JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1968, 1, 167-173 NUMBER 2 (SUMMER 1968)

COLLATERAL SOCIAL DEVELOPMENT ACCOMPANYING REINFORCEMENT OF OUTDOOR PLAY IN A PRESCHOOL CHILD[1,2]

JOAN BUELL, UNIVERSITY OF OREGON; PATRICIA STODDARD AND FLORENCE R. HARRIS, UNIVERSITY OF WASHINGTON; AND DONALD M. BAER, UNIVERSITY OF KANSAS[3,4]

A 3-yr-old preschool girl with deficits in both motor and social repertoires was socially reinforced by teachers for use of outdoor play equipment, as a contribution to her motor skills and as a tactic to produce increased social contact with other children. Her use of outdoor play equipment, and various examples of her social interaction with both teachers and children were scored in the course of experimental development and analysis of her rate of equipment use. Equipment use increased greatly under the social reinforcement contingency; certain desirable examples of social interaction with other children showed a collateral development; other examples of adult-oriented development remained constant; and one class of undesirable baby-like behavior decreased markedly. Thus, the study provided a picture of what other behavior changes may take place in the course of behavior modification aimed at a single response class.

That the preschool teacher should be a notable source of social reinforcement for the children in her class has rarely been doubted. That she can effectively wield this reinforcement as a technique of behavior modification in the service of those children has now been demonstrated in numerous instances (*cf.*, Harris, Wolf, and Baer, 1964; Allen, Henke, Harris, Baer, and Reynolds, 1967; Baer and Wolf, 1968; Hart, Reynolds, Baer, Brawley, and Harris, 1968). These demonstrations uniformly single out a specific class of behavior (a behavior problem for the child studied) and demonstrate that remediation can be produced experimentally. The changes produced are clearly desirable in such cases, and are rarely questioned. However, a persistent question has concerned the possibility of allied behavioral changes in the course of the study. These allied changes are often pointed to as desirable in themselves. Sometimes they are more far-reaching than the behavior originally treated (Baer and Wolf, 1967), and thereby could be seen as the more valuable target of the remediation effort. By contrast, it is sometimes suspected that the allied behavioral changes will represent undesirable developments, due to a surface rather than basic suppression of the child's "real" problem. That is, the new behaviors could represent merely new expressions of the old problem (such that crying, once reduced, might be replaced by, say, thumbsucking).

In the past, little data concerning the actual nature of such allied behavioral changes have been collected objectively. Global observations and impressions have usually testified to the generally desirable character of whatever behavior changes took place, but nothing more specific or precise has been available for close inspection. The present study was designed to provide more objective data, of a reasonably comprehensive nature, concerning the variety and amount of behavioral change that might result, in the course of a behavior modification program aimed at a single specific class of problem behavior. The problem behavior in this case was a lack of both motor play and social repertoires in a 3-yr-old girl; the behavioral setting for remediation was the preschool; and the basic technique applied was social reinforcement.

[1]This research was supported in part by a grant to Donald M. Baer by the National Institute of Mental Health, MH-02208—entitled An Experimental Analysis of Social Motivation.

[2]This research was conducted while the authors were staff members of the Institute of Child Development, University of Washington.

[3]Reprints may be obtained from Donald M. Baer, Department of Human Development, University of Kansas, Lawrence, Kansas 66044.

[4]Research Associate, Bureau of Child Research, University of Kansas.

Procedure

The subject was a strong, attractive 3-yr-old girl, called Polly for this report. Her parents were not native speakers of English, and Polly had spent all of her second year living abroad with them. Presumably as a consequence, her language skills in English, although technically well developed for her age, nevertheless were distinctively strange, by the standards of the usual American audience, and especially so for 3-yr-olds. Thus, it was not particularly surprising to find that Polly participated very little in her preschool program, where she was one of 12 children, the other 11 being normal speakers for their age. In particular, her teachers noted that she showed no cooperative play with the children, never used their names, infrequently touched or spoke to them, and showed only a certain rate of parallel play as her major form of social interaction. She rarely used the outdoor play equipment of the schoolyard. Her behaviors with teachers were frequent, but equally discouraging: she would most often hang on a teacher's coattail and engage in a type of stylized monosyllabic prattling which was clearly a bright imitation of her infant brother's babytalk. No improvement was reported by the teachers after a full month of preschool attendance, and consequently a systematic program of behavior modification was planned.

The essence of this program was to explore a tactic, simple in its basic dimensions but possibly effective in contributing to the totality of Polly's behavior problems. The tactic chosen was to develop Polly's use of outdoor play equipment. It was assumed that if her rate of using such equipment could be increased and maintained, she would very likely be thrown into a steady variety of interactions with her peers, and that from such interactions many useful contributions to her behavioral repertoire could result. To evaluate the extent to which this happened, it was necessary to observe a representative sample of these desired interactions. A set of behaviors reflecting child-oriented and teacher-oriented social behaviors, and equipment use, was defined, as listed in Table 1.

Table 1

Definitions of Responses Under Study

Object of Response	*Type of Response*	*Criteria of Response*
Teacher	Touching	Polly and teacher in contact, no matter who originated the contact; or both touching the same object, such as holding the same toy.
Child	Touching	Same as for touching teacher, but involving another child instead of teacher.
Teacher	Verbalization	Verbalization within 3 ft of a teacher, either using her name or facing the teacher directly.
Child	Verbalization	Verbalization within 3 ft of a child or within 3 ft of a child and teacher, but not also using teacher's name or facing her directly.
Child	Using Child's Name	Speaking the proximate child's name, or saying "you" to the child directly.
Child	Parallel Play	Playing within 3 ft of another child or at the same recognizable location (*e.g.*, sandbox, table, easel) but *not* sharing material (such as same piece of clay, same jar of paint, *etc.*)
Child	Cooperative Play	Shared play, such as building same structure, taking objects from same container, talking together to coordinate activity, following rules of game, sharing roles in activity such as playing store, *etc.*
Teacher	Baby Behavior	Monosyllabic, repetitive babytalk, babylike hand flapping, hopping from one foot to the other and back repetitively, and speaking incomplete sentences.
Equipment	Play on Outdoor Equipment	Appropriate use of swing, trike, boat, tunnel, log, rocking board, jumping board, ladder box, rocking boat, and climbing frames, with or without another child present on the same equipment.

These categories of response were scored by time-sampling. An observer, watching Polly constantly throughout each outdoor preschool session, recorded every 10 sec which of these behaviors, if any, Polly had shown during that 10-sec interval. The observer also recorded teacher response to Polly, whether contingent on these behaviors or offered at other times. Thus, Polly's rate in any behavioral category could be computed as the percentage of 10-sec intervals during which she was observed that she displayed the behavior in question. These rates, expressed as percentages, comprised the basic data of the study.

Observer reliability was checked frequently, mainly because of the unusually large number of categories to be recorded. On three of every five days of each school week, two observers worked as a pair. At the end of each day, their records were compared and a percent-agreement score calculated. Agreement meant that for a given interval of the day, both observers had scored the same behavior as occurring. (Instances in which both observers agreed that nothing had occurred were not counted.) Percent-agreement was calculated as the number of agreements divided by the number of agreements and disagreements combined. Percent-agreement was never less than 85%, and typically exceeded 90%, for each behavior category defined in Table 1. It was thus concluded that observation was adequate to the demands of the study, which then proceeded according to the following design.

The experimental design consisted of a baseline period, followed first by reinforcement coupled with an auxiliary technique of "priming", and then by reinforcement without priming. This subsequent period of reinforcement without priming was probed twice, briefly, by periods of non-contingent reinforcement to examine the role of reinforcement in maintaining any behavioral changes that had appeared so far.

Baseline. The baseline period lasted five days, sufficient to demonstrate that the observational categories and techniques of the study were adequate to produce reliable data, and to confirm the teachers' estimate of Polly's behavioral characteristics. During this time, teachers gave Polly random, noncontingent attention as usual. Polly asked to use play equipment only once, requesting that the seesaw be set up. When it was, she then refused to use it. She did show a low rate of spontaneous use of the outdoor play equipment, but never in response to a teacher's invitation, which she invariably answered with "No, I don't want to."

Reinforcement with priming. Starting on Day 6, teachers began creating an instance of using play equipment outdoors each day, and then reinforcing the behavior created. Referred to here as priming, this technique consisted simply of lifting Polly bodily onto a piece of play equipment once each outdoor session, and holding her there at least 30 sec if necessary. A different piece of equipment was used each successive day. Teachers chose their occasions for doing this by taking advantage of Polly's normal shifts of locale, selecting a piece she had happened to come near at the moment (so long as that piece had not been used for priming on a previous day). Polly was put on equipment whether or not another child was using that equipment, and whether or not she protested (which she did the first three times it occurred). As long as Polly stayed on the equipment, on these as well as on any unprimed occasions, the teacher remained close (within 3 ft or less), watching, touching her as seemed appropriate, smiling and talking about her play, and generally displaying interest, approval, and delight in Polly's activity.

The period of reinforcement with priming lasted nine days (Day 6 to 14), when teachers judged it had served its purpose; it was then supplanted by a period of reinforcement without priming. During this period, in addition to the consistent, continuous reinforcement offerred for all forms of equipment play, primed or not, teachers continued their usual practice of giving random, intermittent reinforcement for Polly's other behaviors.

Reinforcement without priming. Beginning on Day 15, teachers discontinued their daily priming technique. Polly's behavior was reinforced as before if she showed any use of the outdoor play equipment, but she was never lifted or placed on any piece unless she first requested it. Teachers continued to suggest occasionally that she might like to use the equipment ("Polly, would you like a trike?") but urged no further if the invitation were refused. (This had been their standard practice throughout Polly's stay at preschool.) Starting with the fifth day of this period (Day

19), teachers began gradually to make their reinforcement of equipment play more intermittent, stepping a few feet away from Polly between comments (which averaged every 30 sec), and then a few feet more, *etc.* Then, they began staying away longer than 30 sec, gradually lengthening this interval over the days of this and succeeding reinforcement periods of the study. Reinforcement without priming was continued for 27 days, interrupted twice by probes of noncontingent reinforcement.

First probe. After eight days of reinforcement without priming, a five-day probe of noncontingent reinforcement was instituted (Days 23 to 27). During this time, teachers continued (as always) their patterns of intermittent, random reinforcement of various of Polly's activities, as these happened to attract the teachers' attention. Reinforcement for play on outdoor equipment, however, was almost but not quite zero. A five-day probe was judged adequate to show the dependence of the behavior on reinforcement, which accordingly was resumed.

Second probe. Another nine days of reinforcement (Days 28 to 36) followed the first probe. Thereafter, a second four-day probe was initated (Days 37 to 40), which again was judged sufficiently long to demonstrate the continuing reliance on teacher reinforcement of Polly's outdoor equipment use. Procedures during the second probe were essentially identical to those during the first, with the following exceptions:

Use of outdoor play equipment was never reinforced: if Polly asked to use the equipment, she was simply told that it was all right to do so if she wanted; and teachers consistently reinforced Polly within 20 sec of her leaving any piece of outdoor play equipment.

After the second probe had ended, reinforcement was resumed for a final 10 days (Day 41 to 50) when the study ended as the teachers judged that Polly's total pattern of behavior had improved sufficiently.

RESULTS

Use of outdoor play equipment. Figure 1 shows Polly's rate of using outdoor play equipment, as defined in Table 1. It is clear that the initially low rate of equipment use was markedly increased by reinforcement, changing from approximately 2% during baseline to a near-70% rate by the end of the study. These percentages reflect the time that this equipment was available to Polly, not her total day at preschool. (During indoor times, she of course would not be able to use any of the equipment located in the play yard.)

Figure 1 also displays an effect attributable to the priming technique. When on Day 15 priming was discontinued, Polly's rate of equipment use dropped from its previous rate near 50% of the time available to a notably lower rate approximating 30%. This was apparently a transitory loss, her rate soon recovering its previous near-50% level by the fifth day of this period. Nevertheless, it indicates that a certain amount of Polly's use of equipment was dependent on the one instance which the teachers prompted each day of the preceding period. The teachers' technique guaranteed only 30 sec of such activity each day. The gradual rise of equipment use during the reinforcement with priming period, coupled with initial loss of rate and its subsequent recovery under reinforcement alone, suggests that the two techniques interacted to produce the initial results, but that reinforcement was certainly basic to the development produced. This is further supported by the clear collapse of Polly's rate of equipment use during the later probes of noncontingent reinforcement.

An interesting observation made by the teachers and confirmed by the observers was that during the reinforcement with priming period, Polly never spontaneously used a piece of play equipment on which she had not previously been primed. Indeed, it was not until the final period of the study that she used a piece of equipment not involved in the priming of the first reinforcement period.

Collateral social development. Of the behaviors listed in Table 1, some showed no change in the course of the study, some increased, and one decreased. These changes are shown in Fig. 2. Those behaviors which remained constant were primarily teacher-oriented behaviors, specifically touching a teacher or verbalizing to her. However, parallel play remained consistently unstable during the study, too, and this was assumed to be a child-oriented behavior, although one of only rudimentary social significance.

The behaviors which did increase were primarily child-oriented. Specifically, touching or

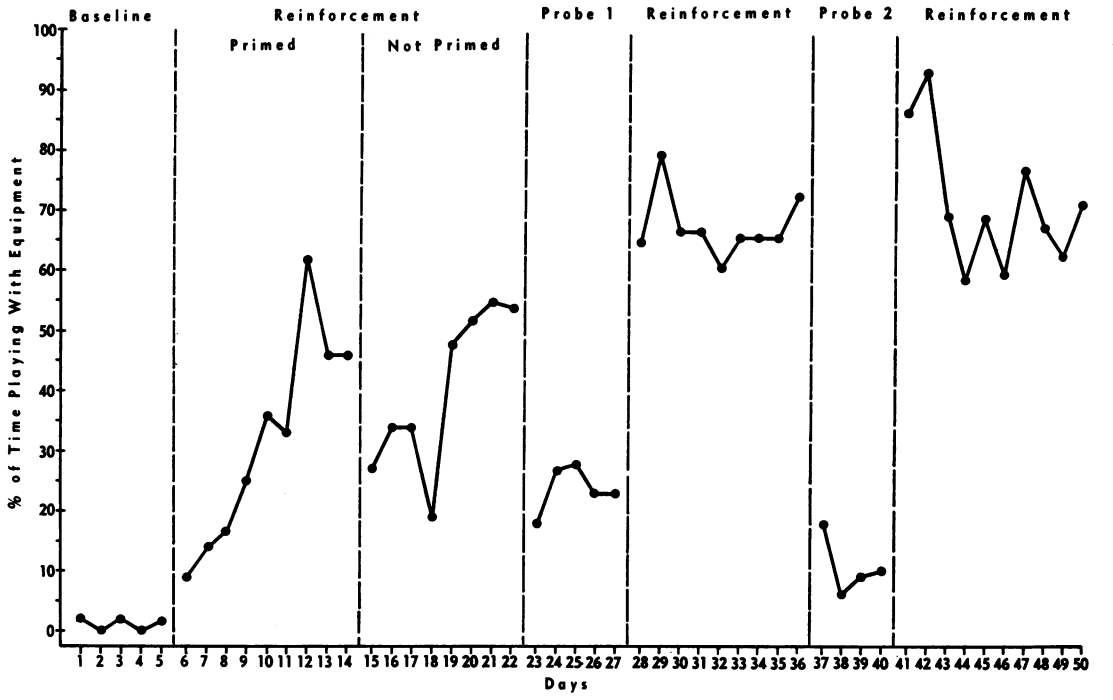

Fig. 1. The development of outdoor equipment use by priming and reinforcement procedures, probed by non-contingent reinforcement.

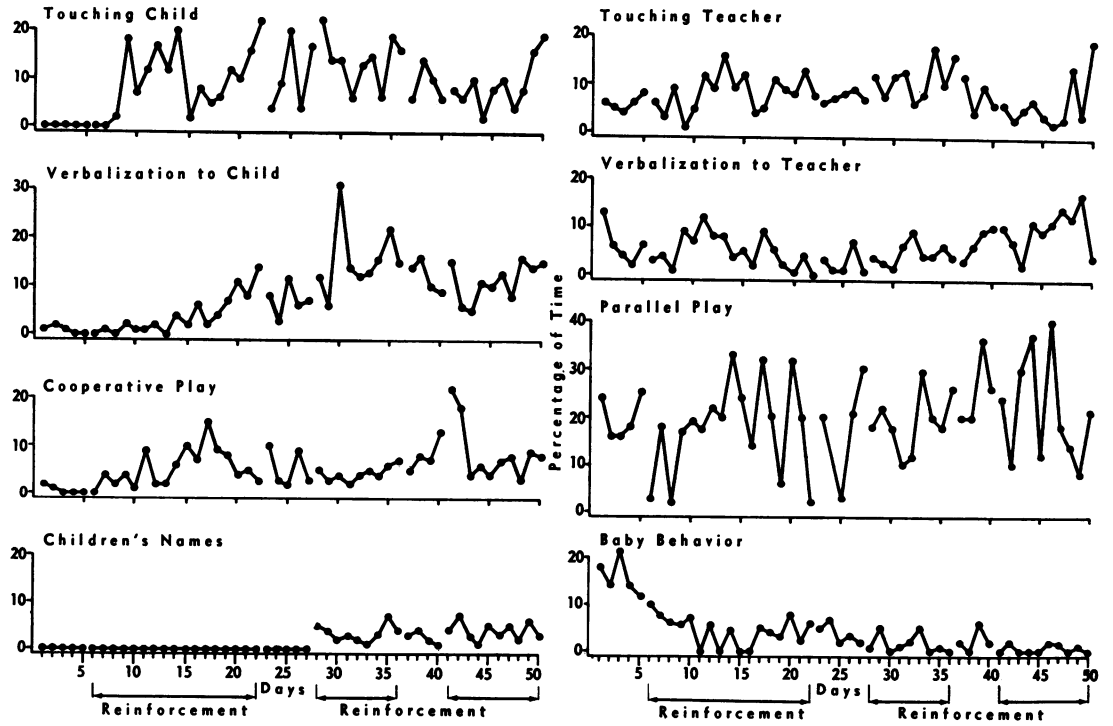

Fig. 2. Collateral patterns of behavior change accompanying the development of outdoor equipment use.

verbalizing to other children, using their names, and engaging in cooperative play with them showed various patterns of increase. Touching children was most prompt in its increase from zero baseline, and was followed closely by a fairly steadily increasing tendency to verbalize to the children touched. Cooperative play also emerged from its near-zero baseline relatively early after reinforcement of equipment play started, and developed slowly but adequately (for 3-yr-old standards) in the course of the next few weeks. The use of other children's names appeared late in the study, but developed to more than adequate levels within a few more days (again, by preschool standards, as exemplified by other children judged quite normal in their social development in such settings).

The one behavior which decreased following reinforcement of equipment use was baby behavior. This category consisted of baby talk, hand-flapping, and hopping responses, appreciated by the teachers as highly accurate imitations of Polly's infant brother, and also of incompleted simple sentences. As the study progressed, baby talk, hopping, and flapping disappeared, leaving an increased frequency of incomplete sentences; presently, however, these too disappeared, leaving a near-zero level of the total response class by the end of the study.

DISCUSSION

The study shows again the clear and powerful role which teacher-supplied social reinforcement can have in developing a selected response class in a preschool child. In this regard, it adds one more behavior class to those already shown sensitive to such analysis. This study also shows, quantitatively and in some breadth, the kinds of behavior changes which may accompany such behavior modification, especially if the behavior chosen for direct modification is a sound tactical choice, in view of the child's total range of behavioral deficit. In this case, the child's basic problems were considered both motor and social. A reasonable tactic, on the face of it, would be to contribute directly to improving the child's motor skill in a sphere—use of outdoor play equipment—where the resulting behavior would tend automatically to create increased social contact with other children. This social contact in itself, if it contained any effective reinforcers for Polly, could be adequate to shape a wide variety of social skills suitable for child-child interaction. The results of this study generally conform with this expectation. Desirable patterns of child-oriented behavior did appear shortly after reinforcement of equipment use was successfully applied, and did continue to develop throughout the periods of the study of equipment use. The developmental curves of these behaviors in general conform only to the initiation of reinforcement at the outset of the study, rather than to its continuing pattern of application in contingent and noncontingent schedules. That appears reasonable, in that this programmed teacher-reinforcement was applied directly only to equipment use, not to the other behaviors under study. Thus, they would have met teacher-reinforcement in the usual way during all phases of the study. More probably, the increasing contact of these behaviors with the demanding contingencies of reinforcement supplied by Polly's peers, now that she was sharing their much-used outdoor play equipment, brought about the desired developments.

Finally, it is encouraging to note that the behavior under study, which might be taken to connote emotional disturbance, autism, regression, or the like, specifically Polly's baby-like repertoire, decreased steadily as the study progressed. Baby-like behavior may have been under more effective extinction during experimental conditions than it had been during the baseline period. The teaching staff, aware of how easy it would be to maintain that behavior by intermittent reinforcement, had from the outset of Polly's year at preschool attempted to ignore it. Unfortunately, they found themselves failing to do exactly that, from time to time. However, during reinforcement of equipment use, the teachers noted that Polly was most likely to begin her baby performance just when she had stopped playing on equipment; it was of course at exactly these moments that teachers turned away from her, as their assignment was to reinforce equipment play, not its cessation. Thus, a side benefit of the reinforcement procedure may have been an increased efficiency of extinction for the baby-like behaviors.

The priming technique used in this study deserves comment. It was designed to hasten

the emergence of equipment use, so that more and more examples of that behavior class would be available for reinforcement. Clearly, it accomplished that. The teachers had wondered whether the use of priming would handicap Polly when priming was later discontinued: would she be able to initiate her own use of the play equipment without teacher assistance? The results show clearly that she was able to do that, with only transitory partial loss of her new rate when priming was discontinued. However, the teachers also noted that not until quite late in the study did Polly show any spontaneous use of a piece of play equipment on which she had not been primed earlier. Thus, priming appears in one sense to have hastened generalization, if it is to be assumed that Polly would not have used any equipment which she was not first acquainted with by teachers. But in another sense, it seems that priming may have restricted generalization, in that Polly would not approach any apparatus she had not previously been primed to use. It is, of course, the same fact of observation which can be interpreted in these two ways. A thorough evaluation of the role of priming in contributing to generalization must remain for future study. In this case, it is clear only that priming can hasten the process of reinforcement, by making available behaviors suitable for reinforcement faster than they would have appeared without priming (according to baseline performance).

REFERENCES

Allen, K. E., Henke, L. B., Harris, F. R., Baer, D. M., and Reynolds, N. J. Control of hyperactivity by social reinforcement of attending behavior. *Journal of Educational Psychology*, 1967, **58**, 231-237.

Baer, D. M. and Wolf, M. M. The entry into natural communities of reinforcement. Paper read at American Psychological Association convention, Washington, 1967.

Baer, D. M. and Wolf, M. M. The reinforcement contingency in preschool and remedial education. In R. D. Hess and Roberta M. Bear (Eds.), *Early education: current theory, research, and practice*. Chicago: Aldine, 1968. Pp. 119-130.

Harris, F. R., Wolf, M. M., and Baer, D. M. Effects of adult social reinforcement on child behavior. *Young Children*, 1964, **20**, 8-17.

Hart, D. M., Reynolds, N. J., Baer, D. M., Brawley, E. R., and Harris, F. R. Effect of contingent and noncontingent social reinforcement on the cooperative play of a preschool child. *Journal of Applied Behavior Analysis*, 1968, **1**, 73-76.

Received 5 February 1968.