

CULTURE AND THE ACQUISITION OF NOUNS AND VERBS

by

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## Abstract

In the early stages of word learning, children often acquire large numbers of nouns and relatively few verbs. This noun bias is a robust feature of early word learning for children acquiring English; however, it is not clear that it is a universal feature of word learning. Gillette, Gleitman, Gleitman, and Lederer (1999) have shown that adults exhibit an analogous noun bias in a simulated word learning (SVL) task in which they watch silent video clips of mothers interacting with their toddlers, and are asked to identify target nouns and verbs uttered by the mothers. In previous work, Western adults correctly identified more nouns than verbs in this task. In the current work, adults from three different cultural groups (Western, Eastern, and Second Generation) were tested in two versions of the SVL task, and only Westerners showed consistent evidence of a noun bias. In Experiment 1, participants were tested in a version of the SVL task in which the mother/toddler pairs were Western. Westerners showed a robust noun bias in this task, but Second Generation and Eastern participants did not. In Experiment 2, participants were tested in a version of the SVL task in which the mother/toddler pairs were Eastern. Western and Second Generation participants showed a noun bias, but Easterners did not. In Experiment 3, a narrower definition of "Eastern" (compared to Experiment 1) was adopted, and participants were again tested in the Western version of the SVL task. All three groups showed a noun bias; however, the bias was strongest for Westerners, weaker for Second Generation participants, and weakest for Easterners. When results from the Eastern and Western versions of the task were compared, there was a clear interaction between the cultural background of participants and the version on which they were tested. Overall, the findings indicate that nouns are more readily identifiable in a simulated vocabulary learning task, but only Westerners show a robust noun bias in this task.

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## Chapter 1: The Noun Bias in Early Word Learning

One of the most robust findings in the study of early word learning is that, around 18 months of age, children enter a period of accelerated word learning characterized by a rapid increase in vocabulary<sup>1</sup> size, particularly with respect to object labels (e.g., Bates et al., 1994; Benedict, 1979; Gentner, 1978; Huttenlocher & Smiley, 1987; Macnamara, 1972; Nelson, 1973; Stern, 1924). This naming spurt results in what is widely known as a *noun bias*: a preponderance of nouns—or, more specifically, object labels—and a scarcity of verbs and other relational terms in children's early vocabularies.

This noun-biased understanding of early word learning has found its way—though not always explicitly—into the foundations of influential theories of word learning. For example, a central assumption of syntactic bootstrapping (e.g., Landau & Gleitman, 1985; Naigles & Hoff-Ginsberg, 1995; Lidz, Gleitman & Gleitman, 2003), a theory accounting for the acquisition of verbs, is that young children must acquire nouns before they can start acquiring verbs with any efficacy. Constraints-based theories also assume an early noun-focused period of word learning. In attempting to account for the alacrity with which toddlers, still years away from acquiring such basic skills as tying their own shoelaces, are able to acquire words, a number of researchers have suggested that young children are guided by a set of word learning principles or constraints (e.g., Golinkoff, Hirsh-Pasek, Bailey & Wenger, 1992; Markman & Hutchinson, 1984; Waxman & Kosowski, 1990). These constraints are proposed to narrow the set of possible interpretations the word learning child considers for any new word. In many cases, an object label is the only interpretation that remains available to the child once the constraints have filtered everything else

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<sup>1</sup> During the early stages of word learning, children are generally able to understand far more words than they are able to produce (Benedict, 1979). In this paper, all references to “vocabulary” and “word learning” refer specifically to children's *productive* use of words.

out. For example, in Markman's (1991; 1994) formulation of the constraints, children are guided by the Whole Object assumption to infer that novel words refer to objects rather than object parts or properties, relations between objects, actions, or anything else. In addition, children are guided by the Taxonomic assumption to infer that words refer to object categories rather than to specific individual objects or to sets of objects thematically associated with the original referent. If word learning is, in fact, guided by these constraints, this would allow nouns to enter the lexicon with greater ease than verbs, resulting in an early noun bias.

Given the numerous reports of a noun bias in children's early vocabularies, this emphasis on noun labels in the study of word learning seems appropriate. One implication of this emphasis on noun labels is that the noun bias is presumed to be a universal aspect of children's early word learning. Indeed, in trying to explain the noun bias, researchers have argued that it must be universal. One such argument is based on the proposal that there is a fundamental difference between the concepts labelled by nouns and those labelled by verbs and other relational terms. According to Gentner's (1978; 1982; Gentner & Boroditsky, 2001) natural partitions theory, the referents of nouns are often saliently coherent items that are easily isolated from their surroundings. In contrast, the referents of verbs are less perceptible and more conceptually complex. Thus, nouns should be relatively easier than verbs for young children to acquire—resulting in the well-documented noun bias. This distinction between nouns and verbs is based on conceptual and perceptual factors and is not tied to any specific language; therefore, all children, regardless of which language they are acquiring, should show evidence of a noun bias.

Gleitman and her colleagues (Gillette, Gleitman, Gleitman, & Lederer, 1999; Gleitman, 1990; Gleitman & Gillette, 1999; Gleitman & Gleitman, 1992) have proposed a somewhat different explanation for the noun bias based on learnability issues associated with the

fundamental noun/verb distinction and a bootstrapping theory of verb learning. In line with Gentner's natural partitions theory, they argue that nouns refer to concrete items in the world and that the word learning child can successfully infer their meaning from non-linguistic information. In contrast, the non-linguistic context on its own is unlikely to be informative as to the referent of a novel verb; rather, the type of cue necessary to decipher the meaning of a novel verb is most frequently a linguistic cue and children are unable to make use of this information until they have achieved some degree of linguistic competence. For example, if a mother points to a dog and says to her child: "Look! The dog is chasing the cat," the child can deduce that "dog" refers to the animal her mother is pointing at. However, to figure out what "chasing" means, the child has to understand the meaning of both "dog" and "cat," has to understand their relationships to the syntactic categories, subject and object, and then map this knowledge onto the action she is witnessing.

Because only non-linguistic contextual information is required for learning nouns and is available at the onset of word learning, children begin by learning nouns—showing a noun bias in their early vocabularies. Once they have acquired some knowledge about nouns, children can use this information to infer, or bootstrap, new knowledge about verbs. As with Gentner's natural partitions theory, this bootstrapping process is not based on the features of any particular language; therefore, children should universally show a noun bias.

#### *Cross-linguistic Differences in the Salience of Nouns and Verbs*

Despite these theoretically driven claims of a universal noun bias in children's early vocabularies, a number of researchers have argued that this bias may not be universal. For example, there are several good reasons to expect that children acquiring certain Asian languages (e.g., Mandarin, Japanese, or Korean) might not show this early noun bias. One such reason is

based on the structural features of these languages—in particular, those that differ from analogous structures in English. For example, word order in Japanese and Korean follows a subject/object/verb (SOV) pattern while English sentences are based on a subject/verb/object (SVO) pattern. As a result, Japanese and Korean verbs are frequently realized in the sentence final position. This position that has been shown to be highly salient to young children learning various languages (Slobin, 1973), and this increased salience presumably allows for speedier learning. In English, the sentence final position is normally held by nouns, leaving verbs in less salient medial positions.

Japanese and Korean also license noun ellipsis (Choi & Gopnik, 1995) wherever there is sufficient contextual information to retrieve the meaning of deleted nouns. As a result, nouns are produced less frequently in conversation and sentences are more likely to consist simply of a verb. Mandarin is an SVO language like English; however, as with Japanese and Korean, noun ellipsis occurs quite frequently, leaving verbs in the salient sentence final position. As well, Mandarin verbs carry far less inflection than do English verbs and this morphological transparency presumably allows Mandarin verbs to be more easily recognized across different contexts of use.

Beyond these structural features, which tend to make verbs more salient in Mandarin, Japanese, and Korean and nouns more salient in English, there are also input features that differ across languages, emphasizing verbs in the Asian languages and nouns in English. In a study of caregiver speech, Tardif and her colleagues (Tardif, Shatz, & Naigles, 1997) found that Mandarin speaking mothers used significantly more verbs than did English mothers. Fernald and Morikawa (1993) found that American mothers tended to label objects more frequently and consistently (using the same word repeatedly rather than using synonyms) than did Japanese

mothers. Gopnik, Choi, and Baumberger (1996) studied English- and Korean-speaking mothers in controlled laboratory play sessions and found that, in similar contexts, the Korean mothers emphasized actions and the English-speaking mothers emphasized object labels. Similarly, Kim, McGregor, and Thompson (2000) found that Korean mothers used more verbs and more salient cues to verb meaning than did English-speaking mothers. In sum, compared to English-speaking mothers, Chinese, Japanese, and Korean mothers tend to use relatively fewer nouns and more verbs while interacting with their children, and they tend to engage their infants in social routines (emphasizing verbs) rather than in the labeling games (emphasizing nouns) preferred by English-speaking mothers.

### *Holistic versus Analytic Cognition*

In addition to cross-linguistic differences, which increase the salience of nouns in English and verbs in some Asian languages, a number of recent findings indicate that Easterners and Westerners<sup>2</sup> perform differently in cognitive tasks that may be relevant to the acquisition of nouns and verbs. Broadly, Easterners' cognitive processes can be characterized as predominantly holistic while Westerners tend to be more analytic (Nisbett, Peng, Choi, & Norenzayan, 2001). Cultural differences in preferences for holistic versus analytic cognitive patterns have been explored in a number of domains, including attention, perception, memory, and categorization.

Nisbett and his colleagues have shown that, in perceiving a visual display, Easterners show a holistic pattern of attention, focussing broadly on the field and on relationships between items; Westerners show a more analytic pattern of attention, focussing more specifically on salient target objects (Nisbett et al., 2001). Relationships between objects are generally labelled with verbs (e.g., the child *threw* the ball), while objects are labelled with nouns (e.g., child, ball).

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<sup>2</sup> "Easterners" here and henceforth refers to people who were raised in an Asian country and speak an Asian language. "Westerners" refers to people who were raised in North America and speak English.

Thus, Easterners attend preferentially to entities labelled by verbs while Westerners attend to entities labelled by nouns.

Evidence of these cultural differences in attentional focus comes from a variety of studies. For example, in the rod and frame task, where participants are asked to determine when a rotating rod is perfectly vertical within a frame that rotates (independently) around it, East Asians make significantly more errors than do Americans (Ji, Peng, & Nisbett, 2000). This suggests that Easterners are less able to attend selectively to the rod and are more influenced by the relationship between the rod and frame. In contrast, Chinese perform better than Americans in correlation detection tasks, where success depends on attending to and remembering patterns of relationships between items. For example, when shown pairs of items that co-occur with correlations of .00, .40, or .60, Chinese subjects show a reliable sensitivity to the actual correlations between items, while American subjects tend to rely on a primacy heuristic. That is, Americans' responses are based on whether items occurred together at the beginning of a trial rather than on how often they occurred together over the course of the trial (Ji et al., 2000).

In a different set of tasks, Americans and Japanese watched animated video segments of underwater scenes and were later asked to recall what they had seen. Compared to their American counterparts, Japanese subjects made twice the number of comments concerning relations between objects (Masuda & Nisbett, 2001). In the same study, subjects were given a recognition memory task in which they were presented with objects from the animated vignettes and objects they had not previously viewed, and were asked to recall which ones they had seen and which ones they had not. The test objects were presented against the original background in one condition and against a new background in a second condition. Japanese performed significantly better when viewing test objects set against the original background, but Americans

showed very little effect of this manipulation. These results suggest that the Japanese subjects' perceptions and memories of the video segments were strongly tied to the scene as a whole, while Americans focussed more narrowly on individual objects in the vignettes.

Another line of research has revealed a different manifestation of the holistic/analytic distinction: in forming categories, Westerners attend more to taxonomic relationships while Easterners attend more to thematic relationships. Taxonomic categories are based on *kind* relationships. For example, Dalmatians and poodles belong to the same taxonomic category because they are both *kinds* of dogs. Note that the kind—or taxonomic category—is labelled by a noun (i.e. “dog”); thus, attending to taxonomic relationships is an important aspect of learning nouns. In contrast, thematic categories are based on *predicate* relationships. For example, dogs and dog collars belong in the same thematic category because dogs *wear* collars. In this case, the predicate—or thematic relation—is labelled by a verb; thus, attending to thematic relationships is an important aspect of learning verbs.

In a study of category salience, results suggested that taxonomic categories are more accessible to Americans than they are to Koreans (Choi, Nisbett, & Smith, 1997). Subjects were given a category induction task: when the salience of a target category was temporarily increased, category induction was facilitated for Korean but not for American subjects. The authors concluded that taxonomic categories were already salient for Americans, thus increasing salience had no effect. In a separate study, Ji, Zhang, and Nisbett (2003) presented participants with sets of three words and asked them to decide which two were most closely related. For each triad (e.g., monkey, panda, banana), both a thematic category (monkey & banana) and a taxonomic category (monkey & panda) were available. Chinese subjects tended to form thematic categories, while their American counterparts tended to form taxonomic categories. Given that

nouns generally refer to taxonomic categories and verbs generally refer to thematic relations, these results suggest that Easterners are more likely to pay attention to those aspects of the world that are labelled by verbs. Westerners, in turn are more likely to pay attention to aspects that are labelled by nouns.

Little is known about the developmental origins of these holistic versus analytic preferences. There is, however, some evidence that children as young as 18 months old show analogous cultural differences. Gopnik and her colleagues (Gopnik et al., 1996) tested toddlers in a sorting task, which required them to sort objects into taxonomic categories. They found that the ability to successfully negotiate the task emerged significantly earlier in Western (American) toddlers than in Eastern (Korean) toddlers. In contrast, Eastern toddlers succeeded at means-ends tasks (e.g., using a stick to obtain an object) significantly earlier than Western toddlers. This pattern of results suggests that, as with adults, Western toddlers are more attuned to the features of their environments that are relevant to forming taxonomic categories and learning nouns, and Eastern toddlers are more attuned to relationships between objects and features relevant to learning verbs. Importantly, these cultural differences appear to emerge early enough in development to have an impact on early word learning.

#### *Cross-linguistic Studies of the Noun Bias*

As a result of cross-linguistic and cultural differences emphasizing nouns for Western children acquiring English and verbs for Eastern children acquiring Asian languages, there are reasons to expect that the noun bias found in the early vocabularies of Western children may not exist in the early vocabularies of Eastern children. This should be a relatively straightforward empirical question; however, the results of empirical investigations of this question have not yielded any straightforward answers. In a study that included both Eastern and Western children

acquiring English, Japanese, Turkish, Mandarin, and Kaluli, Gentner (1982) found no cross-linguistic differences in numbers of object labels versus relational terms in her subjects' early vocabularies. Similarly, Au, Dapretto, and Song (1994) found noun biases in the early vocabularies of both American and Korean 15- to 24-month-olds. They also failed to find any cross-linguistic differences in the proportions of nouns and verbs in the vocabularies of their subjects. Fernald and Morikawa (1993) found that American 12- and 19-month-olds had larger noun vocabularies than their Japanese age mates, but both groups had approximately twice as many nouns as verbs in their vocabularies. Similarly, Kim et al. (2000) found that Korean toddlers had significantly more verbs in their vocabularies than did American children of the same age, but both groups showed a significant noun bias.

In contrast to the preceding results suggesting that children universally show noun biases in their early vocabularies, a number of studies have provided data suggesting that children acquiring languages such as Korean or Mandarin do not show such a bias. When Choi and Gopnik (1995; Gopnik & Choi, 1995) examined word counts from recorded sessions with English- and Korean-speaking toddlers, they found the usual noun bias in their English-speaking subjects but no evidence of such a bias for Korean-speaking toddlers. They also found that, in addition to the naming spurt generally found in English-speaking children, a majority of the Korean subjects showed verb spurts (rapid increases in the number of verbs the children were able to produce)—frequently preceding their naming spurts. In contrast, none of their English-speaking subjects showed such a verb spurt. In a different study, Gopnik and her colleagues (Gopnik et al., 1996) found that the naming spurt emerged significantly earlier in English-speaking toddlers than in Korean toddlers, while the production of at least one class of verbs emerged earlier in Korean toddlers than in English-speaking toddlers. In a study of Mandarin-

speaking toddlers, Tardif (1996), using three different classification methods, found that 22-month-olds used more verbs than nouns. Tardif and her colleagues (1997) coded the fully productive utterances of English-, Italian-, and Mandarin-speaking toddlers interacting with their caregivers; they found that the Mandarin group produced more verbs and fewer nouns than either of the other two groups. In a separate study, Tardif and her colleagues (Tardif, Gelman, & Xu, 1999) found that English-speaking toddlers produced significantly more nouns than verbs in play sessions, while Mandarin-speaking toddlers produced roughly equal numbers of each.

*Methodological Issues in Cross-Linguistic Studies of Word Learning*

These conflicting results have provided very little clarity with respect to the issue of the universality of the noun bias in children's early vocabularies. There are, however, reasons to suspect that the inconsistencies in the results arise from methodological factors. The studies suggesting that the early noun bias is universal have used maternal report checklists for assessing the contents of children's vocabularies, while the studies indicating that only English-speaking children show a noun bias have relied on observational measures. When the same children are assessed with both methods and the results are compared, the checklist measure appears to accentuate the noun bias. For example, Pine, Lieven and Rowland (1996) found that the percentage of common nouns in children's total vocabularies is consistently 20 points higher according to checklist measures than observational measures (e.g., 51.0% vs. 31.4% at the 50-word milestone). Checklist methods rely on mothers' recall of the words their children know, and mothers tend to have differentially better memories for the nouns than for the verbs their children know (Pine et al., 1996). Further, this effect is particularly pronounced for American mothers compared to Chinese mothers (Tardif et al., 1999); thus, checklist measures are particularly unsuitable for cross-linguistic studies.

While checklist measures seem to be systematically biased toward nouns, observational measures may be biased in other ways. Observational measures are based on the assumption that children produce representative samples of their vocabularies during observational sessions. For several reasons, this assumption is not necessarily valid: observational measures are very sensitive to differences in the amount of speech produced by individual children; these measures reflect children's *use* of language, which is not necessarily the same as their *knowledge* of language; children's use of language during any given session may be systematically biased by the context of the session. Tardif and her colleagues (Tardif et al., 1999) found that children produce only 10-15% of their total vocabularies during 30-minute sessions and, more importantly, the ratio of nouns to verbs differs significantly across contexts. All children's utterances tend to emphasize nouns during book reading sessions and verbs during play sessions; however, American children produce relatively more nouns during book reading and Chinese children produce relatively more verbs during play sessions (Tardif et al., 1999). Observational measures are, therefore, also biased in ways that make them unsuitable for cross-linguistic studies.

Clearly, the practice of measuring children's vocabularies is problematic, especially when the goal is to establish the relative proportions of nouns and verbs. Pine and his colleagues (Pine et al., 1996) have argued that the best solution is to combine observational and maternal report methods to produce a comprehensive measure. However, given that the biases in the individual measures play out differently for different language groups, combining them is unlikely to yield a comprehensive measure that produces valid results in cross-linguistic studies. In order to adequately address the question of the universality of the noun bias, a different strategy is required—one that does not involve vocabulary count techniques.

In an influential review of the word learning literature, Woodward and Markman (1998) have noted a further problem with attempting to measure children's vocabularies: "endstate lexicons are often uninformative about the process that led to the acquisition of a word" (p. 384). Given that it is precisely the *process* of word learning that is of interest, it may be more informative to investigate the process of word learning through the use of word learning tasks, rather than attempting to count the number of words children have already acquired. This approach offers several advantages beyond avoiding the perils associated with trying to measure children's vocabularies.

Measures of word learning (rather than words learned) generally allow the researcher to manipulate the information available in the word learning scenario and, thus, to determine what types of cues children are able to exploit in acquiring new words. These measures also allow researchers to control the types of words (e.g., nouns vs. verbs) acquired in these tasks and thus to examine any differences between words from different lexical categories. Word learning tasks can also be used with adult subjects. Whereas measuring an adult's vocabulary is neither practicable nor informative of the word learning process, data on adult performance in word learning tasks can provide a clearer picture of cultural and cross-linguistic differences in word learning strategies. In a number of recent studies (e.g., Gillette et al., 1999; Gupta, 2003; Hall, Burns, & Pawluski, 2003; Markson & Bloom, 2001; Sorrentino, 2001), adult data has been particularly useful in addressing questions concerning word learning in general and the noun bias in particular.

Gillette et al. (1999) have developed a task (suitable for testing adults) that is designed to mimic the young child's experience of word learning. The task involves a stringent test of word learning—which makes it a good task for adult participants—and is particularly useful in

contrasting noun learning with verb learning. In order to test their bootstrapping explanation of the noun bias (i.e., knowledge of nouns is required to infer the meaning of verbs), Gillette et al. (1999) developed a simulated vocabulary learning (SVL) task. The task involves placing adults in word learning situations similar to those frequently encountered by young children and asking them to identify words. Word learning is simulated by presenting participants with video clips of mothers interacting with their toddlers: this procedure is meant to reproduce for participants the information that is normally available to young children in typical word learning scenarios. In order to more closely reproduce for adults the situation young children find themselves in as they acquire their first words, the young child's limited access to linguistic information is simulated by removing the soundtrack; hence, participants have access only to non-linguistic information. The participants' task is to identify particular words uttered by the mothers during interactions with their toddlers: when one of the words is uttered, a tone sounds and participants are asked to guess what the word is. The SVL task does not involve any direct teaching of novel words and, in order to succeed in the task, participants must determine the meanings of the target words. The task, therefore, simulates the acquisition of nouns and verbs under conditions similar to those faced by young children.

Gillette and her colleagues tested Western adults and found that performance differed depending on the lexical form class of the target words: participants showed significantly greater success with nouns than with verbs. Gillette and her colleagues went on to show that increasing the amount of linguistic information available results in improved performance in the verb condition. When, in addition to the non-linguistic information available in the video vignettes, participants were also given alphabetical lists of the nouns in each sentence in which the target word appeared, the percentage of verbs correctly identified increased from 7.7% to 29.0%. When

participants had access to the complete sentences with only the target verb unidentified, as well as the video vignettes, they identified 90.4% of the target verbs.

These results were interpreted as indicating that non-linguistic contextual information may be useful to young children when they are learning (concrete) nouns but is largely uninformative when it comes to learning verbs. These results are, however, based on data collected from a sample of Western participants, and the research indicating that Westerners show more analytic and less holistic attentional patterns than do Easterners suggests that these participants may simply have been inattentive to any non-linguistic contextual information that would be helpful in identifying verbs. In contrast, Easterners may be relatively more attentive to this type of information and, consequently, may be more successful than Gillette et al.'s participants in "learning" verbs in the SVL task.

#### *Summary and Prospectus*

Based on findings from a number of recent studies on cultural differences in attention, perception, memory, and categorization, there are good reasons to expect that Easterners and Westerners might attend to different kinds of information in word learning tasks. In particular, Easterners are likely to be more attentive to verb-relevant information while Westerners might be more attentive to noun-relevant cues. These cultural differences hold important implications for the question of the universality of the noun bias: the strong noun bias observed in Western children acquiring English may be, at least in part, due to their experience in a culture that emphasizes noun-relevant information. If this is the case, then Eastern children, whose cultural experience is less noun-focused and more verb-focused, would not be expected to show a noun bias in their early word learning.

The simulated vocabulary learning task developed by Gillette and her colleagues (1999) provides an ideal procedure for testing the proposal that Westerners attend to noun-relevant information and Easterners attend to verb-relevant information in word learning tasks. This procedure was adopted in the studies described below.

In Experiment 1, three groups of participants were tested in a simulated vocabulary learning (SVL) task. The groups consisted of Eastern and Western adults, as well as adults who were born in the West but whose parents were born in the East. Inclusion of this third group—henceforth referred to as the Second Generation group—allowed for a more finely grained assessment of the hypothesized group differences between Easterners and Westerners. If culture does play a role in shaping cognitive processes in a manner relevant to word learning, then people who have had significant experience (i.e., through their families and through the majority culture) with both cultures of interest should exhibit features characteristic of both cultural groups (e.g., Hong, Morris, Chiu, & Benet-Martínez, 2000; Minoura, 1992). In the context of word learning, Second Generation adults should attend to both noun-relevant and verb-relevant information. The prediction that Easterners and Westerners will attend to different kinds of information in the SVL task can thus be restated to include Second Generation participants, with the qualification that these participants should, like Westerners, attend to noun-relevant information and, like Easterners, attend to verb-relevant information.

If the noun bias observed among (Western) participants in the Gillette et al. (1999) study was, at least partly, due to their attention to noun-relevant information and inattention to verb-relevant information, then Second Generation and Eastern participants should perform differently than Westerners in the SVL task. If Second Generation participants are attentive to both noun- and verb-relevant information, then they should show less of a noun bias than do

Westerners. If Easterners are particularly attentive to verb-relevant information and less attentive to noun-relevant information, then they should not show a noun bias in the SVL task and they might even be expected to show a verb bias.

Inclusion of the Second Generation group also allows for an exploration of the role of participants' first language in any group differences. Some Second Generation adults acquired English as their first language and others acquired their parents' native language as their first language. So, while all these participants will have had similar cultural experiences, they will not all have had similar early language experiences. If first language does play a role, then Second Generation participants who acquired English as their first language should perform more like Westerners, while participants who acquired their parents' native language as their first language should perform more like Easterners. First language data were thus collected from all participants in order to evaluate any possible role of first language.

In Experiment 1, the SVL task stimuli were based on video recordings of Western mothers interacting with their toddlers. These mother/toddler interactions were in all probability more familiar to Western participants than they were to Eastern participants, and this factor could contribute to performance differences across the groups. In order to deal with this possibility, a new set of stimuli was constructed based on video recordings of Eastern mothers interacting with their toddlers. In Experiment 2, participants were tested on this Eastern version of the SVL task. In Experiment 3, a new set of participants was tested on the Western version of the task, which was modified to allow for comparisons between the Eastern and Western versions, and differences between the two versions were considered.

## Chapter 2: Experiment 1

In Experiment 1, three groups of participants were tested in a simulated vocabulary learning task. The underlying hypothesis was that previously documented cultural differences in attention, memory, and categorization would be associated with corresponding differences in a task designed to mimic the acquisition of nouns and verbs. In this task, participants watched silent video clips of mothers and toddlers, and attempted to identify specific nouns and verbs uttered by the mothers while interacting with their toddlers. The general prediction was that Westerners, who have been shown to engage preferentially in analytic reasoning, would attend to noun-relevant information and would show a strong noun bias (i.e., correctly identify more nouns than verbs). In contrast, Easterners, who have been shown to prefer holistic reasoning, were expected to be less attentive to noun-relevant information and more attentive to verb-relevant information, were not expected to show such a noun bias and might even show a verb bias (i.e., correctly identify more verbs than nouns). Second Generation participants, who have had significant exposure to both Eastern and Western cultures, were expected to attend to both noun-relevant and verb-relevant information and to show less of a noun bias than Westerners but more than Easterners.

In addition, because Westerners were expected to be more attentive to noun-relevant information, they were also expected to show a noun advantage relative to Easterners—that is, Westerners were expected to correctly identify more nouns than Easterners. Easterners, in turn, were expected to be more attentive to verb-relevant information and, as a result, to show a verb advantage—to correctly identify more verbs—relative to Westerners. Because they were not expected to attend preferentially to either noun- or verb-relevant information, no predictions were made concerning noun or verb advantages for Second Generation participants.

The SVL task used here was adapted, with three main modifications, from the procedure developed by Gillette et al. (1999). In the original procedure, a total of 48 target words were used (24 nouns and 24 verbs). Gillette and her colleagues found it impractical to subject each participant to 48 separate trials, so three different lists of target words were created and each participant attempted to identify only sixteen target words (8 nouns and 8 verbs). Using multiple lists of words increased the number of participants required by the experimental design. In the current procedure, that number was already increased by the inclusion of different cultural groups. To keep the number of participants at a manageable level, a total of sixteen target words were used and each participant attempted to identify all of these words. Thus, although the total number of target words was only a third of the number used in the Gillette et al. (1999) study, individual participants in both studies were given the same number of trials.

A second modification was related to the instructions given to participants. In the Gillette et al. (1999) procedure, participants were told that half the target words were nouns and the other half verbs. Participants also knew specifically which target words were nouns and which ones were verbs. In the current study, no such information was given: participants were simply told that they should guess which *words* the mothers had said—no mention of nouns, verbs or any other lexical category was made. There were two reasons for this modification. First, there was some concern that not all participants would have good working definitions of nouns and verbs; in particular, these lexical form class labels might not be familiar to participants for whom English was a second language. In order to ensure that all participants approached the task with similar information, none were told that the target words were nouns and verbs.

The second, and more important, reason for this modification was that it did not constrain the range of words participants provided in responding to the SVL task. This allowed for an

assessment of the types of words that participants considered and provided a means for examining the strategies participants adopted in working their way through the SVL task. That is, if participants adopted a noun strategy and tended to include a lot of nouns in their responses, this would suggest they were paying particular attention to noun-relevant information. In contrast, if participants adopted a verb strategy and responded more frequently with verbs, this would suggest they were paying particular attention to verb-relevant information. Use of these different strategies would have been far more constrained if participants knew the lexical category of each target word.

A third modification—already discussed in some detail—involved the addition of a cultural factor to the experimental design. To test the hypothesis that Easterners and Westerners would perform differently in the SVL task, three groups of participants were tested in the current study. One group, the Westerners, consisted of adults who were born in a Western country, who spoke English as their first language, and whose parents were also born in a Western country. Although these criteria theoretically allowed for the inclusion of third or fourth generation descendents of Eastern immigrants, none were actually included in the final sample. A second group, the Easterners, consisted of adults who were born and raised in an Eastern country and whose first language was not English. A third group of adults also participated in the study. These were adults who were born in a Western country but whose parents had emigrated from an Eastern country to the West as adults—this group is referred to as the Second Generation group. Among the Second Generation participants, some had acquired English as their first language and others had acquired their parents' native language as their first language.

For the purposes of this study, Eastern and Western countries were defined according to Hofstede's (1982) cross-cultural classification of 40 countries. The classification was based on

four dimensions (power distance, uncertainty avoidance, individualism-collectivism, masculinity-femininity) and produced two broad clusters of countries—one containing North American and Western European countries and the other containing South American and Asian countries. In the current study, participants from far fewer than 40 countries were included: in the final sample, “Western” countries were limited to Canada and the United States and “Eastern” countries included Mainland China, Hong Kong, Taiwan, India, Japan, and the Philippines. As well as fitting Hofstede’s classification system, adults from the countries included in the Eastern category in the current study have all, in various studies, shown the characteristics associated with holistic, rather than analytic, reasoning (e.g., Ishii, Reyes, & Kitayama, 2003; Nisbett et al., 2001).

### *Method*

#### *Participants*

Three groups of participants ( $N = 72$ ) were recruited from the University of British Columbia (UBC) undergraduate student population. One third of the participants ( $n = 24$ ) were classified as belonging to the Western group. These participants were born in Canada or the US to parents who were also born in Canada or the US, and had all acquired English as a first language. There were 17 women and 7 men in this group, and their average age was 23.6 years ( $SD = 6.5$  years). A second group of participants were classified as belonging to the Second Generation group. These participants were also born in Canada; however their parents were not. See Tables 2.1 and 2.2 for details of these participants’ cultural and linguistic backgrounds. The Second Generation group included 17 women and 7 men, and their average age was 22.0 years ( $SD = 2.3$  years). A third group of participants—the Eastern group—were recruited through the UBC-Ritsumeikan Academic Exchange Programme. These participants were all from Japan,

spoke Japanese as their first language, and had been in Canada for less than a year. There were 16 women and 8 men in the Eastern group, and their average age was 21.5 years ( $SD = .6$  years). Participants enrolled in first or second year Psychology courses at UBC were given course credit for their participation; students who were not eligible for participation credits were given ten dollars.

*Table 2.1: Cultural Backgrounds of Second Generation Participants*

Parents' Birthplace	Number of Participants
China	12
Hong Kong	4
Taiwan	1
China & Hong Kong	2
China & Taiwan	1
India	2
Philippines	1

*Table 2.2: First Language of Second Generation Participants*

Participants' First Language	Number of Participants
English	12
Cantonese	7
English & Cantonese	4
English & Punjabi	1

## Materials

The stimulus materials were constructed through a multi-step process that involved videotaping mother/toddler pairs, selecting target words, and creating a series of short digital video clips.

*Videotaping.* The video footage used in the clips was based on video recordings of four mothers interacting with their toddlers. The mothers and toddlers were all born in Canada; all the mothers spoke English as their first language and the toddlers were acquiring English as their first language. No language other than English was spoken during the videotaping. The four toddlers (2 boys and 2 girls) were between 18 and 25 months old at the time of the taping. Each mother/toddler pair was videotaped for 30 minutes during a free play session in their own home. The experimenter brought a bag of toys (containing a stuffed frog, a stuffed monkey, two stuffed bears, a Mr. Potato Head™, a toy drum with blocks inside, and a wooden puzzle) and asked the mothers to play as naturally as possible with the toys in the bag or with anything else that was available, with the exception of books<sup>3</sup>. Mothers were told that the videos were to be used in word learning studies, but the precise nature of these studies was not discussed until after the videotaping was completed.

*Target word selection.* The maternal speech on the videotapes was transcribed and a database of all the nouns and verbs used by the mothers was constructed. There was a total of 87 different noun types (953 tokens) and 114 different verb types (1337 tokens). The eight most frequently used nouns (that were used by at least three of the four mothers) were chosen as the target nouns; these were: *arm*, *drum*, *ear*, *frog*, *hat*, *monkey*, *nose*, and *tongue*. The target verbs

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<sup>3</sup> Earlier attempts to gather video footage for the simulated vocabulary learning task made it clear that book reading would not yield any useful footage. The SVL task requires footage in which mothers are talking about events that are visible onscreen and even large format picture books were found to be unsuitable for this purpose.

were chosen using slightly different criteria: of all the verbs that were used by all four of the mothers, the eight most imageable<sup>4</sup> verbs were chosen as the target verbs. This approach was used to avoid possible floor effects that might mask any cultural differences. In the Gillette et al. (1999) study, eight of the twenty-four verbs were never correctly identified and a further six were identified by less than 5% of participants. These low baseline levels of performance could make it very difficult to detect any cultural differences in the ability to correctly identify target verbs. Gillette et al. (1999) found that verbs that were judged as most imageable (or concrete) were also more readily identified in the SVL task. Thus, using frequency and imageability criteria, the following verbs were chosen as the target verbs: *fall, look, play, pull, push, put, sit, and take*.

For each target word, six different tokens were chosen from the video footage based on the following criteria: (1) an instance of the word's referent had to be visible onscreen within ten seconds of the utterance, (2) rapid repetitions were avoided as much as possible, and (3) overlap between different clips was also avoided whenever possible. When more than six different tokens were available (and equally suitable, given the criteria above), clips with the closest approximations of mother/toddler joint attention on the object or event of interest were chosen. Rapid repetitions of the target word were not always avoidable: as a result, some clips contained two or three utterances of the target word within a few seconds of each other. Each utterance was counted as a token; therefore, fewer than six video clips were required to achieve the six tokens for many target words.

*Digitization.* The video clips, each consisting of approximately 40 seconds of footage, were digitized using Final Cut Pro 3. The soundtracks were then removed and a computerized tone was inserted for each target word token such that the onset of the tone coincided (within .03

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<sup>4</sup> "Imageable" verbs were defined as verbs associated with concrete actions that could be seen onscreen.

seconds) with the onset of each target word utterance. For each target word, the corresponding clips were assembled in random order and a page-peel transition was inserted between each clip. The result was 16 groups of video clips (8 noun groups and 8 verb groups): these groups were sorted into two different random orders (i.e., with noun groups and verb groups mixed together). A two-second numbered slug (i.e., a black screen with the number corresponding to the sequential position of the target word) was inserted before the first clip for each target word to give participants a short breather between target words and to allow them to track their progress through the procedure. The two randomly ordered sequences were exported to Quick Time. The resulting Quick Time movies were just over 46 minutes long, and the screen dimensions of the movie images were 320 x 240 pixels.

*Final Product.* The final sequences consisted of 69 video clips (each approximately 40 seconds long). The clips were silent except for a tone that sounded whenever the mothers uttered one of the 16 target words. In each clip only one of the 16 target words was uttered. Each target word was uttered a total of six times and could be uttered up to three times within a single clip; therefore, for each target word, there were between three and six video clips, depending on how many times the target word was repeated within each clip. For the target nouns, there was a total of 33 clips (for an average of 4.1 clips per word) between 29 and 57 seconds long ( $M = 39.1$  seconds,  $SD = 4.5$ ); for the target verbs, there was a total of 36 clips (for an average of 4.5 clips per word) between 34 and 56 seconds long ( $M = 38.8$  seconds,  $SD = 4.1$ ). For most clips, there was approximately 30 seconds of footage before the tone sounded (indicating that the target word had been uttered) and approximately 10 seconds following the tone.

*Answer sheets.* Two answer sheets corresponding to the two randomly ordered sequences of video clips were created. Each sheet consisted of 16 numbered groups of blank answer slots.

For each target word, there was one blank slot for each video clip. Next to each slot was a number indicating how many repetitions of the target occurred in the corresponding video clip.

### *Procedure*

*Instructions to participants.* Participants were told that they would be watching a series of video clips of mothers interacting with their toddlers. They were informed that the soundtrack had been removed from the videos so they would not be able to hear what the mothers and toddlers were saying, but they would hear a tone that would sound whenever the mothers uttered particular words; their task was to guess what those words were. Importantly, participants were never given any details about the nature of the target words: they were not told that half were nouns and half were verbs. A few participants asked what kinds of words they should be looking for and they were simply told that the target words were the kinds of words that mothers use when speaking to their young children.

Participants were told that there were 16 target words, and for each word they would see between three and six clips in which the target word was uttered a total of six times. They were asked to make a guess at the end of each clip and to give their “best guess” at the end of the final clip for each word. Participants wrote down their responses on answer sheets provided by the experimenter.

Western and Second Generation participants were tested in English: instructions for completing the task were given in English and participants responded in English. Eastern participants were tested in Japanese: they were given instructions in Japanese (by a native speaker) and they were given the option of responding in English or Japanese (most responded with a mixture of English and Japanese words). A native speaker of Japanese translated Japanese responses into English.

*Coding.* Participants' responses were coded in different ways in order to examine the types of words they considered—providing information concerning the *strategies* they adopted—and the accuracy of their responses—providing information concerning the *biases* and *advantages* they exhibited in the SVL task. To begin with, the lexical category of each response was coded as noun, verb, or neither. A small number of responses (less than 1%) could not be unambiguously coded as either nouns or verbs (e.g., “place”); these, along with those coded as neither noun nor verb, were excluded from the lexical category analyses.

In order to determine whether participants were particularly attentive to noun- or verb-relevant information, the lexical category information was analyzed in two different ways. First, the total number of nouns was compared to the total number of verbs among all of participants' responses. Participants could show evidence of a *noun strategy* (i.e., attending to noun-relevant information) if they provided more nouns than verbs among their responses. Conversely, they could show evidence of a *verb strategy* (i.e., attending to verb-relevant information) if they provided more verbs than nouns. Second, participants' initial responses (i.e., their “first guess” stab at the target word) were searched for lexical category mismatches. A mismatch consisted of a noun when the target word was a verb or of a verb when the target word was a noun. In this analysis, participants could show evidence of a noun strategy if their responses for target verbs included nouns more frequently than their responses for target nouns included verbs (i.e., if they erroneously provided nouns more often than verbs). Conversely, participants could show evidence of a verb strategy if their responses for target nouns included verbs more frequently than their responses for target verbs included nouns (i.e., if they erroneously provided verbs more often than nouns). This second analysis was a more stringent test of evidence for either

type of strategy, as it required participants to be paying attention to precisely the wrong sort of information in order to be credited with a mismatch.

Responses were also coded for accuracy: those corresponding to the target word were coded as target matches and were examined in two different analyses. First, participants had been asked to give their best guess in their final response for each word; therefore, target matches among participants' final responses were analyzed and comparisons were made between the number of matches for target nouns and the number of matches for target verbs. Second, a broader analysis of all responses was conducted and again target matches for nouns and verbs were compared. In these two analyses, participants could show evidence of a *noun bias* by correctly identifying more nouns than verbs. Conversely, participants could show evidence of a *verb bias* by correctly identifying more verbs than nouns.

Group comparisons for the numbers of matches for target nouns and verbs were also made in order to consider evidence of *noun advantages* and *verb advantages*. Participants could show evidence of a noun advantage by making more noun matches than did participants from the other groups. Similarly, participants could show evidence of a verb advantage by making more verb matches than did participants from the other groups.

To summarize, four different analyses were used to consider evidence of noun and verb strategies, biases, and advantages among participants' responses to the SVL task:

1. *Lexical categories of all responses.* All responses provided by participants were coded as nouns, verbs, or neither. The numbers of nouns and verbs were analyzed for evidence of noun or verb strategies.

2. *Lexical category mismatch on initial response.* Lexical category mismatches were coded among participants' initial responses. The numbers of nouns for target verbs and of verbs for target nouns were analyzed for evidence of noun or verb strategies.
3. *Target match on final response.* Participants' final "best guess" responses were examined. The numbers of target matches for nouns and for verbs were analyzed for evidence of noun or verb biases and for evidence of noun or verb advantages.
4. *Target match anywhere.* For each target word, each participant's complete set of responses was examined to determine whether an exact target match occurred at least once (participants got credit for no more than one match per target word even if they repeated the match response more than once). The numbers of target matches for nouns and for verbs were analyzed for evidence of noun or verb biases and for evidence of noun or verb advantages.

### *Results*

In the results presented below, four different analyses of participants' responses were conducted. In these analyses, evidence of noun and verb *strategies*, *biases*, and *advantages* was examined. Westerners were expected to be attentive to noun-relevant information in the SVL task, while Easterners were expected to be more attentive to verb-relevant information and Second Generation participants were expected to attend to both noun- and verb-relevant information. The data provided some support for these predictions.

In addition to the analyses comparing the three cultural groups, results from Second Generation participants were reanalyzed separately to examine possible effects of first language. Half of these participants reported acquiring English as their first language and the other half reported acquiring either Cantonese or Punjabi as their first language (some of these had also

acquired English simultaneously). To determine whether acquiring a first language other than English had an effect on performance in the SVL task, Second Generation participants' responses were reanalyzed with first language included as a factor. The results indicated that first language did not affect participants' performance in the SVL task.

In order to test the general prediction that participants in the different cultural groups would perform differently in the SVL task, two-way analyses of variance were conducted on participants responses. The factors included in these analyses were Cultural Group and Lexical Category: significant effects involving Cultural Group would indicate that participants from the different groups did, in fact, perform differently in the task. Interaction effects, in particular, would suggest that participants from the different groups showed evidence of different strategies and/or biases. More specific examinations of strategies and biases were conducted with analyses of the Lexical Category factor at each level of Group and with analyses of linear trends. Pairwise comparisons involving the three cultural groups were also conducted in order to investigate any potential noun or verb advantages.

#### *Noun and Verb Strategies*

In the analyses based on the lexical categories of participants' responses, Westerners were expected to show evidence of using a noun strategy, Easterners were expected to show evidence of using a verb strategy, and Second Generation participants were not expected to show evidence of using either type of strategy<sup>5</sup>. Evidence of a noun or verb strategy was examined by comparing the numbers of nouns and verbs in participants' responses. The prediction that participants in the different cultural groups would adopt different strategies in the SVL task was assessed by examining strategies separately for the Western, Second Generation, and Eastern

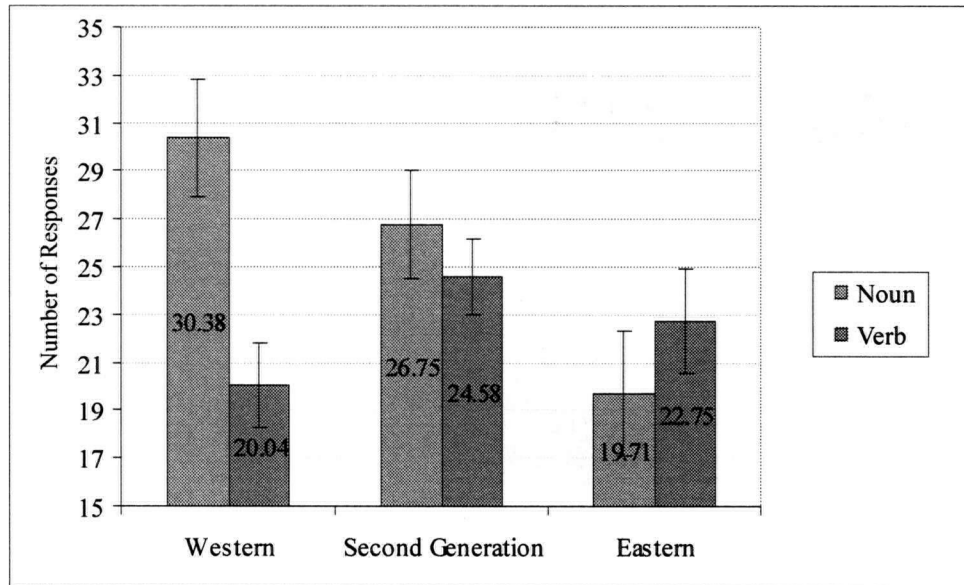
groups (i.e., with tests of simple effects examining noun/verb differences at each level of Cultural Group). This prediction was also tested with a linear contrast using a model in which evidence of a noun strategy was strongest among Westerners and decreased linearly across the Second Generation and Eastern groups.

*Lexical categories of all responses.* The numbers of nouns and verbs provided by participants from each of the three groups are shown in Figure 2.1. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within analysis of variance. There was no main effect of Lexical Category,  $F(1, 69) = 2.34, p = .131$ , but there was a main effect<sup>6</sup> of Cultural Group,  $F(2, 69) = 4.07, p = .021, \eta^2 = .033$ , and a significant Cultural Group by Lexical Category interaction,  $F(2, 69) = 3.56, p = .034, \eta^2 = .063$ . The interaction indicated that, as predicted, the effect of Lexical Category was not constant across the three groups. Tests of simple main effects indicated that there was a Lexical Category effect for Westerners,  $F(1, 69) = 8.37, p = .005, \eta^2 = .074$ , showing that they provided more nouns than verbs among their responses. This effect was not significant for Second Generation participants,  $F(1, 69) = .37, p = .545$ , or Easterners,  $F(1, 69) = .73, p = .394$ . The finding that Westerners provided a greater number of nouns than verbs—while in the Second Generation and Eastern groups participants both provided similar numbers of nouns and verbs—supports the hypothesis that Westerners, but not Second Generation or Eastern participants, would show evidence of a noun strategy in the SVL task.

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<sup>5</sup> Second Generation participants were expected to attend to both noun- and verb-relevant information. Because evidence of noun and verb strategies was based on attending *preferentially* to one type of information, Second Generation participants were not expected to show a preferred strategy.

<sup>6</sup> Effect sizes for significant effects are reported using *eta squared*, which (similar to  $r^2$ ) is the proportion of total variance accounted for by the factor under consideration.



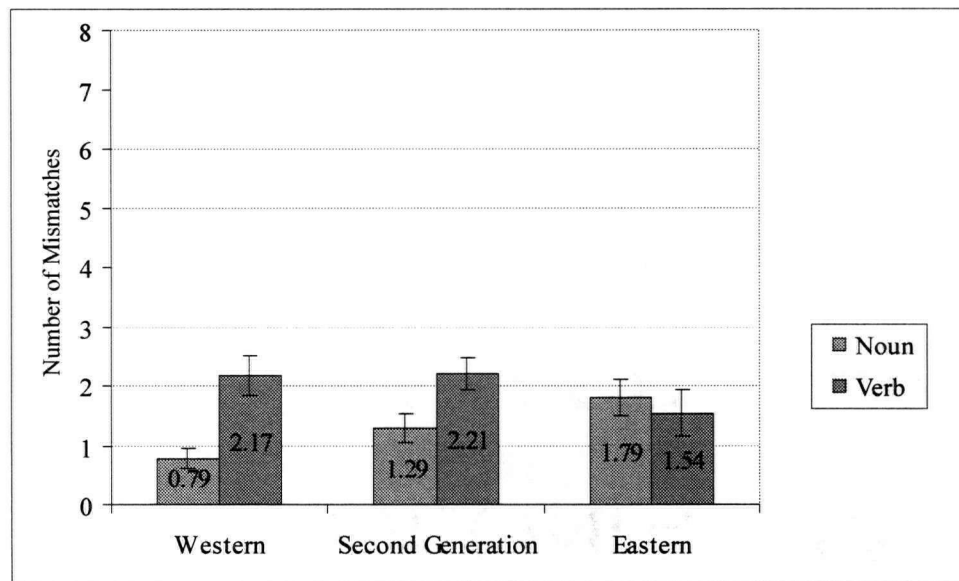
*Figure 2.1:* Mean numbers of nouns and verbs among all of participants' responses.

The prediction that Westerners would show a noun strategy, Second Generation participants would not show either type of strategy, and Easterners show a verb strategy receives some support from the ANOVA results described above; however a more focussed approach to testing this particular hypothesis is available in the form of a contrast analysis (Rosenthal & Rosnow, 1985). The prediction of a steadily decreasing noun strategy across Cultural Groups corresponds to a linear trend in which noun/verb difference scores (i.e., number of nouns minus number of verbs) are greatest for Westerners, smaller for Second Generation participants, and smallest (or more negative, where negative difference scores indicate a verb strategy) for Easterners. Using this linear model did indeed yield a significant contrast<sup>7</sup>,  $t(69) = 2.65$ ,  $p = .005$ ,  $\eta^2 = .092$ , suggesting that the noun strategy was largest for Westerners, smaller for Second Generation participants, and smallest for Easterners.

*Lexical category mismatch on initial response.* The numbers of lexical category mismatches for nouns and verbs produced by participants from each of the three groups are shown in Figure 2.2. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. In this case, there was a significant main effect of Lexical Category,  $F(1, 69) = 5.84$ ,  $p = .018$ ,  $\eta^2 = .051$ . There was no effect of Cultural Group,  $F(1, 69) = .67$ ,  $p = .515$ , and the Lexical Category by Cultural Group interaction failed to meet conventional levels of significance,  $F(2, 69) = 2.95$ ,  $p = .059$ . Nonetheless, tests of simple main effects indicate that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 7.95$ ,  $p = .006$ ,  $\eta^2 = .069$ , showing that Westerners erroneously provided nouns more frequently than they erroneously provided verbs. This effect

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<sup>7</sup> The contrast is tested with an F-ratio in which the numerator has a single degree of freedom, in which case  $F = t^2$ . Using  $t$  rather than  $F$  allows for a directional test: this makes the test more powerful and, of course, requires that the data fall in the predicted direction.



*Figure 2.2: Mean numbers of lexical category mismatches among participants initial responses.*

was not significant for either the Second Generation group,  $F(1, 69) = 3.53, p = .064$ , or the Eastern group,  $F(1, 69) = .26, p = .610$ . Westerners showed evidence of a noun strategy by providing nouns even when verbs were called for (they did this more frequently than they provided verbs when nouns were called for); Second Generation and Eastern participants did not show evidence of such a noun strategy.

A linear trend analysis of noun/verb difference scores based on a model in which difference scores were greatest for Westerners, smaller for Second Generation participants, and smallest for Easterners yields significant results,  $t(69) = 2.37, p = .01, \eta^2 = .075$ . These results indicate that the noun strategy was strongest for Westerners, weaker for Second Generation participants, and weakest for Easterners.

In sum, the lexical category analyses indicate that Westerners showed strong evidence of adopting a noun strategy in the SVL task. Second Generation participants did not show evidence of either a noun or a verb strategy. Easterners provided more verbs than nouns in their responses and produced more mismatches consisting of verbs than of nouns; however, these differences were not significant and so there was no reliable evidence of a verb strategy among Easterners. The next two analyses examine target matches to determine whether group differences pertaining to strategies are associated with corresponding group differences pertaining to biases.

#### *Noun and Verb Biases*

In the analyses based on target matches, Westerners were expected to show a noun bias, Second Generation participants were expected to show a weaker noun bias, and Easterners were expected to show no noun bias at all and to potentially show a verb bias. Evidence of a noun or verb bias was examined by comparing the number of target matches for nouns with the number of target matches for verbs. The prediction that participants in the different cultural groups would

perform differently was again tested with simple effects tests at each level of Cultural Group, and with a linear contrast using a model in which evidence of a noun bias was strongest among Westerners and decreased linearly across the Second Generation and Eastern groups.

*Target match on final response.* The numbers of nouns and verbs correctly identified by participants (among their final responses) from each of the three groups are shown in Figure 2.3. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. There were significant main effects of both Cultural Group,  $F(2, 69) = 6.03, p = .004, \eta^2 = .087$ , and Lexical Category,  $F(1, 69) = 39.84, p < .001, \eta^2 = .141$ , as well as a significant Cultural Group by Lexical Category interaction,  $F(2, 69) = 4.39, p = .016, \eta^2 = .031$ . The interaction indicated that, as predicted, the Lexical Category effect differed across levels of Cultural Group. Tests of simple main effects indicated that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 36.61, p < .001, \eta^2 = .129$ , the Second Generation group,  $F(1, 69) = 4.97, p = .029, \eta^2 = .018$ , and the Eastern group,  $F(1, 69) = 7.04, p = .001, \eta^2 = .025$ . In other words, all three groups correctly identified more nouns than verbs. The finding that all three groups showed a noun bias did not support the prediction that only Westerners would do so; however, the Lexical Category effect was significantly different across levels of Cultural Group and several times larger for Westerners ( $\eta^2 = .129$ ) than for Second Generation participants ( $\eta^2 = .018$ ) or Easterners ( $\eta^2 = .025$ ). The Westerners clearly showed a stronger noun bias than did either of the other two groups.

The prediction of a steadily decreasing noun bias across the three groups was tested with a linear contrast using a model in which noun/verb difference scores (i.e., target matches in the Noun condition minus target matches in the Verb condition) were greatest for Westerners,

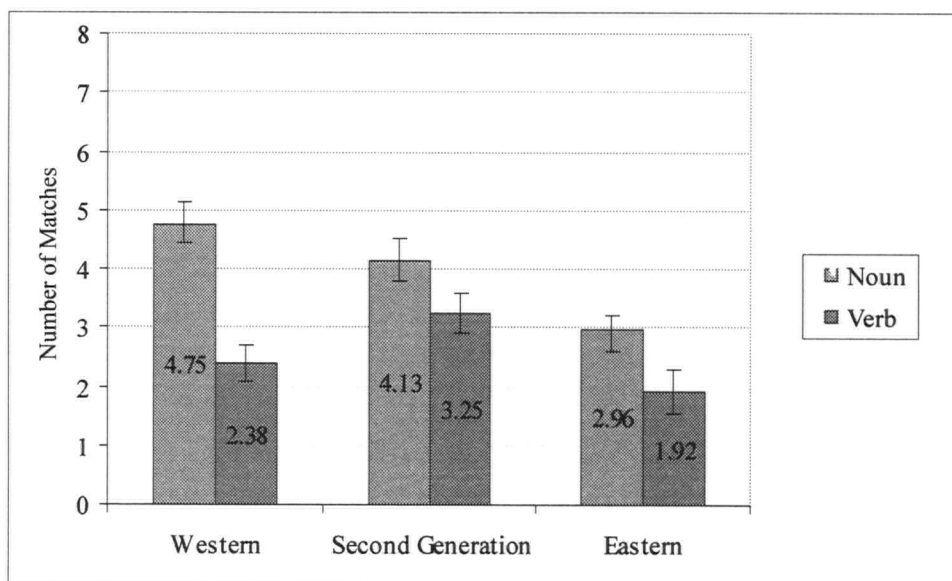


Figure 2.3: Mean numbers of target word matches among participants' final responses.

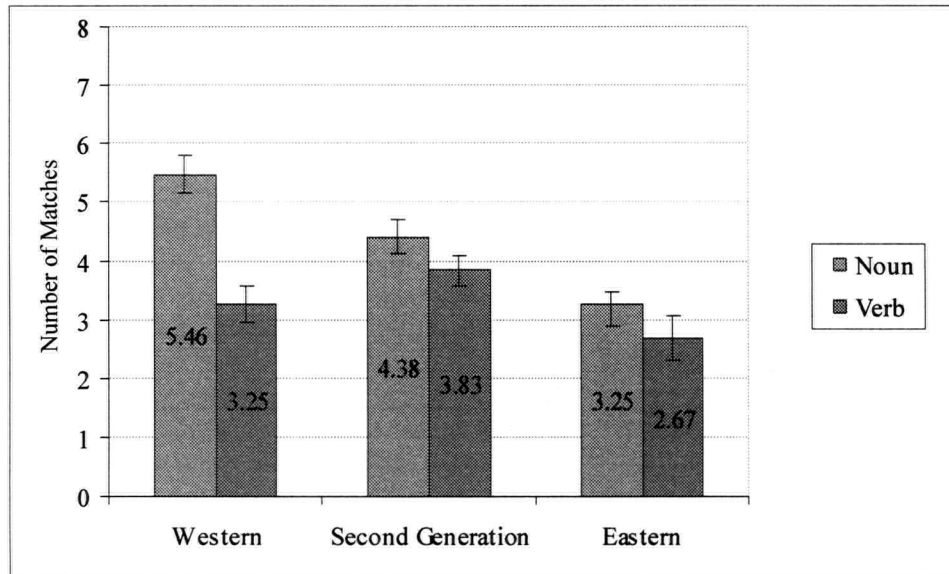
smaller for Second Generation participants, and smallest for Easterners. Using this linear model did indeed yield a significant contrast,  $t(69) = 2.71, p = .004, \eta^2 = .096$ ; however, the noun/verb difference scores were very similar for Second Generation and Eastern participants with the difference scores being slightly larger (rather than smaller as was predicted) for Easterners<sup>8</sup>.

*Target Match Anywhere.* The numbers of nouns and verbs correctly identified by participants from each of the three groups are shown in Figure 2.4. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. The analysis revealed significant main effects of both Cultural Group,  $F(2, 69) = 10.52, p < .001, \eta^2 = .120$ , and Lexical Category,  $F(1, 69) = 20.60, p < .001, \eta^2 = .100$ , and a significant interaction,  $F(2, 69) = 5.02, p = .009, \eta^2 = .049$ . The interaction indicated that, as predicted, the Lexical Category effect differed across levels of Cultural Group. Simple main effects tests showed that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 27.12, p < .001, \eta^2 = .132$ ; however, this effect did not hold for either the Second Generation group,  $F(1, 69) = 1.63, p = .21$ , or the Eastern group,  $F(1, 69) = 1.89, p = .17$ . In other words, Westerners correctly identified more nouns than verbs but, in both the Second Generation and Eastern groups, participants correctly identified similar numbers of nouns and verbs. These findings support the prediction that Westerners, but not Second Generation participants or Easterners, would show a strong noun bias.

A linear trend analysis on noun/verb difference scores indicates that a model in which the noun bias is strongest for Westerners, weaker for Second Generation participants, and weakest for Easterners maps well onto the data,  $t(69) = 2.40, p = .01, \eta^2 = .077$ ; however, the difference

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<sup>8</sup> A quadratic contrast using a model in which noun/verb difference scores are high for Westerners and low for both Second Generation and Eastern participants accounts for a greater proportion of the variance ( $\eta^2 = .118$ ) than does the linear trend contrast ( $\eta^2 = .096$ ).



*Figure 2.4:* Mean numbers of target word matches among all of participants' responses.

scores actually suggest that Second Generation and Eastern participants performed similarly with both showing much weaker noun biases than the Westerners<sup>9</sup>.

In sum, the analyses based on target matches support the prediction that Westerners would show a strong noun bias. The prediction that Easterners would show a verb bias was not supported and neither was the prediction that Second Generation participants would perform midway between Easterners and Westerners. Second Generation and Eastern participants both showed weak evidence of a noun bias in one analysis and no evidence of any noun bias in the second analysis.

#### *Noun and Verb Advantages*

For the analyses based on target matches, the three groups of participants were compared on their performance in the Noun condition and the Verb condition to assess noun and verb advantages. Westerners were expected to show a noun advantage relative to Easterners and Easterners were expected to show a verb advantage relative to Westerners. These predictions were tested using *post hoc* pairwise comparisons between the three groups with respect to their performance on the target nouns and target verbs.

*Target match on final response.* Post hoc analyses using the Neuman-Keuls approach indicated that the Western and Second Generation participants correctly identified similar numbers of nouns and both groups identified more nouns than did Eastern participants. Second Generation participants correctly identified more verbs than did the Easterners; the number of verbs correctly identified by Westerners did not differ from the number identified by Second Generation or Eastern participants.

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<sup>9</sup> Again, a quadratic contrast accounts for a greater proportion of variance ( $\eta^2 = .127$ ) than does the linear contrast ( $\eta^2 = .077$ ).

*Target match anywhere.* Post hoc analyses using the Neuman-Keuls approach indicated that Westerners correctly identified more nouns than did participants in either of the other two groups, and the Second Generation participants correctly identified more nouns than did the Easterners. Second Generation participants correctly identified more verbs than did the Easterners; the number of verbs correctly identified by Westerners did not differ significantly from the number identified by either Second Generation or Eastern participants.

In sum, the prediction that Westerners would show a noun advantage relative to Easterners was supported; however, the prediction that Easterners would show a verb advantage relative to Westerners was not. Second Generation participants also showed both a noun advantage and a verb advantage relative to Easterners.

#### *First Language Effects*

Responses from Second Generation participants corresponding to the two lexical category analyses and the two target match analyses are shown in Table 2.3 broken down by first language. These numbers were reanalyzed to investigate possible effects of first language: of particular interest were interaction effects involving First Language and Lexical Category. Significant interactions would suggest that Second Generation participants with different first languages showed different strategies and/or biases in the SVL task. If there are differences associated with First Language, then participants who acquired English as their first language should be expected to perform more like Westerners while participants who acquired their parents' native language as their first language should be expected to perform more like Easterners.

*Table 2.3: Mean Numbers of Target Matches, Responses, or Lexical Category Mismatches for Second Generation Participants Broken Down by First Language.*

Analysis	Noun		Verb	
	English	Other	English	Other
Lexical Categories of All Responses	27.9	25.6	26.7	22.5
Lexical Category Mismatch on Initial Response	1.3	1.3	2.0	2.3
Target Match on Final Response	4.1	4.3	3.3	3.3
Target Match Anywhere	4.3	4.4	3.8	3.8

*Lexical categories of all responses.* The numbers of nouns and verbs provided by Second Generation participants broken down by first language were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis failed to reveal any significant effects, suggesting that Second Generation participants provided similar numbers of nouns and verbs in their responses regardless of first language.

*Lexical category mismatches on initial response.* The numbers of lexical category mismatches for Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis failed to reveal any significant effects, indicating that Second Generation participants provided similar numbers of lexical category mismatches (for both nouns and verbs) regardless of first language.

*Target match on final response.* Second Generation participants' final response target matches were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of Lexical Category,  $F(1, 22) = 6.56, p = .018, \eta^2 = .068$ , indicating that participants correctly identified

more nouns than verbs. There was no main effect of First Language,  $F(1, 42) = .02, p = .895$ , and the interaction was not significant,  $F(1, 42) = .05, p = .818$ . In other words, Second Generation participants produced similar numbers of target matches (for both nouns and verbs) regardless of their first language.

*Target match anywhere.* The numbers of target matches produced by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis failed to reveal any significant effects, suggesting that Second Generation participants produced similar numbers of target matches (for both nouns and verbs) regardless of first language.

In sum, none of the four analyses revealed any significant effects involving First Language. Participants in the Second Generation group performed similarly regardless of whether they had acquired English or their parents' native language as their first language.

### *Discussion*

The results indicate that there were group differences in the SVL task with respect to strategies, biases, and advantages.

#### *Noun and Verb Strategies*

Westerners showed strong evidence of adopting a noun strategy in their approach to the SVL task. In their attempts to identify the target words, Westerners were more likely to provide nouns than they were to provide verbs. When their initial responses were off-target, Westerners more frequently provided nouns for target verbs than the reverse (i.e., verbs for target nouns). In contrast, Second Generation and Eastern participants showed no evidence of adopting a noun strategy in their approach to the SVL task. Among all their responses both groups provided similar numbers of nouns and verbs. When their initial responses were incorrect, Second

Generation and Eastern participants (unlike Westerners) were no more likely to provide nouns for target verbs than they were to provide verbs for target nouns. The pattern of results concerning participants' strategies did fall in the predicted direction: Westerners showed evidence of being reliably more attentive to noun-relevant information than to verb-relevant information, Second Generation participants were slightly—though not reliably—more attentive to noun-relevant information, and Easterners were slightly—though again not reliably—more attentive to verb-relevant information. The results, therefore, support the predictions, except with respect to Easterners, who were expected to adopt a verb strategy but did not show any reliable evidence of doing so.

#### *Noun and Verb Biases*

The results suggest that Westerners showed a robust noun bias in the SVL task. Westerners correctly identified more target nouns than target verbs, whether the analysis included all their responses or only their final “best guess” responses. Second Generation and Eastern participants showed some evidence of a noun bias in the SVL task; however, this bias was far less robust than the one seen in Westerners. In their final responses, Second Generation and Eastern participants did show noun biases—correctly identifying more nouns than verbs—although this noun-verb difference was less pronounced than the one shown by Westerners (judging by interaction effects and effect sizes). Among all their responses, Second Generation and Eastern participants did not show significant noun biases. Again, with respect to Westerners and Second Generation participants, the pattern of results supports the predictions: Westerners were expected to show a strong noun bias and Second Generation participants were expected to show a weaker noun bias. Easterners were expected to show an even weaker (i.e., absent) noun bias or even to show a verb bias: this was not the case.

### *Noun and Verb Advantage*

In addition to evidence of a strong noun *bias*, Westerners also showed a noun *advantage* relative to Easterners. That is, when the target words were nouns, Westerners produced more target matches than did Easterners.

With respect to evidence of a noun strategy, Second Generation participants seemed to fall somewhere between Easterners and Westerners; however, with respect to absolute levels of performance, Second Generation participants showed more of a best-of-both-words pattern of results. When the target words were nouns, they produced similar numbers of target matches as did Westerners among all their responses and only slightly fewer target matches among their final responses. When the target words were verbs, their performance remained high. As a result, Second Generation participants showed a noun advantage and a verb advantage relative to Easterners: they produced significantly more target noun and target verb matches than did Easterners, whether all responses or only final responses were included in the analysis.

Easterners did not show the predicted verb advantage relative to Westerners.

### *Outstanding Questions*

The results of Experiment 1 suggest that there are important differences between Easterners and Westerners that are potentially relevant to the acquisition of nouns and verbs. In a task designed to simulate early word learning, Westerners showed a strong noun bias but Second Generation and Eastern participants showed little evidence of such a bias. Before drawing any conclusions concerning the implications of these findings for questions concerning the universality of the noun bias, it is important to consider some questions raised by the current study.

One such question concerns the finding that Westerners were more successful than Easterners in identifying the target nouns, while the reverse was not true with respect to successful identification of the target verbs. It is perhaps not surprising that Westerners, who seemed to approach the SVL task with a noun strategy, showed a noun advantage relative to Easterners. If Westerners are particularly attentive to noun-relevant information then they should do particularly well in identifying target nouns. It is, however, surprising that Easterners did not show a corresponding verb advantage and failed to show any evidence of either a verb strategy or a verb bias, given evidence from previous studies suggesting that Easterners should be particularly attentive to verb-relevant information. It is also surprising that Second Generation participants showed both a noun advantage and a verb advantage relative to Easterners, but this finding may suggest a means of exploring the lack of a verb advantage in Easterners. In particular, Second Generation participants may have been more successful in identifying target words than were Easterners because of the particular stimuli used in the SVL task. The stimuli were based on video recordings of Western mothers interacting in English with their toddlers. For Westerners and Second Generation participants these interactions were undoubtedly more familiar than they were for Easterners. Thus, Easterners may have been at a disadvantage relative to the other two groups in the current study. This would explain why Second Generation participants showed both a noun and a verb advantage relative to Easterners, and it may also have masked an underlying verb advantage for Easterners relative to Westerners.

A good approach to addressing this problem is to manipulate the familiarity of the video clips used in the SVL task. In the current study, the video clips were most likely quite familiar to Westerners, perhaps less familiar to Second Generation participants, and unfamiliar to

Easterners. This situation can be reversed by using stimuli based on video recordings of Eastern mothers interacting with their toddlers. This approach was adopted in Experiment 2.

### Chapter 3: Experiment 2

Experiment 2 involved testing participants in a new version of the SVL task. In this version, the mothers and toddlers depicted in the stimulus videos were Easterners. The mothers, although residing in Canada at the time of the videotaping, were from Mainland China or Taiwan and had been in Canada for a short time (less than 5 years). They spoke to their children primarily in Mandarin and the children had, thus far, been exposed to very little English.

The Eastern version of the SVL task provided a means to investigate several new questions. First, it was assumed that the Eastern mother/toddler interactions would be more familiar to Eastern participants (and less familiar to Western participants) than were the Western mother/toddler interactions in the Western version of the task. As a result of this familiarity, it was expected that Easterners might be more successful (relative to Westerners and Second Generation participants) in identifying target words than they were in the Western version of the task. It was expected that this would address questions concerning why Easterners tended to be less successful than the other two groups in the Western version of the SVL task.

In addition, including a new version of the SVL task in the larger experimental design made it possible to begin addressing questions about the developmental origins of the group differences documented in Experiment 1. That is, if Easterners are more successful in identifying target words in Experiment 2 than they were in Experiment 1 and Westerners' performance is, conversely, worse overall, this would suggest that participants were simply responding to the familiarity of the different stimulus sets. If, however, differences in performance in the Eastern and Western versions of the SVL task are more complex (i.e., if strategies and biases change from one version to the other), this would suggest that there are important cultural differences within the mother/toddler interactions.

In the current experiment, a narrower definition of “Eastern countries” was used for the purpose of recruiting subjects for the Second Generation and Eastern groups. Because the mothers depicted in the Eastern version of the SVL task were from Mainland China or Taiwan and because the Eastern mother/toddler interactions were meant to be familiar to the Eastern participants, Easterners in the current experiment consisted of people who were born in Mainland China, Hong Kong or Taiwan. Second Generation participants were similarly restricted to Canadians whose parents were born in Mainland China, Hong Kong, or Taiwan.

### *Method*

#### *Participants*

Three groups of participants ( $N = 72$ ) were recruited from among student and non-student members of the UBC community. One third ( $n = 24$ ) of the participants were classified as belonging to the Western group. These participants were born in Canada or the US to parents who were also born in Canada or the US, and had all acquired English as a first language. This group included 19 women and 5 men, and their average age was 21.5 years ( $SD = 5.8$  years). A second group of participants were classified as belonging to the Second Generation group. These participants were also born in Canada; however, their parents were born in China, Hong Kong, or Taiwan. Just over half (13) of the Second Generation participants reported acquiring English as their first language; the remaining participants (11) reported acquiring Chinese (either Mandarin or Cantonese) as their first language. The Second Generation group included 21 women and 3 men, and their average age was 19.8 years ( $SD = 2.4$  years). The third group of participants were classified as belonging to the Eastern group. These participants were born in China, Hong Kong, or Taiwan and had acquired Chinese (Mandarin or Cantonese) as their first language. Eastern participants had been in Canada for up to 15 years ( $M = 8.75$  years,  $SD = 4.58$ ). Nineteen of the

Easterners were women and five of them were men; their average age was 19 years ( $SD = 1.1$ ). Participants enrolled in first or second year Psychology courses at UBC were given course credit for this participation; students who were not eligible for participation credits were given ten dollars.

### *Materials*

A new set of video clips was created for Experiment 2. These were similar to those used in Experiment 1; however the new set was based on video recordings of Eastern mothers interacting with their toddlers.

*Videotaping.* As in Experiment 1, four sets of mother/toddler pairs<sup>10</sup> were video recorded during free play sessions in their homes. Two of the mothers were born in China and two were born in Taiwan: all four of them spoke Mandarin as their first language and their children were acquiring Mandarin as their first language. The mothers had all been in Canada for less than five years, but the toddlers were all born in Canada. The toddlers (3 boys and 2 girls) were between 18 and 25 months old at the time of the taping. As in Experiment 1, the mother/toddler pairs were videotaped for 30 minutes while playing with a bag of toys provided by the experimenter as well as with other toys found in the family homes. The mothers were given the same instructions as the mothers in Experiment 1 had been given; however, this time the instructions were given in Mandarin (by a native speaker).

*Target word selection.* The maternal speech on the videotapes was transcribed in Mandarin (by a native speaker), and then all the nouns and verbs were translated into English. There was a total of 112 noun types (686 tokens) and 105 verb types (1654 tokens). Target words were chosen from among the most frequently used nouns and verbs (that were used by at least

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<sup>10</sup> The four pairs included four mothers and five toddlers: one mother had twin boys and each boy was recorded interacting with his mother for half of the session.

three of the four mothers). Final selections were based on the following criterion: each target word had to be associated with at least six token utterances within the video footage in which the referent of the word was visible onscreen. Among the most frequently used words, only eight nouns (*bear, block, ear, glasses, hand, hat, nose, tree*) and eight verbs (*come, find, go, look, play, press, put, take*) satisfied this criterion and were, therefore, selected as the target words.

For each target word, six different tokens were chosen from the video footage based on the same criteria as were used in Experiment 1. When more than six suitable tokens were available, selections were made in a manner similar to the procedure followed in Experiment 1; however, this time an Easterner made the decisions (rather than a Westerner, as was the case in Experiment 1).

*Digitization.* The clips were digitized and assembled into two different randomly ordered sequences using the same procedure as was followed in Experiment 1, with two exceptions. Several participants from Experiment 1 suggested that the procedure was long and (much to the consternation of the experimenter) boring. In an attempt to alleviate this problem, the duration of each clip in the new stimulus set was shortened: instead of including approximately 30 seconds of footage before the target word, only 20 seconds were used. In all cases, the referent of the target word was still visible onscreen within 10 seconds of the target word utterance. The resulting sequences were just over 34 minutes long (approximately 12 minutes shorter than the sequences used in Experiment 1). The dimensions of the movie images were also changed: from 320 x 240 pixels to 640 x 480 pixels.

*Final product.* The final sequences consisted of 69 video clips (each approximately 30 seconds long). For each target word, there were between three and six video clips, depending on how many times the target word was repeated within each clip. For the target nouns, there was a

total of 32 clips (for an average of 4.0 clips per word) between 25 and 39 seconds long ( $M = 29.8$ ,  $SD = 3.5$  sec); for the target verbs, there was a total of 37 clips (for an average of 4.6 clips per word) between 19 and 34 seconds long ( $M = 29.1$  sec,  $SD = 3.0$ ).

*Answer sheets.* Answer sheets similar to those used in Experiment 1 were created to match the sequences in the new stimulus sets.

### *Procedure*

*Instructions to participants.* Participants were given the same instructions as had been given in Experiment 1. The only exception was that participants in the current study were all tested in English.

*Coding.* The coding procedures followed in Experiment 1 were also used in the current experiment.

### *Results*

The results of statistical tests based on four different analyses of participants' responses are presented below. As in Experiment 1, these analyses were expected to reveal that Westerners were more attentive to noun-relevant information in the SVL task, while Easterners were more attentive to verb-relevant information, and Second Generation participants attended to both kinds of information. In addition, Easterners were expected to perform better (i.e., make more target matches) relative to the other two groups than they did on the Western version of the task. These predictions were tested by examining evidence of noun and verb strategies, biases, and advantages: the results again provided some support for the predictions.

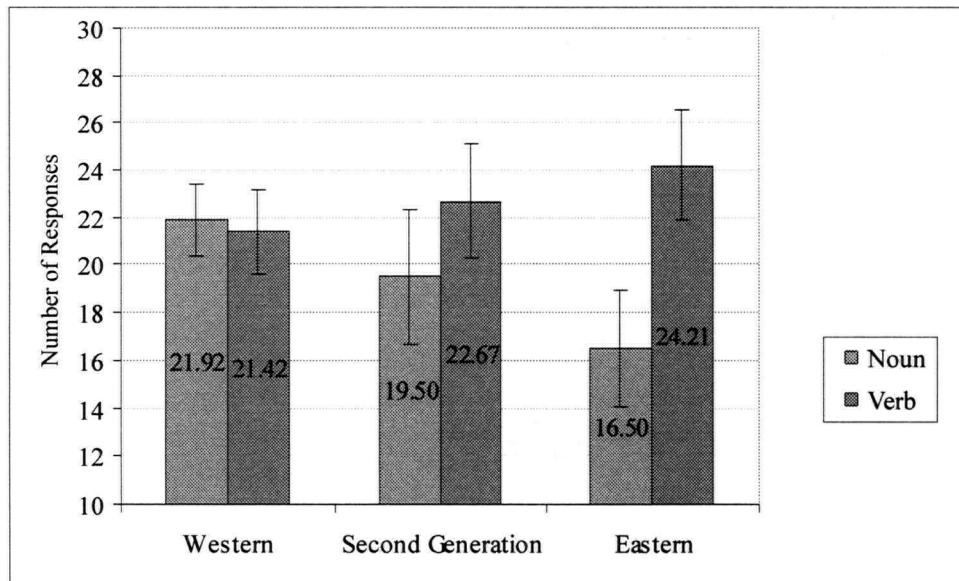
### *Noun and Verb Strategies.*

Westerners were expected to show evidence of using a noun strategy, Easterners were expected to show evidence of using a verb strategy, and Second Generation participants were not expected to use either strategy.

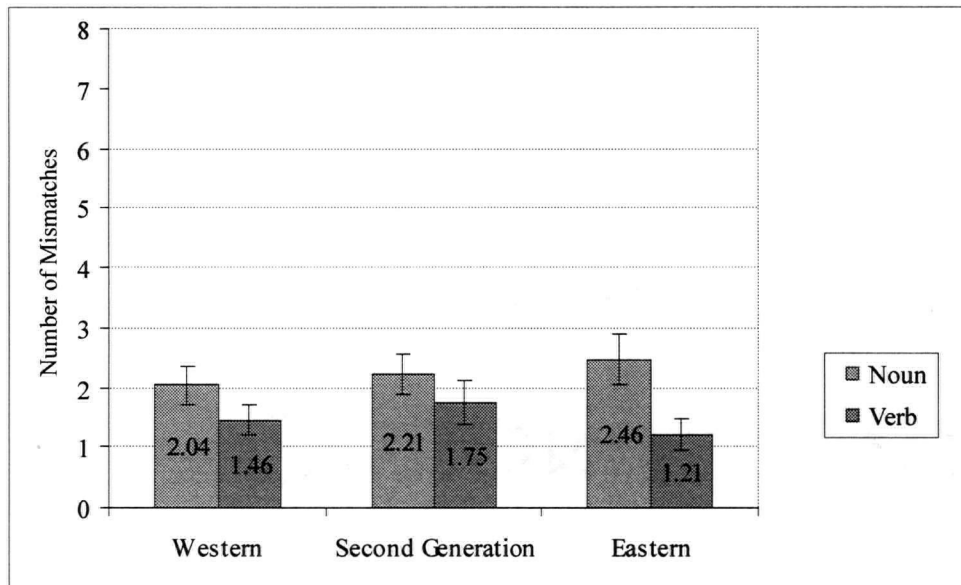
*Lexical categories of all responses.* The numbers of nouns and verbs provided by participants from each of the three groups are shown in Figure 3.1. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. There were no significant main effects or interactions; however, tests of simple main effects indicate that there was a Lexical Category effect for Easterners,  $F(1, 69) = 4.10, p = .047, \eta^2 = .040$ , showing that these participants provided significantly fewer nouns than verbs. The Lexical Category effect was not significant for Westerners,  $F(1, 69) = .02, p = .897$ , or for Second Generation participants,  $F(1, 69) = .69, p = .408$ .

A linear trend analysis comparing noun/verb difference scores across the three groups of participants failed to reach conventional levels of significance,  $t(69) = 1.52, p = .066$ .

*Lexical category mismatch on initial response.* The numbers of lexical category mismatches for nouns and verbs produced by participants from each of the three groups are shown in Figure 3.2. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. There was a significant main effect of Lexical Category,  $F(1, 69) = 6.68, p = .012, \eta^2 = .053$ . There was no effect of Cultural Group,  $F(1, 69) = .29, p = .747$ , nor was the interaction significant,  $F(2, 69) = .69, p = .505$ . Tests of simple main effects indicate that the Lexical Category effect was significant for the Eastern group,  $F(1, 69) = 5.96, p = .017, \eta^2 = .047$ , showing that Easterners



*Figure 3.1:* Mean numbers of nouns and verbs among all of participants' responses.



*Figure 3.2: Mean numbers of lexical category mismatches among participants initial responses.*

erroneously provided verbs more frequently than they erroneously provided nouns. This effect was not significant for either the Western group,  $F(1, 69) = 1.30, p = .259$ , or the Second Generation group,  $F(1, 69) = .80, p = .374$ .

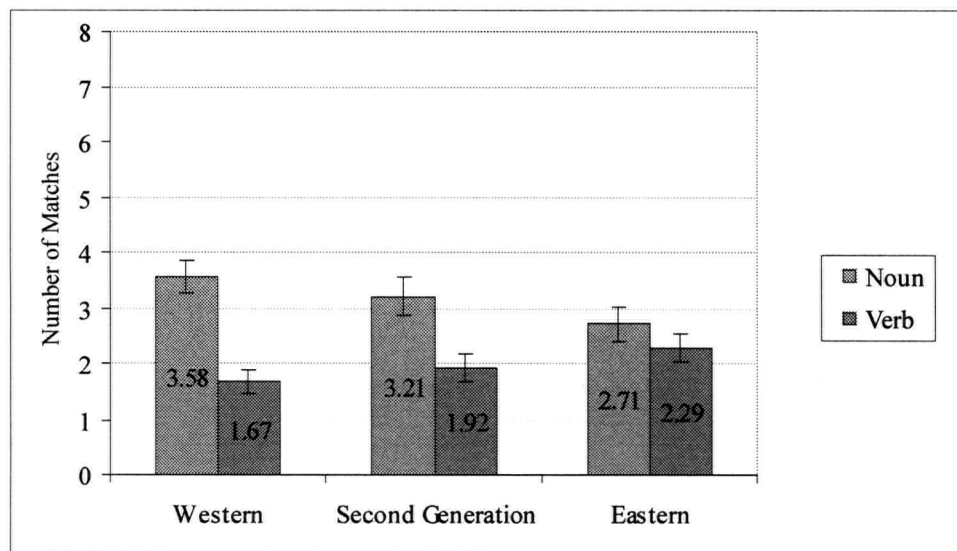
Linear trend analyses did not reveal any further significant effects.

In sum, the lexical category analyses revealed that Easterners showed strong evidence of adopting a verb strategy in the Eastern version of the SVL task. Westerners and Second Generation participants did not show evidence of using either a noun or a verb strategy in this version of the task.

#### *Noun and Verb Biases*

In the analyses based on target matches, Westerners were expected to show a noun bias, Easterners were expected to show no noun bias and potentially a verb bias, and Second Generation participants were expected to fall somewhere in between.

*Target match on final response.* The numbers of nouns and verbs correctly identified by participants (in their final responses) from each of the three groups are shown in Figure 3.3. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. There was a significant main effect of Lexical Category,  $F(1, 69) = 27.41, p < .001, \eta^2 = .157$ , as well as a significant Cultural Group by Lexical Category interaction,  $F(2, 69) = 3.55, p = .034, \eta^2 = .041$ . The interaction indicates that, as predicted, the Lexical Category effect differed across levels of Cultural Group. Tests of simple main effects indicate that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 22.98, p < .001, \eta^2 = .131$ , and the Second Generation group,  $F(1, 69) = 10.44, p = .002, \eta^2 = .060$ , but not for the Eastern group,  $F(1, 69) = 1.09, p = .300$ . In other words, Westerners correctly identified more nouns than verbs in their final responses and



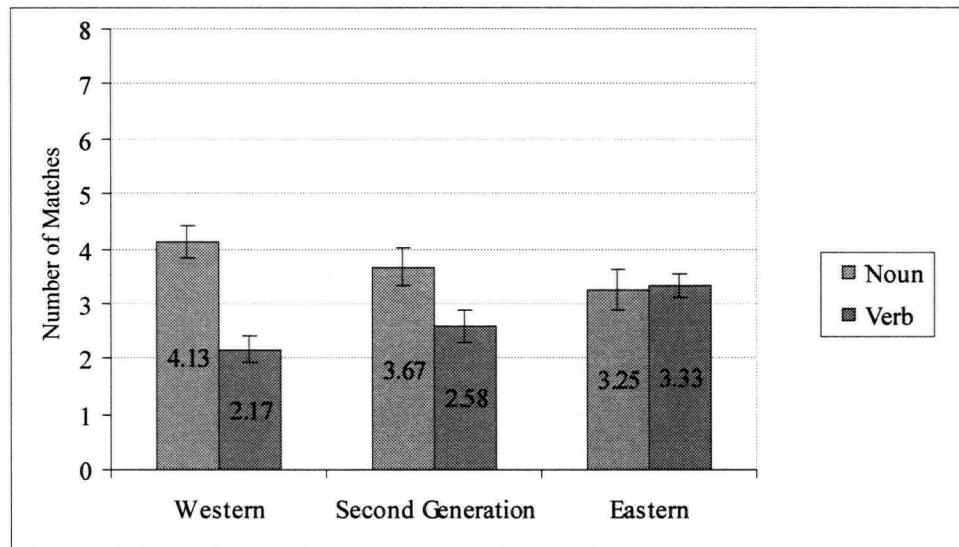
*Figure 3.3:* Mean numbers of target word matches among participants' final responses.

Second Generation participants showed a similar, though smaller (judging by effect sizes) effect. Easterners did not show evidence of such a noun bias among their final answers.

A linear trend analysis on noun/verb difference scores indicates that a model in which difference scores are largest for Westerners, smaller for Second Generation participants, and smallest for Easterners maps well onto the data,  $t(69) = 2.65, p = .005, \eta^2 = .093$ .

*Target match anywhere.* The numbers of nouns and verbs correctly identified by participants (among all their responses) from each of the three groups are shown in Figure 3.4. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. The analysis revealed a significant main effect of Lexical Category,  $F(1, 69) = 15.16, p < .001, \eta^2 = .100$  and a significant Lexical Category by Cultural Group interaction,  $F(2, 69) = 5.45, p = .006, \eta^2 = .072$ . The interaction indicates that, as predicted, the Lexical Category effect differed across levels of Cultural Group. Simple main effects tests showed that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 19.93, p < .001, \eta^2 = .131$ , and the Second Generation group,  $F(1, 69) = 6.10, p = .016, \eta^2 = .040$ ; however, this effect did not hold for the Eastern group,  $F(1, 69) = .04, p = .842$ . In other words, Westerners and, to a lesser extent, Second Generation participants correctly identified more nouns than verbs but Easterners correctly identified similar numbers of nouns and verbs. These findings confirm the prediction that Westerners would show a strong noun bias, Easterners would not show a noun bias, and Second Generation participants would fall somewhere in between.

The prediction that Westerners would show a strong noun bias that would decrease linearly across the Second Generation and Eastern groups was further supported by a linear trend analysis examining noun/verb difference scores. Significant results,  $t(69) = 3.29, p = .001, \eta^2 =$



*Figure 3.4:* Mean numbers of target word matches among all of participants' responses.

.136, suggest that the noun bias was strongest among Westerners, weaker among Second Generation participants and weakest among Easterners.

In sum, analyses based on target matches support the prediction that Westerners would show a strong noun bias, Easterners would not show a noun bias, Second Generation participants would fall somewhere in between. There was no reliable evidence that Easterners showed a verb bias.

### *Noun and Verb Advantages*

Westerners were expected to show a noun advantage relative to Easterners and Easterners were expected to show a verb advantage relative to Westerners.

*Target match on final response.* Post hoc analyses using the Neuman-Keuls approach did not reveal any significant differences between the numbers of nouns correctly identified by participants in the three groups, nor were there any significant differences between the numbers of verbs correctly identified by the three groups.

*Target match anywhere.* Post hoc analyses using the Neuman-Keuls approach indicate that all three groups correctly identified similar numbers of nouns. Easterners correctly identified more verbs than did Westerners, and the number of verbs correctly identified by Second Generation participants did not differ significantly from either of the other two groups.

In sum, Westerners did not show the expected noun advantage relative to Easterners, but Easterners did show a verb advantage relative to Westerners.

### *First Language Effects*

As in Experiment 1, data from Second Generation participants was reanalyzed separately in order to investigate possible effects of first language. Any effects associated with First Language were expected to reveal interactions showing that participants who acquired English as

their first language performed more like Westerners while participants who acquired Chinese as their first language performed more like Easterners. Responses from Second Generation participants corresponding to the four different analyses are shown in Table 3.1 broken down by first language. These numbers were reanalyzed to investigate possible effects of first language.

*Table 3.1: Mean Numbers of Target Matches, Responses, or Lexical Category Mismatches for Second Generation Participants Broken Down by First Language.*

Analysis	Noun		Verb	
	English	Chinese	English	Chinese
Lexical Categories of All Responses	14.5	24.5	25.3	20.0
Lexical Category Mismatch on Initial Response	2.8	1.6	1.3	2.3
Target Match on Final Response	2.8	3.7	1.8	2.0
Target Match Anywhere	3.3	4.1	2.7	2.5

*Lexical categories of all responses.* The numbers of nouns and verbs provided by Second Generation participants were submitted to a 2 (First Language: English, Chinese) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis failed to reveal any significant effects, suggesting that Second Generation participants provided similar numbers of nouns and verbs regardless of first language.

*Lexical category mismatch on initial response.* The numbers of lexical category mismatches provided by Second Generation participants were submitted to a 2 (First Language: English, Chinese) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant interaction,  $F(1, 22) = 4.79, p = .04, \eta^2 = .105$ , indicating that participants

whose first language was English tended to produce more erroneous verbs than nouns (i.e., a verb strategy) while participants whose first language was Chinese showed the reverse pattern.

*Target match on final response.* The numbers of target matches produced by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of Lexical Category,  $F(1, 22) = 7.66, p = .011, \eta^2 = .167$ , indicating that participants correctly identified more nouns than verbs. There were no significant main effects involving First Language, suggesting that Second Generation participants produced similar numbers of target matches (for both nouns and verbs) regardless of first language.

*Target match anywhere.* The numbers of target matches produced by Second Generation participants were submitted to a 2 (First Language: English, Chinese) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of Lexical Category,  $F(1, 22) = 4.37, p = .048, \eta^2 = .107$ , indicating that participants correctly identified more nouns than verbs. There were no significant effects involving First Language, suggesting that Second Generation participants produced similar numbers of target matches (for both nouns and verbs) regardless of first language.

In sum, there was some evidence of differences among Second Generation participants associated with first language. One analysis revealed a significant interaction suggesting that participants who spoke English as their first language showed a verb strategy, while those who had acquired their parents' language as their first language showed more of a noun strategy. This finding does not support, and in fact falls in the opposite direction to, the prediction that participants who acquired English as their first language would perform more like Westerners

while participants who acquired Chinese as their first language would perform more like Easterners.

### *Discussion*

As in Experiment 1, the results revealed group differences pertaining to strategies, biases, and advantages in the SVL task. The pattern of group differences differed in some respects from the one observed in the Western version of the SVL task.

#### *Noun and Verb Strategies*

Westerners did not show the noun strategy in their approach to the Eastern version of the SVL task that they showed in the Western version. They did not provide more nouns than verbs in their responses, and did not show a tendency to provide nouns when verbs were required, as they did in the Western version of the task. Second Generation participants did not show any evidence of a noun strategy, either. Easterners, on the other hand, showed evidence of a verb strategy: they had more verbs than nouns among all their responses and they showed a tendency to provide verb responses when nouns were required.

There was some evidence that Second Generation participants adopted different strategies depending on whether they had acquired English or Chinese as their first language. Participants who had acquired English as their first language responded similarly to Easterners and showed a verb strategy, while those who had acquired Chinese as their first language responded similarly to Westerners and showed more of a noun strategy. These results are puzzling; however, in the absence of any other significant effects involving participants' first language, no clear conclusions can be drawn from these findings.

### *Noun and Verb Biases*

Westerners showed a noun bias in the SVL task, even when the mother/toddler interactions depicted in the stimulus videos were Easterners. That is, Westerners correctly identified more nouns than verbs in the task. Second Generation participants also showed a noun bias, but this effect was less pronounced than in Westerners (judging by effect size differences and linear trend analyses). Easterners did not show any evidence of a noun bias in the Eastern version of the SVL task, nor did they show any evidence of a verb bias.

### *Noun and Verb Advantages*

Westerners did not show a noun advantage relative to either Second Generation or Eastern participants in the Eastern version of the SVL task: in all analyses, all three groups provided similar numbers of nouns. Easterners did show a verb advantage in the Eastern version of the SVL task: among all of their responses, they correctly identified more verbs than did Westerners. Second Generation participants did not show the overall advantage relative to Easterners in the Eastern version of the SVL task that they showed in the Western version.

In the Western version of the SVL task, Easterners tended to be less successful in identifying target matches than Westerners and Second Generation participants. In the Eastern version, Easterners were at least as successful as Westerners and Second Generation participants, suggesting that they were at a particular disadvantage in the Western version of the task—perhaps because the Western mother/toddler interactions were unfamiliar to them.

### *Comparing the Eastern and Western Versions of the SVL Task*

These findings, together with the findings from Experiment 1, suggest that Easterners and Westerners exhibit differences relevant to the acquisition of nouns and verbs. Westerners seem to be particularly attuned to noun-relevant information and Easterners seem more attentive to verb-

relevant information. In addition, there may also be important cultural differences in mother/toddler interactions that are also relevant to the acquisition of nouns and verbs. When Westerners watch Western mother/toddler interactions in the SVL task, they show a strong noun bias in their target matches and they also appear to use a noun strategy in their approach to the task. When they watch Eastern mother/toddler interactions in the SVL task, Westerners still show a noun bias in their target matches, but they do not appear to use that noun strategy. Easterners show some (though very little) evidence of a noun bias in their target matches in the Western version of the SVL task, but they show no such noun bias in the Eastern version of the task. In the Western version, Easterners do not show a clear noun or verb strategy, but they do appear to approach the task with a verb strategy in the Eastern version. Second Generation participants do not show such clear differences—which is not unexpected if the Eastern and Western interactions are equally familiar to them—but in both cases their performance seems to be more or less intermediate between Westerners' and Easterners'.

These differences across Experiments 1 and 2 suggest that different types of information—pertaining to nouns and verbs—are made salient in Eastern versus Western mother/toddler interactions. There are, however, two issues that make it difficult to make direct comparisons between Experiments 1 and 2. One issue pertains to differences in the participants who made up the Second Generation and Eastern groups in the two experiments. The two Second Generation groups are very similar, but in Experiment 1 “Eastern” countries were defined more broadly than in Experiment 2. As a result, the parents of a few Second Generation participants were born in places other than China, Hong Kong, or Taiwan, whereas the parents of all Second Generation participants in Experiment 2 were from China, Hong, or Taiwan. The two Eastern groups differed more critically: in Experiment 1, all the Eastern participants were

Japanese and had been in Canada less than a year; in Experiment 2, the Eastern participants were all Chinese (from China, Hong Kong, or Taiwan) and had been in Canada for up to 15 years.

Differences across Easterners from Experiments 1 and 2 may, therefore, be attributable to differences in Eastern vs. Western mother/toddler interactions or they may be attributable to the different backgrounds of these participants. This issue is addressed in Experiment 3.

A second issue pertains to differences in the video clips used in Experiments 1 and 2. As mentioned previously, the clips used in Experiment 2 were shorter than those used in Experiment 1. Any information lost in the shorter clips was unlikely to be useful in identifying target words, but this difference does make it difficult to compare performance across the two versions of the SVL task. This issue is also addressed in Experiment 3.

## Chapter 4: Experiment 3

Experiment 3 was designed to allow for comparisons between participants' performance in the Eastern and Western versions of the SVL task. In Experiment 2 (in which participants were tested on the Eastern version of the SVL task), the Second Generation and Eastern groups were defined more narrowly than they were in Experiment 1 (in which participants were tested on the Western version of the SVL task). The narrower cultural definition was meant to ensure that the Eastern mother/toddler interactions depicted in the Eastern version of the SVL task would be equally familiar to all participants within the Second Generation and Eastern groups. However, because the Second Generation and Eastern groups in Experiment 1 were different from the Second Generation and Eastern groups in Experiment 2, it would be difficult to draw any reliable conclusions from comparisons made across these groups. Such comparisons are, however, of interest. Therefore, in the current experiment, a new group of participants was tested on the Western version of the SVL task. These participants were recruited on the basis of the same criteria as were used in Experiment 2.

The video clips used in the Western version of the SVL task were also adjusted to more closely parallel those used in the Eastern version.

### *Method*

#### *Participants*

Three groups of participants ( $N = 72$ ), similar to those who participated in Experiment 2, were recruited from among student and non-student members of the UBC community. As in the previous experiments, one third ( $n = 24$ ) of the participants were classified as Westerners, one third as Second Generation participants, and one third as Easterners. The Westerners were all born in Canada or the US (as were their parents) and spoke English as their first language.

Nineteen of the Westerners were women and five were men; their average age was 23.5 years ( $SD = 6.8$  years). The Second Generation participants were also born in Canada, while their parents were born in Mainland China, Hong Kong, or Taiwan. Ten of the Second Generation participants reported acquiring English as their language and the remaining 14 reported acquiring Chinese (Cantonese, Mandarin, or Toi-San) as their first language. The Second Generation group included 15 women and 9 men, and their average age was 21.8 years ( $SD = 3.0$ ). The Easterners were all born in Mainland China, Hong Kong, or Taiwan and had acquired Chinese (Mandarin or Cantonese) as their first language. Easterners had been in Canada for up to 15 years ( $M = 7.38$  years,  $SD = 4.15$ ). Fourteen of the Easterners were women and ten were men; their average age was 21.4 years ( $SD = 4.5$  years). Participants received course credit or ten dollars in exchange for their participation.

### *Materials*

The video clips used in Experiment 1 (i.e., in the Western version of the SVL task) were modified to more closely parallel the video clips used in Experiment 2 (i.e. in the Eastern version of the SVL task). The individual clips were shortened by, in most cases, editing out the first 10 seconds of footage, and resized to 480 x 640 pixels. The clips were then reassembled into the same two randomly ordered sequences as were used in Experiment 1. The resulting sequences were just over 36 minutes long. The average length of the noun clips was 31.0 seconds ( $SD = 3.4$  seconds), and the average length of the verb clips was 29.6 seconds ( $SD = 2.5$ ).

### *Procedure*

*Instructions to participants.* Participants were given the same instructions as had been given in Experiments 1 and 2. All participants were tested in English.

*Coding.* The coding procedures followed in Experiments 1 and 2 were also used in the current experiment.

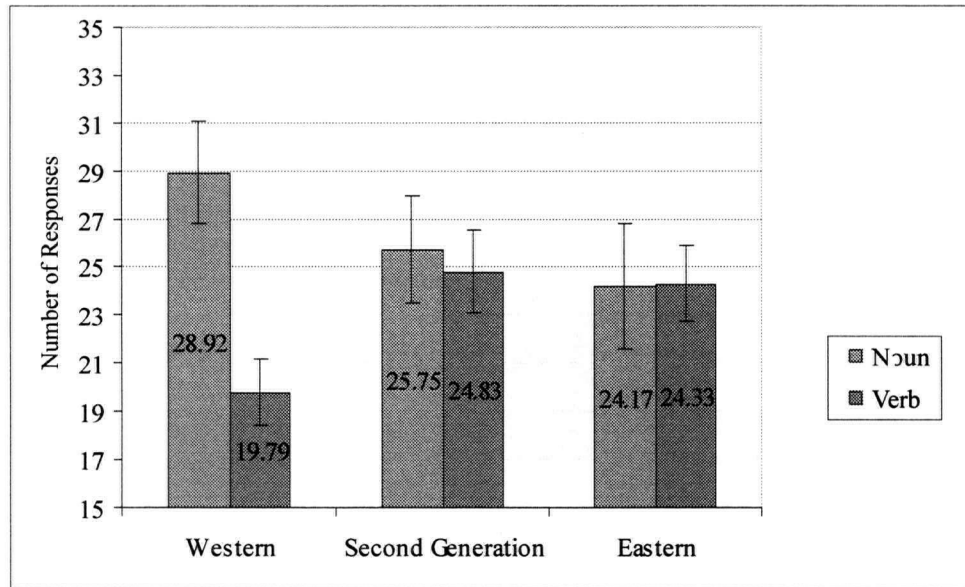
### *Results*

The data were examined using the four analyses previously discussed. Westerners were expected to attend to noun-relevant information, Easterners were expected to attend to verb-relevant information, and Second Generation participants were expected to attend to both kinds of information. The results were expected to be similar to those observed in Experiment 1 with respect to strategies, biases, and advantages. Again, the results provided support for these predictions.

#### *Noun and Verb Strategies*

As in the previous experiments, Westerners were expected to show evidence of adopting a noun strategy, Easterners were expected to show evidence of adopting a verb strategy, and Second Generation participants were not expected to prefer either strategy.

*Lexical categories of all responses.* The numbers of nouns and verbs provided by participants from each of the three groups are shown in Figure 4.1. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. The Lexical Category main effect,  $F(1, 69) = 3.39, p = .070$ , and the Lexical Category by Cultural Group interaction,  $F(1, 69) = 2.69, p = .075$ , failed to reach conventional levels of significance; however, tests of simple main effects indicate that Westerners did show a Lexical Category effect,  $F(1, 69) = 8.68, p = .004, \eta^2 = .072$ . There was no such effect for Second Generation,  $F(1, 69) = .09, p = .768$ , or Eastern participants,  $F(1, 69) = .002, p = .969$ . These findings indicate that Westerners, but not Second Generation or Eastern participants, showed evidence of a noun strategy in their approach to the SVL task.



*Figure 4.1:* Mean numbers of nouns and verbs among all of participants' responses.

A linear trend analysis comparing noun/verb difference scores across the three groups yielded significant results,  $t(69) = 2.12, p = .019, \eta^2 = .061$ , indicating that the noun strategy observed among Westerners decreased linearly across Second Generation and Eastern participants.

*Lexical category mismatch on initial response.* The numbers of lexical category mismatches for nouns and verbs produced by participants from each of the three groups are shown in Figure 4.2. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. There was a significant main effect of Lexical Category,  $F(1, 69) = 7.96, p = .006, \eta^2 = .064$ , and a significant Lexical Category by Cultural Group interaction,  $F(2, 69) = 4.14, p = .020, \eta^2 = .067$ . Tests of simple main effects indicate that the Lexical Category effect was significant for the Western group,  $F(1, 69) = 15.28, p < .001, \eta^2 = .124$ , showing that Westerners erroneously provided nouns more frequently than verbs. This effect was not significant for either the Second Generation group,  $F(1, 69) = .95, p = .333$ , or the Eastern group,  $F(1, 69) = .00, p = 1$ . In this case, Westerners showed evidence of a noun strategy by providing nouns even when verbs were called for (they did this more frequently than they provided verbs when nouns were called for); Second Generation and Eastern participants did not show evidence of such a noun strategy.

Linear trend analyses examining noun/verb difference scores yielded significant results,  $t(69) = 2.76, p = .004, \eta^2 = .100$ , suggesting that the noun strategy observed among Westerners decreased linearly across Second Generation and Eastern participants.

In sum, the lexical category analyses indicate that, as in Experiment 1, Westerners showed evidence of adopting a noun strategy. Easterners did not show any evidence of adopting

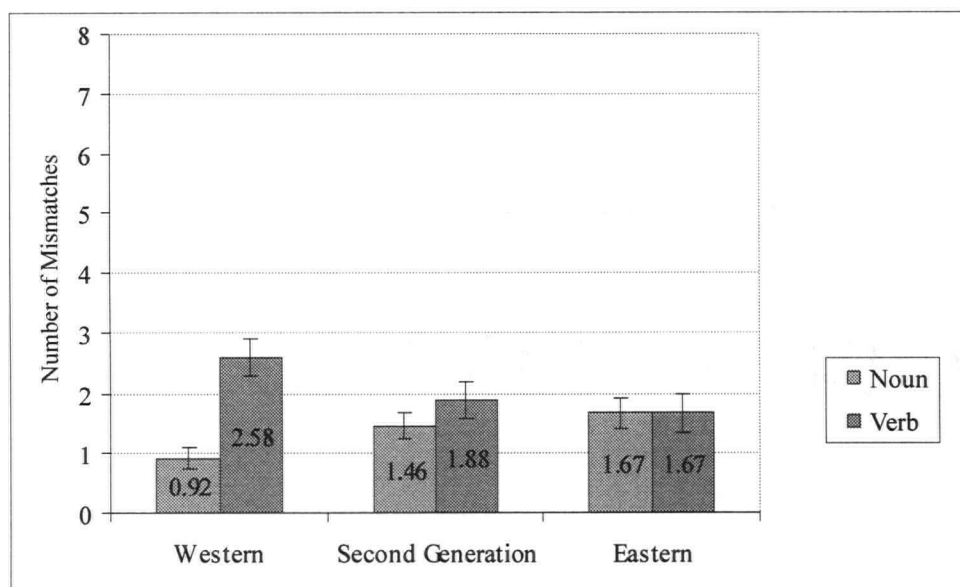


Figure 4.2: Mean numbers of lexical category mismatches among participants initial responses.

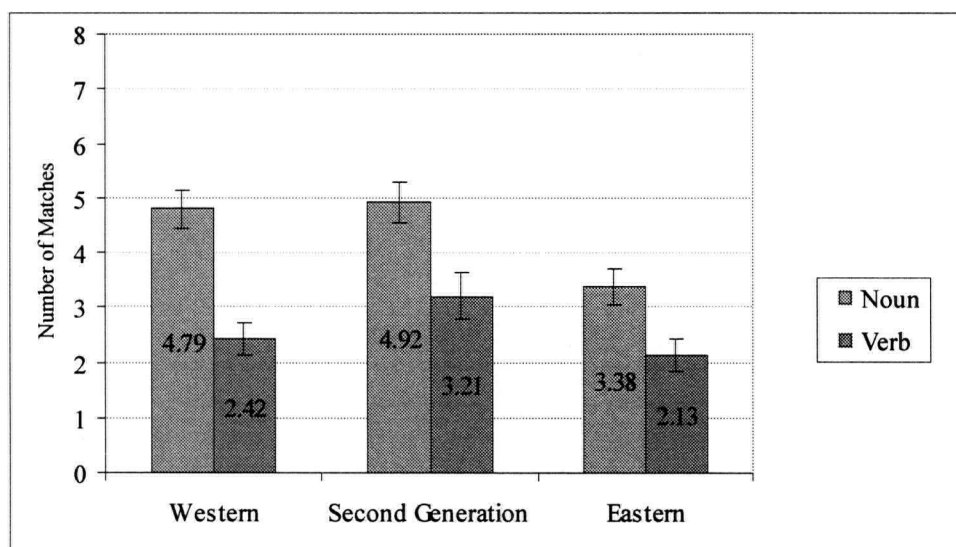
a noun strategy, but they also did not show any evidence of adopting a verb strategy. Second Generation participants did not appear to adopt either a noun or a verb strategy.

#### *Noun and Verb Biases*

As in the previous experiments, Westerners were expected to show a strong noun bias, Second Generation participants were expected to show a weaker noun bias, and Easterners were not expected to show a noun bias.

*Target match on final response.* The numbers of nouns and verbs correctly identified by participants (in their final responses) from each of the three groups are shown in Figure 4.3. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within analysis of variance. The analysis revealed significant main effects of both Lexical Category,  $F(1, 69) = 67.95, p < .001, \eta^2 = .205$ , and Cultural Group,  $F(2, 69) = 5.36, p = .007, \eta^2 = .077$ , with no Lexical Category by Cultural Group interaction,  $F(2, 69) = 2.29, p = .109$ . Simple main effects tests showed that the Lexical Category effect was significant for all three groups, but, as in the previous analysis, the size of the Lexical Category effect was largest for Westerners,  $F(1, 69) = 40.40, p < .001, \eta^2 = .122$ , smaller for the Second Generation participants,  $F(1, 69) = 20.91, p < .001, \eta^2 = .063$ , and smallest for Easterners,  $F(1, 69) = 11.91, p = .001, \eta^2 = .034$ . In other words, participants from all three groups correctly identified more nouns than verbs, but this noun bias was strongest among Westerners and weakest among Easterners.

A linear trend analysis on noun/verb difference scores indicates that a model in which the noun bias is strongest for Westerners, weaker for Second Generation participants, and weakest for Easterners maps well onto the data,  $t(69) = 2.13, p = .018, \eta^2 = .062$ .

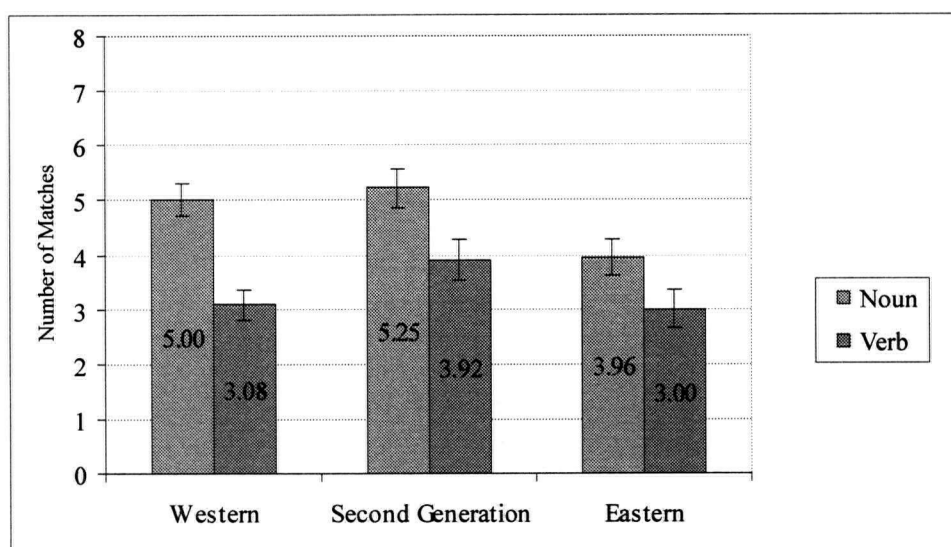


*Figure 4.3: Mean numbers of target word matches among participants' final responses.*

*Target match anywhere.* The numbers of nouns and verbs correctly identified by participants (among all their responses) from each of the three groups are shown in Figure 4.4. These numbers were submitted to a 3 (Cultural Group: Western, Second Generation, Eastern) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. The analysis revealed significant main effects of both Lexical Category,  $F(1, 69) = 37.87, p < .001, \eta^2 = .160$ , and Cultural Group,  $F(2, 69) = 4.86, p = .011, \eta^2 = .066$ , with no Lexical Category by Cultural Group interaction,  $F(2, 69) = 1.50, p = .231$ . Simple main effects tests showed that the Lexical Category effect was significant for all three groups, but the size of the Lexical Category effect largest for Westerners,  $F(1, 69) = 23.57, p < .001, \eta^2 = .100$ , smaller for the Second Generation participants,  $F(1, 69) = 11.41, p = .001, \eta^2 = .048$ , and smallest for Easterners,  $F(1, 69) = 5.89, p = .019, \eta^2 = .025$ . In other words, participants from all three groups correctly identified more nouns than verbs, but this noun/verb difference was greatest among Westerners and smallest among Easterners.

The prediction that Westerners would show a strong noun bias and that this bias would decrease linearly across Second Generation and Eastern participants received support from a linear trend analysis examining noun/verb difference scores. Significant results,  $t(69) = 1.72, p = .045, \eta^2 = .041$ , suggest that the noun bias was strongest among Westerners, weaker for Second Generation participants, and weakest among Easterners.

In sum, the analyses of target matches indicate that, as predicted, Westerners showed a strong noun bias and Second Generation participants showed a weaker noun bias. Easterners showed an even weaker, but still significant, noun bias.



*Figure 4.4:* Mean numbers of target word matches among all of participants' responses.

### *Noun and Verb Advantages*

Westerners were expected to show a noun advantage relative to Easterners, and Easterners were expected to show a verb advantage relative to Westerners.

*Target match on final response.* Post hoc analyses using the Neuman-Keuls approach indicate that, among their final responses, Westerners and Second Generation participants correctly identified similar numbers of nouns and both groups correctly identified more nouns than did Easterners. All three groups identified similar numbers of verbs.

*Target match anywhere.* Post hoc analyses using the Neuman-Keuls approach indicate that, among all of their responses, Westerners and Second Generation participants correctly identified similar numbers of nouns and both groups correctly identified more nouns than did Easterners. All three groups identified similar numbers of verbs.

In sum, both Westerners and Second Generation participants showed noun advantages relative to Easterners. Easterners did not show a verb advantage relative to Westerners.

### *First Language Effects*

Responses from Second Generation participants corresponding to the four different analyses are shown in Table 4.1 broken down by first language. These numbers were analyzed to investigate possible effects of first language. As in the previous experiments, any effects of First Language were expected to show that participants who had acquired English as their first language would perform more like Westerners while participant who had acquired Chinese as their first language were expected to perform more like Easterners.

*Table 4.1: Mean Numbers of Target Matches, Responses, or Lexical Category Mismatches for Second Generation Participants Broken Down by First Language.*

Analysis	Noun		Verb	
	English	Chinese	English	Chinese
Lexical Categories of All Responses	25.7	25.8	24.9	24.8
Lexical Category Mismatch on Initial Response	2.1	1.1	2.3	1.6
Target Match on Final Response	3.9	5.3	2.6	3.5
Target Match Anywhere	5.0	5.4	3.6	4.1

*Lexical categories of all responses.* The numbers of nouns and verbs provided by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis failed to reveal any significant effects, suggesting that participants performed similarly regardless of first language.

*Lexical category mismatch on initial response.* The numbers of lexical category mismatches produced by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of First Language,  $F(1, 22) = 7.04, p = .015, \eta^2 = .114$ , indicating that participants whose first language was English produced more lexical category mismatches—for both nouns and verbs—than did participants whose first language was Chinese. There was no main effect of Lexical Category, nor was there an interaction between First Language and Lexical Category did not interact.

*Target match on final response.* The numbers of target matches produced by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical

Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of Lexical Category,  $F(1, 22) = 14.75, p = .001, \eta^2 = .122$ , indicating that participants correctly identified more target nouns than verbs. There were no significant effects involving First Language, suggesting that participants performed similarly regardless of first language.

*Target match anywhere.* The numbers of target matches produced by Second Generation participants were submitted to a 2 (First Language: English, Other) by 2 (Lexical Category: Noun, Verb) between-within ANOVA. This analysis revealed a significant main effect of Lexical Category,  $F(1, 22) = 11.79, p = .002, \eta^2 = .141$ , indicating that participants correctly identified more target nouns than verbs. There were no significant effects involving First Language, suggesting that participants performed similarly regardless of first language.

In sum, the results suggest that Second Generation participants with different first languages performed similarly. In the one instance in which there were differences associated with participants' first language, there was no interaction with Lexical Category, indicating that participants showed similar strategies and biases regardless of first language.

### *Discussion*

#### *Noun and Verb Strategies*

The results of the current experiment replicate the findings from Experiment 1 showing that Westerners adopt a noun strategy, and Second Generation and Eastern participants do not adopt either a noun or a verb strategy in the Western version of the SVL task.

#### *Noun and Verb Biases*

As in Experiment 1, Westerners also showed a strong noun bias in the Western version of the SVL task. The prediction that noun bias would be weaker for Second Generation

participants and weaker still for Easterners received strong support in the current experiment. The prediction that Easterners would show a verb bias was not supported.

### *Noun and Verb Advantages*

As in Experiment 1, both Westerners and Second Generation participants showed noun advantages relative to Easterners. Easterners did not show a verb advantage relative to Westerners in the Western version of the SVL task.

### *Comparing Experiments 1 and 3*

The results of the two experiments based on the Western version of the SVL task were, as expected, very similar. There was, however, one notable difference. In Experiment 1, Second Generation participants showed an overall advantage relative to Easterners: they correctly identified more nouns and more verbs than Easterners. In the current experiment, however, Second Generation participants showed a noun advantage relative to Easterners, but they did not show a verb advantage. Relative to Second Generation participants, Easterners in the current experiment were more successful in identifying verbs than were Easterners in Experiment 1.

In Experiment 1, it was unclear why Second Generation participants would show both a noun and a verb advantage relative to Easterners, but one likely explanation was that the SVL task was more difficult for Easterners because the Western mother/toddler interactions depicted in the stimulus videos were unfamiliar to Easterners. This explanation received some support from the results of Experiment 2: when the stimulus videos were based on Eastern mother/toddler interactions (and were therefore more familiar to Easterners), Second Generation participants did not show either a noun or a verb advantage relative to Easterners. The results of the current experiment may also provide some support for the familiarity explanation. The Easterners in Experiment 1 were all Japanese exchange students who had been in Canada for less

than a year; the Easterners in the current experiment were from Mainland China, Hong Kong or Taiwan and had been in Canada for up to 15 years. It is likely then that the Easterners' greater success in identifying verbs in Experiment 3 can be attributed to the fact that the Easterners in that study had had greater exposure to Western culture and the Western mother/toddler interactions were thus more familiar to them.

The Easterners in the current experiment may have been more familiar with Western mother/toddler interactions, but there were still group differences in both strategies and biases exhibited in the SVL task. The pattern of group differences observed in the Western version of the SVL task differed from the pattern observed in Eastern version of the task; that is, performance in the SVL task seems to be influenced by the cultural group membership of both the participants and the mother/toddler pairs depicted in the stimulus videos. The interaction between these two factors will be discussed in the next chapter.

## Chapter 5: Comparing the Eastern and Western Versions of the SVL Task

Experiment 3 was designed to provide data on the Western version of the SVL task that could be compared with the Eastern version data from Experiment 2. However, even though the participant groups were matched across Experiments 2 and 3 and the stimulus videos in the two versions were constructed in the same fashion, the two sets of target words were not identical (though there was some overlap), and so some caution is warranted when comparing performance across the two versions of the SVL task. Different levels of performance on the two versions of the task could be partly due to particular difficulties associated with specific target words. As a result, comparisons were made based on examinations of the general patterns that emerged from the analyses in Experiments 2 and 3, rather than statistical analyses in which task version was included as an additional factor.

### *Noun and Verb Strategies*

Figures 5.1 and 5.2 depict the strategies (i.e., noun/verb difference scores) shown by Westerners, Second Generation participants, and Easterners in the Eastern and Western versions of the SVL task (in Figure 5.1, positive difference scores indicate that participants showed a noun strategy by providing more nouns than verbs and negative scores indicate that participants showed a verb strategy; in Figure 5.2, negative difference scores indicate that participants showed a noun strategy by providing erroneous nouns more frequently than they provided erroneous verbs and positive scores indicate that participants showed a verb strategy). Participants' strategies differed markedly across the two versions of the SVL task: for all participants, evidence of a noun strategy was weaker in the Eastern version—or, conversely, evidence of a verb strategy was stronger—than in the Western version. Westerners clearly used a noun strategy in the Western version, but this strategy was less evident in the Eastern version.

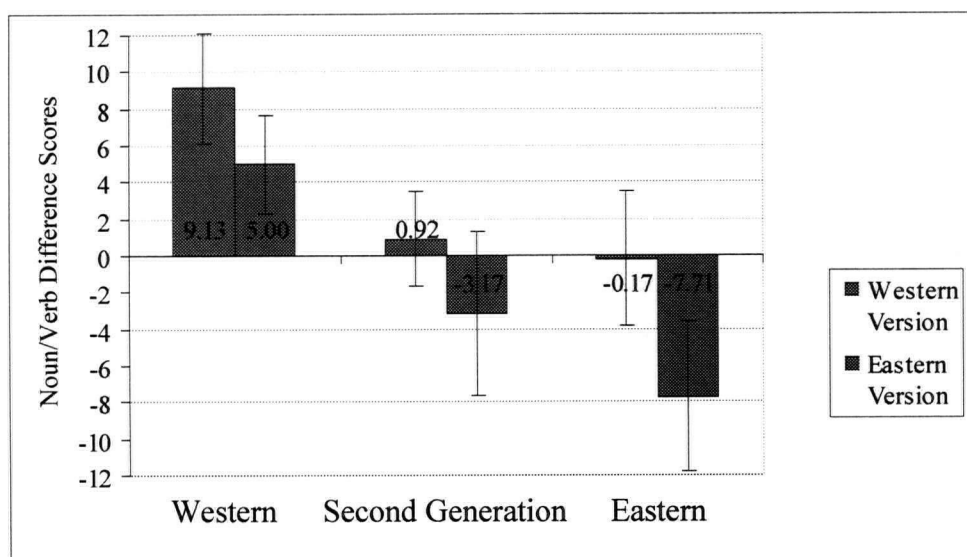


Figure 5.1: Noun/Verb difference scores based on numbers of nouns and verbs among all responses.

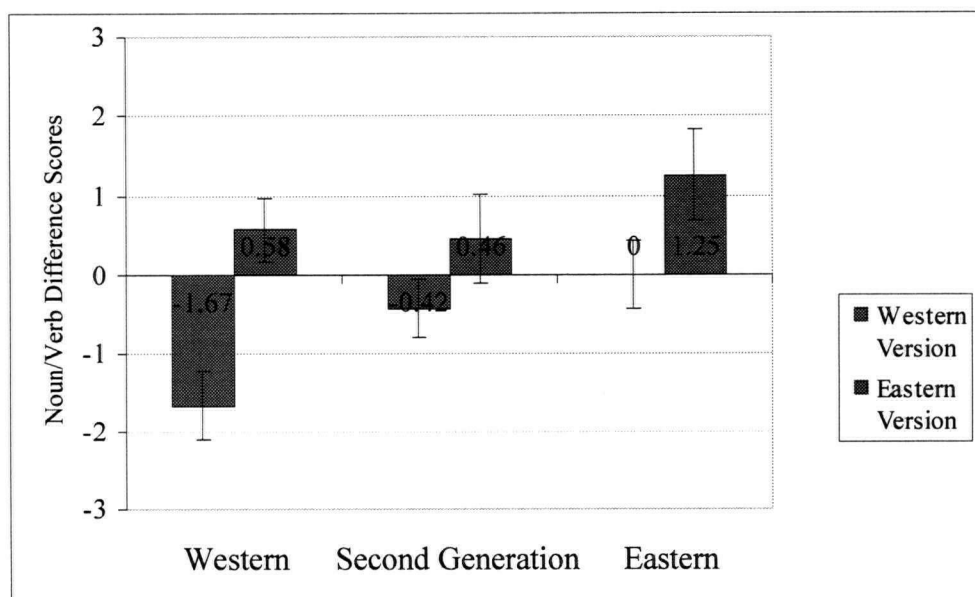


Figure 5.2: Noun/Verb difference scores based on lexical category mismatches.

Easterners clearly used a verb strategy in the Eastern, but not the Western, version of the SVL task. Second Generation participants did not show strong evidence of using either type of strategy in either of the versions.

The finding that strategies differed across versions of the SVL task is surprising. Westerners were expected to attend to noun-relevant information and Easterners were expected to attend to verb-relevant information regardless of the task. These results suggest that there are differences within Eastern and Western mother/toddler interactions that guide participants to attend relatively more to noun-relevant information in the case of Western interactions and to attend relatively more to verb-relevant information in the case of Eastern interactions.

#### *Noun and Verb Biases*

Figures 5.3 and 5.4 depict the biases (i.e., the difference between the numbers of correctly identified nouns and verbs—higher scores indicate stronger noun biases) shown by Westerners, Second Generation participants, and Easterners in the Western and Eastern versions of the SVL task. In comparing performance across the two versions, one possible outcome is that participants performed better—for both nouns and verbs—in one version as a result of their familiarity with the mother/toddler interactions. That is, Westerners might have performed better overall in the Western version and Easterners might have performed better overall in the Eastern version. If familiarity were the critical factor, then noun/verb difference scores should be relatively stable across the two versions of the task. For example, if Westerners did better in the Western version than in the Eastern version, then both their noun and verb scores should be higher but their difference scores should be similar. The pattern of results shown in Figures 5.3 and 5.4 suggest that familiarity was not the only factor that differed across the two versions of the SVL task: difference scores are quite different across the two versions and seem to be lower

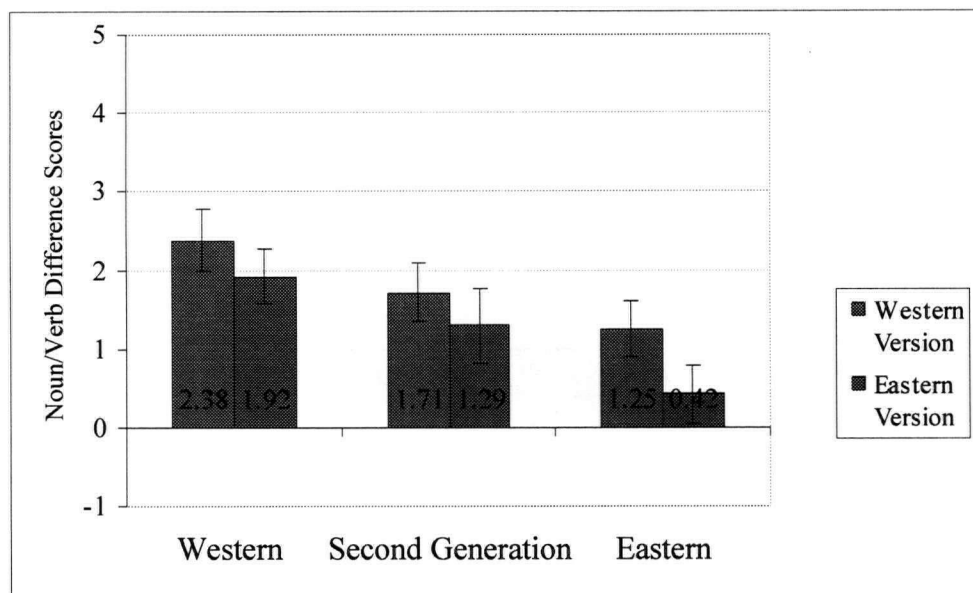


Figure 5.3: Noun/Verb difference scores based on target matches on final response.

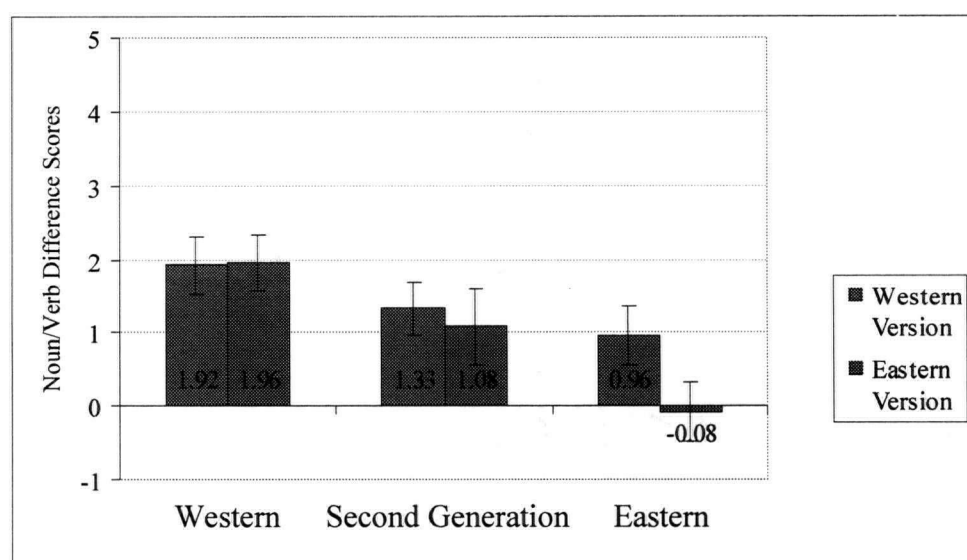


Figure 5.4: Noun/Verb difference scores based on target matches anywhere.

in the Eastern version. For Westerners, difference scores change very little across the Eastern and Western versions of the task and their noun bias seems to be robust across versions. Difference scores are less stable for Second Generation participants, dropping slightly in the Eastern version. For Easterners, there is a marked difference across the two versions with the noun bias observed in the Western version disappearing in the Eastern version.

Snedeker, Li, and Yuan (2003) have recently reported a pattern of findings that also indicates that there are differences between Eastern and Western mother/toddler interactions that may be relevant to the acquisition of nouns and verbs. Using a similar methodology, they found that both Easterners and Westerners correctly identified more nouns than verbs when watching Western mother/toddler interactions, and both groups correctly identified similar numbers of nouns and verbs when watching Eastern mother/toddler interactions. Snedeker et al. (2003) did not report any group differences in the degree to which Easterners and Westerners showed noun biases in their responses: this may be because they imposed constraints on the types of responses their participants could give by specifying whether each target word was a noun or a verb. When the lexical categories of participants' responses are examined, it is clear that participants' use of a noun or verb strategy is related to noun biases among their target matches.

These findings suggest that there are important cultural differences within mother/toddler interactions that are relevant to the acquisition of nouns and verbs. Some aspect of Western mother/toddler interactions seems to make noun-relevant information more salient, while some aspect of Eastern mother/toddler interactions seems to make verb-relevant information more salient. This effect interacts with participants' own biases with the result that Westerners show a noun advantage relative to Easterners in the Western version of the SVL task and Easterners show a verb advantage relative to Westerners in the Eastern version of the task.

## Chapter 6: General Discussion

The results of cross-cultural studies indicate that Western adults show a persistent and robust noun bias in the SVL task. These findings mirror those reported by Gillette et al. (1999) and support the argument that nouns can be readily acquired on the basis of non-linguistic contextual information while verbs cannot. However, Second Generation adults do not show the same robust noun bias in the SVL task and Easterners show even less evidence of a noun bias. These group differences call into question the notion that there is something special about nouns that makes them more readily identifiable than verbs in the SVL task. Instead, the differences imply that there is something particular to Westerners that makes it easier for them to identify nouns than to identify verbs in the SVL task.

There is, nonetheless, a clear noun/verb asymmetry in the SVL task. Consider the evidence from Westerners: in the Western version of the SVL task, they show evidence of using a noun strategy, and they show both a noun bias and a noun advantage relative to Easterners. Now consider the evidence from Easterners: in the Eastern version of the SVL task, they show evidence of using a verb strategy, and they show some evidence of a verb advantage relative to Westerners but no evidence of a verb bias in their target matches. The noun-focused performance of Westerners in the Western version of the SVL task is partly, *but not fully*, mirrored by the verb-focused performance of Easterners in the Eastern version of the task. Now consider the evidence from Second Generation adults: in both the Eastern and Western versions of the SVL task, they seem to use a balanced strategy—providing similar numbers of nouns and verbs among their responses. In the Western version of the task, this strategy yields a noun bias among their target matches; in the Eastern version of the task, this balanced strategy still yields a noun bias. Thus, although there is not consistent evidence for a strong noun bias across all groups, the

cross-cultural evidence does point to differences—or an asymmetry—between nouns and verbs in the SVL task. This asymmetry indicates that there is something particular to nouns that makes them more readily identifiable than verbs in the SVL task. The group differences also indicate that there is something particular to Westerners that makes it easier for them (but not necessarily for other cultural groups) to identify nouns than verbs in the SVL task.

These findings raise two questions. First, what is it about nouns that makes them more easily identifiable in the SVL task? This question has already been addressed elsewhere, and the noun/verb asymmetry revealed by the data in the current study do not conflict with the bootstrapping hypothesis proposed by Gleitman and her colleagues (e.g., Gleitman & Gleitman, 1992) or with the natural partitions hypothesis proposed by Gentner (1982). As would be predicted by these hypotheses, Westerners and Second Generation participants show a noun bias; and Easterners, even though they seem to be more attentive to verb-relevant information, do not show a verb bias. The cross-cultural differences also revealed by the data in the current study may not necessarily conflict with the bootstrapping or natural partitions hypotheses, but they do require further explanation—which leads to the second question. What is it about Westerners that allows them to identify nouns so much more successfully than verbs in the SVL task; how do we explain the group differences observed in the current study?

One formulation of a response to this question revolves around the Whorfian debate concerning the relationship between language, culture and cognition. According to this formulation, either linguistic differences drive cognitive differences among different cultural groups—in some kind of Whorfian (e.g., Whorf, 1956) fashion—or language merely reflects the cultural differences underlying cognitive differences. In this view, linguistic differences are either the causal force behind the group differences observed in the SVL task or linguistic

differences are an outcome of underlying group differences. Attempts to resolve the language and cognition debate have generated some excellent research and discourse (e.g., Berlin & Kay, 1969; Bowerman & Levinson, 2001; Levinson, Kita, Haun, & Rasch, 2002; Li & Gleitman, 2002; Roberson, Davies, & Davidoff, 2000); however, focusing on the either/or question can distract attention away from questions concerning the specific factors that drive differences between cultural groups. As well, given the chronic conflation of language and culture, attempts to rule out language as a source of group differences frequently become exercises in circularity.

On a different formulation, language is viewed as inextricably intertwined with culture, and linguistic differences are treated as one aspect of larger cultural differences. This view of language as an integral part of culture is implicit in much of the recent work in cultural psychology. For example, in their review of cultural differences associated with holistic and analytic cognition, Nisbett and his colleagues (Nisbett et al., 2001) treat language as one of many social practices: other social practices include religion; law and contracts; and argument, debate, and rhetoric. This approach opens the door to exploring relevant linguistic differences that may give rise to cognitive differences, without denying that other aspects of culture may play some additional role.

Consider, then, some linguistic factors that could arguably play a role in driving the group differences revealed in the current study. These factors potentially include all those mentioned earlier in the context of linguistic differences relevant to the universality of the noun bias: sentence structure (i.e. SVO vs. SOV), verb morphology, and noun ellipsis. All these factors make nouns more salient in English—the language spoken by Western participants in the current study—but they do not all apply to all of the languages spoken by the Eastern

participants<sup>11</sup>. In English, SVO sentence structure puts nouns in the salient sentence initial and final positions; in Japanese, SOV sentence structure puts verbs in the salient sentence final position. This makes verbs more salient in the language spoken by some Eastern participants, but in Mandarin and Cantonese, the languages spoken by a majority of the Eastern participants, the sentence structure is SVO—like English. On the other hand, the simple verb morphology found in Mandarin and Cantonese that has been argued to make verbs more transparent, is not found in Japanese. The only feature that makes verbs more salient and applies to all the languages spoken by Easterners in the current study, but not to English, is noun ellipsis. Mandarin, Cantonese, and Japanese allow noun ellipsis, or the omission of nouns wherever their meaning can be recovered from contextual information.

Noun ellipsis could lead Easterners to pay greater attention to verbs: if nouns are infrequently realized in common conversation, then verbs must carry a greater share of semantic information and might, as a result, require more careful attention. If speakers of Mandarin, Cantonese and Japanese habitually pay greater attention to verbs, this could potentially explain their performance in the SVL task. Their attention to verbs could be the reason that Easterners showed more of a tendency to employ a verb strategy in the SVL task and less of a tendency to employ a noun strategy than Westerners. The noun ellipsis explanation is not, however, entirely satisfactory. If the group differences observed in the current study were based entirely on linguistic factors like noun ellipsis, then one would expect these differences to play out differently between, on the one hand, Second Generation adults whose first language is English and, on the other hand, Second Generation adults whose first language is Mandarin or Cantonese. In particular, one would expect Second Generation adults whose first language is

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<sup>11</sup> Recall that Easterners in Experiment 1 spoke Japanese while Easterners in Experiments 2 and 3 spoke Cantonese and Mandarin.

English to perform more like Westerners, while Second Generation adults whose first language is Mandarin or Cantonese should perform more like Easterners. This was not the case: in most cases Second Generation adults performed similarly in the SVL task regardless of whether they had acquired English or Chinese as their first language. The one analysis that did reveal differences between the two groups indicated that the Chinese-first-language group performed more like Westerners while the English-first-language group performed more like Easterners. Thus, to the extent that language and culture can be teased apart in the current studies, participants' performance in the SVL task is more closely tied to their cultural backgrounds than to their linguistic experience.

If linguistic factors are not entirely adequate in attempting to explain the group differences observed in the SVL task, it may be informative to look at other cultural factors. Culture, on its own, is not an explanatory concept (Medin & Atran, 2003) and certainly it makes little sense to invoke culture as an explanation for differences between groups of participants who were grouped on the basis of their cultural backgrounds. However, there have recently been some serious attempts to uncover specific factors that may underlie differences among people who belong to different cultures, and these factors are useful in making sense of the current set of results.

In a seminal paper, Markus and Kitayama (1991) argued that a view of self as either independent (as is typical of Westerners; e.g., Bellah, Madsen, Sullivan, Swider, & Tipton, 1985) or interdependent (as is typical of Easterners; e.g., Lebra, 1976) greatly influences psychological processes, including cognition. According to this argument, Westerners see themselves as independent autonomous individuals, while Easterners see themselves as interdependently linked to a larger social whole. With respect to cognition, Markus and Kitayama argue that self-concept

influences the types of information that receive the most attention. Supporting this proposition, Kühnen, Hannover, and Schubert (2001) have shown that manipulating self-concept (i.e., by priming independence or interdependence) affects performance on cognitive tasks. When participants are primed to feel independent, they show more analytic, context-independent thinking; when participants are primed to feel interdependent, they show more holistic, context-bound thinking. Importantly, independent and interdependent self-concepts occur to different degrees within individuals, and Kühnen and his colleagues (2001) have argued that culture acts “as a chronic source of activation of relevant self-construals” (p.398). That is, Westerners are primed by features of Western culture to experience an independent self-concept, which leads them to engage in analytic reasoning and, consequently, to focus on noun-relevant information. Easterners are primed by features of Eastern culture to experience an interdependent self-concept, which leads them to engage in holistic reasoning and, consequently to focus on verb-relevant information. The elegance of this theoretical framework is that it can be tested: independence-primed participants should show a strong noun bias in the SVL task and interdependence-primed participants should not. This testing approach might be most effective with Second Generation participants who, in the absence of deliberate priming, seem to adopt neither a noun strategy nor a verb strategy in the SVL task.

These cultural features—independent versus interdependent views of self, analytic versus holistic systems of thought—provide a framework for understanding and further exploring the group differences observed in the SVL task. It is, to some extent, helpful to make sense of one group of people attending to noun-relevant information as a result of having an independent view of self and an analytic system of thought, and of a second group of people attending to verb-relevant information as a result of having an interdependent view of self and a holistic system of

thought. This is more helpful, at any rate, than simply concluding that the first group is more noun-focused because they are Westerners and the second group is more verb-focused because they are Easterners. However, noticing the different views of self and systems of thought that are typical of Eastern and Western cultures is still more descriptive than explanatory; it may help us understand why Easterners and Westerners perform differently in the SVL task, but it does not necessarily help us understand what makes Westerners more independent and analytical and Easterners more interdependent and holistic.

A different approach to investigating the sources of group differences is to look at the developmental origins of these differences. That is, if we can get a handle on how Western children acquire Western cultural habits and on how Eastern children acquire Eastern cultural habits this could shed light on the essential differences between Eastern and Western adults. The differences observed in the Eastern and Western versions of the SVL task may be one key to this developmental approach. That is, if adults perform differently in the SVL task depending on whether they are watching Eastern or Western mother/toddler interactions, then there must be important differences within those interactions. There is little doubt that mother/toddler interactions play a role in the development of cultural habits; therefore, close analyses of both linguistic and non-linguistic features of these interactions could shed light on the developmental origins of cultural differences.

For example, recent work on social and pragmatic cues to word meaning (e.g., Akhtar & Tomasello, 1996; Baldwin, 1991) has shown that joint attention is a critical component of early word learning. Snedeker and Li (2003) have looked at social and pragmatic cues and have failed to find any differences in the frequency with which Eastern and Western mothers use pointing or direct gaze while labelling objects; however, there have not yet been any reports of

investigations of joint attention. Coding instances of joint attention in the stimulus videos used in the SVL task and looking at the referents of joint attention could be informative in addressing questions such as: Are the referents of joint attention different for Eastern and Western mother/toddler pairs? Is the process of initiating joint attention different for Easterners and Westerners?

With respect to linguistic features, the Eastern and Western mothers who were videotaped for the SVL task used similar numbers of nouns and verbs during the videotaped play sessions; however, their type-to-token ratios differed quite dramatically. For the Western mothers, the ratios indicated that the mothers repeated each noun an average of 11 times and each verb an average of 12 times; for the Eastern mother, the ratios indicated that the mothers repeated each noun an average of 6 times and each verb an average of 16 times. Sheer repetition is unlikely to be a factor in the SVL task—every target word was repeated six times—but it may be an important feature of mother/toddler interactions worthy of further investigation. Noun and verb tokens could also be analyzed to answer questions such as: do verbs carry a greater proportion of the semantic information in Eastern mother/toddler interactions than in Western interactions? These types of analyses are beyond the scope of the current study, but in future work they could provide a useful means for investigating the developmental origins of cultural differences.

Given that there are differences between cultural groups in performance on the SVL task, how does this inform the question of the universality of the noun bias (i.e., how do these findings bear on the question that originally launched the current study)? In attempting to answer this question, a different issue first deserves some consideration: is the SVL task an ecologically valid simulation of early-word learning? In other words, are the results of the current study at all

relevant to the study of early word learning? Gillette et al. (1999) argue that the SVL task does a good job of recreating early word learning because the stimulus materials “derive from actual videotape of mothers at play with their 18- to 24-month-old language-learning offspring, and so represent the kind of talk in the kinds of setting in which infants begin to learn words” (p. 139). The fact that participants were actually sitting in a small windowless room watching these mothers and toddlers on a computer screen adds an undeniable element of artificiality, but the information available to adults in the SVL task is similar to the type of information available to toddlers in typical early word learning scenarios. Let us assume, then, that the results of the current study can inform the question of the universality of the noun bias.

In that case, do the results of the current study support the proposal that the noun bias is universal? The short answer is no: adult performance on the SVL task more closely parallels the results of studies showing that the noun bias is not universal. A number of studies (Choi & Gopnik, 1995; Gopnik & Choi, 1995; Gopnik et al., 1996; Tardif, 1996; Tardif et al., 1997; Tardif et al., 1999) have shown that children acquiring Mandarin and Korean do not show a noun bias, or show a much weaker noun bias than children acquiring English, in their early vocabularies. They do not, on the other hand, show a verb bias. These findings are mirrored by the findings in the current study that Easterners show either no noun bias or one much weaker than the one shown by Westerners in the SVL task, and that Easterners do not show a verb bias. Thus, the current findings concur with previous findings showing that the noun bias is not universal. However, the pattern of results in the current cross-cultural studies indicates that there is a kind of noun/verb asymmetry in adult performance in the SVL task. For example, Westerners adopt a noun strategy and exhibit a noun bias in the SVL task, and Easterners adopt a verb strategy but they do not exhibit a verb bias.

The pattern of results that has emerged from cross-linguistic studies of early word learning suggests that there is also a noun/verb asymmetry in children's early vocabularies. A number of studies have shown that children acquiring English are exposed to large numbers of nouns in their linguistic input and a smaller number of verbs, while children acquiring Japanese, Korean, or Mandarin seem to be exposed to a smaller number of nouns and a greater number of verbs in their input (e.g. Fernald & Morikawa, 1993; Gopnik, et al., 1996; Kim et al., 2000; Tardif et al., 1997). Children acquiring English also show a robust noun bias in their early vocabularies (e.g., Bates et al., 1994); however, several studies (e.g., Gopnik & Choi, 1995; Tardif, 1996) have provided evidence suggesting that children acquiring Asian languages do not show the robust noun bias documented in children acquiring English. Importantly, children acquiring Asian languages do not show any evidence of a verb bias either. In short, children who are exposed to linguistic input in which nouns are emphasized seem to show a noun bias; in contrast, children who are exposed to linguistic input in which verbs are emphasized do not show that robust noun bias but they do not show a verb bias. Again there is a noun/verb asymmetry, where some children show a noun bias but even children exposed to verb-heavy input do not show a verb bias.

As with the noun bias shown by Westerners in the SVL task, the noun/verb asymmetry seen in cross-linguistic studies of children's early vocabularies suggests that two separate factors underlie the robust noun bias in the early vocabularies of children acquiring English. First, given only the non-linguistic contextual information available to young children at the onset of word learning (Gentner, 1982; Gillette et al., 1999), nouns do seem to be more easily acquired than verbs. This appears to be a universal feature of word learning. Second, there must be something peculiar to experience of Western children acquiring English that leads them to acquire nouns

with so much more alacrity than they acquire verbs. This second factor is not universal: it does not appear to be present for Eastern children acquiring Mandarin or Japanese, with the result that these children do not show the strong noun bias seen in children acquiring English. The remaining question is: what might this second factor be?

As discussed earlier, there are a number of linguistic factors (e.g., noun ellipsis) that make nouns more salient in English and verbs more salient in languages like Mandarin and Japanese, and these could potentially account for the fact that children acquiring English show a strong noun bias and children acquiring languages like Mandarin or Japanese do not. However, the results of the current study suggest that nonlinguistic factors may also play a role. In particular, the performance differences across the Eastern and Western version of the SVL task indicate that there are cultural differences in Eastern and Western mother/toddler interactions that are relevant to the acquisition of nouns and verbs. All participants showed at least some evidence of a noun bias when watching Western mother/toddler interactions, while Easterners did not show a noun bias when watching the Eastern mother/toddler interactions. There seems to be something about Western mother/toddler interactions that highlights noun-relevant information. Although it is beyond the scope of the current study, investigating the cultural differences in mother/toddler interactions is likely to provide insight into the different word learning experiences of Eastern and Western children.

The important question for theories of word learning is when do the effects of cultural experience begin to play a role—do they do so early enough in development to be of consequence during the early stages of word learning? In order to extend the results of the current study more solidly to the study of early word learning, it will be important to study children growing up in Eastern and Western cultures and to determine whether the cultural

differences observed in adults can play a role in early word learning. If cultural factors do play a role, how is early word learning affected? How do young children growing up in Eastern cultures acquire verbs before they have acquired a large stock of nouns? Do children in Eastern cultures show evidence of relying on the same word learning constraints as do Western children (Imai & Haryu, in press)?

One approach to answering these questions is to test much younger participants in the SVL task. In ongoing studies, Eastern and Western 5-year-olds are being tested in a simplified version of the task. Preliminary results suggest that preschoolers can provide useful data in this procedure. Another approach could involve testing even younger children in word learning comprehension tasks (e.g., Brown, 1957). These procedures can be adapted for use with children young enough to be in the earliest stages of word learning (e.g., Markman, Wasow, & Hansen, 2003; Waxman & Booth, 2003; Waxman & Markow, 1995; Werker, Fennell, Corcoran, & Stager, 2002), can be used for investigating the acquisition of nouns, verbs and other lexical categories (e.g., Booth & Waxman, 2003; Brown, 1957; Imai, Haryu, & Okada, 2002; Maguire, Hennon, Hirsh-Pasek, Golinkoff, Slutsky, & Sootsman, 2002), and for studying children who are acquiring languages other than English (e.g., Chi, 1996; Gathercole & Min, 1997; Imai & Gentner, 1997).

In conclusion, how does this work bear on the question of the universality of the noun bias? The data reported here indicate that the noun bias is not universal among adults in a simulated word learning task. There is a clear distinction between nouns and verbs, but this distinction does not always lead to a noun bias. For people whose cultural and linguistic experience emphasizes noun-relevant information, this noun/verb distinction does appear to produce a noun bias. For people whose cultural and linguistic experience emphasizes verb-

relevant information, the noun/verb distinction does not lead to a noun bias. The current work, therefore, makes a strong case for the role of culture in the acquisition of nouns and verbs and points to the need for a greater understanding of individual and group differences that conflict with universalist accounts of word learning. This approach promises to further illuminate the cognitive mechanisms behind language acquisition and, in the broader context of increasing globalization and multiculturalism, to promote greater understanding across cultural boundaries.

## References

- Akhtar, N. & Tomasello, M. (1996). Two-year-olds learn words for absent objects and actions. *British Journal of Developmental Psychology*, 14, 79-93.
- Au, T. K., Dapretto, M., & Song, Y. (1994). Input vs. constraints: Early word acquisition in Korean and English. *Journal of Memory and Language*, 33, 567-582.
- Baldwin, D. A. (1999). Infants' contribution to the achievement of joint reference. *Child Development*, 65, 875-890.
- Bates, E., Marchman, V., Thal, D., Fenson, L., Dale, P., Reznick, J. S., Reilly, J., & Hartung, J. (1994). Developmental and stylistic variation in the composition of early vocabulary. *Journal of Child Language*, 21, 85-123.
- Bellah, R. N., Madsen, R., Sullivan, W. N., Swider, A., & Tipton, S. M. (1985). *Habits of the Heart: Individualism and Commitment in American Life*. New York, NY: Harper & Row.
- Benedict, H. (1979). Early lexical development: comprehension and production. *Journal of Child Language*, 6, 183-200.
- Berlin, B. & Kay, P. (1969) *Basic Color Terms: Their Universality and Evolution*. University of California Press.
- Booth, A. E. & Waxman, S. R. (2003). Mapping words to the world in infancy: Infants' expectations for count nouns and adjectives. *Journal of Cognition and Development*, 4, 357-381.
- Bowerman, M. & Levinson, S. C. (2001). *Language Acquisition and Conceptual Development*. Cambridge, UK: Cambridge University Press.
- Brown, R. W. (1957). Linguistic determinism and the part of speech. *Journal of Abnormal and Social Psychology*, 55, 1-5.

- Chi, P. (1996). *The Interaction Between Taxonomic Assumption and Syntactic Category: Data from Mandarin Chinese-Speaking Children*. Unpublished dissertation, University of Wisconsin-Madison.
- Choi, S. & Gopnik A. (1995). Early acquisition of verbs in Korean: a cross-linguistic study. *Journal of Child Language*, 22, 497-529.
- Choi, I., Nisbett, R. E., & Smith, E. E. (1997). Culture, category salience, and inductive reasoning. *Cognition*, 65, 15-32.
- Fernald, A. & Morikawa, H. (1993). Common themes and cultural variations in Japanese and American mothers' speech to infants. *Child Development*, 64, 637-656.
- Gathercole, V. C. M. & Min, H. (1997). Word meaning biases or language-specific effects? Evidence from English, Spanish and Korean. *First Language*, 17, 31-56.
- Gentner, D. (1978). On relational meaning: The acquisition of verb meaning. *Child Development*, 49, 988-998.
- Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. Kuczaj (Ed.), *Language development: Language, cognition and culture*. Hillsdale, NJ: Erlbaum.
- Gentner, D. & Boroditsky, L. (2001). Individuation, relativity, and early word learning. In M. Bowerman & S. C. Levinson (Eds.), *Language acquisition and conceptual development*. Cambridge, UK: Cambridge University Press.
- Gillette, J., Gleitman, H., Gleitman, L., & Lederer, A. (1999). Human simulations of vocabulary learning. *Cognition*, 73, 135-176.
- Gleitman, L. (1990). The structural sources of verb meaning. *Language Acquisition: A Journal of Developmental Linguistics*, 1, 3-55.

- Gleitman, L. R. & Gillette, J. (1999). The role of syntax in verb learning. In W. C. Ritchie & T. K. Bhatia (Eds.), *Handbook of child language acquisition* (pp. 279-295). San Diego: Academic Press.
- Gleitman, L. R. & Gleitman, H. (1992). A picture is worth a thousand words, but that's the problem: The role of syntax in vocabulary acquisition. *Current Directions in Psychological Science*, 1, 31-35.
- Golinkoff, R. M., Hirsh-Pasek, K., Bailey, L. M., & Wenger, N. R. (1992). Young children and adults use lexical principles to learn new nouns. *Developmental Psychology*, 28, 99-108.
- Gopnik, A. & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean speakers: Nouns are not always learned before verbs. In M. Tomasello & W. E. Merriman (Eds.), *Beyond names for things: Young children's acquisition of verbs*. Hillsdale, NJ: Erlbaum.
- Gopnik, A., Choi, S., & Baumberger, T. (1996). Cross-linguistic differences in early semantic and cognitive development. *Cognitive Development*, 11, 197-227.
- Gupta, P. (2003). Examining the relationship between word learning, nonword repetition, and immediate serial recall in adults. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 56A, 1213-1236.
- Hall, D. G., Burns, T. C., & Pawluski, J. L. (2003). Input and word learning: caregivers' sensitivity to lexical category distinctions. *Journal of Child Language*, 30, 711-729.
- Hofstede, G. (1982). Dimensions of national cultures. In R. Rath, H. S. Asthana, D. Sinha, & J. B. P. Sinha (eds.) *Diversity and Unity in Cross-Cultural Psychology* (pp. 173-187). Lisse, Netherlands: Swets and Zeitlinger.

- Hong, Y., Morris, M. W., Chiu, C., & Benet-Martínez, V. (2000). A Dynamic Constructivist Approach to Culture and Cognition. *American Psychologist*, 55, 709-720.
- Huttenlocher, J. & Smiley, P. (1987). Early word meanings: The case of object names. *Cognitive Psychology*, 19, 63-89.
- Imai, M. & Gentner, D. (1997). A crosslinguistic study of early word meaning: Universal ontology and linguistic influence. *Cognition*, 62, 169-200.
- Imai, M. & Haryu, E. (in press). The nature of word learning biases: From a cross-linguistic perspective. In D. G. Hall & S. R. Waxman (Eds.), *Weaving a Lexicon*. Cambridge, MA: MIT Press.
- Imai, M., Haryu, E., & Okada, H. (2002). Is verb learning easier than noun learning for Japanese children?: 3-year-old Japanese children's knowledge about object names and action names. *Proceedings of the 26<sup>th</sup> Annual Boston University Conference on Language Development*.
- Ishii, K., Reyes, J. A., & Kitayama, S. (2003). Spontaneous attention to word content versus emotional tone: differences among three cultures. *Psychological Science*, 14, 39-46.
- Ji, L.J., Zhang, Z., & Nisbett, R.E. (under review). *Is it Culture, or is it language? Examination of language effects in cross-cultural research on categorization*. Unpublished manuscript. Queens University.
- Ji, L. J., Peng, K., & Nisbett, R. E. (2000). Culture, control, and perception of relationships in the environment. *Journal of Personality and Social Psychology*, 78, 943-955.
- Kim, M., McGregor, K. K., & Thompson, C. K. (2000). Early lexical development in English- and Korean-speaking children: language-general and language-specific patterns. *Journal of Child Language*, 27, 225-254.

- Kühnen, U., Hannover, B., & Schubert, B. (2001). The semantic-procedural interface model of the self: The role of self-knowledge for context-dependent versus context-independent modes of thinking. *Journal of Personality & Social Psychology*, 80, 397-409.
- Landau, B. & Gleitman, L. R. (1985). *Language and Experience: Evidence from the Blind Child*. Cambridge, MA: Harvard University Press.
- Lebra, T. S. (1976). *Japanese Patterns of Behavior*. Honolulu, HI: University Press of Hawaii.
- Levinson, S. C., Kita, S., & Haun, D. B. M. (2002). Returning the tables: Language affects spatial reasoning. *Cognition*, 84, 155-188.
- Li, P. & Gleitman, L. R. (2002). Turning the tables: Language and spatial reasoning. *Cognition*, 83, 265-294.
- Lidz, J., Gleitman, H., & Gleitman, L. R. (2003). Understanding how input matters: Verb learning and the footprint of universal grammar. *Cognition*, 87, 151-178.
- Macnamara, J. (1972). Cognitive basis of language learning in infants. *Psychological Review*, 79, 1-13.
- Maguire, M. J., Hennon, E. A., Hirsh-Pasek, K., Golinkoff, R. M., Slutsky, C. B., & Sootsman, J. (2002). Mapping words to actions and events: How do 18-month-olds learn a verb? *Proceedings of the 26<sup>th</sup> Annual Boston University Conference on Language Development*.
- Markman, E. M. (1991). The whole object, taxonomic, and mutual exclusivity assumptions as initial constraints on word meanings. In S. A. Gelman & J. P. Byrnes (Eds.), *Perspectives on language and thought* (pp. 72-106). Cambridge: Cambridge University Press.
- Markman, E. M. (1994). Constraints on word meaning in early language acquisition. *Lingua*, 92, 199-227.

- Markman, E. M. & Hutchinson, J. E. (1984). Children's sensitivity to constraints on word meaning: Taxonomic versus thematic relations. *Cognitive Psychology*, 16, 1-27.
- Markman, E. M., Wasow, J. L., & Hansen, M. B. (2003). Use of the mutual exclusivity assumption by young word learners. *Cognitive Psychology*, 47, 241-275.
- Markson, L. & Bloom, P. (2001). Evidence against a dedicated system for word learning in children. In M. Tomasello & E. Bates (Eds), *Language Development: The Essential Readings* (pp. 129-133). Malden, MA, US: Blackwell Publishers.
- Markus, H. R. & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98, 224-253.
- Masuda, T. & Nisbett, R. E. (2001). Attending holistically versus analytically: Comparing the context sensitivity of Japanese and Americans. *Journal of Personality and Social Psychology*, 81, 922-934.
- Medin, D.L & Atran. S. (Submitted). *The Native Mind: Biological Categorization, Reasoning and Decision Making in Development Across Cultures*. Unpublished manuscript. Northwestern University.
- Minoura, Y. (1992). A sensitive period for the incorporation of a cultural meaning system: a study of Japanese children growing up in the United States. *Ethos*, 20, 304-339.
- Naigles, L. R. & Hoff-Ginsberg, E. (1995). Input to verb learning: Evidence for the plausibility of syntactic bootstrapping. *Developmental Psychology*, 31, 827-837.
- Nelson, K. (1973). Some evidence for the cognitive primacy of categorization and its functional basis. *Merrill-Palmer Quarterly*, 19, 21-39.
- Nisbett, E. R., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review*, 108, 291-310.

- Pine, J. M., Lieven, E. V. M., & Rowland, C. (1996). Observational and checklist measures of vocabulary composition: what do they mean? *Journal of Child Language*, 23, 573-589.
- Roberson, D., Davies, I., & Davidoff, J. (2000). Color categories are not universal: Replications and new evidence from a stone-age culture. *Journal of Experimental Psychology: General*, 129, 369-398.
- Rosenthal, R. & Rosnow, R. L. (1985). *Contrast Analysis: Focused Comparisons in the Analysis of Variance*. Cambridge, MA: Cambridge University Press.
- Slobin, D. I. (1973). Cognitive prerequisites for the development of grammar. In C. A. Ferguson & D. I. Slobin (Eds.), *Studies of Child Language Development*. New York: Holt, Rinehart & Winston.
- Snedeker, J., Li, P., Yuan, S. (2003). Cross-cultural differences in the input to early word learning. Proceedings of the Twenty-fifth Annual Conference of the Cognitive Science Society. Mahwah, NJ, USA: Lawrence Erlbaum Associates.
- Sorrentino, C. (2001). Children and adults represent proper names as referring to unique individuals. *Developmental Science*, 4, 399-407.
- Stern, W. (1924). *Psychology of early childhood up to the sixth year of age*. New York: Holt.
- Tardif, T. Gelman, S. A. & Xu, F. (1999). Putting the "noun bias" in context: A comparison of English and Mandarin. *Child Development*, 70, 620-635.
- Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language*, 24, 535-565.

- Waxman, S. R. & Booth, A. E. (2003). The origins and evolution of links between word learning and conceptual organization: New evidence from 11-month-olds. *Development Science*, 6, 128-135.
- Waxman, S. R. & Kosowski, T. D. (1990). Nouns mark category relations: Toddlers' and preschoolers' word learning biases. *Child Development*, 61, 1461-1473.
- Waxman, S. R. & Markow, D. B. (1995). Words as invitations to form categories: Evidence from 12- to 13-month-old infants. *Cognitive Psychology*, 29, 257-302.
- Werker, J. F., Fennell, C. T., Corcoran, K. M., & Stager, C. L. (2002). Infants' ability to learn phonetically similar words: Effects of age and vocabulary size. *Infancy*, 3, 1-30.
- Whorf, B. 1956. *Language, Thought & Reality*. Cambridge, MA: MIT Press.
- Woodward, A. L. & Markman, E. M. (1998). Early word learning. In D. Kuhn & R. S. Siegler (volume eds.), W. Damon (Ed.), *Handbook of Child Psychology, Volume 2: Cognition, Perception, and Language*. New York: John Wiley & Sons.