Task pragmatics and the lexicon: A re-examination of the role of language in cognition

Laraine McDonough and Akiko Fuse
Brooklyn College and the City University of New York Graduate Center

1. Introduction

According to our traditional views, cognitive universals allow for easy acquisition of simple spatial terms in all languages. However, it has since become apparent that across languages children easily learn spatial relational terms of widely different forms. For example, previous research by Choi and Bowerman (reported in Bowerman, 1996) has shown that English and Korean contrast in the manner in which containment and support relations are expressed. Their data, based on an elicited-production task with two-year-olds, called into question the manner in which children learn spatial terms. They proposed that spatial concepts are mediated by language. Recent research has shown that the influence of language extends to comprehension of spatial terms as early as 18 months of age (Choi, McDonough, Mandler & Bowerman, 1999); however, preverbal infants are also sensitive to spatial categories that are not salient in the language they are in the process of learning (McDonough, Choi & Mandler, 2003). Consideration of the larger picture suggests that infants' preverbal spatial categories are flexible in that they are amenable to reorganization when language is being learned.

Yet, little research has been conducted on infants' spatial categorization abilities (c.f., Quinn 1999) and there are several languages for which we still do not understand the full breadth of how spatial relations are lexicalized. But before we continue to explore preverbal categories, we wish to continue work on another language, Japanese. We will explore the technique developed by Choi and Bowerman by replicating their study in English and extending our understanding of the task by considering the how best to analyze the data. We then compare our findings with their own and arrive at conclusions that enrich our understanding of spatial categorization in general and, more specifically, the methods we use to test knowledge of spatial relations. We find that what is expressed in one language with a verb and in another language with a preposition is an awkward comparison at best and does not capture the flexibility or richness of language.

In terms of number of speakers, Japanese is about the eighth most widely spoken language in the world with approximately 125,000,000 speakers. Japanese and Korean are similar in sentence structure to the extent that a Japanese sentence can sometimes be translated into Korean morpheme by morpheme. Even though some linguists suspect that Japanese and Korean have a common ancestor, the few who have worked on this theory have met with little success. It is possible that the two languages are isolates like Basque in Europe and Burushaki in the Himalayas. However, both Japanese and Korean use verbs for many of their locatives. Whereas English uses verbs for motion events, English typically conflates motion with manner and expresses path separately whereas Japanese and Korean conflate motion with path, which is distinguished from manner. The similarities between Japanese and Korean suggest that the two languages may also be quite similar in the way spatial relations are discussed, but as will be seen, this is not the case.

Researchers in geographic information science have investigated some spatial terms in Japanese and English in order to design user-friendly query languages, translation machines, or to understand human spatial cognition. However, comparing these two languages is not straightforward. For example, the Japanese locative particle 'ue ni', which roughly corresponds to the English preposition 'on' has a different ideal meaning from 'on'. The manner in which their references to space is partitioned is not the same and words have differing sets of applicable situations, particularly concerning figure and ground relations (see Mori, M. website: mori.ucgixz.org).

Other research on Japanese spatial terms conducted by Kita (1998) showed that the relations 'kore', 'sore', and 'are' in Japanese respectively refer to 'near the speaker', 'near the addressee' and 'far from both the speaker and addressee'. 'Sore' is also used to draw attention to an event that is not close to the addressee than the speaker, a distinction similar but not identical to 'su' in Turkish, with no comparable lexical item in English.

More recent research by Munnich, Landau, and Dosher (2001) shows that Japanese encodes contact relations involving support regardless of the supported object's position to the reference object (e.g., top or sides). This differs from English which focuses on the support of the top of a reference object (e.g., an apple on the table) which in turn differs from Korean in that support terms are used less often and are not obligatory.

To date, Japanese developmental data on spatial terms is sparse and unsystematic. Some time ago, Clancy (1985) reported that there is some evidence that locatives are acquired in a stable sequence indicating initial acquisition of terms indicating containment/support, at, to/toward, the place at which action is performed, up to, and

from. Slightly later, the terms for top, middle, inside, bottom, side and place are learned. Clancy reports that this sequence is similar to Turkish locatives but also reports that more systematic data are clearly needed before conclusions can be made.

Sinha, Thorsen, Hayashi, and Plunkett (1994) conducted a study on one Japanese-learning child who was raised in a bilingual home but whose dominant language was Japanese. The results examined locative particles (6 in Japanese compared to around 66 in English), partonymic-locative nouns that denote parts and regions of landmarks that can co-occur with locative particles (Yamada, 1990), and verbs which are important in the expression of spatial relations in Japanese. Locative particles are often omitted in colloquial speech and especially in child-directed speech thus making particles a late acquisition in Japanese. The spatial verbs are of particular interest because Japanese, like Korean, is a S-O-V ordered language, making verbs highly salient and learned early in development. Sinha and colleagues reported that children learning either Danish, English or Japanese underextend or conservatively use spatial terms, a pattern quite different from that found by Choi and Bowerman in their analysis of English and Korean. Yet, Sinha et al. analyzed spontaneous productions whereas Choi and Bowerman analyzed elicited productions. Spontaneous speech is difficult to make conclusions about in that there can be many reasons why a child may not use a term in a context other than not knowing the term to describe it. The elicited-production task is more likely to be an accurate reflection of what the child understands about how language is used to talk about spatial relations.

We chose to examine spatial terms using Choi and Bowerman's elicited production task because it most efficiently and effectively allows one to examine how children and adults use their language to talk about spatial relations across a variety of objects in which several relations are demonstrated. The objects they used or ones highly similar to those they used are readily available and their procedure is outlined in a manner allowing others to use it with other languages. Like Slobin's extended use of the frog story to examine grammatical structure and pragmatics across several languages, we believe that Choi and Bowerman's technique and stimuli are potentially useful to examine spatial terms across several languages. In Experiment 1, we replicate and extend Choi and Bowerman's findings by coding the data for prepositions and verb-plus-prepositions (to be explained below). In Experiment 2, we test children and adult monolingual speakers of Japanese. In Experiment 3 we test a second group of adult monolingual Japanese speakers and compare the results with Experiment 1.

Given that the Japanese data is spatial verbs and the English data is spatial prepositions, we reasoned that verbs (representing dynamic information about the spatial relations) and prepositions (representing static information about the spatial relations) are not semantically comparable. Given that motion events are used to test spatial terms in the elicited production task, then verbs are an informative part of the semantic context and should be considered in both languages. We suspended for the moment the differences between the verbs in the two languages in terms of manner and path information. We reasoned that both manner and path potentially contribute to cognitive and linguistic definitions of space.

2. Method

2.1 Participants

We tested 20 monolingual English-speaking adults who were undergraduate students at Brooklyn College. Participation was rewarded by partial course credit in an undergraduate Introductory Psychology class. We also tested 20 monolingual Japanese-speaking adults in Japan who were thanked for their time and participation in our research. For the developmental data, we tested 8 monolingual Japanese 2-year-olds (Mean age: 2;8; Range: 2;4 to 2;11). Because the procedure was changed slightly to accommodate this age group, we then tested another group of monolingual adult speakers of Japanese (N = 10) who were parents of the children tested. The children and their parents were recruited from a daycare facility in Toyko, Japan. The daycare facility was given a small monetary gift for their assistance.

2.2 Stimuli

The stimuli were toys or household objects listed on Table 1. These objects as well as the activities modeled with them are the same or similar to those used by Choi and Bowerman.

Table 1

Ground object	**Figure object**	**Activity and Demonstration**
suitcase	lid attached to suitcase	close suitcase

cassette tape in cassette case	cover attached to case	close cassette case
small box	lid of small box	close box
button on dress	buttonhole on dress	button dress
Velcro (‘hook side’)	Velcro (‘loop side’)	fasten velcro
3 legos	1 lego	join legos (1 onto 3)
pan	lid	lid on pan
wall	suction cup	attach suction cup on wall
hand	Band-aid	Band-aid on hand
pen	top of pen	place top on pen
3 pop beads	1 pop bead	join pop beads (1 goes onto 3)
train car with hole	train cars with hook	hook train cars together
towel ring	towel	place towel on ring
pole	small ring	place small ring on pole (tight)
unfinished puzzle	puzzle piece	put piece into puzzle
pillow	pillowcase	put pillowcase on pillow
pole	Large ring	put large ring on pole (loose)
cassette tape case	cassette tape	put cassette into case
tote bag	lego pieces	place legos into bag
box	2 small toy cars	put cars into box
frying pan	blocks	put blocks into pan
miniature bathtub	doll	put doll into bathtub
bowl	toy boat	place boat into bowl
suitcase	various small toys	place toys into suitcase
person	wool hat	put wool hat on head
person	big brimmed hat	put hat on
a couple of rubber bands	small box	put rubber band on box
doll	sock	put sock on doll’s foot
doll	shoe	put shoe on doll’s foot
person	slipper	put slipper on on (experimenter’s) foot
person	scarf	put scarf on (experimenter’s) head
person	strap attached to hat	fasten hat on (experimenter’s) head
doll	undershirt	put undershirt on doll’s body
doll	dress	put dress on doll’s body
doll	underpants	put underpants on doll’s body
table	suitcase	put suitcase on table
towel spread out on surface	doll	place doll on towel
freight train car for logs	log	place log on train
Symmetrical activity	**Symmetrical activity**	**Bring both together simultaneously**
two pop beads	two pop beads	attach 2 beads to 2 beads

two legos	two legos	attach 2 legos to 2 legos
magnetic train car	magnetic train car	Attach train cars together

2.3 Procedure

An elicited-production task was used in which actions were demonstrated and the participant was asked to describe the activities. For the 20 adult English and 20 adult Japanese speakers, these activities were modeled using the same technique as used by Choi and Bowerman. For example, a plastic ring was held in one hand and a plastic pole was held to a flat surface by the other hand. The experimenter began to bring the ring towards to top of the pole and then stopped mid-air. She then asked, "What should I do with the ring?" and waited for the participant to respond by inferring what should happen next (e.g., "Put it on the pole."). The Japanese children were somewhat reluctant to respond unless the experimenter completed the action, so their task was changed to accommodate them. The experimenter placed the ring on the pole and they were asked, "Mitmite! Ima kore wo (ga) doushita (dounatta)?" ["Look! What did I just do with this (these) object(s)?/What happened?"]. Each participant was tested individually.

2.4 Dependent measure

The experimenter wrote down on individual 3 x 5 cards each response for each relation given by adults and children. Inter-rater reliability was 100% for English speaking adults, but reliability was not obtained for the Japanese-speaking adults or children due to a shortage of Japanese-speaking experimenters. Given that the same experimenter tested all the subjects and is a native speaker of Japanese, it is assumed that the Japanese data is also be reliable. We coded the data in terms of prepositions or verbs for English-speakers and verbs for Japanese-speakers. Then we included verb information in the English-speakers data and compared the "verb-plus-preposition" responses in English to the verbs in Japanese.

3. Results

We first examined the English speakers' data to evaluate how well our findings replicate those by Choi and Bowerman (reported in Bowerman, 1996). Responses to our stimuli were positively correlated with their stimuli, $r = .56$, $p < .001$. Only 5 relations showed little agreement and these were for the verbs button, fasten and close. Because of this, our data were more variable overall but agreement was largely found for the prepositions used for the remaining 36 items we tested (in, on, join, into).

An examination of the Japanese speakers' data showed that children are parsing larger spatial categories than adults ($M = 11.4 < 15.8$; $t(16) = 3.65$, $p < .05$), a developmental pattern consistent with Choi and Bowerman's English and Korean data. These results suggest that children tend to overextend the spatial terms they know to larger sets of spatial relations than would be included in adult's lexical categories. That is, the elicited-production task provides a quite different view of how children use spatial terms than the spontaneous production task used by Sinha et al.(1994) who concluded that children are conservative in their use of spatial terms in that they tend to under-extend them.

Next, we compared the spatial categories of adult speakers of Japanese and English (see Table 2). We compared spatial verbs used in Japanese and spatial prepositions used in English. The results suggest that Japanese has a more precisely defined spatial lexicon than English. The mean number of lexical categories in Japanese were 17.3 whereas the mean number of categories in English were 7.8 ($p < .001$). It would appear that like Korean, Japanese has many more terms to use for talking about spatial relations than English.

Examination of the data suggested to us that it made little sense to ignore the richness of the full responses given by participants in favor of an exclusive focus on individual terms (a point made by Alvarado & Jamison, 2002 in their cross-linguistic work on color terms). Unlike Japanese or Korean that has one term on for 'tight-fitting containment', English cannot convey such information using one word only. But this does not mean that English speakers do not offer more precise information. We then examined the English speakers' responses in terms of their combinations of verb-plus-prepositions in their descriptions. The results suggested that English speakers do indeed have a variety of ways to express a number of different relations. They expressed a mean number of 17.2 different spatial relations, a mean that is not significantly different from that obtained by Japanese speakers ($M= 17.3$; $p = 0.94$, n.s.). Furthermore, the number of responses per relation was highly correlated between the two languages: $r = 0.63$, $p < .001$.

However, when one inspects the responses to each relation (by conducting an item analysis), the English speakers gave more responses per relation than Japanese speakers (M = 7.9 v. 3.9 respectively, p , >001). This finding makes sense given that English speakers had more words they could put together in different combinations to convey information about each spatial relation. For example, in the relation of putting two pop beads together with two other pop beads, English speakers could say "stick the two together", "put them together", or "push them together". Note that "stick" and "push" convey the idea of tight fit whereas "put" is ambiguous as to how the fit relation was between the objects. While it is not news that the type of fit is optional in English, it is news that English speakers can and do convey such information in their descriptions of these relations.

A final analysis on the differences in modeling (participants who made an inference based on an incomplete action vs. participants who described completed actions) did not show any significant differences in the data with the Japanese adults. Whether or not modeling differences influence children's data is not yet known and is currently being investigated.

4. Discussion

This study used Choi and Bowerman's elicited production technique to: 1) replicate their findings with English speaking adults; 2) extend their findings with monolingual Japanese-speaking adults and children; 3) investigate the breadth of spatial categories beyond the constraints of the single word in English; and 4) compare slightly different modeling procedures for collecting data. The results provided a fair replication of Choi and Bowerman, with the exception of the few English verbs used to describe close, attach and button relations. English speakers prepositions were highly similar to those reported by Choi and Bowerman. This finding is important in that it replicates their findings with a larger and more diverse population: college students attending a multi-linguistic and multi-cultural college in Brooklyn. Many of our participants are exposed to other languages on a daily basis but they are monolingual speakers of English.

The data on Japanese adults and children shows the same developmental pattern found by Choi and Bowerman in their research on Korean and English. Children tend to parse larger and less differentiated categories than adults do. This can be attributable to a number of reasons, one being that their vocabularies are smaller and they were willing to overextend the spatial terms they knew. Whether or not their conceptual categories were also larger cannot be assessed using this measure. For that, nonverbal tasks, which are under construction, are needed.

We also found the Japanese spatial terms contrast considerably with Korean. For example, Korean distinguishes loose-fitting containment and tight-fitting containment, a distinction not made in Japanese or English. Both Japanese and Korean distinguish loose support and tight support, a distinction not made in English. In Table 2, several distinctions made in Japanese are depicted along with pictures showing the relations tested. Also in Table 2, the Japanese terms most frequently used by adults and children are listed. Keep in mind that the list of terms is not exhaustive; many more terms were given than could possibly be accounted for in the table. For a complete list, please contact us.

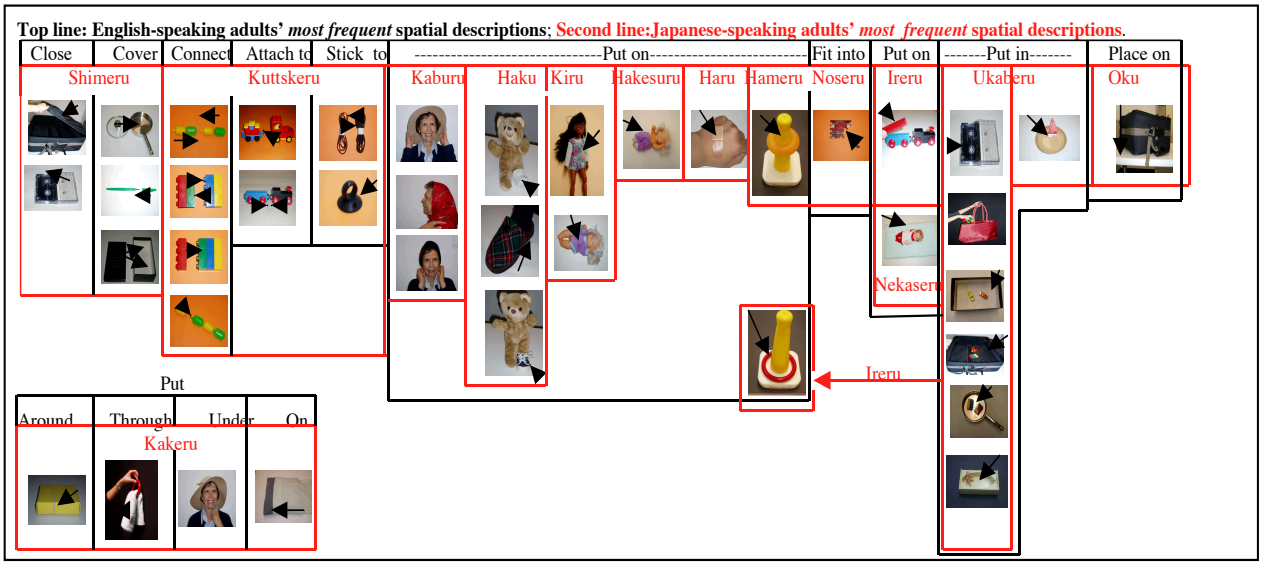
Although these findings add to our understanding of Japanese spatial terms, a language for which very little research has been conducted in this domain, we believe that this research must be conducted in light of the meanings conveyed by speakers in each language. If it is impossible for a speaker to use a single lexical item to describe a spatial relation, it does not follow that the speaker does not think about the relation in a less complex way, an implication made by Levinson and his colleagues in their research on spatial relations and frames of reference (e.g., Levinson, 1996). Only the constraints of the task (or the constraints imposed by a particular coding scheme) lead us to believe that spatial categories contrast so sharply from one language to another (see also Li & Gleitman, 2002). A more complete analysis of the full data set we have collected will reveal some differences between Japanese- and English-speakers categories even when analyzed beyond the one word level; however, these categories will not be bounded by sharp distinctions. We are in the process of evaluating these differences by using a multi-dimensional space program to map out where the categories in each language will cluster. It is likely that differences to be found between the two languages will be due to the use of manner or path verbs, yet both manner and path can potentially contribute to the definitions of spatial categories. We also anticipate that more consistent responses will be found for Japanese than English verbs. One reason is that figure-motion information is more frequently conflated in Japanese verbs. Even though we did our best to maintain constant figure-ground relations in the task by highlighting them, it is possible that some participants construed these relations a bit differently than the way they were modeled. We have since constructed a DVD for future explorations of spatial relations across languages so that each participant will see each relation modeled in the exact same way.

Our claim is that the use of verbs and prepositions to analyze spatial relations adds considerably to the variability and richness of the data. Spatial boundaries will be loosely constructed around what appear to be

prototypes of relations. This prediction is based on research by Huttenlocher & Lui (1979) who found that action categories (denoted as verbs in the present experiments) are not as clearly defined as object categories. Thus, we should not be surprised to find spatial categories whose boundaries overlap and blend. Variation is assumed and reasonably expected when participants are not constrained to single words. Even though one is more likely to find overlap between languages when analyses are extended beyond the single word, the data will likely suggest that some differences, perhaps subtle, nevertheless remain. Our hope is that an exploration of these prototypes across languages will reveal common focal points than can then be tested using preverbal and nonverbal measures.

At this point, one might ask what pragmatics has to do with our study. How participants construe a task and how constrained they are in their responses is a non-trivial issue. We believe that an analysis at the level of single lexical items will certainly reveal differences among languages, but we question the validity of this kind of analysis in terms of making speculations about cognition. If people engage in linguistic strategies while thinking about a situation, it seems highly unlikely that their strategies are limited to a single word. Although it is important to consider how languages package information, we should not stop at the single package. Thought is more likely to be a party of ideas with lots of packages of different sizes and groupings. Our examinations of linguistic data should reflect this.

Table 2



References

Alvarado, N. & Jameson, K.A. (2002). The use of modifying terms in the naming and categorization of color appearances in Vietnamese and English. *Journal of Cognition and Culture, 2.1*, 53-80.

Bowerman, M. (1996). Learning how to structure space for language: a crosslinguistic perspective. In P. Bloom, M. Peterson, L. Nadel, & M. Garrett (Eds.), *Language and space*. Cambridge, MA: MIT Press.

Choi, S. & Bowerman, M. (1991). Learning to express motion events in English and Korean: the influence of language-specific lexicalization patterns. *Cognition, 41*, 83-121.

Choi, S., McDonough, L., Bowerman, M. & Mandler, J.M. (1999). Early sensitivity to language-specific spatial categories in English and Korean. *Cognitive Development, 14*, 241-268.

Clancy, P.M. (1985). The acquisition of Japanese. In Slobin, D.I. (Ed.), *The crosslinguistic study of language acquisition, Vol. 1*: The idea. Hillsdale, NJ: Erlbaum.

Huttenlocher, J. & Lui, F. (1979). The semantic organization of some simple nouns and verbs. Journal of Verbal Learning and Verbal Behavior, 18, 141-179.

Levinson, S.C. (1996). Language and space. *Annual Review of Anthropology, 25*, 353-382.

McDonough, L. Choi, S. & Mandler, J.M. (2003). Understanding spatial relations: Flexible infants, lexical adults. *Cognitive Psychology 46*, 229-259.

Munnich, E., Landau, B. & Dosher, B.A. (2001). Spatial language and spatial representation: A cross-linguistic approach. *Cognition, 81*, 171-207.

Quinn, P. (1999). Development of recognition and categorization of objects and their spatial relations in young infants. In Balter, L., Tamis-LeMonde, C.S. (Eds.). *Child psychology: A handbook of contemporary issues.* Philadelphia, PA: Psychology Press/Taylor and Francis.

Sinha, C., Thorseng, L.A., Hayashi, M., & Plunkett, K. (1994). Comparative spatial semantics and language acquisition: evidence from Danish, English, and Japanese. *Journal of Semantics, 11*, 253-287.