Evidence for a Language Learning Strategy: On the Relative Ease of Acquisition of Prefixes and Suffixes

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KUČZAJ, STAN A., II. Evidence for a Language Learning Strategy: On the Relative Ease of Acquisition of Prefixes and Suffixes. CHILD DEVELOPMENT, 1979, 50, 1-13. 4 experiments tested Slobin's hypothesis that children are predisposed to learn suffixes rather than prefixes. In general, the results support the hypothesis and demonstrate that this learning bias for suffixes may affect the initial processing of information about affixes and/or the postinitial processing of such information. However, the results of experiment 1 demonstrate that previous experience may alter learning biases to some extent. The findings obtained from the 4 experiments are discussed in terms both of the importance of language learning strategies in the language acquisition process and of the influence of experience on the child's utilization of such strategies.

It is well recognized that the child learning his mother tongue faces a formidable task. The language acquisition task becomes a bit less awesome if one assumes that the child comes to the task with some predispositions about language. Although the precise nature of these predispositions is far from clear (see Chomsky 1972; Derwing 1973), numerous theorists have suggested that the language-learning child is equipped with a set of strategies which somewhat ease the child's task (Bever 1970; Brown 1973; Chomsky 1969; Clark 1977; Slobin 1973), although a strategy might occasionally mislead a child, as in the child's interpretation of passive sentences as active (Bever 1970, Maratsos 1974a). Slobin (1973) has provided the most comprehensive list of possible strategies (which he terms operating principles) the language-learning child might employ, as well as rationale for the same (see Maratsos, in press, for a critical discussion of Slobin's posited operating principles and universals of language development). Of particular concern here is the following suggested universal of grammatical acquisition and its corresponding operating principles. Universal A₁: For any given semantic notion, grammatical realizations in the form of suffixes or postpositions will be acquired earlier than realizations in the form of prefixes or prepositions. Operating principle A: pay attention to the ends of words. Operating principle B: the phonological forms of words can be systematically modified.

In essence, this hypothesized universal and two hypothesized operating principles predict that suffixes marking a particular semantic notion will be earlier acquisitions than prefixes marking the same semantic notion, the reasons being the child's hypothesized disposition to pay attention to word endings and his (tacit) knowledge that the phonological form of a word can be systematically modified in order to alter the meaning of the word (see Slobin 1966). In support of the purported universal and operating principles, Slobin (1973) reports that children simultaneously learning Hungarian and Serbo-Croatian acquire the Hungarian locative prior to the Serbo-Croatian locative. Since the Hungarian locative is expressed by noun suffixes and the Serbo-Croatian locative is not, this finding suggests that the child may be attending to word endings and thus acquire forms to express a meaning.

I am grateful to Becky Engelhorn, Cynthia Morris, and Mary Nunley for their assistance in pilot testing and collecting the data of the experiments reported in this paper. A version of this paper was presented at the biennial meeting of the Southwestern Society for Research in Human Development held in Dallas, Texas, March 1978. Author's address: Department of Psychology, Southern Methodist University, Dallas, Texas 75275.
earlier if the forms are suffixes. However, the Hungarian locative is linguistically less complex than the Serbo-Croatian locative, and so it is not clear what factor determines the earlier acquisition of the Hungarian locative—the fact that it is expressed via suffixes, the fact that it is not as complex a linguistic system as the Serbo-Croatian locative, or both? Nonetheless, as Slobin notes, the fact that locative inflections appear before locative prepositions in monolingual child speech in several languages (including Serbo-Croatian) suggests that word endings are perceptually salient, as does the finding that the accusative and dative are earlier acquisitions in languages in which they are expressed as suffixes than, for example, in German where they are expressed as prenominal articles.

Slobin also notes that children's spontaneous imitations of words are consonant with the notion that word endings are perceptually salient in that children often imitate only the last part of a word (e.g., raaff for giraffe in English). However, the spontaneous imitations comprise an unsystematic set of data, and it is not immediately clear whether children exhibit a strong tendency to imitate the last part of a word if any part of the word is imitated.

The experiments reported in the present paper were intended as empirical tests of two of the main ideas underlying Slobin's posited universal and operating principles. The two hypotheses to be tested are: (1) suffixes have greater perceptual saliency for young children than do prefixes; (2) suffixes which express a given meaning will be easier acquisitions than prefixes which express the same meaning.

Experiment 1

Method

Subjects.—Subjects were 48 preschool children ranging in age from 4-3 (years, months) to 6-9, grouped according to age, condition, and Peabody Picture Vocabulary Test score, as will be explained below.

Design.—A matched-subjects experimental design was employed. Although a within-subjects design would have been preferable since it would have allowed a direct comparison of the relative ease of learning suffixes versus prefixes for individual children, pilot testing revealed that children found it very difficult to learn novel suffix and prefix forms if they were exposed to novel suffixes and novel prefixes. (Pilot work also revealed that 3-year-old children found the task most difficult.) Thus, a decision was made to expose individual children to either a novel suffix or a novel prefix expressing either past reference or future reference. This yielded four conditions for each age group: prefix/past, prefix/future, suffix/past, and suffix/future. Since there were three age groups (4-year-olds, 5-year-olds, and 6-year-olds), there was a total of 12 groups. Within each age group, the groups were matched for sex (two males and two females in each group) and for scores on the Peabody Picture Vocabulary Test which had been given approximately 1 week earlier. (The matching on the Peabody test was not perfect, since identical scores were rare. However, an attempt was made to match the groups as closely as possible on Peabody scores.)

Exposure and test sentences.—The nonsense syllable ip was used as the novel suffix or prefix for each group. Each group received the following eight exposure sentences with ip serving as a verb suffix or prefix depending upon the condition (for each instance of an affixed word, the root was stressed). (1) The boy jump on the bed. (2) The lady drive the car. (3) The mother swing the baby. (4) The boy kick the car. (5) The dog fall down. (6) The man push the car. (7) The baby kiss the dog. (8) The boy hit the girl.

Children in the past tense conditions received the following eight test sentences: (1) The horse ran fast. (2) The monkey climbed the tree. (3) The girl brushed her hair. (4) The bird flew high. (5) The lion roared very loud. (6) The plant grew tall. (7) The baby cried three times. (8) The fish swim upstream.

Children in the future reference conditions received the following test sentences. (1) The horse will run fast. (2) The monkey will climb the tree. (3) The girl will brush her hair. (4) The bird will fly high. (5) The lion will roar very loud. (6) The plant will grow tall. (7) The baby will cry three times. (8) The fish will swim upstream.

Procedure

Each child was trained and tested individually with the entire procedure being recorded on a Sony portable tape recorder. The experimenter sat at a table with the child and allowed the child to choose one of two available puppets to use in the experiment. The experimenter then took the remaining puppet.
and explained to the child that the experimenter's puppet would speak a little bit differently than everybody else and that the child should listen very carefully to what the experimenter's puppet said so that the child could teach his or her puppet to talk like the experimenter's puppet.

For the two past reference groups, the experimenter acted out the action expressed in an exposure sentence (with toys), then had his puppet say the sentence with ip in either a suffix or prefix position depending on the condition, and then asked the child to have his puppet repeat the exposure sentence. If necessary, the exposure sentence was repeated in order to allow the child to attempt to reproduce it. Then this procedure was repeated with the next exposure sentence, and so on, until all eight exposure sentences had been presented to the child. Immediately following this, the experimenter presented the test sentences to the child. For the past reference condition, the experimenter told the child that he was going to say something and that the child should make his puppet say it the way the experimenter's puppet would say it, in other words, to talk like the experimenter's puppet did. The experimenter then said an English past tense sentence (see above), and asked the child to have his puppet say the sentence the way the experimenter's puppet would say it. This procedure was repeated until the child had responded to each of the eight test sentences.

The procedure for the children in the future reference condition differed only in that during the presentation of the exposure sentences, the experimenter's puppet said one of the sentences, the child attempted to have his puppet repeat the sentence, and then the experimenter acted out the action described in the sentence. During testing, these children were given future tense sentences (see above) to transform to sentences that the experimenter's puppet would understand.

Scoring
The children's imitations of the exposure sentences were scored as correct if the child retained ip in the position (prefix/suffix) it had occupied in the exposure sentence. There were three categories of incorrect imitations: (1) those which omitted ip (e.g., the lady ipdrive the car imitated as the lady ipdrive the car), (2) those which moved ip to a different position than that it had occupied in the exposure sentence (e.g., the lady ipdrive the car imitated as the lady drive-ip the car), and (3) those which kept ip in the prefix or suffix position but added a modal auxiliary or past tense marker (e.g., the lady ipdrive the car imitated as the lady will ipdrive the car or the lady ipdried the car).

Responses to the test sentences were scored according to whether ip was used and according to the position (prefix or suffix) in which it appeared. A correct response was one in which the child used ip in the appropriate position.

Results
Imitations.—The elicited imitation task was designed as a means to insure that the children had in fact attended to the prefix/suffix ip. The exposure sentences were relatively short in order to reduce the possibility that the length of the model sentences would prohibit the children from processing the novel prefix/suffix. Nonetheless, children were unable to imitate each model sentence correctly. Table 1 shows that older children were more likely to imitate the model sentences correctly than were their younger counterparts, $F(2,36) = 6.59$, $p < .01$. There was virtually no difference between children's ability to correctly imitate model sentences containing a prefix and those containing a suffix. However, children were more likely to imitate past tense model sentences correctly than they were to imitate future tense model sentences correctly, $F(1,36) = 4.65$, $p < .05$. In spite of these differences, the results suggest that children in all conditions were able to attend to the novel prefix/suffix. That there was no difference between children's imitations of prefix sentences and suffix sentences does not reflect on Slobin's hypothesized universal and operating principles since the model sentences were short enough to allow verbatim reproduction in many cases.

Although children were much more likely to imitate the model sentences correctly than to imitate the model sentences incorrectly, $F(1,36) = 21.55$, $p < .001$, the few incorrect imitations do provide some information concerning the manner in which the children processed the information in the exposure sentences since the incorrect imitations did not occur randomly. Omissions of ip from imitations were more likely for future tense sentences than for past tense sentences, $F(1,36) = 9.37$, $p < .01$. Moreover, although errors involving the shifting of ip from its position
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#### TABLE 1

**SUMMARY OF RESPONSES DURING EXPERIMENT 1 GROUPED ACROSS CONDITION AND CHRONOLOGICAL AGE**

<table>
<thead>
<tr>
<th>RESPONSE MEASURES AND AGE</th>
<th>Prefix/Past</th>
<th>Suffix/Past</th>
<th>Prefix/Future</th>
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<tbody>
<tr>
<td><strong>Mean number of correct responses in imitation task:</strong></td>
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<td><strong>Mean number of correct responses in test task:</strong></td>
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<td><strong>Mean number of omissions of novel prefix/suffix in test task:</strong></td>
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<tr>
<td>4</td>
<td>5.0</td>
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<td>2.75</td>
<td>1.5</td>
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<tr>
<td><strong>Mean number of times children used prefix as suffix (or vice versa) in test task:</strong></td>
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<tr>
<td>4</td>
<td>1.25</td>
<td>0</td>
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<td>0.5</td>
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in the exposure sentence to a new position were quite rare, no such errors occurred in the suffix/past condition or the prefix/future condition. Errors of this type consisted of moving *ip* from a prefix position to a suffix position in the prefix/past condition or moving *ip* from a suffix position to a prefix position in the suffix/future condition. The relation of these errors, the deletion errors, and the correct imitations to the children's responses in the test situation will be discussed later.

**Test Responses**

The children's responses to the test sentences are summarized in table 1. Older children were more likely to respond correctly than were younger children, $F(2,36) = 14.69$, $p < .001$. Children were also more likely to respond correctly to past tense test sentences than to future tense test sentences, $F(1,36) = 5.87$, $p < .01$. Children were also better at responding to suffix test sentences than to prefix test sentences in accordance with Slobin's hypothesis, although this difference failed to achieve statistical significance, $F(1,36) = 2.38$, $p > .1$. Significantly, there was a strong interaction between the prefix/suffix dimension and the past/future dimension, $F(1,36) = 15.96$, $p < .001$. The implications of this interaction are important, as will be noted in the discussion.

Older children were less likely to omit *ip* in their responses to the test sentences than were the younger children, $F(2,36) = 15.58$, $p < .001$. Children were also more likely to omit *ip* if they had been exposed to it as a prefix than if they had been exposed to it as a suffix, supporting Slobin's hypothesis about the relative perceptual salience of suffixes. This difference failed to achieve statistical significance, however, $F(1,36) = 2.39$, $p > 1$. Interestingly, age was not a significant factor insofar as the use of *ip* in the wrong position (in a nonprefix position after exposure to *ip* as a prefix and in a nonsuffix position for *ip* as a suffix) was concerned, $F(2,36) = 1.88$, $p > .25$. There was, however, a strong interaction between the prefix/suffix factor and the past/future factor, $F(1,36) = 38.54$, $p < .001$.

**Relation between Imitation and Test Response**

There was a significant relation between correct responding on the imitation task and correct responding on the test task, $r(47) = .43$, $p < .01$, and also between deletion of *ip* in imitations and omission of *ip* in the test task, $r(47) = .60$, $p < .01$. This is not surprising, since a child who could not imitate *ip* in its proper position in the elicited imitation task could hardly be expected to use *ip* correctly in the test task condition. In fact, given this probable dependence relation, one might have expected the correlations to have been higher than they were. Recall, however, that the elicited imitation task was constructed in order to facilitate correct responding. Thus, children
were much better at the imitation task than at the test task. The difference between correct responding in the imitation task and correct responding in the test task was substantial ($\bar{X} = 7.13$ for imitation task, $\bar{X} = 3.42$ for test task). It is also interesting that no child responded correctly in the imitation task as often as he did in the imitation task ($p < .001$, by sign test). It would appear, then, that the imitation task served its function as an indicator of whether or not the children had even superficially analyzed the novel nonsense suffix/prefix, while the test task assessed the degree to and the manner in which the children used this initial analysis.

**Discussion**

The results from experiment 1 provide some support for Slobin's hypothesis that suffixes will be easier acquisitions than prefixes, since in general children were more likely to respond correctly in suffix test conditions than in prefix test conditions. However, this was an overall difference, and there was a significant interaction between the prefix/suffix dimension and the past/future dimension. Children were more likely to respond correctly in the suffix/past test condition than in the prefix/past condition, $t(22) = 10.61, p < .001$, and were more likely to respond correctly in the prefix/future condition than in the suffix/future condition, $t(22) = 1.47, p > .1$. Although the latter difference is not statistically significant, it is noteworthy because it helps to illustrate the interaction observed between prefix/suffix and past/future conditions. This interaction is also borne out in the movement of *ip* to a different position than it had occupied in the exposure sentences. Children in the suffix/past condition did not move *ip* to a prefix position in the test situation, while children in the prefix/past condition did occasionally move *ip* to a suffix position in the test situation, this being a significant group difference, $t(22) = 3.94, p < .001$. Children in the prefix/future condition did not move *ip* to a suffix position in the test situation, whereas children in the suffix/future condition did sometimes move *ip* to a prefix position in the test situation, $t(22) = 4.28, p < .001$.

These results do not provide straightforward support for Slobin's claim that suffixes will be easier acquisitions than prefixes for a given semantic notion. The prefix *ip* was an easier acquisition than the suffix *ip* in the future condition, while the suffix *ip* was an easier acquisition than the prefix *ip* in the past condition. However, these findings do not necessarily repudiate Slobin's hypothesis. Instead, they demonstrate the influence of past knowledge on the processing of new information. Children acquiring English as their first language have gained considerable knowledge about past tense and future tense forms prior to the age of 4-3 (Brown 1973; Clark 1970, 1973; Cromer, Note 1) this being the age of the youngest child in experiment 1. Thus, the children had (tacit) knowledge that English expresses the simple past tense via a suffix (the regular -ed form) and numerous irregular forms and the future tense via a prefix (usually *will*). The results reflect this tacit knowledge and demonstrate that the processing of new linguistic forms is influenced by past experience in the sense that children appear to develop expectancies as to where certain semantic information is most likely to be syntactically encoded in their language. If a child has learned to express a semantic notion with a suffix (the English past tense), he finds it easier to learn a novel suffix than a novel prefix with which to express the semantic notion. If, however, he has learned to express a semantic notion with a prefix (the English future tense), he finds it easier to learn a novel prefix than a novel suffix with which to express the semantic notion. Moreover, if the child has learned to express a semantic notion with a prefix (suffix), he will sometimes move a novel suffix (prefix) to the previously learned prefix (suffix) position. Thus, children seem to learn syntactic positions as well as linguistic forms with which to express a given semantic notion. This knowledge appears to influence both the initial and postinitial processing of linguistic information (at least that concerning affixes).

At any rate, the results demonstrate that Slobin's hypothesis concerning the relative difficulty of learning prefixes and suffixes for a given semantic notion does not hold for semantic notions for which a linguistic form (or forms) has been acquired. In such cases, the consolidation of previously acquired information proves to be as important as whether the novel form appears in either a suffix or prefix

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1 It is not clear that English actually utilizes a future tense in the same sense that it utilizes a present tense and a past tense (see Jespersen 1969; Lyons 1969). Speakers of English do engage in future reference, and this behavior is what is referred to by the phrase "future tense" here.
Condition. However, Slobin's hypothesis need not account for the acquisition of novel forms with which to express a semantic notion which is already expressed by either a prefix or suffix form since the hypothesis was not supposed to reflect an unyielding bias but a relative tendency. Thus, a better test of the hypothesis would involve the utilization of semantic notions which children have not yet learned to express primarily with either a prefix or a suffix form. This is what was attempted in the following experiment.

Experiment 2

Method

Subjects.—Subjects were 48 preschool children ranging in age from 3-2 to 5-10. As in experiment 1, children were grouped according to age, condition, and Peabody Picture Vocabulary Test score. Unlike experiment 1, 3-year-old children were tested in experiment 2 in the hope that at least some information could be gained about the younger child's biases in regard to prefix/suffix learning. Thus, the three age groups in experiment 2 were 3-year-olds, 4-year-olds, and 5-year-olds. The four groups within each age group were matched for sex and Peabody Picture Vocabulary Test scores (again, only approximate matching was possible for the Peabody scores.)

Conditions.—The domains of application in experiment 2 were size and color, more specifically, big and red. Young preschool children appear to have at least some knowledge of these concepts (Heider 1971; Maratsos 1973, 1974b), and so the concepts themselves should not present undue difficulty to the children. More importantly, English does not consistently mark size or color via prefixes or suffixes. Instead, linguistic forms marking size and/or color can be used in a prenominal position (the big boy hit the girl; the red ball rolled down the hill) or a variety of postnominal positions (the boy that is big hit the girl; the boy is big; the ball that rolled down the hill is red). Admittedly, when an adjective denoting size or color is used in a noun phrase, the adjective precedes the noun. However, the child is unlikely to learn a bias to place color and size adjectives before nouns since such adjectives can also appear in postnominal positions. Thus the size and color domains appear to avoid the possibility of previous experience establishing a disposition in regard to marking these concepts in sentences in either a prefix or a suffix position. Nonetheless, both size and color were used in order to determine if children had learned to consistently use big or red in a prefix or suffix position. If so, this should exhibit itself in different developmental patterns (unless a specific prenominal or postnominal position had been learned for both terms). The four conditions in experiment 2 were big-prefix, big/suffix, red-prefix, and red/suffix. (Children in the red conditions were tested prior to the start of the rest of the procedure to insure that they could discriminate red from other colors.)

Exposure Sentences and Test Conditions

The nonsense syllable *ip* was used as the novel suffix or prefix for each group. Children in the big conditions received eight exposure sentences, with *ip* immediately preceding or succeeding the noun in either the first or second noun phrase, depending on the condition. For each condition, the children were exposed to *ip* in connection with the first noun phrase in four sentences and in connection with the second noun phrase in four sentences. The exposure sentences for the big conditions were as follows: (1) The boy drove the car. (2) The lady pushed the swing. (3) The dog jumped on the bed. (4) The man drove the car. (5) The rock fell off the truck. (6) The giraffe kicked the hippo. (7) The elephant pushed the car. (8) The girl kissed the man. In the first four sentences, *ip* was placed immediately before or after the noun in the first noun phrase depending on the condition (suffix vs. prefix). In the last four sentences, *ip* was placed immediately before or after the noun in the second noun phrase depending on the condition. The order of presentation of the eight exposure sentences was random.

The eight exposure sentences in the red condition were as follows: (1) The boy drove the car. (2) The lady pushed the swing. (3) The pig jumped on the bed. (4) The man drove the car. (5) The rock fell off the truck. (6) The giraffe kicked the tree. (7) The elephant pushed the block. (8) The girl kissed the man. As was the case for the big condition, the first four sentences contained *ip* in the first noun phrase while the last four sentences contained *ip* in the second noun phrase. The eight sentences were presented in a random order.

As in experiment 1, stress was placed on the root of the affixed words.

Children in the big condition saw the experimenter perform the following eight ac-
tions with toys for the test aspect of the procedure: (1) a big lion kissing a frog; (2) a big man standing on his head; (3) a big wheel rolling off a truck; (4) a big turtle getting in a truck; (5) a duck pushing a big block; (6) a boy moving a big rock; (7) a cat chasing a big dog; and (8) a man kissing a big lady.

Children in the red condition saw the experimenter perform the following actions with toys for the test aspect of the procedure: (1) a red goat jumping a fence; (2) a red car pushing a cow; (3) a red turtle getting in a truck; (4) a red tree falling down; (5) a boy pushing a red car; (6) a man driving a red motorcycle; (7) a dog chasing a red cat; and (8) a dinosaur jumping on a red balloon (uninflated).

In both the big and red conditions, the eight test actions were presented in a random order.

Procedure

Each child was trained and tested individually with the entire procedure being recorded on a Sony portable tape recorder. As in experiment 1, the child was asked to choose a puppet to play with and then told that the experimenter’s puppet spoke a little differently than everyone else and that the child should listen very carefully so that he could teach his puppet to speak like the experimenter’s puppet.

For the two big conditions and the two red conditions, the experimenter acted out an action corresponding to an exposure sentence, had his puppet say the exposure sentence with ip in the appropriate position, and then asked the child to have his puppet repeat the exposure sentence. This was repeated until the child had been exposed to each of the eight training sentences.

In order to facilitate the child’s learning that ip corresponded to red or big, the toys used by the experimenter to act out the exposure sentences contrasted big with small and red with nonred. For example, in the big conditions, the experimenter showed the child a big (tall) lady and a small (short) lady, specifically informed the child that one was big and one was small, and then had the big lady push the swing, followed by the experimenter’s puppet saying the ip-lady pushed the swing (or the lady-ip pushed ———). The sole difference between the two lady dolls was that one was tall and one was short. For each of the other sentences acted out by the experimenter, the two objects corresponding to the crucial noun differed only in that one was bigger than the other (for the big conditions) or that one was red and the other was not (for the red conditions).

For the test conditions, the experimenter performed one of the test actions with toys and then asked the child to have his puppet tell the experimenter’s puppet what happened using the experimenter’s puppet’s different language. As was the case for the exposure sentences, there were two objects (big/small, red/nonred) corresponding to one of the nouns used to describe the action the experimenter had performed.

Results

Imitations.—As shown in table 2, older children were more likely to correctly imitate the model sentences than were their younger counterparts, $F(2,36) = 6.06, p < .01$. Children were as likely to correctly imitate sentences containing ip as a prefix as they were...
to correctly imitate sentences containing *ip* as a suffix. There was no statistically significant difference in the frequency of correct imitations in the *big* and *red* conditions.

Children apparently were able to process *ip* and its sentential position (prefix vs. suffix), regardless of whether it referred to *big* or to *red*, at least insofar as the ability to imitate an immediately preceding model is concerned. (Supplementary analysis revealed that whether *ip* occurred in the first or second noun phrase had no effect on children's ability to correctly imitate *ip* in the model sentence.) Again, the model sentences were deliberately constructed to facilitate correct imitation (i.e., they were kept as short as possible), and so these results do not directly bear on the hypothesis of concern here, namely whether suffixes are easier acquisitions than prefixes.

**Test**

Older children were more likely to respond correctly (i.e., put *ip* in the position in which it had appeared in the exposure sentences) than were younger children, $F(2,36) = 16.11$, $p < .001$. Suffix *ip* proved to be easier than prefix *ip*, $F(1,36) = 12.67$, $p < .001$. (Whether *ip* appeared in the first or second noun phrase was not a significant factor.) The difference between the *red* conditions and the *big* conditions was not significant, $F(1,36) = 3.17$, $p < .1$. These data are summarized in table 2.

Younger children were more likely not to use *ip* in their responses to the test situations than were older children, $F(2,36) = 14.28$, $p < .001$. Children were more likely to omit *ip* in the *big* conditions than in the *red* conditions, $F(1,36) = 5.11$, $p < .05$. These data are summarized in table 2.

One last point regarding the children's responses in the test situation. In experiment 1, children occasionally responded with *ip* in a suffix position in the past conditions regardless of whether they had been exposed to it as a prefix or a suffix. Children occasionally responded with *ip* in a prefix position in the future conditions regardless of whether they had heard *ip* in a prefix or suffix position. Such effects were not observed in experiment 2. Children exposed to *ip* as a prefix did not use it as a suffix in the test situations, nor did children exposed to *ip* as a suffix use it as a prefix in the test situations. Although children did occasionally use *ip* in an inappropriate sentential position, these inappropriate positions were rarely readily identified as inappropriate prefix positions for what should have been a suffix position, or vice versa. Instead, they appeared to be instances where the child realized that he should use *ip* but did not know exactly where to insert it in his sentence plan and so just put it in anywhere. In other words, the consistent misplacement patterns observed in experiment 1 did not have any parallels in experiment 2. Thus it would appear that the domains tested in experiment 2 (*big, red*) were not subject to previously learned placement biases as were the domains in experiment 1 (past, future), and so experiment 2 provides a better (purer) test of Slobin's hypothesis than experiment 1.

**Relations between Imitation and Test Responses**

There were no dramatic relations between children's responses to the imitation task and their responses to the test task. The highest correlation was that between correct responses on the imitation task and correct responses on the test task, $r(47) = .38$, $p < .01$. This lack of strong correlations suggests that the children's imitations reflect at best superficial analyses of *ip*, while the test responses reflect the extent to which these superficial analyses have been transformed, organized, and reorganized in a more long-term memory store. Again, this discrepancy between imitation responses and test responses is not surprising. Model sentences used in the imitation task were deliberately constructed to facilitate immediate correct superficial analyses since such analyses are the minimum requirement for acquiring novel linguistic forms. Thus, if the initial acquisition task had been too difficult, the children would likely have failed to acquire any knowledge of *ip* at all (as was the case for children in various pilot studies where the acquisition tasks proved to be too difficult).

**Discussion**

The results of experiment 2 provide more straightforward support for Slobin's hypothesis than did the results of experiment 1. The test results indicate that children do find it easier to learn suffixes than prefixes insofar as a given semantic notion is concerned. In both the *big* condition and the *red* condition, children were more likely to respond correctly in the test situation when they had been exposed to *ip* as a suffix than when they had been exposed to *ip* as a prefix. This is strong sup-
Experiment 3

Method

Subjects.—Thirty children participated as subjects in experiment 3. This sample was divided into three groups on the basis of chronological age. Children in group 1 ranged in age from 3-2 to 3-7; children in group 2 ranged in age from 4-0 to 4-6; and children in group 3 ranged in age from 5-0 to 5-7.

Task.—An elicited imitation task was used. In such a task, the child is asked to repeat whatever the experimenter has just said. Previous research using this method has demonstrated that if the model sentences are sufficiently long and/or complex to prohibit rote imitation, then the child’s imitations may reveal the extent to which he processed the information in the model sentence through his syntactic and semantic systems (Kuczaj 1975; Kuczaj & Maratsos 1975; Slobin & Welsh 1973; Smith 1970; Thieman 1975). Thus, if model sentences containing a novel prefix or novel suffix are sufficiently long, the child’s imitations of these model sentences should reveal the relative ease with which he is able to initially process prefixes and suffixes.

The present task consisted of 36 model sentences, 18 of which contained a novel prefix and 18 a novel suffix. Five of the children

It is possible that the children in experiment 2 failed to apprehend the intended meaning of \( ip \) (\( big \) or \( red \)), and only learned to respond correctly by using \( ip \) in the correct sentential position without knowing what meaning \( ip \) was supposed to have. This is unlikely, given the fact that there was no effect of noun phrase (first vs. second). If children had learned to respond on the basis of sentential position independent of meaning, they would have been extremely unlikely to respond correctly since a correct response consisted of placing \( ip \) in the appropriate prefix or suffix position in the appropriate noun phrase. Although some correct responses could occur by chance if the child had learned to correctly use \( ip \) solely on the basis of syntactic position (since he would have a 50% chance of choosing the right noun phrase) there should have been many errors in which the child used \( ip \) in the wrong noun phrase but as an appropriate syntactic suffix (or prefix). These errors were exceedingly rare, and so it would seem that the children’s correct responses were based on syntactic and semantic information.
in each age group heard *ip* as a prefix and *uf* as a suffix while the other five children in each age group heard *ip* as a suffix and *uf* as a prefix. Half of the model sentences containing a novel prefix had the prefix attached to the noun in the first noun phrase (e.g., *the ip-girl ran up the steep stairs*), while the other model sentences containing a novel prefix had the prefix attached to the noun in the second noun phrase (e.g., *the little frog jumped over the ip-log*). This was also true of the model sentences containing a novel suffix. As in the previous experiments, the root of the affixed word was stressed rather than the affix. The order of presentation of the model sentences was random for each child.

**Procedure**

Each child was tested individually. Prior to beginning the elicited imitation task, the child was asked to choose a puppet to play a game with. He was then asked to have his puppet say what the experimenter's puppet said and then given several short model sentences to repeat in order to insure that he had comprehended the task. Following this, the child was given the elicited imitation task and attempted to imitate each model sentence immediately after it was presented.

**Results**

The results are summarized in table 3. Older children were more likely to respond correctly (i.e., imitate the novel suffix or prefix in the appropriate position) than were younger children, $F(2,27) = 56.19$, $p < .001$. Sentences containing a novel suffix were more likely to be imitated correctly than were sentences containing a novel prefix, $F(1,27) = 5.19$, $p < .05$, although this tendency held only for 3-year-olds and 4-year-olds.

Younger children were more likely to omit the novel prefix or suffix from their imitations than were the older children, $F(2,27) = 42.33$, $p < .001$. Prefixes were more likely to be omitted from the children's imitations than were suffixes, $F(1,27) = 11.23$, $p < .001$, although this was only true for 3-year-olds and 4-year-olds.

**Experiment 4**

This experiment was conducted in an effort to obtain some information about the initial processing of prefixes and suffixes by young 2-year-old children. Pilot testing revealed that the model sentences used in experiment 3 were far too difficult for such children, and so an elicited imitation task was constructed which utilized single words (i.e., the child was asked to imitate isolated words). Half of the words the child was asked to repeat contained a novel prefix with a common root (e.g., *ip-car*). The remaining words had a novel suffix with a common root (e.g., *ball-uf*). To prevent possible biases due to the prefix and suffix words qua sounds, half of the children tested were exposed to *ip* as a prefix and *uf* as a suffix, while the other children heard *ip* as a suffix and *uf* as a prefix.

**Subjects**

Eight children (5 males, 3 females) participated as subjects. The children ranged in age from 1-10 to 2-5, with a mean age of 2-2.

**Procedure**

Each child was tested individually in his home. The child was given a puppet to play with and was instructed to make his puppet say what the experimenter's puppet said. Following several practice trials with verb base forms (e.g., *eat*), the child was presented with the test words. There were 20 test words (10 prefix and 10 suffix). Interspersed in this list were six verb base forms (e.g., *eat*) in order to provide some relief from the novel prefix and suffix forms.

The entire procedure was recorded on a Sony portable tape recorder.

**Results**

The children were more likely to imitate suffix forms correctly ($\bar{X} = 7.63$) than they were to imitate prefix forms correctly ($\bar{X} = 5.38$), $t(7) = 2.85$, $p < .05$. Moreover, prefixes were more likely to be moved to a suffix position in imitations ($\bar{X} = 1.12$) than suffixes to a prefix position ($\bar{X} = .12$), $t(7) = 2.38$, $p < .05$.

**TABLE 3**

<table>
<thead>
<tr>
<th>Mean Number of Correct and Incorrect Responses in the Imitation Task of Experiment 3 Grouped according to Chronological Age, Response Type, and Prefix vs. Suffix</th>
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Discussion

The results of experiments 3 and 4 provide further support for Slobin's hypothesis that suffixes are easier acquisitions than prefixes if everything else is equal. Children in experiments 3 and 4 were better able to correctly imitate suffixes than prefixes indicating that initial processing favors word endings rather than word beginnings. Thus, as Slobin has suggested, children do seem prone to pay attention to the ends of words. Interestingly, however, the disparity between prefix and suffix responses diminishes with increasing age insofar as initial processing is concerned. However, this developmental tendency was not observed insofar as learning to productively use novel prefix and suffix forms was concerned. In other words, suffixes remain easier acquisitions than prefixes even after the initial processing differences between prefixes and suffixes disappear. This suggests that the later utilization of the information provided by initial processing is quite important and that previous experience is a major determinant of later development. Both of these points are expanded below.

Initial processing of information is obviously quite important. If one does not pick up information from a present array then it will not be available for later processing. Regarding Slobin's hypothesis, the better initial processing of suffixes than prefixes evidenced in experiments 3 and 4 (for children younger than 5 years, at any rate) provides the postinitial processing mechanisms with more information about suffixes than about prefixes and thus allows for easier acquisition of suffixes than prefixes. Moreover, young children exhibited a greater tendency to repeat prefixes as suffixes than vice versa, indicating that the "processing set" for suffixes may yield some inaccurate initial processing of prefixes as suffixes and thus increase the information bias (in terms of amount available for postinitial processing).

The finding in experiment 3 that 5-year-old children do not find it easier to process initial information about suffixes than to process initial information about prefixes is curious in that the 5-year-old children in experiment 2 found it easier to learn to productively use suffixes than to productively use prefixes (these children also did not evidence any difference in initial processing of prefixes and suffixes). Theoretically, the lack of any significant difference in initial processing of suffixes and prefixes should provide the later processing mechanisms with equivalent information about the suffixes and prefixes. If the difference in learning is not due to a difference in initial processing, then it must be due to a transformation of the information which was initially processed. This suggests that the influence of the strategy to pay attention to ends of words exists even after the strategy has waned on the initial processing level. Even children who have come to pay attention to both word beginnings and endings at the level of immediate perception and processing may pay more attention to word endings at the level of postinitial processing. The result is the memory decay of the information about prefixes due, most likely, to two factors: (1) a lack of rehearsal of the information provided by initial processing, (2) some of the information about prefixes being transformed such that it now becomes information about suffixes, that is, the child comes to use information about prefixes as if it was information about suffixes. This latter possibility gains some support from the fact that the children in experiment 4 occasionally used prefixes as suffixes in a task involving immediate processing. If this can occur at the initial processing level, then it may also occur at later processing levels. In fact, children of all ages in experiment 1 demonstrated a tendency to transform initially processed information so that it would accord with their earlier acquired knowledge about forms used to refer to the past and the future. In the same vein, children may also transform information about prefixes into information about suffixes at the postinitial processing level because of the emphasis on suffixes rather than prefixes in the early portion of the language acquisition process. Not only could the strategy hypothesized by Slobin and supported by the experiments in this paper lead to this ten-

3 It should be noted that the following discussion is based on a relative rather than an absolute difference. Children at all ages in all tasks exhibited an ability to deal with prefixes successfully, but children were significantly more successful at dealing with suffixes than they were at dealing with prefixes. Thus, the results support Slobin's hypothesis that children learning their first language may use a strategy of attending to word endings rather than word beginnings, but the results do not demonstrate that children cannot attend to and learn prefixes. They can and do, but they seem to be biased toward selectively attending to suffixes.
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dency to use information about prefixes as if it were information about suffixes; the child’s early acquisition of various noun and verb inflections could also contribute to this tendency. In the early periods of language acquisition, the child learns to use the progressive -ing, the plural -s, the regular past tense -ed, the possessive -s, and the third person singular present -s (Brown 1973; Cazden 1968; Kuczaj 1977, 1978). All of these forms are suffixes, and most are regular forms which are overgeneralized to irregular forms. (It would be interesting to compare the frequency and types of overgeneralization errors which occur for a given semantic notion expressed by a suffix or system of suffixes in one language and by a prefix or system of prefixes in another language.) At any rate, the child acquiring English as his mother tongue has encountered much success by paying attention to suffixes and so even after he has begun to pay as much attention to prefixes at the level of initial processing, he may continue to pay more attention to suffixes during the later processing of the information obtained during initial processing and perhaps even treat information about prefixes as if it were information about suffixes. Thus, the easier acquisition of suffixes than prefixes may be the result of the better initial processing of suffixes (occurring early in the child’s acquisition of his first language) or the result of postinitial processing favoring suffixes (occurring later in the child’s acquisition of his first language). This latter effect occurs because of previous experience which biases postinitial processing toward suffixes, at least for children learning English as their first language. Past experience, then, is doubly important. It provides a basis for establishing an “attention set” in postinitial processing. If paying attention to suffixes during initial processing has paid off then the child is likely to continue to attend to suffixes rather than prefixes in postinitial processing. Thus children learning a first language which rewards this strategy will exhibit this postinitial processing bias for suffixes whereas children learning a first language which does not reward this strategy will not. Past experience also provides a basis for deciding what type of form (prefix vs. suffix) is commonly used to express a given function, as shown in experiment 1. The interaction between language processing strategies used by the child in learning his first language and the child’s success with these strategies is in need of further investigation since such research could provide information concerning both the degree to which children persist in using inappropriate strategies (for a particular acquisition or even a particular language) and the universality of particular strategies.

Reference Note

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