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Interaction Between Particles and Word Order in the Comprehension and Production of Simple Sentences in Japanese Children

Kenji Hakuta
Yale University

English is a language that relies extensively on word order to signal grammatical roles and meaning of sentences. Although studies have heavily emphasized the role of word order for children learning English, there is little information regarding children learning languages that rely less on word order and more on inflections and particles. Such data would be essential in formulating a language-universal theory of language acquisition. This article reports four experiments tapping comprehension, production, and imitation of simple sentences in Japanese children between 2 and 6 years of age. Japanese children must learn a language that has a dominant subject-object-verb order yet that allows flexibility in word order due to postposed particles that signal grammatical role. Results across different tasks suggest that children learning Japanese show neither a strong reliance on word order nor on particles alone. Rather, they possess a bias for a matching between particles and the position in the sentence where they appear.

A theory of language development must attempt to outline the sorts of biases that the child either brings to the language-learning situation or develops in the course of exposure to the particular language. This article speaks to two related dimensions along which different languages can vary: the basic order of the language, and the extent to which it allows variability from that order. By looking at the patterns of children learning languages that differ along such dimensions, we can begin to develop a theory of the specific biases that children bring to the task of language acquisition.

English-speaking children have been extensively studied with respect to their comprehension of reversible active and passive sentences (e.g., Bever, 1970; Chapman, 1977; de Villiers & de Villiers, 1973; Fraser, Bellugi, & Brown, 1963; Maratsos, 1974). Reversible sentences refer to those sentences in which the meaning underlying the sentence cannot be determined on the basis of the lexical items alone. Thus to correctly comprehend the sentence, "The frog kissed the fly," one needs to have an understanding of the grammatical and semantic roles signified, in the case of English, through word order.

There are two general findings that emerge from the studies on English-speaking children. First, active sentences are far easier to comprehend than passives. Active sentences appear to be mastered roughly by age 3 or younger, whereas it is not until age 5 or so that children begin comprehending the passive correctly, and even then with complications well into the school years (Baldie, 1976; Beilin, 1975; Horgan, 1978; Sinclair, Sinclair, & De Marcellus, 1971). Second, children at a certain point in development, roughly around age 4, systematically misinterpret passive sentences, choosing the first noun of the sentence as the agent. For example, "The frog was kissed by the turtle" is interpreted as the frog kissing the turtle. At this point in development, children's per-

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Requests for reprints should be sent to Kenji Hakuta, Department of Psychology, Yale University, Box 11A Yale Station, New Haven, Connecticut 06520.

formance on reversible passives drops below chance level (Bever, 1970; Maratsos, 1974).

Presumably, this period of systematic reversals of passives is the result of the child overgeneralizing the statistically predominant surface order of agent–action–patient that exists canonically in the language. Bever (1970) suggested that the child follows a strategy based on word order: "Any Noun-Verb-Noun sequence within a potential internal unit in the surface structure corresponds to [agent–action–patient]" (p. 248). This research tests the generalizability of these results to Japanese and more generally investigates the role of word order in a language where it does not play a critical function in signaling grammatical relations.

Unlike English, where word order determines the grammatical role of nouns in a sentence, Japanese signals grammatical role through postpositional particles. Thus, although the predominant, canonical order of a sentence is subject–object–verb (SOV), that order is free in the sense that word order is not essential for assigning grammatical role. The major constraint on word order is that the main verb must be sentence-final (Kuno, 1973), but even this constraint can be violated through dislocation of a constituent to a position after the verb. With regard to the relative frequencies of the two orders in the language, Kuno estimated that the ratio of SOV to object–subject–verb (OSV) orders appearing in newspaper articles is 17:1. Although there are no comparable data for adult speech addressed to children, the above estimate suggests that SOV is the predominant order.

Linguists working on Japanese have not explicitly worked out the full implications for meaning of the word order change, but in general it is considered an optional rule that does not affect the propositional meaning, although it clearly affects the intended focus, or topic, of the sentence. Thus, an OSV order sentence tends to be used when the object is being highlighted by the speaker. McCawley (1976) formulated the word order change in terms of Ross's (1967) "scrambling rule" for Latin, which simply interchanges the position of noun phrases. One important function of the scrambling rule in Japanese, as McCawley has pointed out, is to make multiple center-embedded sentences comprehensible.

Table 1
Examples of Sentences Created From Combination of Two Levels of Voice and Two Levels of Word Order

Voice/word order	Example
Active/SOV	AGENT-ga PATIENT-o BIT-active.
Active/OSV	PATIENT-o AGENT-ga BIT-active.
Passive/SOV	PATIENT-ga AGENT-ni BIT-passive.
Passive/OSV	AGENT-ni PATIENT-ga BIT-passive.

Note. SOV = subject–object–verb; OSV = object–subject–verb.

Since the SOV and the OSV orders can be used for both the active and passive voices, there are four basic simple sentence forms in Japanese: SOV/active, OSV/active, SOV/passive, and OSV/passive. Table 1 lists examples for each of these four sentence forms. For expository convenience, I have chosen the two nouns in the sentences to be "agent" and "patient," corresponding to their semantic role within the sentence. The reader might imagine all of the sentences as referring to interactions between an insurance agent and his hospitalized client. Referring to the first example in Table 1, AGENT-ga PATIENT-o BIT-active, is equivalent to the English sentence, "The agent bit the patient." The -ga marking on AGENT indicates that it is the subject of the sentence, and the -o marking on PATIENT indicates that it is the object of the sentence. The verb affix indicates that the sentence is in the active voice. Sentence 2, PATIENT-o AGENT-ga BIT-active, is identical in every way to the first sentence, except that the position of the subject and the object have been switched. Sentence 3, PATIENT-ga AGENT-ni BIT-passive, is the SOV/passive form. Notice now that the -ga marking, which signals the grammatical subject of the sentence, is on the patient. The object of passive sentences is marked by -ni. The verb affix indicates passive voice. Once again, when the subject and object are switched, it results in the fourth sentence, AGENT-ni PATIENT-ga BIT-passive.

What sorts of predictions might be made

about Japanese children's comprehension of these four sentence forms? Since SOV/actives (agent–patient–action), being the canonical simple sentence, are the most frequent in the language, one possibility is that children will form a generalization based on the semantic sequence inherent in these sentences. This would result in the Japanese version of the strategy proposed by Bever (1970) for English. It would take the form: "Any noun–noun–verb sequence in the surface structure corresponds to agent–patient–action." If this were the case, we should expect Sentences 1 and 4, which have the agent–patient–verb sequence, to be comprehended better than Sentences 2 and 3, which have the patient–agent–verb sequence. We might also expect a period of systematic reversals for the patient–agent–verb sentences, as has been found quite consistently for English children.

A second possibility is that the semantic sequence plays no role at all and that the children pay attention to the information signaled by the particles. Since actives are more frequent than passives, we would expect overall better comprehension of actives over passives; however, within these two levels of voice, we would not predict differences as a function of word order, since they do not differ with respect to particles.

There are several studies that shed light on these possibilities. Yamanaka (cited in Murata, 1972) used a picture-cued comprehension procedure and tested the comprehension of reversible and nonreversible active and passive sentences, but only in the SOV order. Her results are somewhat puzzling in that only at age 5 did her subjects begin performing above chance on any of the syntactic types, including irreversible sentences. Her conclusion was that particles seem to confront the Japanese child with a difficult learning task. An alternative possibility is that the test was poorly designed or administered. Hayashibe (1975) found somewhat more positive results. Using an act-out comprehension procedure, he looked at SOV and OSV orders, but only for active sentences. His subjects were between 3 and 6 years old. The analysis of his data was not ideal for our purposes because he grouped his children according to error rates and showed that the group with the lowest error rate had the highest mean age. Nevertheless, it is possible to infer from his tables that from about age 4 on, the children were responding to the contrast contained in particles.

Four experiments are reported in this article. In the first experiment, children were tested on comprehension of the SOV and OSV active and passive sentences described above in Table 1. The second experiment attempted to look at comprehension under conditions in which the particles were omitted, thus allowing us to assess the role of word order in the absence of particles. The third experiment looked at spontaneous usage of the subject- and object-marking particles in an elicited production task. The fourth experiment looked at children's ability to imitate sentences in the SOV and OSV orders. The results consistently suggest that Japanese children are sensitive to the correlation between particles and their location within the sentence, and that violation of this condition disrupts performance. These results are compared to data from other languages in the discussion.

Experiment 1

The purpose of the present experiment was to explicitly compare the four sentence forms mentioned above by using an act-out procedure.

Method

Subjects. Subjects were 48 children, who were divided evenly into four age groups[1]: Group 1, 2 yr. 3 mo. to 3 yr. 2 mo.; Group 2, 3 yr. 3 mo. to 4 yr. 2 mo.; Group 3, 4 yr. 3 mo. to 5 yr. 2 mo.; Group 4, 5 yr. 3 mo. to 6 yr. 2 mo. Sex was balanced within each group. For all studies reported in this article, the children came from a large public day-care center in Tokyo. The socioeconomic level of the children ranged considerably, but since eligibility for day care is based primarily on

[1] It is appropriate to justify the apparent arbitrary grouping of the age ranges used for this and subsequent experiments. Children in this day-care center are assigned to classes on the basis of their age on April 1, the beginning of the school year in Japan. For practical reasons associated with collecting data in a large day-care center, the age groups I chose were adopted as they were represented in each of the classes. Thus the age groups differ slightly across experiments depending on when the experiment was conducted.

need, the majority of children, especially those in families with both parents working, can be described as lower-middle to middle class.

Materials and procedure. Three replications of each of the four sentence forms resulting from the combination of two levels of voice (active/passive) and two levels of word order (SOV/OSV) were devised. Thus there were 12 sentences presented to each child. Lexical items were randomly assigned to the appropriate sentence frames. The nouns used were *alligator* (*wani*), *gorilla* (*gorira*), *camel* (*rakuda*), *panda* (*panda*), *bear* (*kuma*), *cow* (*ushi*), *elephant* (*zo*), *giraffe* (*kirin*), *tiger* (*tora*), *frog* (*kaeru*), and *turtle* (*kame*). The verbs were *kicked* (*ketta* in active, *kerareta* in passive), *licked* (*nameta* in active, *namerareta* in passive), *hit* (*butta* in active, *butareta* in passive), *kissed* (*kisu-shita* in active, *kisu-sareta* in passive), and *tickled* (*kusugutta* in active, *kusugurareta* in passive). The animals were selected on the basis of the availability of toy replicas, and verbs were selected on the basis of their requiring distinct actions when the child acted them out. From the first set of 12 sentences, a second set was created in which the same verbs were used but the two nouns were reversed to counterbalance any effects due to the lexical items. Within each age group, an equal number of children were assigned to do each set.

The children were tested individually in a separate room in the day-care center. One experimenter presented the sentences and was the primary interactor with the child while the second experimenter coded the child's response. The first experimenter was blind to the hypotheses of the study. To familiarize the child with the materials, each animal was introduced individually and the child was asked to name it and encouraged to play with it. A puppet was then introduced. The child was told that the game was to act out on a wooden "stage" what the puppet said. Three simple warm-up sentences, consisting of an intransitive action and two irreversible actions, were given. The 12 sentences immediately followed in random order across subjects. Only the relevant animals were placed on the stage for each sentence. The entire procedure lasted about 15 minutes.

Scoring. Each correct response was scored as 1, and each incorrect response was scored as 0.

Results and Discussion

For this and subsequent experiments in which two sets of sentences were created and subjects were randomly assigned to either set, the variable (set) was included in the initial overall analysis of variance (ANOVA) as a between-subjects variable. When set was not significant as a main effect or as an interaction with other variables, a second ANOVA was carried out pooling across set to increase the power in testing the effects of interest. The ANOVA reported excluded the variable set from the analysis except for cases in which it turned out significant in the first ANOVA.

Table 2
Means and Standard Deviations of Voice × Word Order Interaction

	Word order					
	SOV			OSV		
Voice	*M*	SD_1	SD_2	*M*	SD_1	SD_2
Active	.819	.257	.024	.569	.322	.032
Passive	.431	.330	.067	.521	.307	.072

Note. SOV = subject–object–verb; OSV = object–subject–verb. SD_1 refers to subject variability, and SD_2 refers to sentence variability.

In this experiment, overall analysis was conducted by a three-way ANOVA, with subjects nested within age and the repeated measures factor, sentence, nested within a cross of voice and word order.[2] The between-subjects factor, age, was significant, $F'(3, 18) = 9.207$, $p < .001$. Inspection of the means revealed a consistent increase with age. Age did not interact significantly with any of the repeated measures factors. The two repeated measures factors, voice and word order, as well as the Voice × Word Order interaction, were all significant. For voice, better performance was found for actives than passives, $F'(1, 9) = 36.079$, $p < .001$. For word order, SOV was greater than OSV, $F'(1, 7) = 6.161$, $p < .05$. The means for the two-way interaction, $F'(1, 14) = 16.672$, $p < .002$, appear in Table 2.

Inspection of Table 2 reveals performance on SOV/active to be considerably superior to the other sentence forms. Individual comparisons of the means revealed that it differed significantly from all the others: with OSV/active, $t'(4) = 7.500$, $p < .002$; with SOV/passive, $t'(6) = 8.051$, $p < .001$; with OSV/passive, $t'(6) = 5.783$, $p < .002$. Of the other three means, only the difference between SOV/passive and OSV/active was significant, $t'(4) = 3.053$, $p < .05$. Thus the

[2] Following Clark's (1973) suggestion, both subjects and sentences are treated as random variables, using procedures outlined in Winer (1971). Quasi-*F*-ratios (F') are reported for ANOVAs, and individual comparisons are made through t' where appropriate. Means are reported with two standard deviations. SD_1 refers to subject variability, and SD_2 to sentence variability.

significant main effects for voice and for word order in the overall ANOVA were clearly due to the superior performance of the children on SOV/actives.

The results do not support either of the two possibilities outlined earlier. One possibility was that children would have an agent–patient–action strategy and therefore would do well on SOV/active and OSV/passive sentences but poorly on OSV/actives and SOV/passives. Yet their performance on the OSV/passive sentences was considerably poorer than on the SOV/active sentences. In addition, children did not benefit from the fact that the OSV/passives have the agent–patient–action sequence, as evidenced by the fact that its mean did not differ significantly from either of the patient–agent–action sentences. The second possibility that was not supported by the results claimed that word order would not make a difference, since particles are what children pay attention to. Indeed, word order had a tremendous effect on the active, although not on the passive, sentences.

The picture that emerges from these results is that Japanese children require some sort of agreement between the particle marking and the location of the noun within the sentence. In particular, for the active sentences they have a specific requirement that the first noun be marked by -ga in order for it to be interpreted as the agent. If -ga is not on the first noun but rather on the second noun, as in the case of the OSV/active, they cannot take advantage of the information contained in the particle. And if the sentence takes the agent–patient–action sequence but there is a mismatch of particles, as in the case of the OSV/passive, children are unable to benefit from the correspondence of the sentence to the canonical sequence.

An analysis of the individual patterns of performance was conducted by looking at which of the sentence forms tended to be "acquired" by the children. The criterion for acquisition was a consistently correct response over the three replications for each sentence form. In general, the results revealed that when a child had acquired only one sentence form, it was the SOV/active, and when a child had two forms, they tended to be the SOV/active and OSV/active. There were 13 children who had acquired none of the sentence forms, 19 who had acquired one, 13 who had acquired two, and 3 who had acquired three forms. There were no children who had acquired all four sentence forms. The specific forms acquired by individual children can be found in Table 3.

The pattern emerging from this individual analysis of the data is highly consistent with the overall analysis. If the children had control over one sentence form, it tended to be the canonical SOV/active sentence. It is of some interest to note that there were three children who might be called "perfect" users of the agent–patient–action strategy. These children correctly comprehended all three replications of both SOV/active and OSV/passive sentences and reversed all replications of OSV/active and SOV/passive. To test whether there was such a trend among other children who were not as consistent in their responses, I chose to look at those who reversed either four or five out of the six instances of combined OSV/active and SOV/passive responses. I will call this group the *reversers*. As a comparison group, I selected children who reversed two or three of those same sentences. This group of children is called the *nonreversers*. Those children who reversed none or one of the sentences were the more advanced learners, and they were left out of this comparison. The reversers and the nonreversers were compared on the average number of correct comprehensions of the sentences with the agent–patient–action sequence, namely the SOV/active and the OSV/passive. If indeed the reversers were following an agent–patient–action strategy, then we should expect them to do better on these items than the nonreversers, since these sentences conform to their strategy. This does not appear to be the case. In fact, the data are in the opposite direction. The 20 nonreversers performed better on the agent–patient–action sentences ($M = 4.15$) than the 16 reversers ($M = 3.31$), $t(34) = 2.25$, $p < .05$. Thus there is very little evidence of individual children following the agent–patient–action strategy.

In addition to the individual analysis, response patterns were analyzed by grouping children according to their performance in a production task, to be described in detail subsequently. Grouping according to production was performed to determine whether there were developmental trends that might otherwise be obscured by grouping by age. The production task required the child to describe a set of cartoon pictures. The measure was the mean length of production (MLP) in morphemes in the task. Although MLP and age are highly correlated ($r = .67$), MLP is a more meaningful index of linguistic development, since it relates comprehension to a measure of production.

The MLP of the children in this experiment ranged from 5.04 to 11.84. The MLP is considerably longer than the mean length of utterance (MLU) computed for spontaneous speech (e.g., Brown, 1973) because the production task demands explicit description of pictures, and MLU generally includes utterances produced in running discourse, such as single-word responses to questions. The MLP might be more comparable to the upper bound of the MLU range. The MLP range was divided into four groups so that a roughly comparable number of children fell into each category. Group 1 (n = 15) had an MLP less than 7.00, Group 2 (n = 12) had an MLP of 7.00–7.99, Group 3 (n = 13) had an MLP of 8.00–8.99, and Group 4 (n = 8) had an MLP greater than 8.99. To incorporate a larger amount of data, children were considered to have acquired a sentence form if they comprehended at least two of the three trials. Figure 1 shows the percentage of children in each MLP group who had control of each sentence form. By this criterion, it is evident that by Group 3, all children had control of the SOV/active, and by Group 4, all children had control of the OSV/active. What is striking from this analysis, however, is the dip in the percentage of children in Group 2 who had control of the SOV/passive. Of the 12 children in Group 2, not one had control over the sentence form. Thus there does appear to exist a period in the developmental progression of the Japanese child when the SOV/passive is systematically reversed. At this stage it is possible that the child is interpreting the -ga marking on the first noun to be the agent marker, having generalized this pattern from the SOV/active sentence form.

Summary

This experiment tested the comprehension of active and passive sentences in the SOV and OSV orders in children between 2 yr. 3 mo. and 6 yr. 2 mo. Children showed a strong preference for the SOV order for active sentences, but no corresponding preference was found for passives. The fact that children did not find the OSV/passive particularly easy suggests that Bever's (1970) noun–verb–noun (NVN) strategy for English cannot be extended to Japanese in the most straightforward translation possible, since OSV/passives take the semantic sequence agent–patient–action. It appears that

Table 3
Patterns of Specific Forms of Active and Passive Sentences Acquired by Individual Children

Number of sentence forms acquired	n	SOV/active	OSV/active	SOV/passive	OSV/passive
0	13				
1	15	X			
1	1		X		
1	1			X	
1	2				X
2	7	X	X		
2	3	X			X
2	1	X		X	
2	1			X	X
3	2	X	X	X	
3	1	X		X	X

Note. SOV = subject-object-verb; OSV = object-subject-verb. X refers to structures that have been acquired.

there is a requirement that -ga appear on the first noun of the sentence. Otherwise children do not pay attention to the particle, accounting for the poor performance on the OSV/actives. The claim that children impose the interpretation that "the first noun marked by -ga is the agent" is supported by an apparent period of systematic reversal of SOV/passives that children go through.

Experiment 2

In the first experiment it was shown that the data from comprehension of active and passive sentences cannot be accounted for by appeal to either an explanation based purely on the semantic sequence of the sentences or purely on particles. Rather, it appeared that there must be an agreement between the particle and its location within the sentence. The children appeared to go through a period of development when they were particularly receptive to imposing an agent–patient–action interpretation when the first noun was marked by -ga. They did not do so when the particle mismatched, such as in the OSV/passive. A natural question that now arises is whether Japanese children impose an agent–patient–action interpretation on sequences of nouns and a verb that are not marked by particles.

Sinclair and Bronckart (1972) presented French-speaking children with sequences of two nouns and a verb, unmarked by inflections and without articles. The sequences were in all three possible orders: NNV, VNN, and NVN. They found an increasing tendency with age to assign the agentive role to the first noun, with that tendency strongest for the NVN sequence. Tager-Flusberg (1978) reported a similar finding with English-speaking children. Since both French and English have the basic canonical SVO order, it is not surprising that the children showed the highest probability of choosing the first noun as the agent for the NVN sequence. Extended to Japanese children, this would mean that children should show a preference towards the NNV sequence, since it corresponds to the basic canonical configuration. Although children in the first experiment did not impose the agent–patient–action interpretation across all sentence forms, this could have been due to the sup-

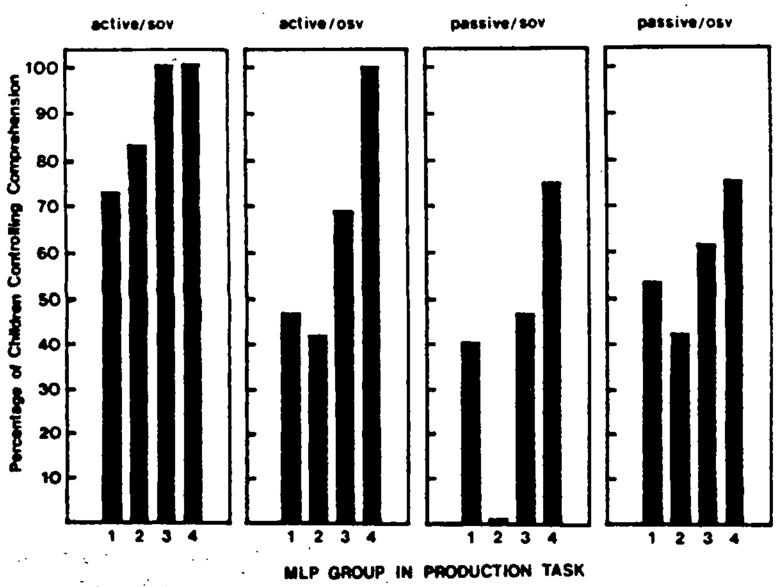

Figure 1. Percentage of children in mean length of production (MLP) groups who performed correctly at least two out of three responses for active and passive sentences in subject–object–verb and object–subject–verb (SOV) (OSV) orders.

pressing effect of a mismatch between articles and their location. In the absence of mismatched particles, the effect may appear.

Method

Subjects. Subjects were 30 children, who were divided evenly into three age groups: Group 1, 3 yr. 3 mo. to 4 yr. 2 mo.; Group 2, 4 yr. 3 mo. to 5 yr. 2 mo.; Group 3, 5 yr. 3 mo. to 6 yr. 2 mo.

Materials and procedures. Three levels of configuration (NNV, NVN, and VNN) were crossed with three replications to yield nine sequences for presentation to each child. In addition, as a control two nonreversible sequences in which one of the nouns was inanimate was created for each configuration. In one instance, the first noun was the inanimate noun, and in the other the second noun was inanimate. Thus there was a total of 15 sequences presented to each child. The sequences were constructed by assigning lexical items randomly to the frames. For the reversible sequences, the same animals and actions as the first experiment were used. For the nonreversible sequences, the animate noun and the actions were drawn from the same pool. The inanimate nouns were *chair* (*isu*), *banana* (*banana*), *apple* (*ringo*), and *bicycle* (*jitensha*). As in the first experiment, a second set of sentences was created from the first set by reversing the order of the nouns selected. An equal number of children within each age group was assigned to do each set.

The testing procedure was essentially the same as in the first experiment, except that we explained the deviant sentences to the child by telling him or her that the puppet did not know how to speak properly and that the child's role was to help him by showing the action on the stage.

Scoring. The child's response was recorded as the first noun being agent, the second noun being agent, or as "other." For purposes of analysis, a numerical score of 1 was assigned if the child chose the first noun as the agent and 0 if either of the other two response types occurred.

Results and Discussion

None of the children showed any problems in interpreting the nonreversible sequences, regardless of the order in which the nouns occurred. Thus the nonreversible sequences are not discussed further in this article.

The reversible sequences were analyzed through a two-way ANOVA, with subjects nested within age and the repeated measures factor, sentence, nested within configuration (NNV/NVN/VNN). Age was significant, $F'(2, 9) = 6.688$, $p < .05$. Inspection of the means, shown in Table 4, reveals that this effect was due to an increase in preference for the first noun as agent between Groups 1 and 2. The means for Groups 2 and 3 were identical. Age did not interact significantly with configuration. The main effect for configuration was not significant, $F'(2, 11) = 1.975$, $p < .25$, but an inspection of the means is revealing. Of the three configurations, NNV, which should have the highest mean if Japanese children impose their canonical order on these sequences, is in fact the lowest. The NVN sequence had the highest mean.

Table 4
Means for Responses Where the First Noun Was Chosen as Agent for Noun–Noun–Verb (NNV), Noun–Verb–Noun (NVN), and Verb–Noun–Noun (VNN) Sequences

	Sequence			
Age group	NNV	NVN	VNN	Combined
1	.533	.700	.567	.600
2	.700	.867	.800	.789
3	.667	.900	.800	.789
Total				
M	.633	.822	.722	
SD_1	.365	.259	.264	
SD_2	.088	.051	.135	

Note. SD_1 refers to subject variability, and SD_2 refers to sentence variability.

The fact that Japanese children have a stronger tendency to impose the agent–patient interpretation on NVN sequences over the NNV sequences shows that the earlier findings of Sinclair and Bronckart (1972) and Tager-Flusberg (1978) are not restricted to SVO languages. If children tend to impose the canonical order of their language to these sequences, exactly the reverse of the obtained results should have been found.

The results of this experiment also serve to emphasize the important role of particles in Japanese. For the NNV sequence, children will consistently interpret the first noun as the agent only if it is marked by -ga. The first experiment showed that they will not do so when the first noun is marked by some other particle. This experiment shows that they will also be inconsistent if the noun is left unmarked. Analysis of the data at the individual level shows that compared with

60% of the children who consistently choose the first noun as the agent in the NVN sequence, 40% chose the first noun as the agent in the NNV sequence and 37% chose it in the VNN sequence.

Summary

This experiment presented sequences of uninflected NNV, NVN, and VNN for interpretation by children between ages 3 yr. 3 mo. and 6 yr. 2 mo. For all sequences the tendency was to choose the first noun as the agent of the action, but that tendency was strongest for the NVN sequence and weakest for the NNV sequence that corresponds to the canonical Japanese form. This finding is consonant with data from French-speaking and English-speaking children. In the absence of particles, it appears that Japanese children have no particularly strong bias to impose an agent–patient–action interpretation on the NNV sequence.

Experiment 3

Production data were obtained through an elicitation task from each of the 48 children who took part in Experiment 1.

Method

Materials and procedure. The elicited production task was administered immediately following the comprehension task. The task consisted of 16 cartoon pictures that the child was asked to describe. They depicted various combinations of animals performing common actions. The pictures varied with respect to the following parameters: (a) the action depicted was either describable by a transitive verb (e.g., *kicking*) or an intransitive verb (e.g., *sleeping*); (b) both the agents and objects of the actions were either single or compound (e.g., *stork* or *stork and monkey*); and (c) the objects of the actions were either animate or inanimate (e.g., *gorilla* or *umbrella*).

The pictures were presented to the children through a portable slide viewer to discourage them from pointing to the picture during production. The children were asked to describe to a puppet what they saw on the "television." Following three warm-up slides, the 16 pictures were presented in random order. The children's utterances were recorded on a cassette tape recorder and subsequently transcribed.

Scoring. The children's MLP in morphemes was computed. If a child refused to give the description of any picture, or stopped with no signs of closure on the sentence, the utterance was excluded from the analysis.

The production of the particles -ga and -o was scored for each child by calculating the percentage of instances in which each of the particles was supplied in possible contexts where they could occur. The contexts are obligatory in formal speech in most cases, but in colloquial speech -o is often optional, especially for inanimate objects and other unambiguous contexts. Sentences were also noted as to whether they were in the active or passive voice and whether they were in the SOV or OSV order.

Results and Discussion

Children were grouped by their MLP. Table 5 presents the average score for each particle of the children in the different MLP groups.

The first striking fact about Table 5 is that -ga is supplied far more frequently than -o. Across MLP groups, the difference between the two particles is highly significant, $t(44) = 12.481$, $p < .001$. This is not surprising, since -o is often optional in colloquial speech, whereas -ga is obligatory. Thus this result alone would not allow us to draw the conclusion that -ga is "acquired" in any sense before -o. For -ga, one can set a criterion of 90% that would be reasonable, since it is obligatory. For -o it can be empirically determined through inspection of Table 4. The percentage supplied reaches an asymptote of development at MLP Groups 3 and 4. One might reasonably consider the point of development at MLP at which this asymptote is reached as the acquisition point, since that percentage reflects the general agreement among the more advanced children on when particles should be supplied for the sentences used in the description of the particular events in this production task. Thus, defining the acquisition point for both -ga and -o as the point at which asymptote is reached, -ga is acquired by MLP Group 2, and -o by MLP Group 3. Statistically this is demonstrated by the fact that the only significant difference in the means between adjacent MLP groups occurs at the points of acquisition defined above. Thus, for -ga the difference is between MLP Groups 1 and 2, $t(25) = 2.881$, $p < .01$, and for -o the difference is between MLP Groups 2 and 3, $t(23) = 2.138$, $p < .05$. Thus in production as in comprehension it appears that -ga is primary.

Among the 16 pictures, 12 contained transitive actions that could appear in either the SOV or OSV order and in either the active

Table 5
Percentage Supplied in Possible Contexts for -ga and -o as a Function of Mean Length of Production (MLP) Group

	MLP 1		MLP 2		MLP 3		MLP 4	
Noun	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
-ga	.655	.321	.927	.067	.979	.033	.954	.033
-o	.157	.194	.282	.268	.515	.276	.580	.135

Note. Mean length of production (MLP) is listed in number of morphemes. MLP 1 < 7.00; MLP 2 = 7.00–7.99; MLP 3 = 8.00–8.99; MLP 4 > 8.99.

or passive voice. The object of the transitive action was animate in half of these cases and inanimate in the other half. Since there were 48 children, there was a total of 576 opportunities. In all, there were 13 instances of OSV in the active voice, of which 3 instances had inanimate objects. There were no instances of the OSV/passive. There were 14 instances of the SOV/passive, which were all descriptions of pictures with animate patients. Thus, it is fair to conclude that there were very few sentences in either the OSV order of the passive voice. This finding is in accord with the comprehension results in which the SOV/active sentences were easiest.

It is interesting, however, that OSV/active sentences and SOV/passive sentences found in the data tended to be on the pictures with animate patients, which results in an animate noun still remaining in the sentence-initial position. The latter finding is of interest in light of recent reports (de Villiers, 1980) that suggest a bias toward promoting animate nouns rather than inanimate nouns to the subject position of passive constructions. Explicit investigation of this parameter in Japanese, perhaps using the immediate imitation and delayed production paradigm described in the next section, is a promising avenue for future research.

Summary

The sentences produced in an elicited production task by children in Experiment 1 were analyzed for control of particles and the preferred word order in production. It was found that children acquire control over the -ga particle before the -o particle, corresponding to the apparent importance of -ga in comprehension. In addition, the overwhelming majority of the sentences produced were SOV/actives. There were very few passives produced, and all of them were in the SOV order.

Experiment 4

The previous study demonstrated that in relatively free production, children will produce the SOV order. It is not clear, however, whether they actually have difficulty producing the OSV order or whether they simply choose not to do so for stylistic reasons. To test this possibility, a more constrained production situation is necessary.

Sentence imitation has been used by many researchers in developmental psycholinguistics (e.g., de Villiers, Tager-Flusberg, & Hakuta, 1977; Slobin & Welsh, 1973). In general, the assumption is that children should have difficulty in correctly imitating sentences that are not part of their linguistic repertoire and that errors should reflect the nature of that system. This does not imply, however, that correct imitation necessarily implies control over the form being tested. In the classic study explicitly testing the relationship between imitation, comprehension, and production, Fraser et al. (1963) demonstrated that correct imitation is possible without full comprehension. Most relevant for the present discussion, they found that 3-year-old children could correctly imitate passives while misinterpreting passives in comprehension and misusing them in production. Thus Fraser et al.'s results serve as a caution against using imitation as the sole tool with which to investigate the child's control of a particular structure. Rather, the data should be interpreted in conjunction with information obtained from other tasks, namely comprehension and production.

The children who were in the present experiment ranged in age from 3 yr. 10 mo. to 6 yr. 8 mo., and thus it was not anticipated that they would have trouble with the immediate imitation of simple sentences in SOV and OSV orders. The main reason for having them imitate the sentences initially was for them to remember the sentences for later production, cued by a picture depicting the described action. Research with English-speaking adults has generally shown poor retention of the specific forms in which sentences are presented, such as whether a given sentence was in active or passive form (Bransford, Barclay, & Franks, 1972; Bransford & Franks, 1971; Sachs, 1967; Wanner, 1968). In pilot work with American children, Pinker and I (Hakuta & Pinker, Note 1) have found similar poor retention of the form of sentences, even with delays of 5 sec. It was therefore the aim of the delayed picture-cued production part of the task to see to what extent the children would vary the form of the sentences given an original equal distribution of frequency of the different forms in the immediate imitation.

Method

Subjects. Subjects were 14 children ranging in age from 3 yr. 8 mo. to 6 yr. 8 mo., with a mean age of 5 yr. 5 mo.

Materials and procedure. Each picture depicted transitive actions (hitting, kicking, or pushing) between two animals. There were 16 pictures in all. For half of the pictures, sentences describing the action in the SOV/active form were created, and for the other half, the sentences were in the OSV/active form. A second set with the picture and sentence word order reversed was created, and children were randomly assigned to the sets. The pictures were ordered randomly, with the constraint that no picture could appear in the same ordinal position in the sequence more than once. The pictures were mounted on ring binders, and the child was told that it was a storybook. The experimenter then introduced the child to a puppet and asked the child to repeat the story for the puppet. There were three warm-up pictures, and the 16 target pictures immediately followed. Following completion of the immediate imitation part of the experiment, subjects were told that it was now their turn to tell the story on their own. The pictures were then presented in the same order as for the immediate imitation. Each session lasted between 20 and 30 minutes. The entire session was recorded on a cassette tape recorder and subsequently transcribed.

Scoring. The immediate imitation was scored as 1 if the response was correct, and 0 if there was an error. Errors were also coded as to whether the child transposed the position of the nouns or used a wrong particle. Delayed production was scored 1 if the child used the SOV order, and 0 if the OSV order or any other form was used.

Results and Discussion

Overall analysis of the responses from the immediate imitation phase of the task was conducted by a two-way ANOVA, with subjects nested within set, and the repeated measures factor, sentence, nested within word order. Set is included in this ANOVA because it turned out significant both as a main effect, $F'(1, 10) = 8.070$, $p < .02$, and as an interaction with word order, $F'(1, 10) = 8.070$, $p < .02$. It turned out that the main effect and the interaction were due to the same source, since the mean for one level of word order, SOV, was 1.00 with absolutely no variance. Every child imitated it correctly on all replications. Inspection of the individual means for each sentence within the two sets revealed that the effect of one set being better than the other was true for all OSV sentences rather than being the result of an outlier. Thus it appears that the significant effect for set was due to the spurious effect of the more advanced children being assigned to one set.

The repeated measures factor, word order, had a highly significant effect, $F'(1, 9) = 32.912$, $p < .001$. As mentioned earlier, all children correctly imitated all instances of the SOV sentences. This mean of 1.00 with no variance compares with the mean for OSV sentences of .634 ($SD_1 = .312$, $SD_2 = .089$). Thus the results indicate a significant amount of difficulty with the OSV order in immediate imitation even at a relatively old age. Individual analyses showed that only two out of the 14 children did not make any errors. A breakdown of error types showed that of the 41 errors, only four consisted of transposing the order of the subject and object. There were 35 errors in which the order of the nouns was retained, but the particles were either switched, or the particle on the first noun was changed to -ga, leaving both nouns with -ga. This error is very similar to

Roeper's (1973) description of German children's errors in imitating sentences with reversible dative and accusative inflections. When the order of the nouns did not match the preferred order, children tended to switch the particles, retaining the same order of nouns. These errors provide strong evidence for the view that children expect agreement between particles and their location within the sentence.

In the delayed production condition, these children overwhelmingly preferred the SOV order. The mean score per response for the SOV sentence was .879 ($SD_1 = .172$, $SD_2 = .062$). In fact, there were only three children who used the OSV order at all.

The effect of the word order in which the model sentence was first presented for immediate imitation was assessed by a two-way ANOVA with subjects crossed with sentence nested within model, where model was either SOV or OSV. If there was retention of the original word order in which the sentence was presented, there should be an effect for model. The results show no such effect ($F' < 1$).

Summary

This experiment used an immediate imitation and delayed production paradigm looking at SOV/active and OSV/active sentences in children between ages 3 yr. 10 mo. and 6 yr. 8 mo. Children encountered difficulty imitating the OSV sentences correctly. Inspection of the errors in imitation revealed that they mostly involved particles, where the order of the nouns was retained but the first noun was marked by -ga. This constitutes strong evidence that children require agreement between the particle -ga and its position within the sentence. The delayed production data show that the SOV order was produced with overwhelmingly high frequency despite that they were modeled in equal frequency as to the OSV order in the immediate imitation phase of this experiment.

General Discussion and Conclusions

English-speaking children overgeneralize the agent–action–patient semantic sequence corresponding to the NVN sequence in the canonical, simple active sentence, and apply that strategy to reversible passive sentences at one point in development. In Japanese, the predominant, canonical word order is SOV. If children recruit similar methods of decoding incoming speech regardless of the language they are learning, one would expect Japanese children to extract from this frequent form the semantic sequence agent–patient–action and to apply this interpretation to NNV sequences. One would expect Japanese children to easily comprehend the OSV/passive while systematically reversing the SOV/passive and the OSV/active. They do not. Rather, Japanese children's requirement for overgeneralization of the canonical form is more specific. They require that the sentence share not only the NNV sequence but also the appropriate particle -ga on the first noun as well. The proper conclusion appears to be that both Japanese and American children overgeneralize from the canonical form of their language, but under different conditions. Whereas for the English-speaking child the canonical form is represented solely by word order, for the Japanese child the canonical form consists of the word order and, additionally, the particle -ga attached rigidly to the first noun position.

One would like to know the generality of these findings to other languages. Although there are few comparable studies, Segalowitz and Galang (1978) reported data on children acquiring Tagalog, a language in which basic word order is VOS. The subject and object are marked by preposed particles, and the verb affixes determine whether the subject is the agent or the patient of the action. Children reportedly find the patient-marked sentences easier than the agent-marked sentences, since the former assumes the verb–agent–patient order. Segalowitz and Galang also reported on the comprehension of sentences in the SVO order. Apparently this form is only used in formal dialogue, and so the child hears it infrequently. Nevertheless the children reportedly find the patient focus and agent focus equally easy. These results suggest differential comprehension of inflections with respect to their position within the sentence, as in Japanese children. It is unclear, however, why children showed good comprehension of what Segalowitz and Galang reported as an unusual construction.

Slobin (in press) reports some preliminary data from a cross-linguistic project involving English, Italian, Serbo-Croatian, and Turkish. Of interest here are his data from Serbo-Croatian and Turkish. Serbo-Croatian is apparently a language in which word order is relatively free, though not quite as free as Turkish in which inflections are highly regular and obligatory. Slobin and his colleagues administered sentences in all six possible orders of S, O, and V to these children, of which the SOV and OSV orders are of particular interest to the present discussion. Slobin in fact makes an explicit comparison of his Turkish data with my data reported in preliminary form (Hakuta, 1977). Slobin's comparison of our data, with minor modifications, appear in Figure 2. As can easily be seen from the graph, Turkish children apparently have no problems with either order from the very young age of 2. Slobin suggests that this superior performance on both orders is due to the highly regular markings used in Turkish as well as that all possible orders are used in Turkish. The data from the Serbo-Croatian children show that these children apparently had considerable difficulty with the OSV sentences, although the full data are not available in the article, and his final report on the project is forthcoming. Nevertheless, Slobin reports that "the child requires normal marking in terms of both word order and inflection for comprehension." Thus the Serbo-Croatian children, with their adherence to a combination of word order and inflection, appear to resemble Japanese children more than the Turkish children.

The critical variable in determining whether we observe children in particular language groups adhering to purely inflectional marking, to word order in conjunction with inflection, or to word order alone most likely depends on what the children come to expect, presumably based on the input frequencies of various combinations. Languages that utilize inflections only marginally, such as English, naturally have very little room to allow word order variability.

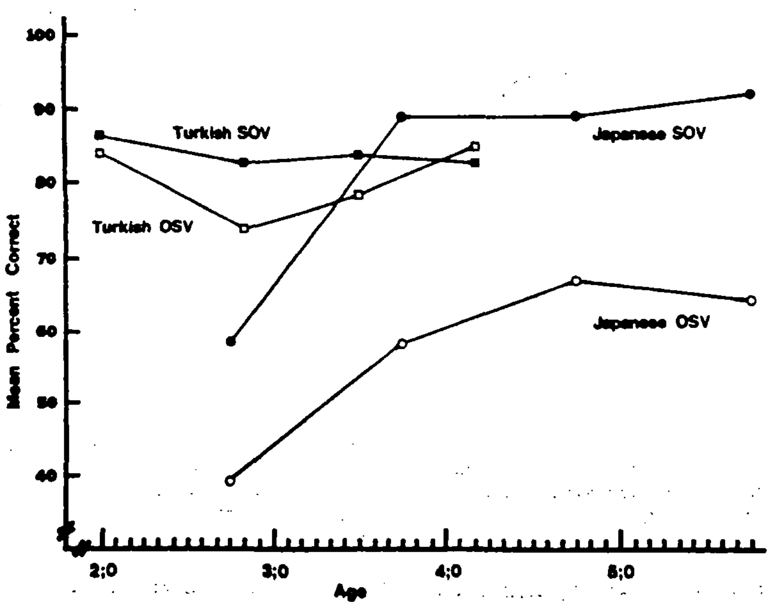

Figure 2. Comparison of Turkish and Japanese children's comprehension of subject-object-verb and object-subject-verb (SOV) (OSV) active sentences. (From "Universal and Particular in the Acquisition of Language" by D. I. Slobin. In L. Gleitman & E. Wanner (Eds.), *Language Acquisition: State of the Art*. New York: Cambridge University Press, in press. Copyright 1982 by Cambridge University Press. Reprinted by permission.)

However, even within languages rich in inflectional marking, there is considerable variance in the extent to which word order variation is observed (Steele, 1978). In Japanese and Serbo-Croatian, in which there are particles and yet in which there is a dominant canonical order, children hone in on the correlation between particles and their location within the sentence. When this expected correlation is violated, such sentences are difficult for children to comprehend. In languages such as Turkish, where all orders are heard, no such correlation exists in the language, and thus children are not bound by the constraints of word order in sentence interpretation. The extent to which inflectional marking correlates with word order is a characteristic of languages that has received increasing attention in the literature in linguistic typology (Greenberg, 1978; Li, 1975). It is regarded as a dimension along which universals of human language might be meaningfully stated. In formulating a characterization of the constraints that the child brings to the task of language acquisition, cross-linguistic research of children acquiring languages located strategically along the variables defined by the study of linguistic universals is indispensable.

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