Cooperative behavior in preschool children¹

S. JOYCE BROTSKY² AND KARLA THOMAS³
SAN FERNANDO VALLEY STATE COLLEGE

Twenty-seven pairs of preschool children were reinforced for simultaneous operant responses. Although a significant increase in cooperative responding occurred over the 10-min acquisition period, noncooperative responding also increased. It was concluded that the Ss were learning the operant response of "knob pressing" rather than a true "cooperative response."

Peters & Murphree (1954), working with severely regressed schizophrenics, developed a cooperative multiple choice apparatus consisting of two boxes wired together so that reinforcement was delivered only when the correct lever was pulled on each box simultaneously by the two "cooperating Ss." Following a similar procedure, Azrin & Lindsley (1956) established cooperative behavior in children between the ages of 7 and 12 years. The present experiment was concerned with determining if a cooperative response can be established and maintained in preschool children under conditions similar to those described above. Additional concerns included the influence on cooperative behavior of such variables as sex, socioeconomic level, and parental attitudes.

Subjects

The Ss were 54 children between the ages of 3 and 5 years, pupils of the Preschool Laboratory of San Fernando Valley State College. Thirty-four children, the Tuition group, lived in the middle class homes of the suburban area surrounding the college. Twenty children, the Scholarship group, lived in an adjoining economically depressed area and were of low income families.

Apparatus

The apparatus was a wooden box 2 ft x 2.5 ft x 4 in. On each end were three wooden knobs, 1.5 in. in diameter, each painted a different color, red, yellow, or blue. Knobs of the same color were placed directly across from each other. Moderate pressure on a knob activated a telegraph key located immediately beneath the top of the box. The telegraph keys were wired so that activation of the same color knob within 0.5 sec produced a buzz and the flash of a small light bulb. The buzz and light served as a signal to E, who dispensed an edible reinforcer to each S whenever the buzzer sounded. Each telegraph key was wired to a single contact on an Esterline-Angus 20 channel recorder; thus, all knob presses were recorded. The buzzer-light combination was also recorded. A Plexiglas screen across the box permitted conversation but discouraged physical contact between Ss. Verbal responses were tape recorded.

The edible reinforcers were a mixture of M&Ms, a sweetened cereal called "Twinkles," and small

marshmallows. The E dispensed them, in the order listed above, into plastic bowls located at each end of the table.

Procedure

Twenty-seven pairs of Ss (dyads) were chosen randomly within sexes, within classrooms, and within socioeconomic groups. The random order was decided prior to experimentation. Occasionally a child was absent or refused to accompany E. When this occurred, the child next on the list was chosen and the dyads were renumbered.

After the children were seated, they were instructed to press the knobs until they figured out "how the game works." They were told that each time they made "the game work right" they would receive a treat. The E demonstrated how the knob was to be pressed. Encouragement to "try it," or "see how it works," was given when no response was emitted during a 30 sec interval. The experiment lasted 10 min.

Responses were categorized as cooperative responses (CRs) or noncooperative responses (NRs). A CR was defined as a response that occurred when both members of a dyad pressed knobs of the same color within .5 sec. Each CR was followed by a buzz, a light, and an edible treat. Since reinforcement was contingent on responses by both members of the dyad, both Ss always emitted the same number of CRs, although their NRs were not necessarily equal in number.

Questionnaire and Teacher Rating

Teachers and parents were given a questionnaire composed of seven favorable statements and were asked to check the three statements that best applied to the child "as he is now" and the three that best applied to him "as you would like him to become." The statement "he cooperates well with other children" was considered most relevant to the experiment. It was hypothesized that those youngsters who were seen as cooperative, or for whom cooperative behavior was valued as a goal by parents or teachers, would emit more cooperative responses than other children.

Following the experimental sessions, the continuous tape recordings and notes taken by an assistant during the sessions were independently evaluated by two raters (the authors), and each child was assigned an Individual Verbalization Score (IVS), where a rating of 1 corresponded to "verbalized nothing relevant to the experimental contingencies," and a rating of 5 corresponded to "consistently and adequately verbalized the experimental contingencies." A dyad score (DVS) was also assigned, where 1 corresponded to "neither child

Table 1 Mean number of CRs, mean number of NRs, and mean proportion of CRs to NRs for the 27 dyads for five 2-min periods

	1	2	3	4	5
CRs	11.2	14.9	17.1	17.4	16.7
NRs	77.6	93.1	93.8	96.6	95.6
CR/NR	.224	.240	.229	.198	.210

verbalized anything relevant to the experimental contingencies" and 10 indicated that "both children consistently and adequately verbalized the experimental contingencies." In 80% of the cases the raters were in perfect agreement. In no case was there a discrepancy of more than 1 point of IVS ratings or 2 points on DVS ratings. Where discrepancies occurred, the raters consulted the data again, both individually and together, until agreement was reached.

Results

The 10 min acquisition period was partitioned into five 2 min periods (TPs). Table 1 shows the mean number of CRs and NRs for the 27 dyads for the five TPs. An orthogonal polynomial trend analysis (Grant, 1956) was performed to determine if learning had occurred and if there was a difference in the acquisition curves of CRs and NRs. For both CRs and NRs, responses increased and then decreased over time. Only the quadratic component was significant ($F=6.40$, $df=1/26$, $p<.05$). The shapes of the CR and NR acquisition curves did not, however, reliably differ.

Table 1 also includes the mean proportion of CRs to NRs for each TP. There is no significant difference among these proportions, indicating that the Ss showed no reliable increase in cooperative as distinguished from noncooperative behavior.

In order to determine if there were sex or socioeconomic differences, a 2 by 2 factorial analysis of variance was performed on the CRs. No significant differences were found, although there was some tendency for the Female Tuition dyads to emit more CRs than the three other groups. A similar analysis conducted on NRs yielded similar results, with the exception that a significant interaction effect was found between the two variables ($F=4.63$, $df=1/18$, $p<.05$). Female Scholarship dyads were least responsive ($M=337.2$) and Male Scholarship dyads were most responsive ($M=622.5$), while the Tuition groups responded intermediately, with the females responding more than males.

Children who were rated as cooperative by parents and teachers, or whose parents or teachers valued cooperation, were compared with children whose parents and teachers did not respond to this variable on the questionnaire. No statistically significant differences were found. However, a behavioral measure of parental cooperation (whether or not the parents returned the questionnaire) did differentiate significantly between groups. More CRs were emitted by those 39

children whose parents returned the questionnaire than by those 15 children whose parents did not ($F=4.04$, $df=1/52$, $p<.05$).

Product-moment correlation coefficients were obtained between the 27 DVS scores and average age of dyad members ($r=.55$), number of CRs ($r=.48$), and number of NRs ($r=.35$). For the same 27 dyads, the following correlations were obtained: Age and number of CRs ($r=.48$), age and number of NRs ($r=.38$), and number of CRs and number of NRs ($r=.43$). All correlations were reliable at or beyond the .05 level. When the same correlations were based on 54 IVS scores, the coefficients were somewhat lower although statistically significant, with the exception of the correlation between age and NRs ($r=.21$, $p>.05$).

Discussion

The goal of this research was to determine if a cooperative operant could be acquired by preschool children and to determine the variables related to cooperative behavior as defined in this study. If the increase in CRs over time were considered in isolation, it might be concluded that reliable acquisition had occurred. Considered in relation to the NRs, however, this conclusion seems unwarranted. The trends for the CRs and NRs did not differ reliably, and an increase in the ratio of CRs to NRs did not occur. Thus, as total responses increased, the number of CRs increased; as total responses decreased, the number of CRs decreased.

As would be expected, there was a positive relationship between age and verbalization score and between both variables and the number of CRs. However, the positive correlations between these variables and the number of NRs suggest that the production of CRs was closely related to level of "knob pressing." This finding lends support to the conclusion that these preschool children were learning to press knobs rather than learning to emit a cooperative operant.

References

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Notes

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- Now Postdoctoral Fellow, Department of Social Relations, Harvard University.
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