The overlearning reversal effect in preschool children as a function of age

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Rats typically display the overlearning reversal effect (ORE) in discrimination reversal employing object or brightness problems; primates do not. It was hypothesized that this difference in results was related to the greater perceptual experience of the primates rather than phylogenetic level. Two age groups of preschool children were given a reversal either after criterion or overlearning. As predicted, the younger children showed the ORE; but the older group did not.

In critical discussions (e.g., Lovejoy, 1966; Paul, 1965) of the overlearning reversal effect (ORE) consideration has been given only to rat or non-primate studies. There are, however, investigations with infra-human and human primates. Studies with squirrel monkeys (Cross & Brown, 1965; Cross, Fickling, Carpenter, & Brown, 1964) not only failed to demonstrate a facilitation of reversal performance following overlearning but actually suggested that increased original training retards reversal. Similar failures to observe the ORE have been reported with Capuchin monkeys (D'Amato, 1965), stump-tailed monkeys (Boyer & Cross, 1965), rhesus monkeys (Cross & Boyer, 1966; Tighe, 1965), and with five-year-old children (Vaughter & Cross, 1965). Other negative findings with children have also been observed (Hochman, 1966; Stevenson & Weir, 1959; Viney, 1964).

The ORE phenomenon cannot be reduced simply to a matter of species level since it has been found in children given a paired-associate task (Youniss & Furth, 1964) and also in college students under a learning task of high difficulty (Sitterley & Capehart, 1966). If, however, consideration is restricted to conventional, nonposition discrimination problems with apparatus of the same genre as the Grice box or the WGTA, the usual finding is that rats show the ORE, whereas monkeys and children do not.

While some of the studies with monkeys employed naive animals, the Ss were all relatively mature except for Tighe's which were, nonetheless, experienced in discrimination problems. Even the studies with children did not use the very young. If an attentional model of ORE (e.g., Lovejoy, 1966; Sutherland, 1959) has validity, it can be argued that mature monkeys or older children can, as a result of previous perceptual experience, attend more readily to the relevant dimension of a discrimination and continue such attention into the reversal. Overlearning, for an organism already maximally attending, affords no benefit over control Ss equally facile in isolating and continuing with the appro-

priate "stimulus analyzing mechanism." In the case of rats, however, overlearning results in an increased attentional facility during reversal which is reflected in many studies showing an ORE.

The present investigation employed preschool children of two age levels in a single habit reversal in an attempt to test the hypothesis that the ORE may be observed in children, even with conventional discrimination problems, when Ss of "appropriate" immaturity are utilized.

Method

The Ss were 32 Negro preschool children, 15 boys and 17 girls, selected from the Carver Heights Day Nursery of Lubbock, Texas. The Ss were separated by age at the nursery into two play areas and 16 Ss were selected from each of the two age groups. The mean ages of the Ss were 67 and 46 months, respectively. Six younger children and one older child failed to learn the initial discrimination after 160 trials and were replaced. One older child had to be replaced because of an E error in procedure.

The apparatus was a modified, drawer-type WGTA with dimensions identical to those employed by Vaughter & Cross (1965). The two objects utilized throughout the experiment were multidimensional or "junk" objects with identical wooden bases.

The 16 Ss of each age group were randomly assigned to one of two equal subgroups, a criterion learning (CL) or an overlearning (OL) group. All Ss were individually brought into the test room and seated opposite E. The E asked S if he liked candy and extended the three-well formboard to S. The center foodwell contained an M & M candy, and a plain adaptation block lay behind the baited foodwell. On the next trial the block partially obscured the candy, and on the third trial the reward was completely covered. An additional trial or two was given and then, without further instructions, the two-object problem was presented to S from the peripheral foodwells.

All Ss were given 20 noncorrection trials per day until a criterion of 17 out of 20 correct responses was reached. The rewarded position was randomized for each S but balanced over the 20 daily trials.

In the session after reaching criterion, Ss in the CL groups received six additional trials on the original problem and immediately thereafter were given the reversal problem under the same procedure and criterion as employed in the initial problem. When Ss in the OL groups met criterion, they were given 80 postcriterion trials (four additional days) before re-

ceiving the identical reversal procedure as CL Ss. The CL Ss received a total of six overlearning trials, while OL Ss received 86.

Results

The older Ss made an average of 23.63 errors-to-criterion (ETC) in the original discrimination as against 43.81 for the younger Ss. This difference was statistically significant, $F=6.97$, $df=1/28$, $p<.01$. There was no significant difference attributable to the CL-OL category, $F=.62$, $df=1/28$.

An initial analysis of ETC scores for the reversal data indicated heterogeneity of variance, $F_{max}=33.73$, $df=3/7$, $p<.01$. This problem was corrected by subjecting ETC scores to a square-root transformation (Freeman & Tukey, 1950), $F_{max}=5.88$, $df=3/7$, $p>.05$. Analysis of variance of the transformed data indicated that the older children made significantly fewer errors during reversal than the younger children, $F=15.96$, $df=1/28$, $p<.001$. More errors were observed in the CL groups than in the OL groups, $F=6.64$, $df=1/28$, $p<.05$. There was also a significant Age by Treatment (CL-OL) interaction, $F=4.24$, $df=1/28$, $p<.05$. These results are summarized in Table 1. The Age by Treatment interaction is shown in the large mean difference between younger and older Ss in Group CL. The corresponding difference between age subgroups in Group OL is small.

Discussion

The results of this study have given support to the hypothesis under investigation. The older Ss failed to display the ORE, consistent with results of numerous studies with mature and/or experienced primates. The younger children did, however, display the ORE, and this is consistent with at least one recent report (Wattenbarger & Viney, 1965) in which large, though nonsignificant, mean differences were observed between criterion and overtrained preschool Ss only slightly older than the younger children of this study. Additional research with very young and experimentally naive infrahuman primates should be done. A tentative conclusion is that ontogenetic level and percep-

tual experience are more important factors than is phylogenetic level in predicting the presence of the ORE in conventional, animal-type discrimination reversal.

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Note

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Table 1. Transformed Error-to-Criterion Scores for the Criterion and Overtrained Subgroups

Age	Criterion	Overtrained	Totals
Younger	11.33	6.66	9.00
Older	5.23	4.71	4.97
Totals	8.28	5.69	6.98