Effects of sensory deprivation on discrimination learning

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Twenty-four college students were tested under 15, 30, or 60 min of sensory deprivation (SD) or social isolation conditions. Results on a subsequent visual discrimination task indicated that sensory or social deprivation reduced visual discrimination errors; however, deprivation degree effects were not monotonic as hypothesized. Results favored a drive-reduction interpretation and indicated an adaptation variable relevant to specific deprivation times.

There is much evidence in the literature which indicates that Ss' responses to experimental tasks are in part the result of time spent in sensory deprivation (SD). However, there is also evidence which indicates that SD has no effect upon responses related to cognition. An interesting study by Vernon & McGill (1957) showed no significant differences ($p < .05$) between control and experimental Ss for learning lists of adjectives when Ss were confined for periods ranging from 24 to 72 h. Sensorially deprived Ss performed no differently from controls on verbal intelligence tests (Scott et al, 1959); and apparently general intelligence, as measured by the WAIS, was not significantly ($p < .05$) affected by SD (Robertson & Walter, 1963). However, results may have been confounded by practice effects and lack of S matching for intelligence between control and experimental groups prior to testing. Zuckerman & Haber (1965) showed that sensorially deprived Ss had a greater need for stimulation as evidenced by increased stress responses to perceptual isolation over a 3-h period. SD Ss used perceptual stimulators significantly ($p < .05$) more than control groups when confined for a period of 72 h (Vernon & McGill, 1960).

During SD external stimulation is lacking so internal tension builds up and consequently requires elimination (Goldfried, 1960). Experimental tasks allow Ss to gain external stimulation which is withheld during SD. The present study was undertaken to assess whether or not confinement in SD would affect responses on a discrimination learning task, as the Vernon & McGill (1960) study seems to indicate.

It was predicted that sensorially deprived Ss would make fewer errors than control Ss while learning a visual discrimination problem.

SUBJECTS

Twenty-four male and female students from Fresno State College served as Ss for the study. Twelve of the 24 were randomly chosen as the experimental group. The remaining 12 served as controls.

DESIGN

Experimental Ss were confined in SD for 15, 30, or 60 min. The control groups spent zero time in SD but corresponding amounts of time in social isolation. After confinement the E tested Ss on a discriminative learning task. Ss first learned a discrimination in which two stimulus dimensions were used, only one of which was relevant. Four cards were used as stimuli (see Kendler & Kendler, 1962). The cards varied both in size and brightness, but size was the relevant cue; large cards were positive (correct) and small cards were negative (incorrect). Ss were then shifted to another discrimination task involving a different stimulus dimension. Thus, brightness became the relevant stimulus dimension; dark was correct and light incorrect. The task was considered learned when the S gave four successive correct responses on each discrimination. Figure 1 illustrates the two types of discrimination.

EXPERIMENTAL SESSION

Each experimental S was placed on an air

mattress in a dark, sound-deadened room (9 x 4 x 8 ft), for 15, 30, or 60 min. Experimental Ss wore blindfolds and cotton gloves. They were instructed not to remove them and to remain silent and motionless. Ss were told they would remain in the room for an indefinite period of time. They were assured that they would not be harmed or frightened in any way. After Ss completed their stay in SD, E entered the antechamber, allowed a few seconds for S's adjustment to light, and administered the test. E showed S two cards each trial and asked him to respond as to which of the two cards was correct. E replied with either "correct" or "incorrect" after S's response. The experiment was terminated when S gave four successive correct responses on the first and then the second discrimination. Control groups were tested in the same manner; they were isolated in the same antechamber, but they were not required to remain motionless on an air mattress, did not wear gloves or blindfolds, and the instruction "remain silent" was not given to this group. The procedure was the same for all confinement periods.

RESULTS

A 2 by 3 factorial design was used to assess differences in rates of learning on a visual discrimination task with two deprivation levels and three different time periods constituting the respective variables. There were three experimental (SD) and three control (social isolation) groups with four Ss in each group. Mean number of errors to a criterion of four successive correct discrim-

FIRST DISCRIMINATION

Large positive

Nonreversal Shift

SECOND DISCRIMINATION

Black positive

Fig. 1. Nonreversal shifts. In each case, Ss first learn the discrimination on the left where size is the relevant dimension and brightness is the irrelevant dimension. Ss then learn a second discrimination in which the previously irrelevant dimension becomes relevant, so that Ss must now respond on the basis of brightness (after Kendler & Kendler, 1962).

inations did not differ significantly for the two levels of deprivation. The mean number of errors was significantly ($p < .05$) different over the three levels of time spent under deprivation. Time by deprivation level differences were not significant.

Table 1
Analysis of Variance for Time by Deprivation Level

Source	df	MS	F
Deprivation Level	1	6.000	.79
Time	2	27.125	3.57*
DL by T	2	7.625	.29
Within	18	28.361	
Total	23		

* $p < .05$

Experimental Ss under 15- and 60-min conditions made fewer mean errors to a learning criterion than did Ss in corresponding control groups. Experimental Ss in the 30-min group made more mean errors than 30-min control Ss.

Table 2
Mean Errors on Visual Discrimination Task

Time	Experimental Group	Control Group
15	7.00	9.00
30	8.50	7.25
60	10.00	12.25

DISCUSSION

For increased deprivation times mean errors to a visual discrimination-learning criterion decreased significantly ($p < .05$) in the present study. However, the relationship between deprivation time and discrimination error production was reversed in the 30-min groups as compared to the 15- and 60-min groups. This may have been due to increased perception of internal stimuli in the 30-min sensory-deprivation group, and increased self-stimulating acuity leading to no increased external stimulation needs during subsequent testing on a visual discrimination task. Whereas the 15-min group was sensorially deprived, results based upon discrimination errors indicated the 30-min group may merely have substituted internal for external stimulus factors. Under the disorienting effect of 60-min sensory deprivation this substitution process ceased and Ss were again under sensory deprivation. The qualitative difference of the 30-min group so reversed error scores as to preclude differential SD by Time interactions. These results suggest that the internal tension build-up Goldfried (1960) hypothesized may be the result of the disorienting effects of certain sensory deprivation periods rather than general lack of external stimulation.

The results failed to support the hypothesis that higher levels of sensory deprivation would increase rates of learning on a visual discrimination problem but

supported the hypothesis that total time spent in deprivation, whether of a mild social isolation nature or severe sensory nature, would have a significant ($p < .05$) effect upon learning a visual discrimination task. Further investigation as to whether error reduction was due to actual visual discrimination improvement or increased interest factors is clearly indicated, as well as further exploration of the acclimation process involved in sensory deprivation.

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Fig. 2. Plot of mean visual discrimination errors.

Adaptation of the wrist to displacing prisms

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Tests were carried out to determine whether or not Harris' position sense theory holds true for the hand in relation to the arm and whether or not there occurs a spontaneous change in the position sense of the arm due to (possible) adaptation in the hand. Eight Ss adapted to displaced vision by pointing to a moveable target while

wearing displacing prisms. During this adaptation period, Ss' arms were immobilized, but their wrists were free to move. During testing, Ss were told to use the entire forearm in pointing to the target. Control Ss, not subjected to displaced vision, were required to point to the target with the entire forearm. Results showed that the position sense of the hand does indeed change during adaptation, but transfer of this adaptation to the forearm does not occur.