Sound Symbolism and Early Word Learning in Two Languages

HanakoYoshida (hayoshid@indiana.edu)
Linda. B. Smith (smith4@indiana.edu)
Psychology Department, Indiana University, 1101 E. 10th Street
Bloomington, IN 47405-7007 USA

Abstract

Verb learning seems especially difficult for children learning many languages, at least relative to nouns. Many have speculated because this is because verbs refer to relational events that are components of much more complex events. Consider a buying-selling event. If the child hears the verb "buy", does it mean sell, get, handover, give money, or perhaps smile? By this view, a key problem in learning verb is parsing complex events into relevant components and then attending to the right components. This study presents evidence that parents use sound symbolism to direct children's attention to the proper component and that children readily use that information when learning new verbs. The study specifically compares two languages that differ in their sound-symbolic words—Japanese language with its class of mimetics that are heavily used in speech to children and English language which is commonly considered to be a less sound symbolic language. The results indicate that both Japanese- and English-speaking parents use sound symbolism to teach verbs and that both children learning Japanese- and English benefit from this symbolism. This work provides new insight into verb learning, the nature of the input, and the universal aspects of sound symbolism in language use.

Introduction

Most studies of early vocabulary growth point to a noun advantage in early language. In particular, nouns dominate verbs in early productive vocabulary, dramatically so in English and to a lesser degree in "verb heavy" language such as Mandarin or Japanese (Gentner, 1982; Goldin-Meadow, Seligman & Gelman, 1976; Markman, 1989; Gelman & Tardif, 1998). A variety of explanations have been offered. Gentner and Boroditsky (2001) suggest that general cognitive and perceptual factors contribute to the dominance of noun in early vocabularies. Specifically, nouns are said to refer to cohesive perceptual bundles. As a result, they argue, young word learners universally learn nouns easily. Verbs, in contrast, refer to relational aspect of events, which are not perceptually given. Thus different languages lexicalize verbs differently and they are harder to learn, indeed a product of lexical learning other than a precursor.

The ideas especially make sense when one thinks about the contexts in which children typically learn early nouns and verbs. Children typically learn object names, through ostensive definition. Adults point to the object and say the name. Perceptually segregating the referent from the larger scene is clearly relevant to mapping the name to the right referent and this is easy for objects which are stable, unitary wholes. Further, basic level object categories are well organized by similarity and particularly by similarity in shape (Rosch, 1973; Biederman, 1989). Thus, beds are usually somewhat regular and boxy, cups are cup shaped, dogs are dog shaped, and so forth. The fact that object names map to object categories with similar perceptual organizations, that is shape-based, may also give young learners a leg-up (Sandhofer, Smith & Luo, 2000).

These factors that help noun learning --- coherent perceptual bundles and similar category structures --- are not there for verbs. The motions and relations to which verbs refer are not perceptually obvious units. First, motions and relations are transitory events. Second, these actions and relations appear as a compound of the performed or ongoing event. Moreover, these complex events can include initial states, actions, outcomes, and objects. Consider, for example, the verb 'hit' – there is, in any hitting event, the agent, the instrument, the object and if the object is a person, a perhaps dramatic outcome. Therefore, verbs refer to an abstract relation in a complex event, and are not so directly perceived. Further, different verbs refer to different kinds of relations and actions. Whereas, common concrete nouns refer to objects well organized by shape, common verbs such as 'put', 'see' and 'jump' have very different (and much more complex) semantic structures. This may make the mapping of verbs to actions non-obvious and difficult for children.

Possible role of sound words

Many languages use sound-symbolic words. Onomatopoeia words that sound like what they mean, for example, 'bow-bow' and 'cock-a-doodle-doo' that depict animal sounds and an ideophone, for example, 'helter-skelter' and 'zig-zag' are some of sound symbolic words that capture more abstract type of information in English.

The present experiments focus on particular types of onomatopoeic words in Japanese, *gitaigo*. This

gitaigo words are closely related to onomaopoeic words in that language sounds are used expressively, but express aspects of incident which may not produce sounds (e.g., sara-sara conveys smoothness of aspect/object) rather simple imitation of natural sounds. Mimetic words that imitate non-sound events (state or manner) are not so common in other European languages, this particular class of words translated in many ways: mimetic words, onomatopoetic words, onomatopes, mimesis, sound symbolic words, etc (Oda, 2001). To make it simple, I specifically use *gitaigo* for conventionalized mimetics that specifically express non-sound events (e.g., zig-zag), onomaopoeic words for conventionalized mimetic words that specifically imitate natural sound (e.g., pop!). These mimetic words including *gitaigo* and onomaopoeic words *iconically* represent aspects of motion as in as; '*pyoko-pyoko*' [jumping up and down], '*pisyan*' [a sound when two thin entities are hit] and '*gyobogyobo*' [gurgling] (Tsujimura, 1996). Interestingly, the combination of this mimetic word and light verbs; *suru/shita/shinai* (do, did, don't) yield a varied supply of verbs, specific to specific events. And, a particular mimetic based verb refers to a particular event systematically. The relationship between mimetic words and the referred events give arise to the idea that mimetic words may naturally segregate actions, taking the listener to the right perceptual components, by mimicking the aspect of the referred to events. Moreover, if children attend to a relevant element (action) in complex events by attending to the similarity between the sound of the label and perceptual properties, then they might easily map the presented label to the part of the segregated event that is similar to the label. These ideas lead to specific questions about development of word learning.

1) Do Japanese-speaking parents use mimetics in the speech to children when teaching them about action events?
2) Do English-speaking parents use sound symbolism in these same contexts?
3) Does sound symbolism facilitate verb learning in children learning English and Japanese?
4) Is there any advantage in verb learning for Japanese-speaking children with a codified sound symbolism language than for English-speaking children?

Experiment 1

To naturalistically study the nature of the input to children, we asked parents to teach their child about four novel toys that involved interesting actions. Parents were not told that the experiment was about verbs or language or language learning, but only to show their child the toy, the action and to encourage their child to perform the action. In this way, we hoped to measure the frequency and nature of sound-symbolism in spontaneous parent speech when engaged in complex action events with their child.

Method

Participant. Fifteen monolingual English-speaking children who were between 18.75 to 47.3months and their mothers, and 15 monolingual Japanese-speaking children who were between 17.43 to 47.6 months and their mothers participated in the study.

Stimuli and procedure. Parents and children were brought to a testing room with a couch, table television monitor, and rug on the floor. Parents were told that they were going to watch a video demonstrating a play activity and then after watching that video, they would be given the same toys and were to teach the activity to their child, and to encourage their child to play with the toy in the same way (see Table 1). There were four video demonstrations each followed by a 2 minute play session with the real toys. The four demonstrations were: putting a pole through colored rings, sprinkling glitter into a cup, pulling open a tape measure and then winding it closed, and spinning a holding a sand toy to upside down and pushing it along the table so that its wheel turned, and presented as a fixed order respectively (see Figure 1) . The child and parent were alone in the testing room during the demonstrations and video and all interactions were video taped for late coding.

Results

The sessions were transcribed by a native speaker. These transcriptions were coded for the following: (1) the use of gitaigo words (i.e., lexicalized mimetic words that express non-sound property --in English 'zigzag'), (2) onomatopoeia (e.g., 'pop'), (3) invented mimetic words (e.g., chugi-chugi when moving the object), and sound effect (e.g., gurgling sounds). In addition, we coded all sound synchronies involving standard lexical items, mimetics, onomatopoeia, and invented words. Sound synchronies consisted of the use of words linked in time to the action event. There were three main kinds: (1) linking the duration of the word to the duration of the event, (2) repetitions of words synchronous to repetitions of actions, and (3) intonation contours in time with action contours. Descriptions of these are given in Figure 2. Table 2 shows the proportion of trials on which each of the following occurred: gitaigo, invented mimetic words, sound effects, onomatopoeias, and real words that were also sound synchronous with the action. Note that while Japanese parents use gitaigo words frequently (75% of the trials), English-speaking parents rarely do. This reflects a real difference between the two languages. But, notice that English-speaking parents make up for this by making non-mimetic words 'iconic' by

dynamically linking them to the action. For example, one parent pulled a tape measure out by says "look, puuuuullllllll" as to fulfill the duration of the action with the word. Another example is a mother repeated the word 'winding! winding! winding! as she winded the tape measure to close.

These results suggest that sound symbolism may be a regular part of all children's language learning experiences, that Japanese language may lexicalize, codify, a universal aspect of language—using iconicities across sounds and actions—to perceptually link the two.

Experiment 2

The results of Experiment 1 tell us that parents use sounds in ways that link those sounds iconically to actions. But does this link matter? Does it help children map verbs to the right relational features in complex events? Experiment 2 was designed to address this question. Here we presented twenty English-speaking and twenty Japanese-speaking children with a novel verb learning tasks. The children were presented with novel verbs that were either arbitrary or mimetic or arbitrary but presented in the same syntactic form used for the mimetic (control) along with novel events performed in video. Children were then presented test events using the same or different objects and the same or different action. The question was whether children would learn the mapping and extend it to the same action involving a different object.

Method

Participants. Twenty monolingual English-speaking children who were between 24.2 to 47.01 moth olds and 20 monolingual Japanese-speaking children who were between 20.23 to 50.72 moth olds participated in the study. Ten children in each language group were randomly assigned to either the Arbitrary condition or the Mimetic condition or the Control condition.

Stimuli. *Pre-training events.* All the stimuli used in the study were shown on color television monitors. There were 4 different types of trials in the experiment; familiarization, training, learning measure, and crucial trials. The familiarization phase provided pre-training events in which participants were introduced to the task with an animation showing a doll sleeping on the bed. The experimenter then said, *"Look! Do you see that? She is sleeping."[hora mitegoran. onnanoko ga neteirune.]* Then another animation showed a bear jumping. And the experimenter asked, *"What about this one? Is this one sleeping? [ja, kore-wa doukana? neteiruno kana?]* Participants who said "no" were given feedback, but participants who said "yes" to the question, or did not respond were told, "*Look*, *that one is not sleeping, that is jumping*." *[hora yokumite, netenaiyo janpu shiteiruyo]* The purpose of this familiarization phase is for children to be exposed to questions, and answering "yes" or "no". Also, with the feedback, the familiarization helps practice focusing on the action of the event.

Training events. Through out the task, total of 24 training events were shown accompanied by novel Arbitrary/Mimetic verbs or Arbitrary verbs in mimetic syntactic forms. There were 2 types of training events: target event and contrast event. The target event involved a yellow drop shaped puppet moving up and down in a hoping like fashion. This target event was always presented along with the phrase "this one is morping" for the Arbitrary verb condition, "this one is doing bing-bing" for the Mimetic verb condition, and "this one is doing morp" for the Control group to ensure the syntactic frame presented with the Mimetic verb condition ("this one is doing___") does not help children to learn novel verbs any ways rather than the iconicity provided by the Mimetic verb condition. The contrast event involved a blue square shaped puppet scooting back and forth. This contrast event was always presented along with the phrase "this is spoging" for the Arbitrary verb condition, "this one is doing shug-shug" for the Mimetic verb condition, and "this one is doing spogg" for the Control group (see Figure 3). The target event was presented total of 15 times and the contrast event was presented total of 9 times through out the task. For neither of the training event, no questions were asked, thus no feedback was provided.

Test trials. The events used for the test trials were all combination of target and contrast objects and actions (see Figure 4).The crucial trials are those in which the original objects and actions are crossed. There were 12 instances of the 4 kinds of test trials.

Procedure

Children were invited to a testing room with their mother/preschool teacher and asked to take the sheet with him/her at a distance of about 1.5 meters from the television monitor. Mothers of participants and the teachers in the testing room were asked to not to react to experimental stimulus, questions and participants' responses. To begin the experiment, children were instructed to watch events that would show up on the monitor carefully and answer some questions by saying yes or no. The video was then started and participants were preceded to the familiarization trials. Following the familiarization trials, first 5 training events, 4 target events and 1 contrast events) were introduced with either a novel verb (morping for target, spogging for contrast) or a novel mimetic (doing bing-bing for target, doing shug-shug for contrast.) After the first 5 training trials, rest of the 19 training events, 12 learning measure trials and 12 crucial trials were presented in a random fixed order. The total number of trials including the first 5 training trials was 48.

Results

The correct answers from the crucial four conditions were submitted an analysis of variance, 2(English, Japanese) X 2(Verb, Mimetic). Figure 5. shows the percentage correct on crucial and learning measure trials. As it apparent, over all, both English-speaking and Japanese-speaking children learned the mimetic more readily than the arbitrary verbs (regardless of the presented syntactic frames). There was a main effect of type of novel words, $F= 7.758$ $p<.01$, and this indicates that regardless of the language groups, participants learned the target novel mimetics better than target novel mimetics (see Figure 5). There was no interaction between language and type of word. Participants in the Control condition did not learn the novel verb any better than those in the rest of the conditions. This indicates the syntactic frame in which novel verbs were presented did not contribute to children's verbs learning as much as the mimetic use.

Discussion

The results from these two experiments provide new insights into the nature of the input in early verb learning and the role of sound symbolism in language learning. When parents are teaching children about complex action events, they naturally and spontaneously use iconicities between sound and actions to bring children's attentions to the critical event. Japanese-speaking parents do so through the use of *gitaigo*, codified mimetic words. English-speaking parents do not have much of these kinds of words at their disposal, but that does not stop them. Instead they make arbitrary English words with no mimetic properties iconically linked to the action by synchronizing their production of the word with the production of the action. This suggests that sound symbolism is a universal aspect of language, one that brings attention to the right properties of complex events by building on natural perceptual cross-modal similarities. And, the results indicate that children learning two languages exploit these similarities between sound and action when learning verbs.

These facts raises profoundly important question. If sound symbolism is naturally present in language use, if particular sound words help children maping words to referents, why is not language more iconic? Why aren't most words mimetic? The arbitrary symbolic nature of most words seems likely to bring computational power that iconic forms cannot. Specifying exactly why this is so will be important contribution to cognitive sciences.

Table

Table 1: The instruction used in Experiment 1.

There will be 4 different demonstrations on videotape. When the videotape indicates, "START", then you should use the same object to teach your child how to do the same action, then let him/her perform the action. When a beep sound occurs, the videotape will indicate "END", then stop your work and pay attention to the screen again—there will be the second demonstration on the screen. Repeat the same procedure. There will be four segments for you to show your child.

Table 2: Proportion of trials on which iconic way of referring occurred.

		Gitaigo	Onoma-topoeic	Invented word	sounds effect	Non mimetic
Japanese	total	39	0	7	33	7
	M	2.60	0.00	0.47	2.20	0.47
	%	75.00%	0.00%	11.67%	55.00%	11.67%
English	total	3	0	1	17	37
	M	0.25	0.00	0.08	1.42	3.08
	%	6.25%	0.00%	2.08%	35.42%	77.08%

Figures

Figure 1: Actions and stimuli used for Experiment 1.

Linking the duration Examples: spinning a sand toy against a table, as he/she says "vroooooooooommm" fulfilling the duration of the action with word.

["vroooooooooooooooooooooooooooooooommm"]
time

Repetitions of words synchronous to repetitions of actions Examples: as one spin a sand toy against a table, he/she says "vroom" the time/number thus correspond to the time/number of action.

["vroooooooooommm!" "vroooooom….]
time

Intonation contours in time with action contours Examples: as one spin a sand toy against a table, he/she says "vroom" by adding intonation at the end as to differentiate/mark the end of the action.

["vroooooooooooooooooooooooooommm"]
(intonation goes up at "mmm")
time

Figure 2: Examples of sound synchronies (using standard lexical items)

	Arbitrary		Mimetic		Control	
	target	**contrast**	**target**	**contrast**	**target**	**contrast**
Puppet & action						
Novel word	morping	spoging	doing bing-bing	doing shug-shug	doing morp	doing spogg

Figure 3: stimuli and action used for the Training trials

Test trials	Puppet & action
learning measure with target	yellow 
crucial with target	yellow
crucial with contrast	gray 
learning measure with contrast	gray

Figure 4: stimuli and action used for the Test trials

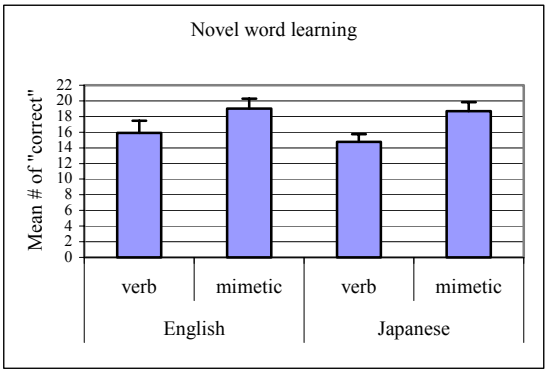

Figure 5: mean number of correct answers in the Test trials

References

Biederman, I. (1989). "Recognition-by-components: A theory of human image understanding": Clarification. *Psychological-Review. 96*

Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativityversus natural partitioning. In S. A. Kuczaj (Ed.) Language development, 2 Language, thought and culture.

Gentner, D., & Boroditsky, L. (2001). Individuation, relational relativity and early word learning. In M. Bowerman & S. Levinson (Eds.), Language acquisition and conceptual development. Cambridge, England: Cambridge University Press.

Gelman, S. A. & Tardif, T. (1998). Acquisition of nouns and verbs in Mandarin and English. Clark, E. V. (Ed) The proceedings of the twenty-ninth annual child language research forum. Stanford, CA, USA: Center for the Study of Language and Information.

Goldin-Meadow, S., Seligman, M. E. & Gelman, R. (1976) Language in the two-year-old. *Cognition. 4*

Markman, E. M. (1989). Categorization and naming: in children: Problems of induction. Cambridge, MA: MIT Press.

Oda, Hiromi (2001) An embodied semantic mechanism for mimetic words in Japanese. Dissertation Abstracts International Section A: Humanities & Social Sciences. Vol 61(7-A), pp. 2686

Rosch, E. (1973). On the internal structure of perceptual and semantic categories. In T. E. Moore (Ed.), Cognitive development and the acquisition of language. San Diego, CA: Academic Press.

Sandhofer, M. C., Smith, B. L. and Luo, J. (2000). Counting nouns and verbs in the input: differential frequencies, different kinds of learning? *Child Language. 27*. Cambridge University Press.

Tsujimura, N. (1996). An Introduction to Japanese Linguistics. MA, USA: Blackwell Publishers Inc.