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THE EFFECT OF SELF-INITIATED AND OTHER-INITIATED ACTIONS ON LINGUISTIC PERFORMANCE

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Two studies were conducted to determine the effect locus of action had on children's conjunction use and clause ordering. Subjects in the first study were 45 normal children between the ages 3:0 and 5:2. The results of the first study showed that the two contexts in which children performed actions were more facilitating to language performance than the context in which children observed the experimenter perform actions. However, the verbal model which accompanied the two child-initiated action contexts might have contributed to these differences. A second experiment was therefore conducted in which the verbal model was eliminated. No differences in conjunction use or clause ordering were found among contexts in the second study. Thus, by itself, locus of action had little influence on language performance. However, when coupled with the verbal model, which seemed to function as a focusing device, performance was enhanced. It was concluded that child-initiated action contexts which include a verbal instruction are preferred over other-initiated action contexts in which a verbal model is not presented.

There recently has been some discussion in the literature (Courtright & Courtright, 1976, 1979; Holland, 1975; Lahey & Bloom, 1977) concerning factors which influence the learning of language forms and structures. Lahey and Bloom, for example, described three contexts in which language forms could be introduced: (a) use of picture stimuli, (b) observation of someone performing an action, and (c) self-enactment of an action. There is some evidence (Leonard, 1975) that the observation of an actual demonstration is more effective in teaching certain language forms than the use of picture stimuli. Also, Courtright and Courtright (1976, 1979) have shown that an imitative modeling strategy was more effective in teaching children rules they lacked than a mimicry strategy. No study, however, has considered whether a child's own demonstration of the sentence stimuli would be a more effective language learning context than watching someone else perform an action.

Piaget's (1962) cognitive theory suggests that the locus of action might have some influence on language performance. According to Piaget, early developments in language reflect a child's dynamic relations and interactions with entities and events in the world. This view of language suggests that children's first concepts and grammatical relations derive from actions and the results of actions (Nelson, 1973, 1974; Sinclair, 1973). In the

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same vein, children might be more prone to express certain forms, perhaps novel ones, in descriptions of self-initiated actions rather than actions performed by others. Some recent studies on children's early lexical acquisition, however, have found the role that action plays in language development to be considerably more complex than initially believed (Benedict, 1979; Schwartz & Leonard, 1980). Benedict noted, for example, that although action is central to the young child, its importance is reflected differently in comprehension and production.

The present investigation examined the importance of action in the assessment of young children's linguistic and related conceptual knowledge. The factors which influence language assessment procedures are in many ways similar to those which affect the learning of language forms. One would expect that an effective language elicitation context would also be an effective language learning context. In this study, children were presented with three elicitation contexts which varied according to the agent and recipient of some temporally linked actions. In Context 1 the child was neither the agent nor the recipient of the actions. In Context 2 the child was the agent but not the recipient of the actions, whereas in Context 3 the child was both the agent and the recipient of the actions.

There was some indication in the literature that Context 3 might be the most facilitating one for language performance. For example, Curcio, Robbins, and Slovin (1971) found that number conservation involving body parts preceded number conservation involving external objects. In addition, Piaget, Inhelder, and Szeminska (1960) noted that before children used an independent measuring instrument, they often used parts of their bodies to measure objects, much as if conservation of their own body lengths were a prerequisite for the generalization of this principle to external objects.

An interest in children's developing understanding of sequentially related and simultaneously related events motivated the selection of sentence stimuli. These stimuli were sentence events that were temporally related by either *then* or *while*. In the next section, the sentence events and the scoring procedures are described in some detail.

EXPERIMENT 1

METHOD

Subjects

Subjects were 45 normally developing children, 22 boys and 23 girls ranging in age from 3:0 to 5:2. The subjects were divided into five groups of nine children each, according to age. Each group contained five girls or five boys. The mean ages of the groups were 3:0, 3:6, 4:0, 4:6, and 5:0, and no child deviated from one of these mean ages by more than ± 2 months. All the children were native speakers of English who had no diagnosed speech, language, hearing, or neurological disorders.

Elicitation Contexts

The three contexts are summarized below:

1. The child was neither the agent nor the recipient of the action. The experimenter performed the actions.
2. The child was the agent but not the recipient of the action; that is, the child manipulated objects in response to a verbal command.
3. The child was both the agent and the recipient of the action; that is, the child performed some action involving body parts in response to a verbal command.

It should be apparent that the three contexts differed not only in the instigator and recipient of the action, but also in terms of the verbal input each provided. Both the second and third contexts were accompanied with verbal instructions, whereas the first context was not. Any difference in favor of Contexts 2 and 3 therefore could be due to the verbal input and not the locus of the action. The effect the verbal model had on children's language performance is addressed later in this paper.

Sentence Stimuli

Each context included eight sentences, four *then* sentences and four *while* sentences. The sentences were constructed to vary by not more than ± 3 morphemes or two words. Sentences for Contexts 1 and 2 were essentially similar, as the same objects were paired differently with actions. The objects included a plastic boat, a ball, a clown, a brush, a spoon, and a cardboard box. Sentences in Context 3 substituted body parts for the objects. The test and sample sentences appear in the Appendix.

Procedure

The presentation of the four *then* and *while* sentences within each context was randomized for each child, whereas the order of presentation of the three contexts was counterbalanced within age groups. Children were first familiarized with the toys and then given several sample sentences. Two children were dismissed at this point because they were unable to describe both sentence events. All sentences were presented two times. If a child failed to perform an action or respond to the elicitation question, the sentence was repeated two additional times after all the sentences in the particular context were presented.

Scoring

Scoring of children's responses was complicated somewhat by the three different contexts and the two different sentence types used. It was possible to evaluate children's (a) verbal production of the target conjunction, (b) enacted order of the sentence events, (c) verbal order

of the sentence events, and (d) enactment of the temporal relation between the sentence events. The responses that were actually analyzed in this study are reviewed below.

First, children's verbal productions of the target conjunctions were recorded for both sentence types across the three contexts. An analysis of errors also was performed on these data. Second, the verbal order and enactment order of the sentence events was noted for *then* sentences. These two order analyses were not performed for the *while* sentences because the temporal order of events in clauses linked by *while* were not order bound. That is, the sentences "I opened my mouth, while I was touching my nose" and "While I was touching my nose, I opened my mouth" were both appropriate. Third, verbal order of the sentence events was analyzed for all three contexts, but the enacted order of the sentence events could be calculated only for Contexts 2 and 3 because children did not act out the sentence events for Context 1. Finally, comprehension of the conjunctions as revealed by the child's enactment of the temporal relations between sentence events was not reported. Previous analysis of these data (Kamhi, 1976) indicated that young children typically acted out all the sentence events sequentially, whereas older children were more likely to make some distinctions between sequentially related and simultaneously related sentence events. These data seemed to shed little light on the questions raised in this investigation.

Compilation of the data showed that all children performed the sentence event enactments; however, five times out of a possible 1,080 instances a verbal response was not made. These five "no responses" came from the younger children who had few if any correct productions of the conjunctions. Because the proportion of "no responses" was so small, these instances were scored according to the children's typical response pattern—in this case, errors.

RESULTS

Table 1 presents the means, standard deviations, and percentage of correct productions of *then* and *while* according to group and context. The result of accepting *when* as an appropriate response for *while* sentences also can be seen in this table. To analyze the data, two-factor, split-plot, mixed-effect analyses of variance were used (Kirk, 1968). The two factors were group and the repeated measure, context. The results are reviewed below according to sentence type.

Then Sentences

A significant main effect was found for context ($F = 6.83$; $df = 3, 80$; $p < .01$), but not for group ($F = 2.15$; $df = 4, 40$; $p > .10$). The interaction between group and context was not significant ($F = 1.53$; $df = 8, 80$; $p > .10$). The group differences apparent in the mean scores in Table 1 were offset by the high variability of scores within groups and the heterogeneity of variance between groups (Bartlett-Box $F = 2.64$; $p = .048$).

To define further the differences between contexts, a correlated t test was used. The alpha level for the three

TABLE 1. Mean number of correct responses, standard deviations (*SD*), and percentage of correct responses for *while*, *while* + *when*, and *then* according to age group and context.

	While			*While* + *When*			*Then*		
Group	*Mean*[a]	*SD*	*% Correct*	*Mean*[a]	*SD*	*% Correct*	*Mean*[a]	*SD*	*% Correct*
Age 3:0									
Context 1	.00	.00	.0		same[b]		.33	1.00	8.7
Context 2	.22	.67	5.6		same		.78	1.39	19.4
Context 3	.33	1.00	8.3	.56	1.13	13.9	.56	1.13	13.9
Age 3:6									
Context 1	.22	.67	5.6		same		.33	.50	8.3
Context 2	1.11	1.37	27.8		same		.33	.71	8.3
Context 3	.89	1.17	22.2	1.00	1.22	25.0	.45	.71	11.1
Age 4:0									
Context 1	.00	.00	.0		same		.67	.66	16.7
Context 2	1.22	1.22	30.6		same		1.00	.87	25.0
Context 3	1.33	1.58	33.3	1.67	1.50	41.7	1.00	1.32	25.0
Age 4:6									
Context 1	.33	1.00	8.3		same		1.00	1.44	25.0
Context 2	1.00	1.11	25.0	1.56	1.42	38.9	1.55	1.33	38.9
Context 3	1.00	1.44	25.0	1.67	1.50	41.7	1.11	1.61	27.8
Age 5:0									
Context 1	1.55	1.94	38.9	1.67	2.00	41.7	1.11	1.76	27.8
Context 2	2.55	1.97	63.9	3.00	1.73	75.0	2.44	1.74	61.1
Context 3	2.33	2.00	58.3	2.44	1.88	61.1	1.67	1.66	41.7

[a]Group means were calculated by dividing the total number of correct responses by nine.
[b]"Same" indicates that there were no substitutions of *when* for *while*.

comparisons was set at .05, such that each comparison was made at $p < .017$. The analyses revealed significant differences between Contexts 1 and 2, and between Contexts 1 and 3 ($p < .001$). There was no difference between the second and third contexts. Children were thus more likely to use *then* correctly following their own sentence enactments than after observing the experimenter's sentence enactments.

While Sentences

The analysis of the *while* sentences revealed significant group differences ($F = 2.61$; $df = 4, 40$; $p < .06$) and significant differences among contexts ($F = 15.76$; $df = 2, 80$; $p < .001$). The interaction between group and context again proved to be insignificant ($F = 1.73$; $df = 8, 80$; $p > .10$). As was the case with the *then* sentences, heterogeneity of variance (Bartlett-Box $F = 3.53$; $p < .01$) influenced the between-group comparisons.

A Tukey multiple comparison procedure uncovered significant differences between the youngest (3:0) and the oldest (5:0) groups. A correlated t test again indicated that significant differences existed between Contexts 1 and 2 and between Contexts 1 and 3 ($p < .001$). Finally, accepting *when* as a correct response for *while* sentences had no effect on the group or context differences just delineated.

Analysis of Errors

An analysis of children's conjunction errors, not surprisingly, found *and* to be the most frequently used conjunction, accounting for more than three-quarters (76.2%) of the total number of errors made. A second finding was that the younger children made considerably more omission errors than the older children. Approximately one-third (32.4%) of the two youngest groups' errors were omissions, compared to less than 5% for the two oldest groups. More importantly, significantly more omission errors occurred with Context 1 than with either of the other two contexts ($p < .01$, correlated t test). Thus, not only were Contexts 2 and 3 more facilitating to children's correct conjunction use, but they were also more facilitating to children's use of an alternative conjunction.

The analyses performed thus far indicate that Contexts 2 and 3 enhanced children's conjunction use. This finding transcends the variability noted among children's correct conjunction production. The next series of analyses examines the effect the three contexts had on children's verbal order of the sentence events.

Order Analyses

There were four possible order patterns of the experimenter's sentence event order, the child's enactment order, and the child's verbal ordering of the two sentence events. Consider, for example, the sentence "Touch your nose, then clap your hands." Letting the letters A and B stand for the first and second sentence events, we note that the experimenter's order of mention is always AB. The child can then either act out the sentence events in the same order (i.e., AB) or reverse the initial order of mention (i.e., BA). The child's verbal order of mention could also either resemble or not resemble the experimenter's order of mention. The four possible order patterns are summarized below:

Pattern 1: AB, AB, AB—the experimenter's verbal order of mention, the child's enactment order, and verbal order of the sentence events are the same. This pattern is the most mature one.

Pattern 2: AB, AB, BA—the child's verbal ordering of the sentence events reverses the initial order of mention of the sentence events. The child begins verbalization with the last action performed, demonstrating a recency effect.

Pattern 3: AB, BA, AB—the child's enactment order reverses the initial order of mention, whereas the verbalization again demonstrates a recency effect but is identical to the initial order of mention.

Pattern 4: AB, BA, BA—both the child's enactment and verbal ordering of the sentence events reverse the initial order of mention.

As mentioned in the previous section, only *then* sentences were considered for the order analyses because the temporal order of events in clauses linked by *while* are not order bound. Children's verbal and enactment reversals of *then* sentences were analyzed with a two-factor, split-plot, mixed-effect analysis of variance (Kirk, 1968). It should be noted that Context 1 could have no enacted reversals of the sentence events because children did not act out the events. The data for the verbal and enacted sentence event reversals are shown in Table 2.

TABLE 2. Number of enacted and verbal reversals according to group and context.

	Contexts						
Group	*1*	*2*		*3*		*Total*	
(by age)	*Verbal*	*Enacted*	*Verbal*	*Enacted*	*Verbal*	*Enacted*	*Verbal*
3:0	24	2	18	4	13	6	55
3:6	10	3	15	3	12	6	37
4:0	13	1	15	0	8	1	36
4:6	11	1	9	2	3	3	23
5:0	11	0	6	1	3	1	20
Total	69	7	63	10	39	17	171

The analyses of verbal reversals revealed significant main effects for both group ($F = 4.01$; $df = 4, 40$; $p < .01$) and context ($F = 6.32$; $df = 2, 80$; $p < .01$). The interaction between group and enactment context was not significant ($F = 1.80$; $df = 8, 80$; $p > .10$). A Tukey multiple comparison procedure ($p < .05$) revealed significant group differences between Group 1 (aged 3:0) and Group 5 (aged 5:0) and between Group 1 and Group 4 (aged 4:6). The older groups produced significantly fewer reversals than the younger one. Correlated t tests revealed significant differences between the Contexts 1 and 3 ($p = .005$) and between Contexts 2 and 3 ($p = .012$). Context 3 was thus the most conducive one for children's appropriate ordering of sentence events.

As can be seen in Table 2, the number of enacted reversals was small. Not surprisingly, the analysis of these reversals revealed no significant main effects.

Finally, the frequency with which children followed each of the four possible ordering patterns was calculated. Two patterns, the first (AB, AB, AB) and the second (AB, AB, BA), were used more than 95% of the time. Pattern 1 was the most frequently used (64.2%, 472/720), whereas Pattern 2, involving a reversal of the child's verbal ordering of sentence events, was the most frequent reversal pattern to occur (30.3%, 218/720). The younger children who were more prone to exhibit the Pattern 2 reversal were apparently able to remember the order of the verbal model long enough to act out correctly the sentence events but not long enough to verbalize correctly the order of events.

Two important findings emerged from the order analyses. First, Context 3, in which children acted out the sentence events on their body parts, was the most facilitating context for appropriate ordering of the sentence events. Second, the youngest children produced significantly more verbal reversals than the two oldest groups.

Summary

The findings reported thus far indicate that Contexts 2 and 3 were more effective than Context 1 in facilitating production of the conjunctions *then* and *while* and had fewer omission errors associated with them. In addition, fewer sentence event reversals occurred with the other two contexts. These findings indicate that a more accurate picture of a child's linguistic knowledge can be obtained through descriptions of self-initiated actions rather than through descriptions of actions performed by someone else. The meaning of these findings is clouded, however, by the uncertain effect the verbal model had on children's verbalizations in Contexts 2 and 3. A second study of smaller scale was thus conducted in which the verbal model was eliminated in these two contexts. The study is described below.

EXPERIMENT 2

Subjects were nine 4-year-old normal children, five girls and four boys, who ranged in age from 4:0 to 4:10 (mean age = 4:3). The test stimuli and materials remained unchanged. The difference in this study was that the actions children had to perform were demonstrated rather than verbalized; that is, for Contexts 2 and 3, the experimenter first demonstrated the actions. This was followed by the child's enactment of the same actions and a verbal description of these actions. The verbal model was thus totally eliminated in this second experiment, making it possible to determine the differential influence of self-initiated actions on conjunction use and sentence event reversals.

The data were quite clear-cut (see Table 3). Conjunction use was almost identical for all three contexts. Not even one instance of *while* was produced by the children; all the sentences were conjoined by *and, and then,* or *then,* with *and* clearly predominating (83%), followed by *and then* (13%). Only two sentences out of 216 produced did not contain a conjunction, these omissions occurring in the same child. Interestingly, fewer verbal reversals again accompanied Context 3. The data appear to leave little doubt that the verbal model influenced children's responses in the larger study.

TABLE 3. Data from Experiment 2. Mean correct conjunction use and total number of enacted and verbal reversals according to context. All data are from *then* sentences.

	Then			*Reversals*	
Context	*Mean*	*SD*	*% Correct*	*Enacted*	*Verbal*
1	.67	1.12	16.7		10
2	.44	.73	11.1	7	10
3	.78	1.09	19.4	3	5

DISCUSSION

The findings from the two studies seem to be contradictory. On the one hand, the first study found that Contexts 2 and 3 were more conducive to language performance than Context 1, whereas on the other, the second study found no differences among the three contexts. In attempting to resolve the contradictory findings, the effect the verbal model had on children's conjunction use must be determined. Clearly, it had some effect because the results of the two experiments were quite different.

One possibility is that children directly imitated the verbal model. There are several reasons to believe, however, that children's verbalizations were not direct imitations of the model. For one, almost half the children, primarily from the younger groups, never correctly produced either of the two conjunctions. These children apparently made little note of the two temporal relations presented in the study, probably because of insufficient conceptual knowledge concerning sequentially related and simultaneously related events. It was conceivable, however, that children who had sufficient conceptual

knowledge could have imitated the conjunction presented in the verbal model. But one indication that even these children, typically 4- and 5-year-olds, were not directly imitating the model was that several of them substituted *when* for *while*. This substitution, which was always contrasted by a different conjunction for the *then* sentences, indicated that *when* was a member of these children's lexicon, whereas *while* was not. The strongest argument against the direct imitation possibility concerned the nature of the task. The verbal model and children's verbalizations were separated in time by the intervening sentence enactment. Children were thus presented with a deferred imitation task rather than an immediate imitation task. In most instances the time delay created by the intervening sentence enactment probably erased the modeled conjunction from children's memory. These arguments notwithstanding, the possibility that imitation was a factor in the first experiment cannot be unequivocally dismissed. Perhaps future research can resolve this issue.

Assuming that the verbal model was not being directly imitated, what facilitating effect did it have on children's conjunction use? I suggest that the model, through its prosodic characteristics, served to direct children's attention to the conjunction and temporal relation which linked the two sentence events. For the younger children this meant that the conjunction slot often would be filled rather than unfilled, whereas for the older children it meant that different conjunctions often would be used to differentiate between the two temporal relations. For all children, Contexts 2 and 3 optimized language performance, in this case measured by conjunction use.

In the second experiment, without the verbal model to direct attention to the temporal relations between sentence events, children were primarily concerned with the imitation of the various combinations of actions. Focusing on accurately duplicating the experimenter's actions led to an almost exclusive use of *and* to conjoin the sentence events. Indeed, the conjunction *and* was quite appropriate in these instances, because the verbal description reflected the fact that two distinct actions were demonstrated, Action A *and* Action B. It is suggested that on those occasions when the verbal model had an effect on children's verbalizations, it functioned to direct attention on *when* the actions were performed, rather than on *what* actions were demonstrated. Remember, too, that the influence the verbal model had on children's verbalizations did not carry over to Context 1.

The findings from the two studies clearly have shed some light on the role locus of action plays in language assessment and learning. Data from the second experiment showed quite convincingly that the locus of action had little influence on children's ability to act out or verbalize the sentence events. The hypothesis that children might be more prone to express certain forms in descriptions of self-initiated actions was thus not supported. There was some evidence from the first study, however, that the locus of action did have an influence on children's behavior. Specifically, fewer sentence event reversals occurred with Context 3 than with the other two contexts, suggesting that self-directed actions enhanced recall of the temporal order of events. Importantly, these differences were not the result of the verbal model because the model accompanied Context 2 as well. Also, even the limited data in Experiment 2 showed fewer verbal reversals occurring with Context 3 than with the other two contexts. Nevertheless, it was conceivable that the temporal order of events was influenced by differences in the perceptual characteristics of the objects and children's familiarity with these objects. In short, the locus of action might have had some effect on children's verbal ordering of the sentence events but by itself clearly had no effect on conjunction use.

It was only in combination with a verbal model that locus of action had some influence on children's conjunction use. Contexts 2 and 3 in the first study were consistently as effective or more effective than Context 1 in eliciting the stimulus conjunctions. The two self-initiated action contexts thus provided a more accurate indication of children's linguistic and conceptual knowledge of these forms than Context 1. Although it was not possible to exclude completely direct imitation of the model as a factor in the first study, several reasons were presented which argued against this possibility. It was suggested instead that the model did serve to direct attention to the temporal relation between the two sentence events. The presentation of the model was clearly no substitute for prior conceptual knowledge; such knowledge, in essence, determined the effect the verbal input could have on language performance.

No doubt should remain that Contexts 2 and 3 should be preferred over Context 1 in language assessment procedures. Not only do Contexts 2 and 3 focus a child's attention on specific linguistic forms, but they also provide information concerning the understanding of these forms. These language elicitation contexts could be an important supplement to language sampling procedures which typically do not obtain information about the full range of a child's linguistic and conceptual knowledge. Such contexts also could be effectively used to evaluate therapy progress, presuming that the results of this study generalize to disordered populations.

In addition, by including some initial modeling of the actions and some feedback on the child's sentence enactments, Contexts 2 and 3 should be effective language learning strategies. Indeed, many clinicians probably use a similar procedure in their teaching of language forms and structures. This particular language learning strategy might prove to be even more facilitating than the imitative modeling used by Courtright and Courtright (1976, 1979).

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APPENDIX

TEST AND SAMPLE SENTENCES

Context 1

1. Push the boat, then touch the ball.
2. Move the spoon, then pick up the clown.
3. Kick the ball, then stomp on the spoon.
4. Shake the clown, then drop the brush.
5. Kiss the clown, while pushing the boat.
6. Pick up the boat, while touching the ball.
7. Drop the spoon, while kicking the brush.
8. Open the box, while stomping on the clown.

Context 2

1. Touch the spoon, then shake the clown.
2. Open the box, then drop the ball.
3. Push the boat, then touch the box.
4. Stomp on the clown, then move the spoon.
5. Drop the ball, while you're touching the boat.
6. Touch the box, while you're pushing the boat.
7. Pick up the boat, while you're shaking the clown.
8. Stomp on the spoon, while you're kissing the clown.

Context 3

1. Touch your nose, then wave your hand.
2. Stomp your foot, then close your eyes.
3. Open your mouth, then clap your hands.
4. Brush your hair, then touch your toes.
5. Close your eyes, while you're clapping your hands.
6. Wave your hand, while you're stomping your foot.
7. Open your mouth, while you're touching your nose.
8. Touch your ear, while you're shaking your hand.

Sample Sentences

a. Close the box, then touch the clown.
b. Open the box, while you're shaking the spoon.
c. Pick up the spoon, then move the brush.
d. Touch your eye, while you're brushing your hair.