

# The effect of pre-exposure to complex stimuli on activity in a novel environment

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A hypothesis, derived from the optimal level of arousal hypothesis and formulated to account for the decrease in activity over time in a novel environment, was investigated. Exposure to complex stimuli immediately prior to a 12-min activity session significantly lowered general locomotor activity of mice but did not effect the rate of the activity decrement.

Several experiments have demonstrated that the general locomotor activity of rodents decreases as a function of time spent in a novel environment (i.e., Brown, 1968; Carr & Williams, 1957; Gerben, 1967; Glickman, 1958; Halliday, 1967). This phenomenon has been interpreted as habituation to the novel environment by Walters and Block (1969), and the rate of the decline has been used as an index of habituation by Glickman and Hartz (1964). Two different sources of evidence suggest that this interpretation may be questionable. The activity of the golden hamster (Hughes, 1969) and the chick (Morlock, Frank, & Meyer, 1971) increases rather than decreases as a function of the number of minutes spent in a novel environment. This evidence at least restricts the generality of the habituation interpretation.

Several investigators (Browman, 1942; Lester, 1967; Wimer & Stern, 1964) have demonstrated that rodents suffering sensory loss are more active than controls. Glickman (1958) and Klein and Brown (1969) have interpreted this phenomenon as supporting Hebb's (1955) optimal level of arousal hypothesis. Recently, Morlock and Meyer (1971) gave further support to this hypothesis by demonstrating that blinded rats are more active in simple than complex environments. It may be hypothesized that rodents placed in a novel environment are initially quite active in order to raise their arousal level to some optimal point and that as this point is reached activity begins to decrease. If this hypothesis is to account for the rapid decline of activity in a novel environment, then rodents receiving exposure to complex stimuli immediately before being placed in a novel environment should be less active and exhibit a smaller decrease in activity over time than rodents not receiving pre-exposure to complex stimuli.

## METHOD

### Subjects

The subjects were 66 male 56-day-old Swiss-Webster albino mice. Upon receipt, they were housed 16-17 per cage and placed in an isolated room on ad-lib food and water under a 12-h-on/12-h-off lighting schedule. All animals were then housed in individual cages for a 1 week period immediately prior to the start of the study (Essman, 1966).

### Apparatus

A Greek cross maze was used to expose one group of animals to a complex array of stimuli. The four outside compartments of the 24-cm-high maze were 12 cm wide x 16 cm long. One of the compartments was painted completely white, one completely black, one had 1-cm-wide black diagonal stripes on a white background, and another was finished in a black and white checkerboard pattern. The floor of the center compartment was painted flat gray, but the floor of each of the outside compartments was covered with one of the following materials: window screen, fine, medium, or coarse grade sandpaper.

General activity was measured in a box measuring 24 cm wide x 32 cm long x 10 cm high. Three Plexiglas partitions (16 cm long x 10 cm high) were positioned such that the animal was forced to cross from side to side when traversing the length of the box. The entire apparatus was painted flat gray, except for circles (1.5 cm in diam) on each of the Plexiglas partitions which allowed an infrared photobeam to pass the length of the box approximately 1.5 cm above the floor an equal distance from both sides. The number of photobeam disruptions served as the measure of activity and was automatically recorded on a print-out computer. The top of the activity box consisted of a piece of white translucent plastic 26 cm wide x 34 cm long. Four such activity boxes were arranged on a table in two rows of two each, separated by approximately 10 cm. A blower located in the same room provided masking noise.

### Procedure

The mice were randomly divided into two equal-sized groups. The mice in the exposed group were placed (in pairs) in the Greek cross maze for a 20-min period immediately prior to the activity test. The animals in the nonexposed group were taken directly from their individual home cages and placed in the

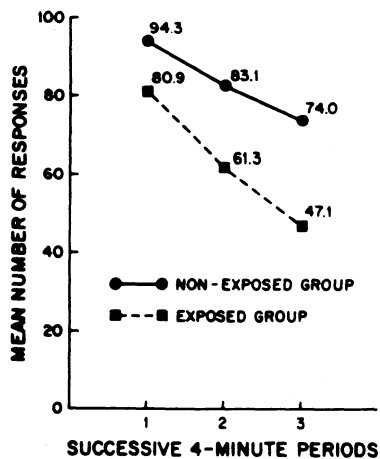


Figure 1. Mean locomotor activity as a function of pre-exposure treatments and successive 4-min periods within the activity test.

activity boxes. Four animals (two of the exposed group and two of the nonexposed group) were tested simultaneously. At the conclusion of the 12-min activity test, all mice were returned to their individual home cages.

### RESULTS AND DISCUSSION

The activity data was analyzed as a two-factor mixed analysis of variance, with successive 4-min periods within the 12-min activity test as the repeated measures variable (Lindquist, 1953, Type I). Only the between-groups effect ( $F = 4.209$ ,  $df = 1/64$ ,  $p < .05$ ) and the repeated measures effect ( $F = 18.720$ ,  $df = 2/128$ ,  $p < .05$ ) were significant. As can be seen in Figure 1, the exposed group was consistently less active than the nonexposed group, and activity in both groups decreased as a function of time in the novel environment. The hypothesis that pre-exposure to complex stimuli would reduce activity in a novel environment was supported. However, the hypothesis that pre-exposure to complex stimuli would effect the rate of the decrease in activity as a function of time in a novel environment was not supported in that no interaction effect was obtained. It appears that prior exposure to complex stimuli results in an overall lowering of activity in a

novel environment but that the rate of decline of activity is not affected.

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