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ABSTRACT

In an experiment conducted with 31 three-, four- and five-year-old Japanese children evidence was found for self-created definitions of the direct and indirect objects of verbs. Linguistic rules undergoing change during the course of the experiment were also observed. The results can be understood as showing that children are guided in their behavior by certain universals of language. Long before children master grammar they show the effects of systematic rules for the construction and comprehension of sentences. Sometimes these rules can be regarded as imperfect copies of adult rules. But often, when the two kinds of rules differ radically, the child's rules are better explained as being grammatical inventions, creations by the child which rest as much on his a priori expectations of the general form of language as on his experience with adult grammar. This experiment is one in which the effects of several such grammatical inventions are seen. The experiment focuses on a small point of grammar, the direct and indirect objects of verbs, but a number of rules are found that are unlike Japanese, the language to which the Ss are exposed, and like certain universals of language, in particular the universal distinction between marked and unmarked categories. (Author/KM)

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The Acquisition of Direct and Indirect Objects in Japanese

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Research Report

The research or work reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare through the Chicago Early Education Research Center, a component of the National Laboratory on Early Childhood Education, contract OEC-3-7-070706-3118.

THE ACQUISITION OF DIRECT AND INDIRECT OBJECTS IN JAPANESE[1]

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In an experiment conducted with 3-, 4-, and 5-year old Japanese children we find evidence for self-created definitions of the direct and indirect objects of verbs. We also observe linguistic rules undergoing change during the course of the experiment. The results can be understood as showing that children are guided in their behavior by certain universals of language.

Long before children master grammar they show the effects of systematic rules for the construction and comprehension of sentences. Sometimes these rules can be regarded as imperfect copies of adult rules. But often, when the two kinds of rules differ radically, such an explanation is untenable. In these cases the child's rules are better explained as being grammatical inventions, creations by the child which rest as much on his a priori expectations of the general form of language as on his experience with adult grammar (see McNeill, 1966, for extensive discussion).

We report here an experiment in which the effects of several such grammatical inventions are seen. The experiment focuses on a small point of grammar--the direct and indirect objects of verbs--but

we find in this small space a number of rules that are unlike Japanese, the language to which our Ss are exposed, and like certain universals of language, in particular the universal distinction between marked and unmarked categories. The experiment thus illustrates the inventive side of linguistic development in several ways. It shows both the product of children's inventiveness and something of its cause, in this case.

Method

Materials

In Japanese both the direct (DO) and indirect (IO) objects of the verb are marked by a postposition, and the order of the DO and IO is accordingly variable. Thus, John the turtle-ni (IO) the fish-o (DO) pushed and John the fish-o (DO) the turtle-ni (IO) pushed both mean "John pushed the fish to the turtle." In contrast to English, therefore, word order in Japanese never indicates the DO and IO; the DO as well as the IO is marked by a particle; and the marking of both is inevitable.

The verb always falls at the end of a Japanese sentence, the subject typically at the beginning, and the objects in between. The sentences we used were imperative without explicit subjects, and therefore included three content words (two objects and the verb). We placed the verb either in the normal final position, in the middle, or at the front. The two deviant sentences sound strange to fluent speakers

but are meaningful. It is also possible to remove one of the postposi-tions without causing ambiguity, and we included sentences with both -o and -ni, only -o, and only -ni. In addition, we had sentences with no postpositions at all.

The results of combining three verb positions and four conditions of postpositional marking is a set of 12 sentence schemas. With the two orders of DO and IO represented, these 12 become the following set of 21 schemas (there being only one order when no postpositions are included).

Fully Marked Sentences

IO-ni	DO-o	V	DO-o	IO-ni	V
IO-ni	V	DO-o	DO-o	V	IO-ni
V	IO-ni	DO-o	V	DO-o	IO-ni

Direct Objects Marked

IO	DO-o	V	DO-o	IO	V
IO	V	DO-o	DO-o	V	IO
V	IO	DO-o	V	DO-o	IO

Indirects Objects Marked

IO-ni	DO	V	DO	IO-ni	V
IO-ni	V	DO	DO	V	IO-ni
V	IO-ni	DO	V	DO	IO-ni

No Objects Marked

N_1	N_2	V
N_1	V	N_2
V	N_1	N_2

Only the schemas without postpositions have an ambiguous meaning for adults. An English example will suggest the effect of the others. "John to the fish the turtle pushed" is interpretable and unambiguous, though obviously a deviation from the grammar of English, and in fact almost an inversion of it.

Every S heard one sentence from each schema; in addition there were eight warm-up sentences (four with DOs only and four with IOs only), for a total of 29 sentences. The test sentences always included the same verb (agete, "give") and different nouns. The DO and the IO sometimes were animate nouns and sometimes inanimate, but whichever, were always the same within a sentence. The Ss, therefore, could never choose the DO on grounds of inanimacy.

An array of toys and other props (purchased in Japan for the sake of familiarity and with names likely to be known to the youngest children) was set before the Ss. Each sentence referred to a different pair of toys and the same sentence referred always to the same toys with all the Ss.

Conduct of the Experiment

The Ss were seen individually in a room set aside for our use at the schools the Ss were attending. In most cases two adults (D. M. and either R. Y. or N. B. M.) were in the room with the S, though on occasion one of the teachers or the headmaster was also present.

Everything said to the S was said in Japanese. R. Y. and N. B. M. are native speakers and conducted the experiment.

Before hearing a test sentence, the S was asked to name the two objects to be used on that trial. Only one child was unable to offer some kind of name, and this on only one trial. On all other occasions either the Ss knew the standard name or had available names of their own. The E used the S's terminology at all times.

The Ss were instructed, by use of the eight warm-up items, to move one toy so that it would touch the other. The exact movement was unimportant, so long as one toy was clearly moved and the other toy was clearly the target of the movement. Children who moved both toys, or who refused to move either toy, were given repeated practice with the warm-up series until clear responses were obtained. Virtually all children were able to master this experimental routine; the few who could not were not used.

The sentences were presented in one of two orders to all the Ss. It was feared that mutilated sentences might confuse and repel the Ss if they were encountered first, so the initial test items were always the

six sentences with both postpositions. The second block of test items was composed of the six sentences with marked IO-ni and unmarked DO, these seeming slightly more natural than the six with marked DO-o and unmarked IO, which made the th block. Last were the three sentences with no marking. Verb-final sentences were first in each block. Within these limitations we used two orders of presentation.

It was decided in designating the experiment that the advantages of presenting the more deviant items later outweighed the resulting confounding between the grammatical form of a sentence and its place in the presentation order.

The procedure required about 15 minutes for the older Ss, and about ten minutes for the younger ones. Fatigue and the wandering of attention were therefore probably not major factors. With the youngest Ss, in particular, the procedure was brisk and lively and designed to hold Ss to the task.

Subjects

The Ss were 31 children, 19 boys and 12 girls, drawn from the student population of two private nursery schools in or near Kyoto, Japan. The families served by the schools are middle and upper middle class. The Ss have been divided into age groups, as described in Table 1.

Insert Table 1 here

Results

Analyses by Age

Table 2 shows the percentage of all responses made with the correct toy (i.e., the one identified as the DO) for each schema, in each of the three age groups. In the case of the unmarked schemas, where no object is identified as the DO, Table 2 arbitrarily shows the percentage of all responses made with the object identified first in the schema. The results with these unmarked sentences will be discussed below, in the section called "Analysis by Individuals."

Insert Table 2 here

Overall performance by the 4-year olds is best (X = 82%); and by the 5-year olds next best (X = 71%); the 3-year olds are worst by a substantial margin and in fact perform no better than at chance levels (X = 53%). These differences are significant at $p < .001$ by the H-test. Since the 4- and 5-year olds come from one school and the 3-year olds from another, the curvilinearity with age cannot be ascribed to any differences between the schools or the families they serve. The difference between the 4- and 5-year olds is significant at $p = .07$ by the U-test.

Aside from these differences with age, few other divisions the data yield significant effects. In particular, whether a sentence is fully dressed with -o and -ni, or with only one postposition and not the other, makes no difference in the number of correct responses. With 3-year olds, 53% of the responses to fully marked sentences were correct, 55% of the responses with the DO but not the IO marked were correct, and 45% of the responses to sentences with the IO but not the DO marked were correct--a variation significant almost exactly at $p = .20$ by the H-test. With 4-year olds the corresponding values are 82%, 74%, and 77%, for which $p < .50$ by the H-test. And with 5-year olds the values are 73%, 75%, and 63%, for which $p > .50$ by the H-test.

This evidence of numbers is consistent with our impression from conducting the experiment. No child seemed surprised by the sentences without a postposition, despite the fact that -o and -ni are obligatory and therefore present in most of the DO and IO sentences children hear. As we will show they have other definitions of DO and IO available and ready for use.

In a similar indifference to the customary form of Japanese sentences, where one would suppose that verbs in the normal final position would produce more correct responses, we find no significant differences among the three verb sites. Performance is marginally better with final verbs among the 3- and 5-year olds, but the difference is remote from significance ($p > .50$).

For later discussion it is worth pointing out a statistically non-significant tendency among the 4 and 5- year olds to choose the first noun of a sentence as the DO, and among the 4-year olds, to choose also the noun next to the verb as the DO. As we will show below, in the section of "Analysis by Individuals," both tendencies correspond to common definitions of the DO before children have discovered the Japanese marking system.

Analyses by Level of Performance

The correlation coefficient (tau) between age and the number of correct responses. While the figure is statistically significant, it shows only a weak association of performance with age. It may be the case that, by grouping the Ss according to age, we have obscured certain regularities which in fact exist. We would lose sight of regularities, if, for example, there are stages in development and two or more occur at a single age. To accentuate such stages, if there are any, we have reorganized our sample of Ss according to their level of performance.

As the measure of performance we use simply the total number of errors. With the 18 sentences where an error is possible, one S committed 15 and three Ss committed none; this range happens to be divided into three roughly equally numerous groups in our data. The 12 best performers (Group I) have a mean age of 4;6 and committed

an average of 2.4 errors; the 9 middle performers (Group II) have a mean age of 3;11 and committed an average of 4.4 errors; and the 10 worst performers (Group III) have a mean age of 3;8 and committed an average of 9.6 errors.

Certain effects now appear which were invisible before, but the data show no sign of stages in development. Groups I and III recemble each other more (tau = .38) than either resembles Group II (tau = .09 and .13, respectively). By organizing the Ss according to performance we seem merely to have separated the Ss who have learned how the DO and IO are indicated by postpositions in Japanese, from those who have not. For Group I IO-marked sentences are better understood than fully marked ones, and fully marked sentences are better understood that DO-marked ones ($p < .001$, by the H-test). The Ss in Group I are thus sensitive to what happens to the postpositions in a sentence. The Ss of Groups II and III show no special sensitivity in their regard: fully marked, DO-marked, and IO-marked sentences are essentially the same for them ($p > .20$ and $> .90$, respectively). We return below to the apparently puzzling fact that for Group I, IO-marked sentences are superior to fully marked ones.

Although Group I has learned how IO and DO are marked and Group III has not, the two groups show a similar pattern when errors are made. There is a tendency for the first noun to be the DO regardless

of its making in both Group I ($p = .05$ by the median test) and Group III ($p < .02$ by the median test). Group II shows a feeble preference for the opposite order ($p > .50$). When the first noun is also the first word of a sentence, there is a still stronger tendency in Groups I and III to make it the DO ($p < .01$ for both groups by the median test), while the opposite is again weakly the case for Group II. Thus, in spite of the great difference in the level of success between Groups I and III the two respond to similar forces within a sentence. There is, besides, a tendency for the noun next to the verb to be the DO regardless of its marking, but this tendency is as weak with the performance grouping as with the age grouping reported above. Also, as with the age grouping, there is no evidence that performance is affected by the position of the verb, even in Group I. Superior performance in the experiment evidently depends only on the postpositions in a sentence.

Analyses by Individuals

If we leave the collective findings and examine the behavior of individual Ss many of the apparent irregularities in the experiment disappear. Only four Ss, two each at three and five years, fail to follow any kind of regular pattern. All other Ss, including those who make only two or three errors, systematically follow a few principles for finding the DO of a sentence. The principles apparently are of the

children's own invention. The true degree systematization is not reflected in the group results because different children follow different rules and some children shift rules in the middle of the experiment. Only the most common and systematically followed rules survive the averaging process. Table 3 summarizes the patterns we find in the individual records. The entries in the table are not independent of each other, as children who follow more than one rule are represented more than once. The number of Ss contributing to Table 3 is 26; 5 Ss with one or no errors have been excluded.

Insert Table 3 here

We have selected and summarize below five individual records of different levels of complexity. Our purpose is to illustrate the major categories of individual behavior in the experiment. Since we have not attempted to account for idiosyncratic details it is possible that there are exceptions to the rules we suppose the Ss follow. The number of exceptional responses, however, is small--never more than 20% and in some cases nil.

1. Our first and simplest example is a child of 3;1 years who has essential mastery of the Japanese system of marking the IO and DO.

On three occasions she followed an alternative and more primitive definition, using the intended IO, when it was next to the verb, as the DO. behavior shows how easily children shift between different definitions of the DO, even when one of them is correct. The lapses occurred at scattered points in the experiment. When the schemas were unmarked the child again chose the noun next to the verb as the DO.

2. Presenting a slightly more complex situation is a child of 3;10 years who understands the meaning of the IO postposition (ni) but is confused by the presence of the DO postposition (o). When only the IO was marked the child's response was always correct; when the sentence was fully marked or the DO only was marked the child's response was to move the toy identified by the first noun. Evidently the postposition -o caused her to retreat to a more primitive level in fully marked sentences. She treated them as if they contained -o only, rather than -ni as well as -o.

3. More complex is a child of 5;1 years, who also understands the IO postposition, but unlike the subject just described, is able to use this postposition in the presence of the DO postposition. However, when the sentences are marked only for DO, she treats the marked noun as the IO. Thus her performance is perfect on fully marked and IO-marked sentences and imperfect on DO-marked ones. It is difficult to say precisely what the IO for this S is, except that her definition does not depend on position in the sentence or proximity to the verb, as long as some postposition exists. In unmarked sentences, however, the

second noun is the IO (and in common with many Ss the DO is the first noun).

4. This example and the next show the shifting of definitions, a phenomenon of some interest, as we discuss below. The first case is a child of 5;0 years, who began the experiment always choosing the noun next to the verb as the DO, and shifted on the seventh trial to the noun away from the verb. When the verb was next to the two nouns, in middle position, the S chose the first as the DO. Thus, he abandoned one perfectly false definition of the DO for another in the middle of the experiment. Our record of observations of the S show nothing unusual at the time of the shift. When no nouns were marked, the S chose always the toy from the right.

5. Our final example reaches such a level of complexity that the full record requires reproduction. The S, a girl of 3;7 years, chose the DO as follows (a "position bias" appears in the record when the S was given a single sentence twice, the left-right position of the toys being reversed, and chose from the same side both times; we performed this test at intervals with all Ss when their behavior suggested such a bias):

Schemas in the order given			S's choices of DO
DO-o	IO-ni	V	N_1 away from the Vb
IO-ni	DO-o	V	N_1 away from the Vb
V	IO-ni	DO-o	N_1 next to the Vb
IO-ni	V	DO-o	N_2 next to the Vb
V	IO-ni	DO-o	N_1 next to the Vb
DO-o	V	IO-ni	N_1 next to the Vb
IO-ni	DO	V	N_2 next to the Vb
DO	IO-ni	V	N_2 next to the Vb
IO-ni	V	DO	Position bias
V	DO	IO-ni	Position bias
DO	V	IO-ni	N_1 next to the Vb
V	IO-ni	DO	Position bias
DO-o	IO	V	N_1 away from the Vb
IO	DO-o	V	N_1 next to the Vb
V	DO-o	IO	N_1 next to the Vb
IO	V	DO-o	N_2 next to the Vb
V	IO	DO-o	N_1 away from the Vb
DO-o	V	IO	N_2 next to the Vb

There seem to be three or four definitions of the DO in use: it is marked with -o, it is next to the verb, it is away from the verb and it.

is the first noun. Each of these principles is used in half the applicable schemas, except the last, which is used in two-thirds.

However, as the lines drawn above are meant to indicate, the S probably used only two definitions and applied them in a complex alternation, much like the "complexes" Vygotsky (1962) described in children's thought. The S begins with the DO as the noun away from the verb, switches to the noun next to the verb, then back to the noun away from the verb, and so forth. The cycles become shorter and shorter. As in a Vygotskyean complex, a single feature of one object forms a bridge to the next, the successive groups all being linked by N_1. A definition was protected from change so long as the DO was the second noun, but when the DO happened to be the first noun it was no longer immune and could be shifted. Obviously, this S was highly sensitive to the positions of words and the proximity of verbs. These two characteristics of sentences accommodate all her responses. If we further suppose that she was attempting to form a notion of what we wanted and to solve the problem of finding the DO in the experiment, but was limited to complexive thinking, we can explain this otherwise complex alternation of definitions as a natural result.

Altogether nine Ss shifted their definitions of the DO in the course of the experiment. Besides the two described above, there are two more 5-year olds, three more 4-year olds, and two 3-year olds. If we look

at the schemas on which these Ss shifted definitions, we find that a large number of shifts occurred when the Ss encountered verbs in abnormal positions, immediately after sentences with verbs in the normal positions. The frequency of shifts at these particular points is two-and-a-half times as great as it would be by chance. Moreover, novelty seems to be the essential factor. Fully marked sentences, which came first in the experiment, are overrepresented by a factor of nearly two, producing the peculiar result that the sentences most like normal Japanese create the greatest uncertainty in the S's definitions of DO.

We suspect that the first and second verb positions had a liberating effect of the Ss, releasing a preferred definition of the DO. In general, young Ss want the DO to be both the first noun in the sentence and the noun next to the verb; it is possible to meet these standards simultaneously only in sentences where, unlike normal Japanese, verbs come first or second.

The unmarked schemas, those without any postpositions, show patterns of response exactly comparable to the patterns of errors shown with the marked sentences. The only major difference lies in the greater number of non-linguistic responses to the unmarked sentences; position biases were about three times as frequent. The similarity of patterning should not surprise us, of course, since the absence of

postpositions leaves no definitions of the DO available except positional ones.

Discussion

Several aspects of language acquisition are on view in this experiment. Within the experiment itself there are examples of what we regard as actual linguistic change.

Virtually every child shows evidence of having some kind of rule for determining the DO and IO of sentences. Most commonly these are rules that depend on the position of nouns and the proximity of verbs; as such, they are without examples in adult speech. Any statistical biases in adult Japanese would of necessity produce a different pattern of results from that which we find. If, for example, there is a tendency for the DO to occur before the IO in the speech of the adults our Ss hear, there is an equal tendency for the DO to occur away from the verb. Since our Ss favor both first nouns and nouns next to verbs, we are assured that these definitions are not reflections of statistical biases in adult speech; they are spontaneous inventions by children to accommodate the concepts of the DO and the IO.

There is no reason to suppose the actual Japanese system of noun marking is acquired in some other way than spontaneous invention. We assume that, at the moment of acquisition, the use of postpositions

also is a spontaneous invention, which differs from the inventions of our Ss only in fitting the facts of Japanese more closely. Such successes obviously do not make the marking of nouns occur in the first place. Moreover, we find five cases of partially correct invention, where a child responds to the marking of nouns but has reversed the significance of the particles (see Table 3). While these reversals do not establish that a marking system has been invented, they do show that it is possible to grasp the principle of marking without experiencing any success at all.

Five Ss changed the definintion of the DO once during the experiment, one S twice, and one S five times. This count does not include the four Ss who (like the first individual S described above) have essential mastery of the Japanese system but use alternate definitions of the DO on three of four occasions. Such shifting of definitions must be the ultimate process of linguistic development. We find no reason to doubt that actual linguistic changes were taking place as the Ss moved from one definition of the DO to another. It is a process that occurs constantly during the period of language acquisition, and our experiment captured the part of it taking place when we saw our Ss. The facility the Ss show in changing rules is surprising to us, however, as it far outdistances anything previously reported. By observing 31 Ss for 10 or 15 minutes each we witnessed rules being changed 14 times. That is, an average

of .04 rules were being changed every minute, or, for a single child, about one rule every half hour. Possibly this high degree of flexibility is one aspect of children's capacity for language.

A somewhat different way of thinking about this experiment is to regard each sentence as a stimulus that can evoke either of two responses: moving the intended DO or moving the intended IO. Every sentence in the experiment evokes both responses from the Ss, but most sentences are stronger stimuli for one response than for the other. If we think of the 21 sentences of the experiment as presenting the range of possible stimuli for these two responses, and locate the actual Japanese sentences we used within this range, we find the sentences of Japanese are not the best stimului for evoking the DO response and suppressing the IO one. The best stimulus to accomplish these effects for our Ss (combining all ages) has the verb first, the DO second and unmarked, and the IO last and marked. Such a sentence is, as it were, a "supernormal" stimulus, working better than anything nature (i.e., Japanese) provides for the control of the DO response.

It is possible that this particular stimulus reflects certain unlearned principles in the organization of sentences, and is "supernormal" for that reason. It will be recalled that when we stratified our Ss according to the level of performance, the most proficient Ss in Group I performed best with IO-marked sentences, next best with fully

marked ones, and poorest with DO-marked ones. Groups II and III showed no such effect. Evidently Ss who are aware of the postpositional marking of objects in Japanese find DO-marking confusing. (The second of the individual cases discussed above shows the same confusion.) We can explain this pattern of errors if we suppose that young children seek marking of the IC but not of the DO. More generally, the pattern reflects a universal distinction in language between marked or secondary forms and unmarked or primary forms (Jakobson, 1968). Our Ss were inclined to accept as the DO both the first noun and the noun next to the verb, showing that for them the DO is the most prominent of the objects and the one most closely related to the verb. In accordance with the universal principle of marking, the Ss seek unmarked DOs and marked IO. Combined with the prominance of the DO this creates a "supernormal" stimulus for the DO response that takes the form we observe it to have. And in general, it causes children who have learned some but not all of the Japanese marking system to be most accurate when the IO alone is marked, next most accurate when the DO also is marked, and least accurate when the IO is not marked.

If our theory is correct, children learning other languages ought to show the same preference for IO-marking, and the languages of the world, reacting to this preference, ought to mark IO more often than DO. There is not yet evidence bearing on either of these points.

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Footnotes

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Table 1

Samples Organized According to Age

GROUP	MEAN C.A.	C.A. RANGE	N
3 years	2;10	2;3 - 3;1	10
4 years	4;1	3;7 - 4;6	11
5 years	5:2	5;0 - 5;7	10

Table 2

Percentages of Responses Correct at 3, 4, and 5 years

Schema			2;3 - 3;1 (N = 10)	3;7 - 4;6 (N = 11)	5;0 - 5;7 (N = 10)
IO-ni	DO-o	V	80	82	100
DO-o	IO-ni	V	40	73	70
IO-ni	V	DO-o	50	82	40
DO-o	V	IO-ni	60	91	100
V	IO-ni	DO-o	80	73	50
V	DO-o	IO-ni	50	91	80
IO-ni	DO	V	50	91	80
DO	IO-ni	V	40	73	80
IO-ni	V	DO	50	63	60
DO	V	IO-ni	40	82	80
V	IO-ni	DO	30	56	80
V	DO	IO-ni	60	81	70
IO	DO-o	V	70	73	50
DO-o	IO	V	60	91	80
IO	V	DO-o	50	81	70

Table 2 (continued)

Percentages of Responses Correct at 3, 4, and 5 years

Schema			2;3 - 3;1 (N = 10)	3;7 - 4;6 (N = 11)	5;0 - 5;7 (N = 10)
DO-o	V	IO	70	91	80
V	IO	DO-o	50	64	50
V	DO-o	IO	30	64	50
N_1	N_2	V	29	83	75
N_1	V	N_2	29	83	63
V	N_1	N_2	17	50	63

Table 3

Summary of Individual Patterns

Definitions of DO	Numbers of Ss
First Noun	12
Second Noun	6
Noun next to Verb	14
Noun away from Verb	6
Noun marked by -ni	3
Definitions of IO	
Noun marked by -o	2
Shift in Definitions	
One Shift	7
Two Shifts	1
Five Shifts	1