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Doing More with Less: Verb Learning in Korean-Acquiring 24-Month-Olds

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Abstract

Research on early word learning reveals that verbs present a unique challenge. While English-acquiring 24-month-olds can learn novel verbs and extend them to new scenes, they perform better in rich linguistic contexts (when novel verbs appear with fully lexicalized noun phrases naming the event participants) than in sparser linguistic contexts (Arunachalam & Waxman, 2011; Waxman et al., 2009). However, in languages like Korean, where noun phrases are often omitted when their referents are highly accessible, rich linguistic contexts are less frequent. The current study investigates the influence of rich and sparse linguistic contexts in verb learning in Korean-acquiring 24-month-olds. In contrast to their English-acquiring counterparts, 24-month-olds acquiring Korean perform better when novel verbs appear in sparse linguistic contexts. These results, which provide the first experimental evidence on early verb learning in Korean, indicate that the optimal context for verb learning depends on many factors, including how event participants are typically referred to in the language being acquired.

To acquire the meaning of a word, we weave together information from various sources. By their first birthdays, toddlers have begun to do the same, coordinating the linguistic and observational information available to them as they map individual words to meaning. Over the next several months, they not only add more words to their burgeoning lexicons, but also begin to differentiate among distinct *kinds* of words. By 13 months, they tease apart nouns from other kinds of words (e.g., verbs, adjectives), link them to the objects to which they have been applied, and extend them systematically to other members of the same object category (Waxman, 1999). This early success with nouns provides toddlers with a strong

starting point as they begin to acquire other kinds of words and map them to their respective kinds of meaning. But the developmental path underlying the acquisition of these other kinds of words, and verbs in particular, is considerably more protracted than that for nouns (e.g., Fenson et al., 1994).

A review of experimental verb learning tasks reveals an intriguing pattern: Children often have difficulty extending novel verbs when they are presented with a scene (e.g., a girl petting a dog) labeled by a novel verb, and then are required at test to extend that verb to one of two new scenes, one depicting the same event category (e.g., petting) but with a different participant object (e.g., the girl petting a *frisbee*), and the other depicting a different event category but the same participants (e.g., the girl *kissing* a dog). In these situations children tend to be ‘captured’ by the participant object. That is, they extend the novel verb to a scene that preserves the original event participants (e.g., girl kissing a dog), even if the relation between them is different (Imai et al., 2005, 2008). What is striking is that although 2-year-olds successfully map nouns to object categories in tasks like this, their difficulty mapping verbs to event categories persists well into the preschool years (ages 3 to 5 years) (e.g., Behrend, 1989; Imai et al., 2005, 2008; Kersten & Smith, 2002).

However, these difficulties are not insurmountable. When provided with rich observational support (several opportunities to observe an event) and rich linguistic support (informative descriptions of the event participants), even 2-year-olds successfully learn the meanings of novel verbs and extend them to scenes that preserve the action, despite a change in participant objects (Arunachalam & Waxman, 2010, 2011; Waxman et al., 2009).

Armed with this evidence, researchers have gone on to specify more precisely the kind of support that undergirds successful verb learning. Focusing on linguistic support, Arunachalam and Waxman (2011) presented 24-month-olds with events involving two participant objects (e.g., girl petting a dog), and described with a novel verb. What varied was the linguistic context in which the verb was presented. In the *rich context* condition, novel verbs appeared in sentences with full noun phrases labeling each event participant (e.g., “The girl is *larping* a dog”). In this condition, toddlers successfully learned the meanings of novel verbs, extending them to scenes that preserved the event category, but involved a change in the participant object (e.g., the girl petting a frisbee). In contrast, in the *sparse context* condition, pronouns replaced the full noun phrases (e.g., “She’s *larping* it”). In this condition, 24-month-olds failed to learn novel verb meanings.

Thus, when seeking to map a novel verb to a two-participant event, 24-month-olds acquiring English benefited from rich linguistic descriptions of the participant objects. The full noun phrases likely facilitated toddlers’ identification of the participant objects and this, in turn, permitted them to ‘zoom in’ on the relation between them (e.g., Gillette, Gleitman, Gleitman, & Lederer, 1999). But this is not to say that rich linguistic descriptions will *always* trump sparse ones.

Instead, we propose that the benefits of rich linguistic information will likely vary *within* a language and *across* languages. For example, within a given language, if the descriptive information about a participant object is unnecessarily rich (e.g., “The shiny opal-colored

seagull with the little brown speck on her tail is diving”), this may draw attention toward the object (the seagull) at the expense of the intended relation (diving). The developmental literature is consistent with this proposal: toddlers fail to map novel verbs involving only a single participant (i.e., intransitive verbs) when they appear in rich linguistic contexts (Lidz, Bunker, Leddon, Baier, & Waxman, 2009). Thus, within a language, the optimal linguistic context for verb learning varies depending on the particular situation at hand.

In addition, we propose that the benefits of rich linguistic information will vary across languages, depending upon the linguistic contexts in which verbs typically appear. Consider Korean as a case in point. In Korean, as in many other languages, if there is sufficient observational and/or linguistic support to readily identify the participant objects in a given event, then both adults and young children tend to drop the noun phrases naming those objects in their utterances (e.g., Clancy, 1993, 1997, 2004; Kim, 1989; Kim, 2000; Lee, 1989). Interestingly, in many verb learning tasks, young learners receive ample support of both kinds. Observationally, the event participants are the only visible referents; linguistically, these participants have been mentioned antecedently. Although toddlers acquiring English successfully map novel verbs in these designs, when the verb is surrounded by two full noun phrases, the same may not be true for toddlers acquiring Korean, because in Korean which noun phrases would likely be elided in these circumstances. In fact, we propose that when Korean-acquiring toddlers do hear full noun phrases in circumstances like these, their attention may be drawn toward the event participants, perhaps at the expense of the intended relation.

This presents an intriguing hypothesis: Korean-acquiring toddlers should have more difficulty learning the meanings of novel transitive verbs if they appear in rich linguistic contexts, with the noun phrases fully specified, than in sparse linguistic contexts, with both noun phrases elided. Plausibility for this hypothesis comes from Japanese, where 5-year-old children more successfully learned novel transitive verbs when both noun phrases were elided than when they were present in the sentence (Imai et al., 2005; 2008).¹

In the current experiment, we test this hypothesis directly, focusing on toddlers acquiring Korean. We concentrate on 24-month-olds because at this developmental point, toddlers have recently begun to produce verbs and to learn novel transitive verbs in experimental tasks. Moreover, at this age, toddlers are sensitive to the linguistic context in which those verbs are presented (Arunachalam & Waxman, 2011). At issue is whether Korean-acquiring toddlers’ success in verb learning will also be gated by the linguistic context in which they are presented.

We adapted Arunachalam and Waxman’s (2011) paradigm, presenting 24-month-olds with a series of two-participant events (e.g., a girl petting a dog) and introducing either novel nouns or novel verbs. By holding constant all elements of the experimental design *except* the linguistic context, this paradigm allows us to shed light on the interpretations toddlers assign to a novel word in different linguistic contexts that vary in the amount of information they provide. As in Arunachalam and Waxman, we compared two verb contexts. In the rich

¹Japanese child-directed speech has similar rates of noun ellipsis as Korean (Kim, 2000).

linguistic context, each event participant was described with a full noun phrase (e.g., “the girl,” “the dog”); in the sparse linguistic context, the noun phrases were dropped.²

Our predictions were straightforward: Toddlers should distinguish novel nouns from verbs, extending novel nouns to scenes preserving the same participant object, despite a change in the action in which it was engaged (e.g., a girl *kissing* a dog), and extending novel verbs to scenes preserving the same relation (e.g., petting), despite a change in the participant objects involved (e.g., a girl petting a *frisbee*). We also predicted that Korean-acquiring toddlers’ performance in the verb conditions would vary depending on the linguistic context in which the novel verb appeared; specifically, that they would be more likely to map the novel verb to the action in the Sparse Verb condition than the Rich Verb condition, where their attention may be drawn toward the participant objects rather than the relation between them.

Methods

Participants

Sixty typically-developing 24-month-olds (30 female, 30 male; mean age 2;0.6 months, ranging 1;10.0 to 2;2.21) were included in the final sample. All were recruited from Seoul and its surrounding areas and were acquiring Korean as their native language. Parents completed the Korean MacArthur-Bates Communicative Development Inventory (MCDI-K) (Pae, 2003). Mean production vocabulary was 286 words (range: 2 to 553). There were no differences among conditions in vocabulary size; nor did performance within a condition correlate with vocabulary size. Any toddler who did not point correctly on at least two out of four pointing game trials with familiar words (described below) was replaced ($n = 7$). An additional nine toddlers, distributed evenly among the conditions, were replaced due to fussiness ($n = 2$) or failure to respond on at least one test trial ($n = 7$).

Materials

Visual Stimuli—Videos were digitized and edited recordings of live actors (See Figure 1). In the dialogue scenes, two female actors were seated side by side at a table. In the action scenes, actors performed continuous actions on inanimate objects. Videos were presented on a computer monitor. See Appendix A for a list of actions and objects.

Auditory Stimuli—Arunachalam and Waxman’s (2011) stimuli were translated into Korean by the third author, a native Korean speaker and trained developmental psycholinguist. Our goal was to balance fidelity to the English stimuli with naturalness in Korean child-directed speech. The speech stimuli, recorded by female native speakers of Korean in a child-directed speech register, were presented via a speaker, hidden below the center of the screen.

Apparatus and Procedure—Toddlers and their parents were welcomed into a playroom. While the toddler and experimenter played with toys, the parent signed the consent form and completed the vocabulary checklist. The toddler and parent then accompanied the

²In Korean child-directed speech, objects are dropped 40–50% of the time, and subjects are dropped over 60% of the time (Kim, 2000). Despite the asymmetry, both argument types are dropped frequently.

experimenter into an adjoining test room where the toddler was seated on her parent's lap at a distance of 12 in. from a monitor. The parent wore headphones to mask the auditory stream. The experimenter sat next to the toddler and elicited pointing responses. Toddlers' pointing behavior was recorded with a video camera positioned to the side of the screen. Sessions lasted approximately 10 minutes and included a pointing game followed by the experiment proper.

Pointing game: To begin, toddlers participated in a game designed to encourage them to point to a scene on the screen. Importantly, no novel words were introduced. On each trial, toddlers viewed two dynamic video clips, side-by-side. On two trials, they were encouraged to point to a particular individual in the scene (e.g., a bear); on the other two, they were asked to point to a particular action (e.g., dancing). Toddlers who pointed to an incorrect scene were gently corrected.

Experiment proper: Toddlers were randomly assigned to one of the three conditions (each, $N = 20$): Noun, Rich Verb, or Sparse Verb. In all conditions, toddlers viewed the same visual materials; what differed were the auditory stimuli accompanying those materials. In all conditions, toddlers participated in six trials, each featuring a different target action and object (e.g., petting a dog), and each including a Dialogue, Familiarization, and Test phase. See Figure 1. The six trials were presented in one of two random orders, balanced across conditions. The left-right position of the test scenes was counterbalanced across trials.

Dialogue phase: (45 s) Toddlers first viewed a video of two women engaged in conversation. The novel word (presented either as a noun or verb) was uttered eight times in different sentential contexts (e.g., different tenses, different event participants). See Appendix B.

Familiarization phase: (40 s) For each trial, toddlers saw four different examples of a given event category, one at a time, on alternating sides of the screen. In each scene, an actor (e.g., a girl) performed the same action (e.g., petting) on one of four objects of the same kind (e.g., four different stuffed dogs). These scenes were followed by a negative contrastive example (e.g., girl drinking from a mug) and a positive reminder (see Booth & Waxman, 2009). The accompanying audio varied by condition, with the novel word presented either as a noun, as a verb in a Rich linguistic context (with full noun phrases labeling both event participants), or as a verb in a Sparse linguistic context (with both noun phrases dropped). During the Familiarization phase, the novel word was presented six times.

Test phase: (13.5 s) Finally, toddlers viewed two test scenes, presented simultaneously on either side of the screen. Both involved the familiar actor (e.g., the girl). In the Familiar Object scene, the actor performed a novel action (e.g., kissing) on the familiar object (e.g., the dog). In the Familiar Action scene, the actor performed the now familiar action (e.g., petting), but on a new object (e.g., a frisbee). The test phase began with an initial inspection period (4 s) in which toddlers viewed both test scenes, hearing, "Now look, they're different." Next, the screen went blank and a test question was posed, e.g., "Where is she *larping* something?" (1.5 s). Next, the two test scenes reappeared, in their original locations, and the test question was repeated (8 s). The experimenter, seated next to the child,

encouraged her to point. Toddlers who pointed were provided with neutral feedback regardless of where they had pointed.

Coding and Analysis—Two trained coders recorded all pointing responses. Inter-coder agreement was 95% (Cohen's kappa = .92). The first point produced on any given trial served as the dependent measure. For each toddler, we calculated the number of trials on which he or she pointed to the Familiar Action scene (e.g., petting a frisbee), and divided this by the total number of trials on which he or she pointed.

Results

The results, depicted in Figure 2, are consistent with our predictions. We submitted toddlers' pointing responses to an Analysis of Variance with subject as a random factor and condition (3: Noun, Rich Verb, Sparse Verb) as a between-subject factor. As predicted, there was a main effect of condition, $F(2, 57) = 4.68, p < .02$. This effect was also reliable in an analysis with item as a random factor, $(F(2, 10) = 5.06, p < .05)$. Planned pairwise comparisons reveal that toddlers in the Sparse Verb condition were more likely ($M = 0.53$) than those in either the Rich Verb ($M = 0.31, p < .01$) or the Noun condition ($M = 0.36, p < .03$) to point to the Familiar Action scene. There were no reliable differences between these latter two conditions.

An additional analysis comparing performance in each condition to chance levels provided support for the prediction that explicit mention of the full noun phrases in the Rich Verb condition would draw Korean-acquiring toddlers' attention toward the referents of those phrases. Like toddlers in the Noun condition, those in the Rich Verb condition favored the Familiar Object test scene ($t(19) = 3.33, p < 0.01$). Toddlers in the Sparse Verb condition, unlike their counterparts, did not favor the Familiar Object test scene; instead, they performed at chance levels ($t(19) = 0.9, p = .37$). We pursue this below.

Discussion

This work, which provides the first experimental evidence of verb learning in Korean-acquiring toddlers, reveals cross-linguistic differences as well as commonalities in toddlers' use of linguistic contexts to identify the meaning of novel words. As predicted, Korean toddlers—like their counterparts acquiring English—successfully mapped novel words, presented as nouns, to object categories. Also as predicted, they were sensitive to the particular linguistic context in which novel verbs were presented. Moreover, the impact of rich and sparse linguistic contexts differed across languages: in contrast to toddlers acquiring English (Arunachalam & Waxman, 2011), those acquiring Korean had more difficulty when novel verbs appeared in sparse, as compared to rich, contexts.

These outcomes indicate that linguistic context exerts an important influence on verb learning, but that this influence depends on the language being acquired. It is well documented that Korean speakers typically drop noun phrases in contexts with ample linguistic and observational support (like the ones we presented). What we show here is that this has consequences for verb learning: in the context of full noun phrases (Rich Verb

condition), toddlers were ‘captured’ by the participant objects, rather than the relations among them, and thus extended novel verbs to test scenes that involved the same participant objects. This failure to learn novel verbs in rich contexts echoes results from Japanese-acquiring 5-year-olds (Imai et al., 2005; Imai et al., 2008).

Notice that although the Korean toddlers in the Sparse Verb condition were not so captured by participant objects, neither did they reliably map novel verbs to event categories. Why might this be the case? To successfully acquire the meaning of transitive verbs, learners must identify both event participants precisely in order to ‘zoom in’ on the relation between them (e.g., Arunachalam & Waxman, 2011). We suspect that toddlers in the Sparse Verb condition may have struggled in this regard. Although subjects and objects are frequently elided in Korean discourse (Clancy, 1993, 1994, 2007; Kim, 1989; Kim, 2000; Lee, 1989), it may be that this context was *too* sparse to support the acquisition of a novel transitive verb at 24 months.³ If this is the case, perhaps 24-month-olds acquiring Korean would benefit from having one of the event participants named explicitly. Future research may test this possibility directly. Note however that toddlers in the Sparse Verb condition are nevertheless “better off” with respect to verb learning than those in the Rich Verb condition: Toddlers who are attending overly to the familiar object in the scene have essentially no opportunity to learn the novel verb, while those who perform at chance may be able to do so if the linguistic or observational context is amended even slightly. We suggest that a promising direction for future research will be to continue to home in on identifying the best learning conditions for acquiring novel verb meanings in Korean.

Of course, what constitutes an optimal linguistic context for verb learning will also vary *within* a language, depending on a host of factors including the knowledge state of the learner, discourse factors, and the informational requirements for the particular to-be-learned verb. In English, for example, full noun phrase descriptions of both participant objects offer toddlers an advantage in acquiring the meaning of transitive verbs (Arunachalam & Waxman, 2011). But when it comes to learning *intransitive* verbs, recent work suggests that full noun phrase descriptions are not required (Lidz et al., 2009; also see Bernal et al., 2007; Oshima-Takane et al., 2011; Oshima-Takane & Kobayashi, 2009). This likely reflects the different informational requirements for acquiring transitive vs. intransitive verbs. For intransitive verbs, where learners must focus on only a single event participant and the action in which it is engaged, apparently full noun phrases are unnecessary. But for transitive verbs, where learners must focus on two event participants if they are to ‘zoom in’ on the relation between them, richer linguistic contexts may be required.

This notion of an interaction between the difficulty of assigning meaning to a sentence and the informativeness required in the sentence context has a rich history in the adult literature on sentence and discourse interpretation (e.g., Almor, 1999; Ariel, 1990; Givón, 1976; Gordon, Grosz, & Gilliam, 1993; Gundel et al., 1993; Sperber & Wilson, 1985). The current results demonstrate that this interaction is also at play for young word learners.

³This is likely true for English toddlers as well: even though English speakers typically replace full noun phrases with pronouns when there is sufficient linguistic and observational support, English-acquiring toddlers nonetheless are unable to establish the meaning of novel transitive verbs when they are presented in sentences with pronouns (rather than full noun phrases) (Arunachalam & Waxman, 2011).

Finally, our findings shed new light on a broad and ongoing debate concerning the acquisition of nouns and verbs. Some have proposed that verbs should be acquired more readily in languages like Korean, where nouns are so often elided and verbs are therefore more salient in the input, than in languages like English. The evidence for this proposal is decidedly mixed (for reviews see, e.g., Gentner, 2006; Imai, Haryu, Okada, Lianjing and Shigematsu, 2006). The current results, in which toddlers acquiring Korean showed no relative advantage for learning novel verbs, cast doubt on this proposal. Instead, these results call for a more nuanced view. Independent of which language is being acquired, the linguistic and observational conditions must be such that toddlers can use the information at hand to discover the verb's meaning. Having established a successful paradigm for examining verb learning in toddlers across languages, we are now poised to consider in greater detail precisely how languages differ in the information typically presented with verbs, and how this influences the course of acquisition.

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APPENDIX A

Actions and objects for each trial.

Novel Word	Familiarization Scene	Test Scenes	
		Familiar Object	Familiar Action
<i>Hothi</i>	Boy pushing chair	Boy lifting chair	Boy pushing box
<i>Laphi</i>	Girl stroking stuffed dog	Girl kissing dog	Girl stroking frisbee
<i>Philkhi</i>	Boy waving balloon	Boy tapping balloon	Boy waving rake
<i>Wupi</i>	Girl twirling umbrella	Girl twisting umbrella	Girl twirling pillow
<i>Khami</i>	Boy pulling bunny	Boy tossing bunny	Boy pulling drum
<i>Mwuphi</i>	Girl washing cup	Girl drinking from cup	Girl washing plate

APPENDIX B

Dialogue for one trial, all conditions.

Dialogue		
Noun		<p>1: <i>ne ku-ke al-a?</i> you that-thing know-int You know what?</p> <p>2: <i>mwe?</i> what What?</p> <p>1: <i>acessi-ka laphi-lul kulk-ess-e.</i> man-nom larpi-acc scratch-pst-decl The man scratched the larp.</p> <p>2: <i>cengmal? accessi-ka laphi-lul kulk-ess-tako?</i> really? man-nom larpi-acc scratch-pst-int Really? The man scratched the larp?</p> <p>1: <i>kuliko yeca-ai-nun laphi-lul ssutatum-ko siphe-hay.</i> and girl-top larpi-acc pet-prog want-decl And the girl wants to pet the larp.</p> <p>2: <i>ung, yeca-ai-nun laphi-lul ssutatum-ul kekwuna.</i> yes. girl-top larp-acc pet-fut-excl Yes, the girl is going to pet the larp. (both laugh)</p>
Verb	Rich	<p>1: <i>ne ku-ke al-a?</i> you that-thing know-int You know what?</p> <p>2: <i>mwe?</i> what What?</p>

Dialogue	
	<p>1: <i>acessi-ka tam.yo-lul laph-yess-e.</i> man-nom blanket-acc larpi-pst-decl The man larped the blanket.</p> <p>2: <i>cengmal? accessi-ka tam.yo-lul laph-yess-tako?</i> really? man-nom blanket-acc larpi-pst-int Really? The man larped the blanket?</p> <p>1: <i>kuliko yeca-ai-nun mengmengi-lul laphi-ko siphe-hay.</i> and girl-top dog-acc larpi-prog want-decl And the girl wants to larpi the dog.</p> <p>2: <i>ung. yeca-ai-nun mengmengi-lul laphi-l kekwuna.</i> yes. girl-top dog-acc larpi-fut-excl Yes, the girl is going to larp the dog. (both laugh)</p>
Sparse	<p>1: <i>ne ku-ke al-a?</i> you that-thing know-int You know what?</p> <p>2. <i>mwe?</i> what What?</p> <p>1: <i>acessi-ka tam.yo-lul laph-yess-e.</i> man-nom blanket-acc larpi-pst-decl The man larped the blanket.</p> <p>2: <i>cengmal? accessi-ka tam.yo-lul laph-yess-tako?</i> really? man-nom blanket-acc larpi-pst-int Really? The man larped the blanket?</p> <p>1: <i>kuliko yeca-ai-nun talun ke-l laphi-ko siphe-hay.</i> and girl-top different thing-acc larpi-prog want-decl And the girl wants to larp something else.</p> <p>2: <i>ung. ku-ke-l laphi-l kekwuna.</i> yes, that-thing-acc larpi-fut excl Yes, (she) is going to larp it. (both laugh)</p>

	Dialogue (See Appendix B)	Familiarization				Test
Noun	<i>acessi-ka laphi-lul kulk-ess-e</i> man-nom ⁴ larpi-acc scratch-pst-decl The man scratched the larp.	<i>pwapwa. yeca.ai-ka laphi-lul ssutatam-ko iss-e</i> look, girl-nom larpi-acc pet-prog be-decl Look! The girl is petting a larp.	<i>e. ce-ke-n laphi-ka ani-ney</i> oh. that-thing-top laphi-nom neg-decl Uh-oh, that's not a larp.	<i>wa! ce-ke-n laphi-ya!</i> wow that-thing-top larpi-decl Wow, that is a larp!	<i>icey pwapwa. twu-kay-ka talu-ney.</i> now look, two-thing-nom different-decl	<i>laphi-ka eti iss-e?</i> laphi-nom where be-int Where is the larp?

⁴ Abbreviations:

acc: accusative case

con: contrastive

decl: declarative

excl: exclamative

fut: future tense

int: question particle

nom: nominative case

prog: progressive

pst: past tense

rel: relative clause

top: topic marker





Verb	Rich	<i>acessi-ka tam.yo-lul laph-yess-e</i> man-nom blanket-acc larpi-pst-decl The man larped the blanket.	<i>pwapwa. yeca.ai-ka mengmengi-lul laphi-ko iss-e</i> look, girl-nom dog-acc larpi-prog be-decl Look! The girl is larping a dog!	<i>e. ce-ke-n laphi-ci anh-ney.</i> oh. that-thing-top larpi-con neg-decl Uh-oh, (she) is not larping that.	<i>wa! ce-ke-n lahpi-ko iss-ta!</i> wow that-thing-top larpi-prog be-decl Wow, (she) is pilking that!	Now look, they're different.	<i>yeca-ai-ka laphi-ko iss-mun key eti iss-e?</i> girl-nom larpi-prog be-rel thing where be-int Where is she larping something?
	Sparse	<i>acessi-ka tam.yo-lul laph-yess-e</i> man-nom blanket-acc larpi-pst-decl The man larped the blanket.	<i>pwapwa. laphi-ko iss-e.</i> look, larpi-prog be-decl Look! Larping!			Familiar object 	Familiar action 

FIGURE 1.
Representative set of stimuli

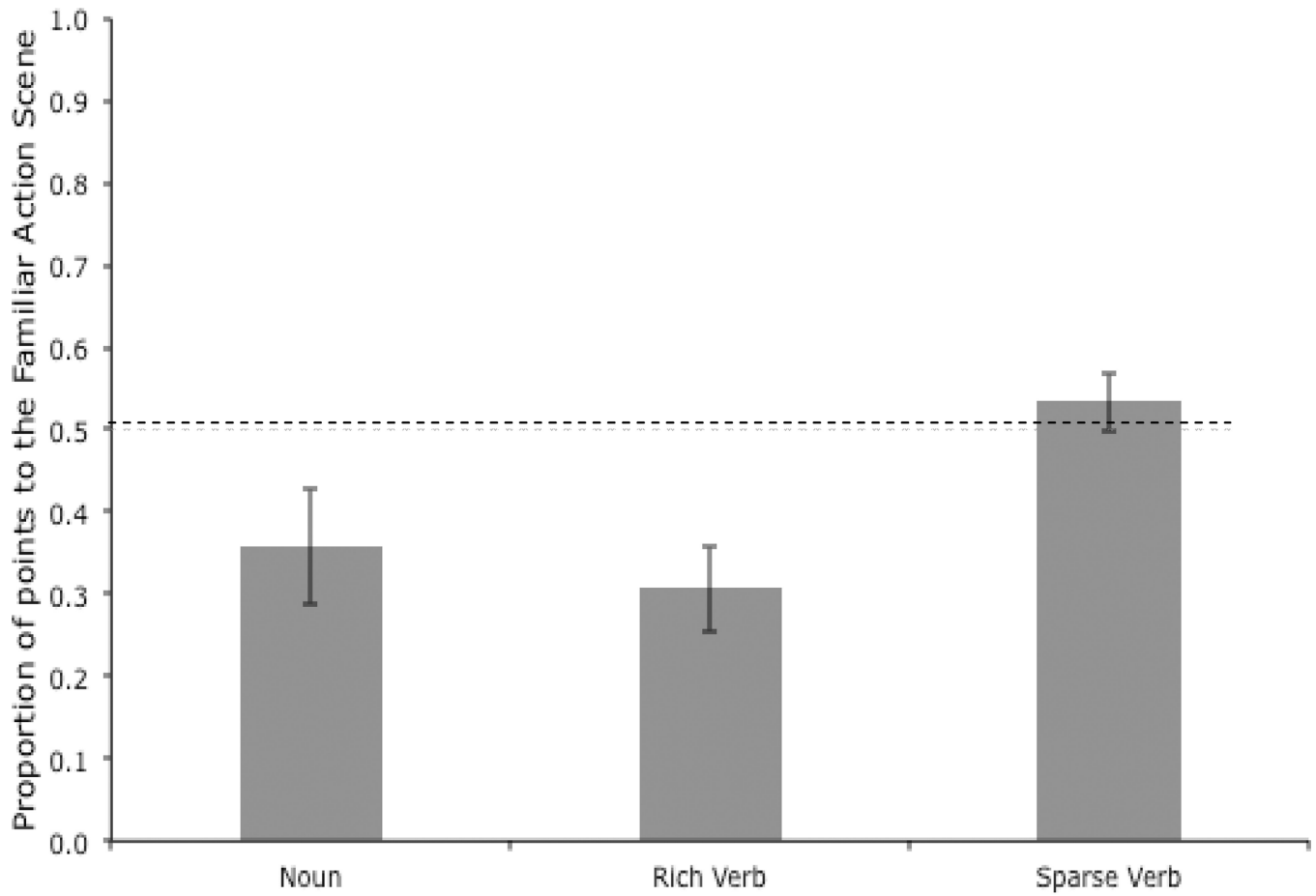


Figure 2.
Mean proportion of points to the Familiar Action scene, as a function of linguistic condition.