The effects of direct and vicarious nonreward upon instrumental performance[1]

JOHN H. WHITELEY[2], *UNIVERSITY OF WESTERN ONTARIO*
THOMAS J. RYAN, *CARLETON UNIVERSITY, OTTAWA*

Kindergarten children performed in pairs on a double lever (R_1 and R_2) apparatus. In group 50:100, Child A received 50% reward for R_1 responses and Child B received 100% reward for R_2 responses. In group 100:100 Child A and Child B received 100% reward for R_1 and R_2 responses, respectively. The R_1 data were contrary to previous findings with rats and children in that Ss rewarded on a 50% schedule responded more slowly than those who were continuously rewarded.

Higher asymptotic performance for partially as compared with continuously rewarded Ss has been demonstrated with infrahuman (Spence, 1960, Chap. 6) and human Ss (Ryan, 1965). A similar finding has been noted when children perform in the presence of a passively observing peer (Rosenbaum & Brunning, 1966).

In one study (Ryan, 1965), children performed two successive lever responses, R_1 and R_2. On R_1, Ss who received 50% reward responded faster than those who received 100% reward; on R_2, where all Ss in both groups received 100% reward, those who had received 50% reward on R_1 responded faster as compared with the 100% group. The present investigation replicated the reward conditions of Ryan's study with the exception that the children were seen in pairs. Thus, each child performed in the presence of an observer who actively performed a similar response.

Method

The Ss were 32 male and 32 female children (64-76 months). With one exception, the double-lever apparatus was as described by Ryan (1965). A unique feature was a common goal box which collected marbles from both levers.

Pairs of Ss were matched for sex and age. Child A performed R_1 and Child B performed R_2 throughout the experiment. The Ss were told that this was a team game which required filling the common goal box with marbles in order to win a toy. Ss were instructed not to converse during the game.[3] There were two rewarded practice trials and 36 test trials. Interresponse and intertrial intervals were 5 and 15 sec., respectively.

Each pair of Ss was assigned to one of two reinforcement conditions. In group 100:100, each member of a given pair received 100% reward. In group 50:100, Child A received 50% reward for R_1 responses and Child B received 100% reward for R_2 responses. For partially rewarded Ss, three reward and three nonreward trials occurred in each block of six trials. Measures of starting time, from onset of a stimulus light to initial movement of the lever, and movement time, duration of the 15-in. lever pull, were taken on each trial.

Results

R_1 starting and movement times were converted to speeds (1/t sec.). In a separate analysis for each measure, the between-Ss variables were reward condition (50:100 vs. 100:100) and sex of S. The within-Ss main effect was trial blocks (six blocks of six trials each). The R_1 movement speeds revealed a significant interaction (Fig. 1) between reward schedule and trial blocks ($F=5.96$, $df=5/140$, $p<.01$). Separate treatment by Ss analyses, with trial blocks as the treatment variable, were performed for each reward group These revealed that the R_1 movement speed of group 50:100 *increased* significantly ($F=4.46$, $df=5/75$, $p<.01$) and that of group 100:100 *decreased* significantly ($F=2.69$, $df=5/75$, $p<.01$) over trial blocks. In the analysis of R_1 starting speeds, three significant interactions were obtained: reward schedule by sex ($F=4.97$, $df=1/28$, $p<.05$), reward schedule by trial blocks ($F=2.46$, $df=5/140$, $p<.05$), and reward schedule by trial blocks by sex ($F=3.11$, $df=5/140$, $p<.05$). Separate analyses were then performed for males and females with reinforcement schedule and trial blocks as variables. The schedule by trial blocks interaction was significant only for males ($F=3.22$, $df=5/70$, $p<.05$). The pattern portrayed by R_1 starting speeds was similar to that for movement speeds, but only for males.

R_2 starting and movement speeds were analyzed

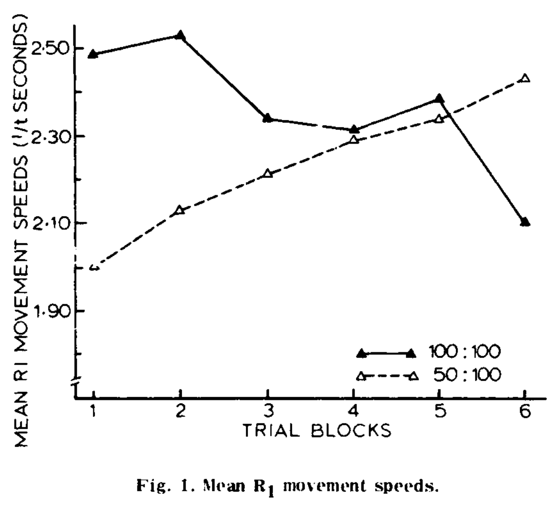

Fig. 1. Mean R_1 movement speeds.

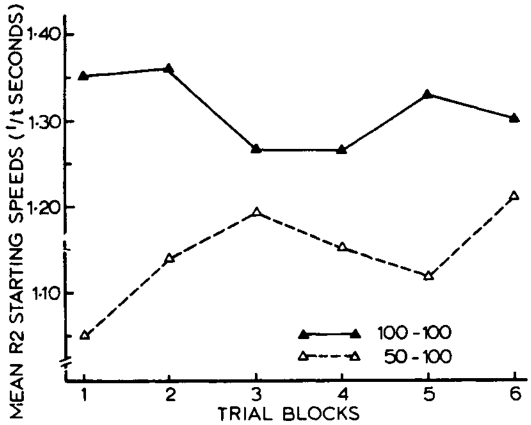

Fig. 2. Mean R_2 starting speeds.

in the same manner as R_1 except that type of trial was added as an additional main effect for within-Ss. For group 50:100 this involved comparisons of R_2 speeds following reward as compared with nonreward for R_1. For group 100:100, this comparison involved the corresponding sets of speeds. It is recalled that R_1 and R_2 refer to responses by two different Ss. Type of trial entered into no significant relationships on either starting or movement speeds. Furthermore, the analysis performed on R_2 movement speeds revealed no significant effects.

On R_2 starting speeds, significant interactions were obtained for blocks by sex ($F=2.99$, $df=5/140$, $p<.05$) and blocks by reward schedule ($F=3.28$, $df=5/140$, $p<.01$). Six separate analyses comparing speeds of the two sex groups at each trial block indicated faster speed for males, as compared with females, only for block 4 ($F=4.51$, $df=1/28$, $p<.05$). The interaction between blocks and schedule (Fig. 2) was followed up by computing separate analyses for each group with trial blocks as the main variable. A significant increase in R_2 starting speeds over trial blocks was noted for group 50:100 but not for group 100:100. Further analyses, comparing the two reinforcement conditions at each trial block, revealed that R_2 starting speeds were significantly faster for group 100:100 as compared to 50:100 at block 1 ($F=7.54$, $df=1/28$, $p<.05$) and block 5 ($F=4.50$, $df=1/28$, $p<.05$).

Discussion

With respect to the R_1 data, the interactions obtained between reward schedule and trial blocks are unlike those demonstrated for infrahumans (Spence, 1960, Chap. 6), for children performing individually (e.g., Ryan, 1965), or in the presence of a passively observing peer (Rosenbaum & Bruning, 1966). A tentative explanation of these data suggests that in group 50:100, Child A may have negatively evaluated his performance in relation to Child B. It has been suggested (e.g., Endsley, 1966) that self-blame situations also elicit inhibitory responses. The popularity of the self-blame hypothesis in post hoc explanations (Endsley, 1966; Ford, 1963) demands research to clarify the function of evaluative stimuli in noncontinuous reward situations.

Unless one wished to argue for a vicariously produced self-blame effect, another explanation must be sought for the slower R_2 starting speeds of group 50:100 relative to group 100:100. Since goal events were more variable in group 50:100 as compared with 100:100, Child B in group 50:100 may focus attention on reward events occurring for Child A. The short R_1-R_2 interval would have caught Child B off guard and interfered with R_2 starting, but not movement speed. Subjective observations by E plus the failure to demonstrate differences between the two reward groups on R_2 movement speed add some support to this notion.

References

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Notes

1. This study was assisted by National Research Council Grant APB-2 to the second author and by the Children's Psychiatric Research Institute, London, Ontario. The authors are indebted to the Board of Education, London, Ontario, for assistance in obtaining subjects.

2. Now at Institute of Child Behavior & Development, State University of Iowa.

3. In a preliminary study (N=80) communication within pairs was allowed and no significant differences occurred between reward groups.