of the constraints imposed by the design of the task. In particular, the stimuli offer rich contextual information that provides good cues to identifying the referents of nouns, but does not provide the linguistic information necessary for identifying the referents of verbs. We suggest, though, that this explanation does not account for the pattern of cross-cultural differences that we observed. Although the noun over verb advantage in the simulated vocabulary learning task was consistent across all three groups, this effect was particularly pronounced in the Western group. Based on  $\eta^2$  calculations, the effect was four to five times larger for Westerners than for Second Generation or Eastern participants. Westerners also appeared to be particularly attentive to noun-relevant information, as measured by the number of nouns and verbs among their responses. In the absence of any information about the kinds of words they should consider, Westerners assumed that nouns were likely candidates more frequently than they did so for verbs. When we factored out this discrepancy, the noun advantage was maintained but was no longer stronger for Westerners than it was for the non-Western groups. These findings suggest that, for Westerners, the noun advantage in the simulated vocabulary learning task can only be partially accounted for by syntactic bootstrapping. The fact that these participants were more attentive to aspects of the mother/toddler interactions that are labelled with nouns than to those that are labelled with verbs also contributed to the noun advantage Westerners showed in the simulated vocabulary learning task.

An important question to consider is whether the numbers of nouns and verbs among participants' responses really do provide an index of what they were attending to. For example, is it possible that Easterners and Westerners provided different types of responses, not because they attended to different aspects of the mother/toddler interactions, but because they speak

languages that lexicalize those portions of the mother/toddler interactions differently? One could imagine scenarios for which two participants who speak different languages could attend to the same feature of a mother/toddler interaction but label it differently because their languages encode that feature differently. For example, both participants could attend to an event such as a child climbing onto a mother's lap. An English-speaking participant might label the manner portion of that action and guess that the target word for that scene was "climb", while a Japanese speaking participant might label the path portion of the action and guess that the target word was "*noboru*" (go up). That is, speakers of different languages might come up with systematically different labels after attending to the same aspect of the same scene because their languages encode different features (i.e., path or manner) of the very same event. Notice, however, that in this example the differences stem from the fact that in some languages, verbs tend to encode the path of an action while in others, verbs tend to encode the manner. In either case, participants in the simulated vocabulary learning task would have guessed that the target word was a verb and we would have interpreted that (correctly in this example) as evidence that those participants were attending to verb-relevant information. The question is, could there be examples in which speakers of different languages come up with words from different lexical classes?

In theory, we think it unlikely that participants gave different types of responses because the same concept is lexicalized as a noun in English and a verb in Japanese (or any of the other languages spoken by non-Western participants). Though languages differ in the particular features of an action that they encode, all languages distinguish between nouns and verbs (e.g., Goldin-Meadow, Butcher, Mylander & Dodge, 1994; Hawkins, 1988) and nouns and verbs lexicalize different types of concepts (Gentner, 1981). Thus, if two participants attend to the same aspect of a mother-toddler interaction, they should both have available to them—within the

resources of their respective languages—a suitable noun or verb to label that portion of the interaction. It is, of course, possible to think of concepts that tend to be lexicalized as nouns in one language and as verbs in other languages. For example, a hungry English speaker might tell her officemate that she is “going out for sushi”, using a noun (sushi) to describe what she is going out for. In contrast, a hungry Japanese speaker might tell her officemate that she is “going out for eating sushi” (*sushi o taberi ikimasu*), using a verb (eating) as well as a noun. These types of examples tend to be quite circumscribed, though: in most cases concepts can be unambiguously lexicalized as either a noun or a verb. Certainly, the types of responses we were looking for and the types that we actually got fit into those unambiguous parameters<sup>2</sup>.

Ideally, we could conduct an empirical test of the question of whether language or attentional differences were responsible for the group differences observed in the simulated vocabulary learning task—perhaps by disentangling language and culture among our participants. For example, we could test Easterners and Westerners whose first language was English, or Westerners only whose first language was English or Japanese. Based on our proposal that attentional differences drove the group differences we observed in the simulated vocabulary learning task, we would expect to find group differences in the first case but not the second. In practice, we were only able to make a much weaker comparison within the Second Generation group. Recall that half of the Second Generation participants indicated that English was their first language while the other half told us they had acquired their parents’ language as their first language. This is not an ideal comparison to make because, even though they reported different first languages, most participants were bilingual. However, if language differences, rather than attentional differences, drove the observed effects then we might expect the English-

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<sup>2</sup> A small number of responses were actually ambiguous with respect to lexical category (e.g., “stick” could have been meant as a noun or a verb). These responses were not included in our analyses.

first-language participants to respond more like Westerners and the remaining Second Generation participants to respond more like Easterners. In fact, we found no such differences between these two subsets of Second Generation participants.

If we can conclude, then, that Western participants were particularly attentive to noun-relevant information in the simulated vocabulary learning task, it may also be the case that Western children are particularly attentive to noun-relevant information in their own interactions with the world. If this is the case, then Western children should be expected to (and in fact do) acquire more nouns than verbs even after they have acquired the additional mechanisms required for learning verbs. In contrast, Eastern children should be expected to (and there is some evidence that they do) acquire similar numbers of nouns and verbs once they master the linguistic prerequisites for learning verbs.

In our attempts to illustrate how cultural differences may influence word learning, we have raised a number of questions. First, the data presented here support the plausibility of the proposal that cultural factors can influence the course of early noun and verb learning; however, we fully acknowledge the limitations of using data from an adult word identification task to address questions concerning word learning in young children. Further work is clearly required to determine whether the cultural differences observed among adults emerge soon enough to play a role in early lexical development. Gopnik and her colleagues (1996) have provided some evidence relevant to this question. They tested Western, English-learning toddlers and Eastern, Korean-learning toddlers on tasks that required children to make use of either their understanding of taxonomic categories (i.e., in an exhaustive sorting task) or their grasp of thematic relations between objects (i.e. to complete a means-ends task). The Western toddlers successfully solved the sorting task earlier than did the Eastern toddlers. This finding did not,

however, reflect a general precocity among the Western toddlers as the Eastern toddlers solved the means-ends task earlier. Since taxonomic categories are labelled by nouns and thematic relations are captured by verbs, these findings suggest that—by 18 months—Western toddlers are better able to cope with noun-relevant information and Eastern toddlers with verb-relevant information. In support of this proposal, Gopnik and her colleagues also found that the Eastern toddlers acquired specific relational terms earlier than did Western toddlers, and that Western toddlers experienced a naming spurt earlier than did Eastern toddlers. It remains to be seen whether these early differences are related to the cultural differences observed among adults; however the Gopnik et al. (1996) studies provide a nice model for future work investigating the early emergence of cultural differences and their potential role in early word learning—without running into the methodological obstacles involved in looking for crosslinguistic differences in children’s early vocabularies. In particular, their use of experimental tasks to address specific hypotheses about the course of early cognitive and linguistic differences among children acquiring different languages seems promising. The current work suggests that attention to different sources of information could play a role in early word learning; therefore, an experimental approach investigating attentional preferences in Eastern and Western toddlers could shed light on whether the current results are relevant to early word learning.

A second question raised by this work revolves around the source of the differences observed among the different groups of participants. The work reported here does not allow for precise considerations of just how a Westerner might come to attend preferentially to noun-relevant information or why an Easterner would not. One possibility is that the languages spoken by members of these cultures draw attention to different sources of information. Perhaps, as argued elsewhere (e.g., Choi & Gopnik, 1995; Gentner, 1982), nouns are more salient than verbs

in English (e.g., because in a subject/verb/object language like English, noun frequently occur in the salient phrase-initial and phrase-final positions while verbs are buried in medial positions) and this might make the referents of nouns most salient to English speakers. On the other hand, nouns might be less salient in Japanese (e.g., because noun phrases are frequently elided) and so their referents might be less salient to Japanese speakers. On this account, we would again make the prediction discussed earlier that Second Generation participants who acquired English as their first language should perform more like Westerners in the simulated vocabulary learning task, while those who acquired their parents' native language should perform more like Easterners. Given that there were no such differences, this leaves us with the possibility that other culturally-linked factors are responsible for the group differences observed in the simulated vocabulary learning task. Further work is clearly required to investigate the nature of those factors.

A third question concerns the finding that, contrary to our predictions, Easterners did not show any reliable evidence of paying particular attention to verb-relevant information in the mother/toddler interactions presented in the simulated vocabulary learning task. In considering this point, it is important to point out that, because the mothers and toddlers in the stimulus videos were Western, these interactions were undoubtedly less familiar to Eastern than to Western or Second Generation participants who would have had many more opportunities to observe Western mothers interacting with their toddlers. In follow up work, we have found that when Eastern mother/toddler pairs are depicted, Eastern participants do show the predicted bias toward attending to verb-relevant information. These findings are in accordance with recent work by Snedeker, Li, and Yuan (2003) showing that adults in a similar task perform differently depending on whether stimuli are based on Eastern or Western mother/toddler interactions.



All considered, the evidence suggests that noun and verb acquisition differ as a function of at least three factors. First, nouns and verbs carry distinct learning requirements. Second, word learners themselves carry their own attentional biases that contribute to differences in noun versus verb learning. Third, the word learning context may vary across cultures in ways that carry different implications for noun versus verb learning. Together, these observations lead to the prediction that verb learning should be delayed relative to noun learning, but that the magnitude of this difference should vary as a function of cultural factors.

In considering the differences between learning nouns and learning verbs, we have taken seriously the notion that word learning is guided by a number of different interacting factors. We argue that cultural factors must contribute to this process, but do not deny the role of other critical sources of information, notably that verb learning requires access to linguistic knowledge that may not be available at the outset of word learning. We propose that cultural factors direct word learners' attention to particular types of information and that these attentional patterns hold important implications for the course of early noun and verb learning.

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Figure Captions

*Figure 1.* Mean numbers of nouns and verbs among participants' guesses.

*Figure 2.* Mean numbers of accurate guesses for target nouns and verbs.

*Figure 3.* Proportion correct scores for target nouns and verbs.







