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DEVELOPING CORRESPONDENCE BETWEEN THE NON-VERBAL AND VERBAL BEHAVIOR OF PRESCHOOL CHILDREN[1]

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Correspondence was developed between children's non-verbal and verbal behavior such that their non-verbal behavior could be altered simply by reinforcing related verbal behavior. Two groups of six children each were given food snack at the end of the day: for reporting use of a specific preschool material during free play (procedure A); and then only for reports of use which corresponded to actual use of that material earlier that day (procedure B). Initially, procedure A alone had little or no effect on the children's use of materials. Procedure B resulted in all of the children in one group actually using a specific material, and after repeating procedures A and B with this group across a series of different materials, procedure A alone was sufficient to significantly increase use of a specific material. Correspondence between verbal and non-verbal behavior was produced such that, in this group of 4-yr-old disadvantaged Negro children, "saying" controlled "doing" 22 or more hours later. In the second group, procedure B initially did not increase the use of a specific material; rather, the children's reports decreased so as to correspond to the intermittent use of the material. It appeared from subsequent procedures with this group that maintenance of a high level of reporting was crucial to the saying-then-doing correspondence seen in the first group.

It is frequently assumed that what a person says he has done or will do relates to what he actually has done or will do. Much of psychotherapy—even the new "behavior" therapy—is based on the assumption that reorganizing and restructuring a patient's verbal statements about himself and his world will result in a corresponding reorganization of the patient's behavior with respect to that world. Similarly, education, in addition to teaching specific skills, strives to inculcate social attitudes—that is, verbal behaviors about the standards of society and the citizen's role in that society—which, it is hoped, will lead to behaviors that correspond to the verbalization of these attitudes.

Since this assumption of a correspondence between verbal and non-verbal behavior is necessary for much of its affairs, society is concomitantly concerned with maintaining that correspondence. The procedures which are advocated and used for producing and maintaining such correspondence largely involve the punishment of verbal behavior which does not correspond to non-verbal behavior. But punishment applied to verbal behavior which does not correspond to *socially desirable* non-verbal behavior should serve to produce correspondence by suppressing the report of the socially desirable behavior to the level of the occurrence of that desirable behavior itself. More beneficial to society might be the production of correspondence by increasing socially desirable behavior to the level of verbal report. If such correspondence were then generalized, desirable non-verbal behavior could be increased simply by increasing related verbal behavior: significant alterations in non-verbal behavior in other settings could be produced by modifying verbal behavior in restricted and convenient settings such as the classroom or the therapist's office.

Investigations of the existence of such a generalized relationship between verbal and non-verbal behavior in preschool children have been made by Lovaas (1961, 1964) and Sherman (1964). In these studies, reinforcement procedures were applied to the modifi-

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cation of verbal behavior alone; little increase in related non-verbal behavior resulted. The purpose of the present study was to develop training procedures which would be sufficient to produce generalized correspondence between verbal and non-verbal behavior in preschool children, such that non-verbal behavior might be modified by reinforcing verbal behavior alone.

METHOD

Settings and Subjects

Twelve children, seven boys and five girls, in a half-day experimental preschool located in a depressed area of Kansas City, Kansas, served. All were 4- to 5-yr old Negroes from large families with low incomes. School lasted for approximately 3 hr. As soon as the children arrived at school at about 9 A.M. they were served cereal and milk or juice for breakfast. After 30 min of free play indoors and 15 to 20 min of music and rhythms, the children had a snack of fruit and cookies or sandwiches before going outside for 30 min of free play. The remainder of this snack was eaten on coming back inside, just before going home. At this time (approximately 12:00 noon) the children sat on two separate rugs, in two groups of six children with one teacher each. Each teacher asked her group: "What did you do that was good today?", and then, for about 10 min, responded to the children's answers while serving the food. Whenever a child was passed the snack baskets, he helped himself to as much food as he wanted or as much as he could hold in both hands. The data on verbal behavior presented in this study were taken during this last snack period. The data on non-verbal behavior were taken during the indoor free-play period, 1.5 hr earlier.

Recording. For each group of six children, an observer recorded in longhand everything said by each child. A third observer took an independent record to determine the reliability of the recording system. She alternated between the two groups, similarly recording in longhand everything said by each child. Approximately halfway through the school year, this third observer took reliability checks on each of the two regular observers only once a week (*i.e.*, only every other week on each given observer); the other four days of the school week she alternated between the two groups and recorded everything said by the teacher to the children.

The childrens' use of materials during indoor free play was recorded by the teachers, who each day noted the time a child began and finished using a given material. Each of the three observers also noted times of using materials by those children whom they were observing in the course of collecting 15-min verbalization samples during free play for another study.

EXPERIMENT I

Procedures

Baseline. For the first 15 days (Days 1 to 15) of school, each teacher presented the question: "What did you do that was good today?" to the six children on her rug, and then responded socially to all ensuing verbalizations from the children. Content of the childrens' verbalization was never differentially reinforced during these 15 days.

For the first five days of baseline, in order to assess operant levels of rate and content of speech among the groups, snack was noncontingent: the teacher held out the snack baskets to each child whether he verbalized or not. Then for the next five days, with food still non-contingent, teachers prompted verbal responses in order to increase the rate of verbalization in the group as a whole. Prompting consisted of asking the question: "And what did you do that was good today?" more than once, and addressing it directly to a specific child. Usually the teacher presented the snack basket to the child simultaneously with asking the question. All verbalizations were responded to socially as before with approval, comments, a further question, or repetition of what the child said. Then, so that teachers in subsequent stages of the experiment would be able to present reinforcement immediately upon a response, snack was made contingent on hand-raising during the last five days of baseline. The children were prompted to raise their hands; when a child's hand was raised, the teacher praised him, simultaneously offering him snack, and then asked what he had done that was good that day. The child was encouraged to take snack whether he verbalized or not; the teacher waited about 30 sec for a response and then turned to another child. Again, all verbalizations were re-

sponded to socially by the teacher, with no differential reinforcement for content.

Reinforcement of content. For the next 24 days (Days 16 to 40) each child was given snack and social approval contingent upon raising his hand and verbalizing that he had interacted with a specific preschool material. In one group (Group A) verbalizing use of blocks was reinforced; in the other group (Group B) verbalizing use of paint was reinforced. That is, the teacher in Group A reinforced with snack and praise any positive statement containing both the words "I" and either "blocks" or any form of the verb "to build"; the teacher in Group B reinforced all positive statements containing both "I" and any form of "paint" used either as a noun or a verb. The teacher responded minimally to any other statements made by the children ("mmhumm", "yes", head nod).

On the first day of reinforcing content, teachers twice prompted the desired response, by saying to the group: "What did you do that was good today? Did anyone build with blocks (paint)?" at the same time looking directly at a child who had done so. As soon as a child verbalized use of the specified material, the teacher, while holding out the snack basket, praised him enthusiastically and repeated his verbalization several times with emphasis on the name of the material used. After the first day, no more prompts were given.

The form of the verbal behavior which initially resulted from thus reinforcing content tended to be stereotyped: the children said either: "I painted" or "I built with the blocks", with very little elaboration. It was thought that the lack of effect on actual use of these materials during free play might be due to this stereotypy; therefore, during the ensuing 19 days (Days 21 to 40) of reinforcing content, teachers required elaboration of a statement of use of a material before presenting a child with snack. The teachers prompted elaboration by asking: "What did you paint?" when a child merely said, "I painted", or "What did you build?" when a child said he had played with the blocks. The final (reinforced) statement from a child had thus to contain some description of what he might have done with a material as well as the reference to himself ("I") and to the material ("paint" or "blocks/build"). Accuracy of description was never differentially reinforced: a child was given snack and teacher praise and comments for his elaborated report whether or not it described what he had actually built or painted.

The teacher in Group B was stationed in the painting area in a small side room during the morning free-play period. She dispensed paint and paper and other needed materials to children, approved appropriate use of materials and hung finished paintings on a drying rack near the rug on which Group B had snack at the end of the day. The teacher in Group A was stationed in the block area in the main room during the morning free-play period. She praised appropriate use of blocks and other materials available in this area. These area assignments remained in effect throughout the study. Thus, while reinforcing with snack at the end of the day verbal behavior for describing painting or block building, teachers were also giving social approval for the behavior itself (as for many other behaviors) if it occurred during the morning free-play period. This 30-min play period, which ended approximately 90 min before the end-of-the-day snack time, was the childrens' only opportunity to use these materials during the school day.

Reinforcement of correspondence. Next, only those statements of use of a material which corresponded to actual use of that material were reinforced with snack. For the next 27 days (Days 40 to 67), a child in Group B was presented snack for saying "I painted" only if he had actually used paint during the morning free-play period. The teacher confirmed the child's report of having painted ("You really did") and pointed out the picture, hanging on the drying rack, which he had made. At the same time, a child in Group A was presented snack for saying, "I built with blocks" only if he had actually used blocks during the morning free-play period. At the end of free play, the teacher had each child who used blocks put two blocks on a separate shelf where they remained until the end of the day. Then the teacher in Group A, as she presented a child's snack, confirmed that child's report of having used blocks, ("You really did") and pointed out the two blocks on the shelf nearby. In both groups, if a child stated that he had used the material, but had not actually done so that day, the teacher said: "You didn't really, though, did

you?", and either went on to another child whose hand was raised, or, if the child verbalized something else he had done, responded socially to that statement. Thus, the teacher responded socially to all children if they raised a hand, but presented snack only for a statement of use of a material that corresponded to actual use of that material.

Results

Recording. The results of Exp. 1 are graphed in Fig. 1. The data graphed as "said" (the dotted line) were taken from the observers' longhand records of everything said by each child during the end-of-day snack period. Each child of the number present in the observed group was counted if he was recorded as saying the reinforced content ("I" plus some form of "paint" or "block/build") one or more times; the percentage of each group who "said" blocks or paint was then derived. Percentages were graphed, rather than actual numbers of children, because of occasional absences among the groups. Reliability between each of the observers and the third (alternating) observer was calculated in terms of the total instances of occurrence or nonoccurrence of the behavior (whether a given child said, or did not say, on a given day, "blocks/build" or "paint" one or more times) recorded by each of the prime observers which were also recorded by the third observer when the two were observing together. The agree-

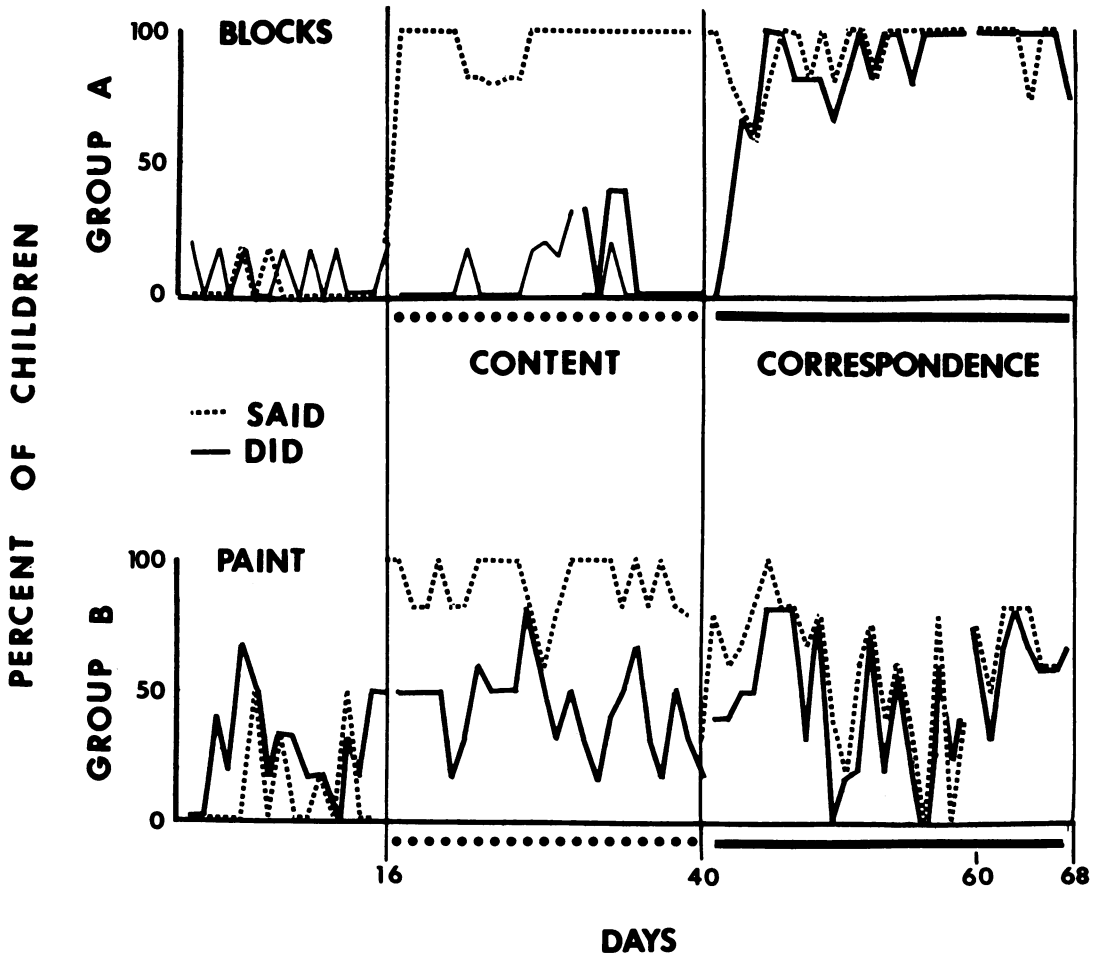

Fig. 1. Percent of children who reported use (said) and who actually used (did) blocks (Group A) and paint (Group B). During the condition labelled CONTENT, reports of the use of blocks (or paint) were reinforced whether or not the children had actually used that material that day. During the condition labelled CORRESPONDENCE, reports of the use of blocks (or paint) were reinforced *only* if the children had actually used that material that day.

ment between the third observer and the observer in Group A was 97%; between the third observer and the observer in Group B the agreement was 95%.

The data graphed as "did" (solid line) in the lower portion of Fig. 1 (Paint) were taken entirely from the records kept by the teacher in Group B, who noted time spent painting by each child who entered her area during the indoor free-play period. The data graphed (solid line) in the upper portion of Fig. 1 (Blocks) were, beginning at the heavy solid lines, taken from the records kept by the teacher in Group A, who noted the time spent by each child using the materials in the block area. The data graphed with the light solid line in Fig. 1, (Blocks) were taken from the 15-min sample records of the three regular observers. These observers, while recording all a given child's verbalizations for 15 min, noted every material used and the time span of its use by that child in that 15 min. Only half of the children, rotated from day to day, were so observed during the indoor free-play period; therefore, these observer records constitute a sampling of the group's use of materials. The portion of Fig. 1 (Blocks) in which the heavy and light solid lines overlap compares the number of children who "did" blocks as recorded by the teacher (heavy solid line) and by observer sampling (light solid line). With both groups throughout this study, the specific child whom an observer designated as using blocks and/or paint in every case was among those children recorded by teachers as using that material that day.

In Fig. 1 the data points for the number of children who "did" use a material are offset at changes in conditions: that is, Day 16 is both the last day of baseline on "doing" and the first day of reinforcement of content for "saying", and Day 40 is both the last day of reinforcement of content on "doing" and the first day of reinforcement of correspondence for "saying". This is because snack time followed indoor play each day, such that when conditions changed at snack time, any effects on the percentage of children engaging in the reported activity would not be seen until the next day.

Baseline. The data shown indicate that more of the children in Group A may actually have used blocks during the baseline period than are represented in Fig. 1 (Blocks); however, these data indicate, as well, that the number was not large. The median percentage of children reporting using blocks was 0%; only two children reported using blocks (once each) during this period. During baseline the median percentage of painting was 20% of the children in Group B per day. While the median percentage of reporting having painted was 0%, the actual instances were higher than those of reporting use of blocks; on only three days however, did the number reporting correspond to the number who actually painted.

Reinforcement of content. When snack was contingent on verbalizing use of blocks or paint, the number of children who "said" the reinforced content rose to a median of 100% in both groups, and remained at 80 to 100% (except for Day 28 in Group B) throughout this condition. No reliable effect on use of the corresponding materials was correlated with this increase in verbal behavior. The number of children in Group A who used blocks during the indoor free-play period remained at baseline level of 0-2 (0 to 33%, 0% median) per day; the percentage of children in Group B who painted rose somewhat, initially, to a median of 50% per day, a number which, in the course of this experimental condition, gradually decreased to a median of 33% per day.

Reinforcement of correspondence. When snack was made contingent on correspondence between the verbal report and the non-verbal behavior, the number of children in Group A who used blocks during the indoor free-play period rose to correspond to the 80 to 100% of the group that reported such use. The median percentage of both saying and doing was 100%. In Group B on the other hand, the number of children reporting painting declined (to a median of 40%) to correspond to the 25% (median) of the children who had actually painted. On only three occasions during this condition did a child who had actually used the materials on a given day fail to so report, once in Group A, and twice in Group B. The divergence in effect between the two groups took place after the eighth day of reinforcing correspondence; at first, the trend of the non-verbal behavior corresponding to the verbal behavior was upward both in Group B and in Group A. On the eighth day, however, only two children painted, and on the

tenth day, none. Subsequently, few children in Group B reported painting unless they had done so, and the number of children painting varied from one to four each day (median 23%), a number slightly lower than during the condition of reinforcing content.

When an effect on actual use of the materials was seen, the relevance of the presence during the snack period of the materials themselves (the pictures painted and the two blocks on the shelf) was tested by interchanging the rugs the two groups were seated on. Being out of sight of the materials they were reporting having used did not alter the near-100% level and correspondence of the verbal and nonverbal behaviors of the children in Group A, and was correlated with a slight increase in the number of children in Group B who painted and correspondingly so reported each day.

Discussion

In both groups, the initial reinforcement of content (*i.e.*, when the children were given snacks for saying they used a material whether they actually had or not) produced a marked effect on the percent of children who reported (said) such use. But only a slight increase was noted in one of the groups in the percent of children who actually did use the materials. This slight increase in the number of children who painted may be a weak effect of the verbal conditioning procedures comparable to that found by Lovaas (1961, 1964) and Sherman (1964): one child in Group B who had not painted for the six previous days painted on each of the four days subsequent to first receiving snack for the verbalization of having painted. More probably however, the increased rate of painting should be attributed to adventitious reinforcement of correspondence between the verbal behavior and the actual use of paint. Two of the three children who had painted on the day that reinforcement of content was begun had painted only six and two times previously; one of these two children subsequently painted every day for the next 10 days, and the other child painted on 31 out of the next 33 days.

The reinforcement of correspondence (*i.e.*, when the children were given snack for saying they had played with the material only when they actually had played with the material) in both groups produced a high degree of correspondence between their verbal and nonverbal behaviors. However, the two groups differed in the manner in which this correspondence was reached. In Group A, this correspondence was a result of a sudden marked increase (from 0 to 100%) in the number of children who played with the material during the free-play time 90 min before the occasion for reinforced reporting. In Group B, this correspondence was a result of a cessation of reporting on the part of those children who had not actually played with the material during the free-play period. The effect in Group A could be characterized as demonstrating the control of reinforcing the childrens' verbal behavior during group time on their nonverbal behavior during the free-play period on the following day. The effect in Group B could be characterized as the children discriminating (differentially responding on the basis of) their own non-verbal behavior during the preceding free-play time on the same day.

A factor that may have contributed to the difference in effects in Groups A and B was the difference in response requirements for using paint and for using blocks. In order to use blocks, a child had only to ask for, and be handed one (or two) which he could stack on the floor and then put up on the shelf. In order to use paint, on the other hand, a child had to emit a fairly long chain of responses in order to acquire an apron, paint, brushes, and paper, before he could arrive at a "painting". In addition, painting was done in a side room rather than in the main preschool room where most other activities (including breakfast and block play) were located.

A second question concerned the discriminative properties of putting two blocks on the shelf: though the exchange of areas between the groups on Day 61 demonstrated that it made no difference whether the materials were within view at snack time, the original placement of the blocks on the shelf may have functioned in some way to reinforce play with blocks (for instance, as a token "guarantee" that snack would be forthcoming later).

These two questions were investigated in Exp. II, in the course of replicating Exp. I in Group A.

A third question concerned the marked decline in verbal behavior in Group B to the level of the occurrence of the non-verbal behavior. With this decline, any stimulus properties of reinforcing the verbal behavior which

might have contributed to actual use of the corresponding material were present much less frequently at snack time: there was little "saying" for "doing" to correspond to. While the reporting of those children who had not painted on a given day was no longer reinforced with snack, it produced the teacher's comment: "You really didn't though, did you?" During the last 18 days of reinforcement of correspondence, children in Group B who had not painted that day rarely reported having done so more than once at the outset of snack time; after the teacher responded: "You didn't really though, did you?" to that statement, these children talked of other activities (and were responded to socially by the teacher when they did so). Thus, under the reinforcement of correspondence procedures, the low rate of painting resulted in a condition in which punishment as well as extinction could have produced the observed decline in reporting.

Table 1

Table of Conditions

	Material	*Reinforce*	*Days*
GROUP A ($N = 6$)			
Baseline			15
Exp. I	Blocks	Content	24
		Correspondence	28
Exp. II	Paint	Content	12
		Correspondence	17
	Blocks	Content	13
		Correspondence	13
	Keg	Content	6
	Tower	Content	4
		Correspondence	4
	Books	Content	1
		Correspondence	1
GROUP B ($N = 6$)			
Baseline			15
Exp. I	Paint	Content	24
		Correspondence	28
Exp. III	Paint	Content	29
		Correspondence	15
	Blocks	Content	9
+ teacher comments		Content	7
− teacher comments		Correspondence	10
+ teacher comments		Correspondence	5

Experiment III investigated the function of the food snack in maintaining reporting and the function of the teachers' comments in reducing reporting, in the course of replicating Exp. I in Group B.

Table 1 presents the number of days in each experimental condition for Group A and Group B, the material of reported use, and the contingency for food reinforcement in that condition.

EXPERIMENT II

Experiment II was designed to investigate whether repeated replication of Exp. I in Group A (reinforcement of content followed by reinforcement of correspondence) would result, in time, in the childrens' verbal behavior beginning to control their non-verbal behavior, such that "saying" would lead to "doing".

Procedures

Preschool conditions, recording and experimental procedures were identical to those in Exp. I.

In order to replicate Exp. I, and at the same time investigate the role of the type of non-verbal response, the children in Group A were, beginning on the sixty-eighth day of school, given snack and social approval for verbalizing use of paint. No prompts were given: the teacher simply waited until one of the children verbalized that he had painted that day. After 12 days of reinforcing content, on Day 80, the children were given snack only if their verbal behavior corresponded to their non-verbal behavior (*i.e.*, if they had actually painted that day). As in Exp. I, the teacher confirmed the child's report as she presented snack ("That's right, you really did"), or disconfirmed it ("You didn't really though, did you?"); she responded socially to all other verbalizations.

On Day 97, after 17 days of reinforcing correspondence in painting (when the children reliably both painted and reported painting), the teacher in Group A returned to giving snack contingent upon only verbal behavior of the content "I played with the blocks". Thirteen days later, on Day 110, she began giving snack for correspondence between the verbal behavior at snack time and actual play with blocks during indoor free play that morn-

ing. All conditions, at snack time and during free play, were similar to those in the last seven days of Exp. I except that the children were not instructed to place two blocks on the shelf at the end of block play.

On Day 123, after 13 days of reinforcing correspondence (when the children reliably both played with blocks and reported it), the teacher in Group A began giving snack for the verbal behavior "I played with the kitty-in-the-keg". No actual use of the material was required, and the teacher neither confirmed nor disconfirmed the reports. (The kitty-in-the-keg was a small nest of barrels, a Montessori-type manipulative toy.) Since no child had played with the keg on the first day of reinforcement of content, the teacher prompted the response by asking: "What else did you play with in the block area?" such that the children, in the course of naming all the materials available in that area, eventually named the keg.

Six days later, on Day 129, the children in Group A were given snack for verbalizing use of the nesting tower (another Montessori-style manipulative toy). No prompts, confirmations, or disconfirmations were given and no actual use was required. On Day 133, the first day after fewer than five of the six children actually used the nesting tower during free play, the teacher began giving snack contingent on correspondence between the verbal behavior and the non-verbal behavior.

After four days, on Day 137, the children in Group A were given snack for verbalizing use of a book. The response was not prompted. The following day, the teacher gave snack only to children whose verbal behavior corresponded to their non-verbal behavior (those who had looked at a book during indoor free play). This move directly to reinforcing correspondence was made in order to offset the formation of a discrimination that the correspondence contingency never followed immediately upon the contingency for content.

Results

The third observer recorded with the regular observer during the snack period every other day (a total of six days) at the beginning of Exp. II; after the eighty-second day of school she observed with the regular observer on varying days of the week once every two weeks (a total of eight days). On all 14 of these days, agreement between the two observers, calculated in the same way as in Exp. I, was 100%. Checks of all the observers' records of the use of materials by given children on given days in every case confirmed the teachers' records of those children's use of that material that day.

The results of Exp. II are graphed in Fig. 2. The data are graphed in the same way as those in Fig. 1: "said" (the dotted line) represents the percentage of the children in the group recorded in the verbatim observer records as verbalizing the reinforced content one or more times, and "did" represents the percentage of children in the group who used the given material, as noted by the teacher in the area. The data points for "did" are offset at changes in conditions, as in Fig. 1. Since they are typical, only the 15 days of baseline immediately before the condition of reinforcing content are shown in Fig. 2 for each material except

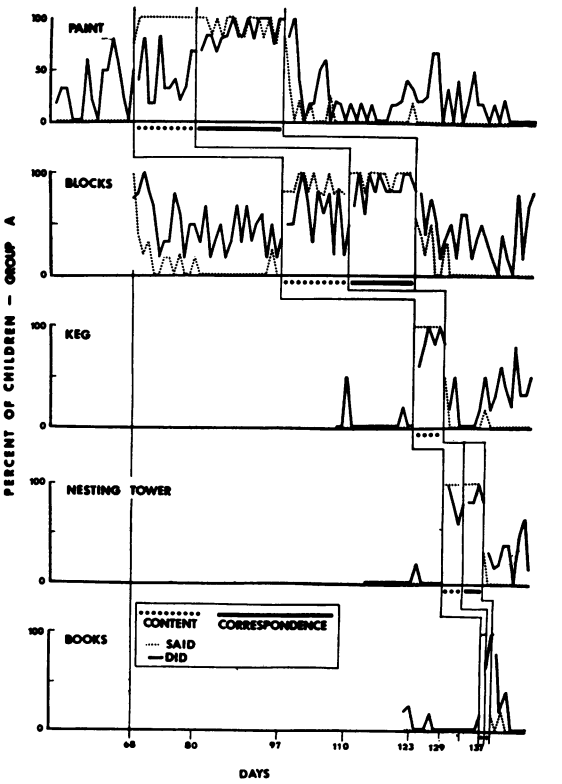

Fig. 2. Percent of children in Group A who reported use at snack time (said) and who actually used (did) during free play paint, blocks, kitty-in-the-keg, nesting tower, and books. The dotted line below each x-axis indicates reinforcement of content; the solid line below each x-axis indicates reinforcement of correspondence. dence.

blocks, where all days are shown subsequent to those shown in Fig. 1.

During the 15 days of baseline on painting, no child in Group A verbalized use of paint, while a median of 33% of the children actually painted. When snack was contingent on verbalizing use of paint, the number of children who reported painting increased to 100% of the group and remained there for 11 days. The number of children in the group who actually used paint increased slightly to a median of 40%. When snack was made contingent upon correspondence between the report and use of the material, both use of paint and reporting its use stabilized at a median of 100% of the group. The increase in painting to five or six out of the six children in Group A each day after snack was made contingent on correspondence, indicates that the difference between the tasks, block play and painting, could not in itself account for the difference between Group B and Group A in Exp. I.

Over the 29 days of reinforcing content and then correspondence in painting, the median percentage of children in Group A verbalizing use of blocks returned to the baseline level of zero. The use of blocks during this period declined to a median of 33% of the children per day. When the children were again given snack contingent on verbalizing use of blocks, 80 to 100% (median, 83%) of the children described use of blocks on the next 13 days. On the fourth day of thus reinforcing content, all six of the children used blocks during indoor free play; on subsequent days, four and five children used blocks (median, 67%). On three of the days of reinforcing content, all of the children who received reinforcement for the verbal content of "blocks", had used the blocks; that is, correspondence was in fact often reinforced when the contingency was for content only. The increase in the average number of children "doing" each day produced by this reinforcement of content (blocks) was greater than that produced by reinforcement of content (paint).

When correspondence between the verbal and non-verbal behavior was reinforced with snack, the average number of children using blocks rose to five to six each day (median, 83%) to match the number reporting such use (median, 100%). This correspondence took place sooner than it had in Exp. I: only on the sixth day of reinforcing correspondence in Exp. I did all of these children use blocks; in Exp. II all of the children used blocks during free play on the third day of reinforcing correspondence. After this first 100% day, the subsequent numbers of children using and reporting blocks each day in Exp. I and II are comparable at five to six children per day. Since the two blocks were not put up on the shelf in the correspondence condition of Exp. II, as they were in Exp. I, such placement was shown to be, at least on replication, not necessary for the effect on block play.

On the second day after reinforcement of reporting use (content) of the kitty-in-the-keg, 80% of the children in the group played with this material during indoor free play, as opposed to the one child during the preceding 13 days of baseline. The number of children using the keg remained at 80 to 100% (median, 83%) on the four subsequent days. With 100% of the children reporting the use of this material, only two children were given snack (once each) on these four days when their non-verbal behavior did not correspond to their verbal behavior. On the first day after reinforcing the verbal behavior, "I played with the nesting tower", all six of the children in Group A engaged in the non-verbal behavior, whereas only one of them had used the nesting tower (once) during the prior 15 days. The number of children using the nesting tower during free play declined (by one child each day) over the next two days. When snack was made contingent on correspondence, the number of children using the nesting tower returned to 100% after two days. The first day after reinforcing the verbalization of looking at a book, four of the six children asked for books during free play indoors, whereas only two children had done so during the previous 10 days. All six of the children looked at a book the next day, after correspondence had been reinforced at snack time. In all cases, when the reinforcement contingency was shifted to reporting a new material, the percent of children who used and reported the previous material declined systematically, approaching the baseline level.

Discussion

Experiment II shows that, over time, "saying" did lead to "doing" for most of the children in Group A: verbal behavior on the prior day controlled non-verbal behavior (the selec-

tion of a play material) on the following day. Across the last four materials, four to six of the children in Group A used each material in turn, in Exp. II, when only the verbalization of use of that material was reinforced with snack. On four occasions, all of the children used a material during free play subsequent to being reinforced for just saying they used it. In these circumstances, correspondence was in fact being reinforced, though the requirement was only of content. It may be that an observed correlation between verbal and nonverbal behavior in everyday situations occurs as a result of some such process: that correspondence between verbal and non-verbal behavior is "accidentally" reinforced, by a reinforcer scheduled not for correspondence, but for either the verbal content or the non-verbal behavior alone, or even for an unrelated behavior.

EXPERIMENT III

Concurrent with Exp. II, Exp. III was conducted with Group B. Recording procedures and preschool conditions were unchanged from Exp. I. The first purpose of Exp. III was to replicate Exp. I in Group B through a reversal to the condition of reinforcement of content in order to increase the verbal behavior, to be followed once again by reinforcement of correspondence.

Procedures

Beginning on the sixty-eighth day of school, after 28 days of reinforcing correspondence in Exp. I, the children in Group B were given snack for verbalizing use of paint whether they actually used it that day or not. The teacher responded socially to the children as she had during the prior condition of reinforcement of content: she approved a child's verbal behavior while offering snack, and responded socially to any other comments made by the children, but neither confirmed nor disconfirmed any child's report of using paint.

After 29 days, on Day 97, when all the children were again reporting use of paint, and actual use was comparable to use during the first condition of reinforcement of content, reinforcement of correspondence was reintroduced. Children were given snack only when their verbal behavior at snack time corresponded to their non-verbal behavior during indoor free play. As in the prior condition of reinforcement of correspondence, the teacher confirmed a child's report while offering snack ("You really did"), or disconfirmed his report by saying: "You didn't really, though, did you?". Any other comments made by children were socially responded to by the teacher as before. Snack was contingent on correspondence for the next 15 days.

In the course of replicating the effects with a new material, an attempt was made to separate the role of the teacher's comments on the reporting from that of food presentation. Beginning on the Day 112 of school, the children in Group B were given snack for reporting use of blocks. The criteria for reinforcible verbal behavior were the same as in the previous conditions of reinforcing content: a positive statement of use containing both "I" and the name of the material. The behavior was not initially prompted. All statements on the part of the children were responded to socially by the teacher, but snack was given only for statements of use of blocks. No comments on block play were made by the teacher.

After 10 days of reinforcing content in the same manner as in the two prior conditions of reinforcement of content, teacher confirmation or disconfirmation of the child's verbal behavior (as previously presented only in the condition of reinforcement of correspondence) was introduced into the condition of reinforcement of content. However, snack continued to be given for all verbalizations of use of blocks. The teacher said (instead of her usual general statement of approval): "That's right, you really did" as she offered snack to a child who had actually used blocks; if the child had not used blocks that day, she said as she offered snack: "You didn't really, though, did you?". All other statements by children were responded to socially by the teacher as in prior conditions.

Seven days later on Day 129, conditions were changed to the reinforcement of correspondence. Snack was presented for reporting use of blocks only if blocks had actually been used during indoor free play that day. However, no differential social response was made to the verbalization. The teacher neither confirmed nor disconfirmed a child's report: she said "mmmhmm" to all statements of use of blocks, but offered snack only to those children who had actually used the material.

After 10 days, while snack was still contingent on correspondence, the differential social response was reintroduced: the teacher again said, as she presented snack to a child whose report of block play corresponded to actual use of the material that day: "That's right, you really did". To a child who reported block play without having actually used blocks, the teacher responded: "You didn't really, though, did you?". Any statements other than reports of block play were socially responded to as in all prior conditions.

Results

The third observer recorded with the regular observer in Group B every other day (a total of six days) at the beginning of Exp. III; after the eighty-second day of school she recorded with the regular observer on varying days of the week once every two weeks (a total of six days). Over the 12 days that reliability checks were made, the inter-observer agreement that each child did or did not verbalize the reinforced content on that day was 98%: there was one disagreement on one child on Day 112. The third observer's records, taken on the other four days of each week after the eighty-second day of school in every case confirmed the description of the social responses given by the teacher to children across the succeeding conditions of Exp. III. Checks of all the observers' records of the use of materials by given children on given days also in every case confirmed the teachers' records of those childrens' use of that material that day. Reliability was taken on one day in each of the conditions during reinforcement of reporting use of blocks; the inter-observer agreement on the number of times per snack time each child verbalized use of blocks was 96%.

The results of Exp. III are graphed in Fig. 3. The dotted line, "said", represents the percent of children in the group recorded in the observer records as verbalizing the reinforced content one or more times, and the solid line, "did", represents the percentage of children in the group who used a given material, as recorded by the teacher in the area. The data points for "did" are offset at changes in conditions, as in Fig. 1 and 2. The first day of "said" (paint) in Fig. 3 coincides with the final day (Day 68) of "did" in Fig. 1.

On the first seven days after the reversal to reinforcement of content in Group B, the correspondence of the verbal behavior to the non-verbal behavior was very similar to that of the prior condition of reinforcement of correspondence; it was nine days before all six children again reported painting. This increase to 100% reporting preceded by one day a similar increase in the non-verbal behavior; on two days (77 and 79 in Fig. 3) every child in the group painted, the first occurrences of 100% "doing" in the entire course of the experiment in Group B. Thereafter, while the number reporting painting remained at 100%, the number of children actually painting gradually decreased to the Exp. I baseline level of a median of 18%. It was not until the eighteenth day of again giving snack for the verbal behavior alone, that each of the children in the group had at least once reported painting without actually having engaged in painting.

When correspondence was again required, the initial effect was comparable to that in Exp. I: on the first day a drop in the number of children who reported painting, followed in succeeding days by an increase in both the non-verbal and the verbal behavior, and then by subsequent decline in verbal behavior to correspond approximately to the non-verbal behavior. Perhaps due to additional strengthening in the second condition of reinforcement of content, the verbal and non-verbal behaviors did not decline in Exp. III as much as they had in Exp. I: rather, they stabilized with a median of 83% of the children regularly reporting, while a median of 67% of the children were actually painting each day. When the criterion for reinforcement was shifted to another material on Day 112, the percentage of children either painting or reporting painting slowly declined to medians of 0%.

When the children in Group B were given snack for verbalizing use of blocks the number of children who reported such use, zero during baseline, increased to 100%. Actual use of blocks during indoor free play, which during baseline was at a median of 33% of the children per day, increased somewhat to a median of 60% during reinforcement of content. As can be seen in Fig. 3, there was no further trend toward correspondence. While the overall number of children using blocks actually declined somewhat to the baseline median of 33% per day when the teacher added confirmation or disconfirmation of each child's

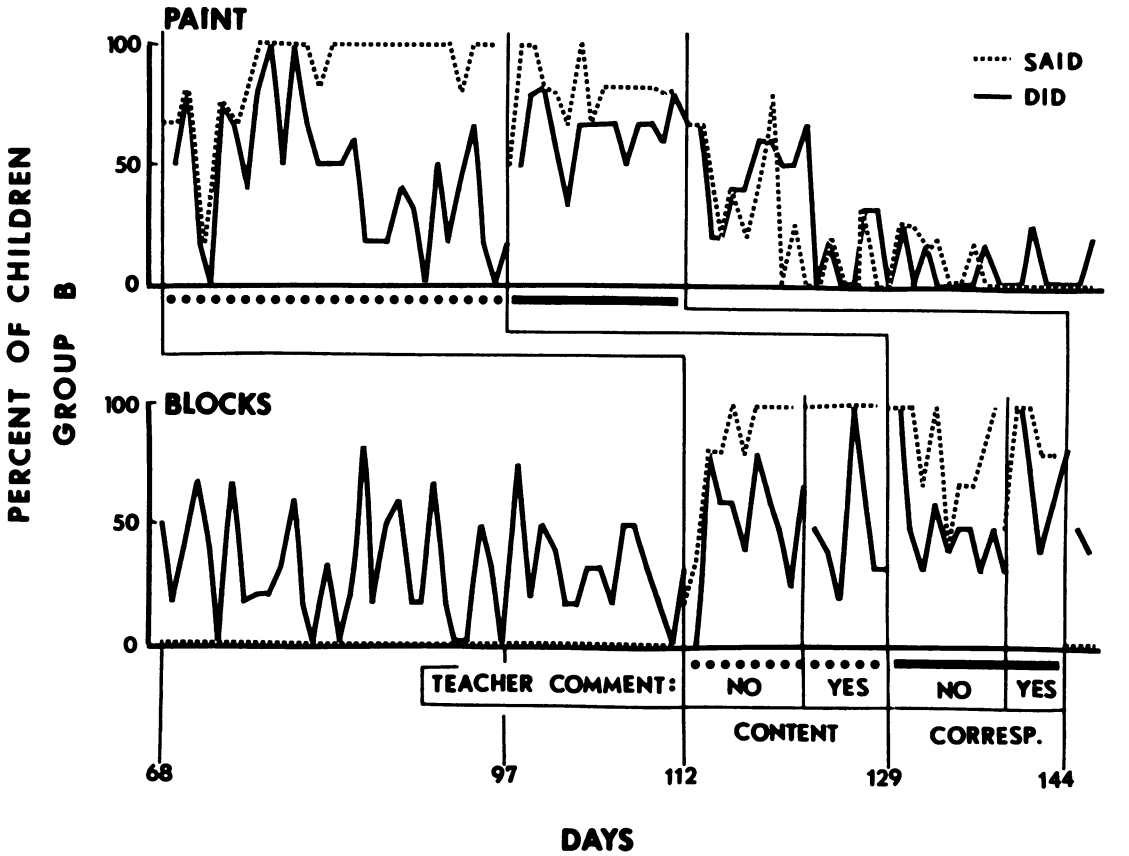

Fig. 3. Percent of children in Group B who reported use (said) and who actually used (did) paint and blocks. Teacher comments (confirmation: "You really did", when a child reporting use of blocks had actually used blocks during free play that day, or disconfirmation: "You didn't really though, did you?" when a child reporting use of blocks had not actually used them that day), were not presented (NO) during the first part of the CONTENT and CORRESPONDENCE conditions (blocks) but were presented (YES) during the second part of these two conditions.

report while still reinforcing content, reporting remained at 100% of the group.

Actual use of blocks increased to 100% of the children on the day after reinforcement of correspondence was introduced without teacher confirmation or disconfirmation but stabilized at 50% of the children per day. The number of children reporting use of blocks decreased until, on the sixth day of this condition, only those two children who had played with blocks during indoor free play that morning reported having done so, an effect similar to that seen with this group in Exp. I (paint) and Exp. III (paint). The number of children reporting rose, however, on the subsequent days such that on Day 138 it was again 100%.

As seen upon the two prior introductions of the requirement of correspondence at snack time (for paint), when teacher confirmation-disconfirmation was added to the presentation of snack for reporting block play, the number of children so reporting dropped on the first day of the condition, and then rose again on the second day. Subsequently, the number of children reporting remained at 80 to 100%. Actual use of blocks increased to a median of 60% in this condition, but due to the end of the school year, there are not enough data points to evaluate this trend adequately.

Figure 4 shows for each condition in Fig. 3 (blocks), the average number of times per day per child that block play was reported by those children who had actually used blocks that day, and by those children who had not used blocks. It can be seen that during reinforcement of content only, children reported

use of blocks equally often whether they had actually played with the blocks or not: 2.5 times per child per snack time.

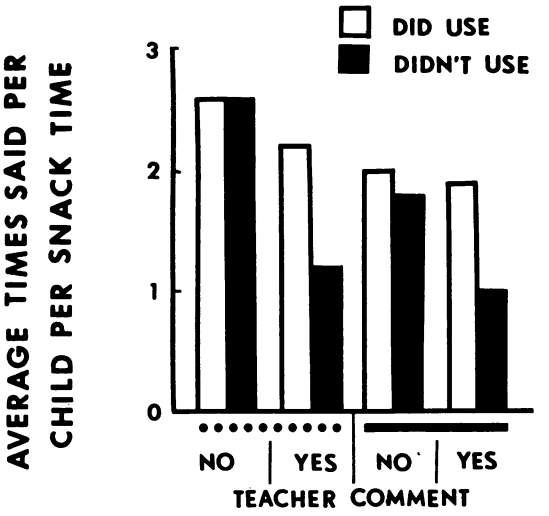

Fig. 4. Average times use of blocks was reported in Group B per child per snack time by those children who had actually used blocks (open bar) and by those children who had not actually used blocks (solid bar) during free play.

When, while still presenting snack for content only, the teacher added confirmation or disconfirmation of the child's report, the rate of reporting by those children who had actually used blocks remained at twice or more per day, while reporting by children who had not used blocks dropped to a little more than once per day. Confirmation did not increase the rate of reporting. On the other hand, the child who reported: "I played with the blocks", and received snack plus the teacher's response: "You didn't really though, did you?", seldom reported block play again that day. Disconfirmation by the teacher appeared, thus, to reduce the rate per child of reporting within snack time, even though it did not reduce the per cent of children so reporting at least once each day.

The presentation of snack alone for correspondence, without teacher confirmation or disconfirmation, led to a decrease in the number of children reporting (Fig. 3) but to an increase in rate of reporting by those children who had not used blocks (Fig. 4). Of the children who had not used blocks and therefore received no snack, those who reported did so nearly as often as did the children who were receiving snack: about twice per snack time, a rate more comparable to that when snack was presented for just the verbal behavior. Those children who continued reporting when they had not actually used the materials were those whose rates of reporting were not sensitive to differential food reinforcers alone.

When teacher confirmation or disconfirmation was added to the contingency for correspondence, the rate of reporting by children who had not used blocks again decreased to once per child per snack time. The twice-per-snack-time average reporting rate for children who had used blocks that day did not change.

Discussion

Reinforcing verbal reporting alone, which (after eight days) produced 100% of the children reporting, was followed by an increase in the percentage of children actually painting to 100% on two days, a level never previously reached with this group. However, with continued reinforcement of verbal reporting alone, the level of doing subsequently declined, producing the discrepancy between the percentage of children reporting and the percentage of children doing previously seen with these children in the comparable condition in Exp. I. Reinforcing again on the basis of correspondence between verbal and non-verbal behavior again produced a level of correspondence similar to that seen with this group in the comparable condition in Exp. I: the percent of children reporting dropped somewhat to correspond to the percent actually using the material. However, the level of non-verbal behavior increased markedly, such that a greater number of children in this group were both doing and saying than in Exp. I. The decline in the number of children actually using paint when the reinforcement contingency was shifted to another material indicates the function of the reinforcement contingencies in maintaining the use of paint in the preceding condition.

The investigation of the role of the teacher's comments in producing the correspondence in this group, particularly the role of disconfirmation ("You didn't really, though, did you?") in producing the drop in percent of children reporting, revealed that whereas this variable apparently functioned as a mild punishing stimulus, it did not account for the drop in percent of children verbally reporting. Al-

though the teachers' disconfirmation was functional in reducing the rate of a child (who had not actually used the reported material) repeatedly reporting the use of the material during snack time, it did not affect the probability of his similarly reporting during snack time on the following day. Differential food reinforcement was apparently the functional variable in producing this drop in verbal behavior. In the correspondence condition, the correlation between reinforcement for reporting and a child's actually having engaged in the non-verbal behavior was apparently sufficient to produce at least an initial decline in reporting. The role of the teacher's comments could probably best be characterized as additional discriminative stimuli specifying the contingencies for reinforcement. In the absence of differential food reinforcement, the teacher's comments had no discernible effect either on reducing the percent of children reporting or in increasing the percent of children actually using the material.

GENERAL DISCUSSION

By the end of this study, several of the children in Group B and all of the children in Group A were clearly emitting non-verbal behavior under the control of the stimulus of differential reinforcement for verbal behavior 22.5 hr (and even 60 hr over weekends) earlier. The present training procedures had developed a generalized correspondence between the verbal and non-verbal behaviors of these children such that their temporally remote non-verbal behavior could be modified by simply reinforcing their verbal behavior. With these children the correspondence between verbal and non-verbal behavior appeared to be a functional sequence of differential reinforcement of verbal behavior affecting non-verbal behavior such that differential reinforcement of "saying" led to "doing". The remaining children in Group B (and all of the children in Group B in the earlier portions of the study) conversely were clearly demonstrated to be differentially responding verbally on the basis of the discriminative stimulus of their own non-verbal behavior 1.5 hr earlier. In this case, differential reinforcement of saying served to bring the children's verbal behavior under the discriminative control of their own non-verbal behavior such that "doing" led to "saying" and "not-doing" led to "not-saying". Even in this group, there were times (*e.g.* during the second reinforcement of content with paint on Days 77 and 79) when saying did lead to doing for all subjects.

The increase in the number of children who engaged in the non-verbal behavior during the second correspondence condition (paint), as compared with the first correspondence condition in Group B, indicates that with a continuation of the sequence of reinforcing content and then reinforcing correspondence (with either the same or new materials) as was carried out with Group A, it is likely that for all the children in Group B the effect seen in Group A of saying leading to doing would have been produced. Except on the initial day of the first correspondence condition for each group, the teachers did not mention the materials which were the basis for differential reinforcement. The children's own verbal behavior appeared to acquire stimulus properties such that their own (or other children's) reports served as instructions for them.

To produce a reliable saying-doing correspondence between verbal and non-verbal behavior, several conditions may have been initially critical. The "difficulty" or probability of occurrence of the non-verbal behavior may have contributed to the differential effect between Group A and Group B in Exp. I, even though later in the study it was shown not to be functional. The token placement of two blocks on the shelf and the teachers' confirmation may have initially served as functional discriminative stimuli to "bridge" the considerable time span involved in the study and to make explicit the reinforcement contingencies. These factors which were not necessary in the later stages of the experiment for saying to lead to doing, may have been critical, especially in combination, to the initial effect. The food reinforcer, which was demonstrated to be critical in producing the effect, was not dependent upon any discernible level of food deprivation, as it was delivered less than 1 hr after the second meal of the children's 3-hr preschool day. In this study, involving disadvantaged Negro preschool children, the non-verbal behavior "directed" by the childrens' own verbal behavior was performed the next day almost 24 hr after the verbal behavior occurred, and the reinforcement of correspondence between verbal and

non-verbal behavior took place 1.5 hr after the occasion for the non-verbal behavior. The characterization of members of this population as unable to plan ahead or delay gratification (Mischel, 1958), if at all true, appears not to apply at age four.

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