Extra-maze pre-exposure and choice behavior¹

JAMES L. PATE, GEORGIA STATE COLLEGE
TERRY R. ANDERS, UNIVERSITY OF ALABAMA

Sixty albino rats were given a single test trial in a black-white T-maze following exposure to either a black or a white stimulus. It was found that a significant number of animals chose the non-exposed brightness in the maze. This is the first study to demonstrate that exposure to a stimulus outside the choice apparatus affects the choice behavior. Exposure time was not a significant factor in determining the animal's choice but this may well have been the result of using long exposure times. A marked brightness preference was also noted.

In studying alternation type behavior the animal is typically exposed to a stimulus in one of three ways. First and most commonly the animal is exposed to a stimulus following a choice response. This is the typical two-trial study in which the animal is given one trial followed closely by a second in which it has usually been observed that the animal alternates stimuli or responses on the two trials. A second means of exposing the animal to a stimulus is to place the animal directly in one of the choice arms after which the S is put into the start box to begin a choice trial. Glanzer (1958) compared this method of exposure with the first method and found that in both cases there was a significant amount of alternation.

The third means of exposing the animal to a stimulus involves placing the animal in the stimulus outside the area where he is later to be given a choice. Walker et al (1955) studied the effects of pre-exposure in an extra-maze situation and concluded, "It is quite clear that exposure to one of the alternative stimuli outside the maze creates no predisposition for the animal to choose the alternative stimulus in the maze" (Walker, Dember, Earl, Fliege, & Karoly, 1955, p. 25).

It is possible, however, that the animals were exposed to additional stimuli between the exposure period and the choice time. The present study was designed to evaluate the effect of extra-maze pre-exposure on later choices when the choices immediately followed the exposure. Additionally, the present study was designed to determine the effect of varying exposure times on choices and to determine the relationship between choice latency and pre-exposure time and pre-exposure brightness.

Method

The Ss were 30 male and 30 female albino rats of the Purdue-Wistar strain. All animals were naive and were between 66 and 71 days of age at the start of the investigation. Prior to the maze experience each animal was handled for four days. On each day, the experimenter removed the rat from the home cage, placed it in a carrying cage for 1 min. and then returned it to the home cage. This was judged to be a sufficient

amount of handling because the animals were rather gentle at the start of the procedure. During this phase of the experiment food and water were available ad libitum.

Apparatus. A T-maze was constructed of wood and painted with flat paint on all interior surfaces. The start alley was painted gray and measured 18 in. long x 2 in. wide. The choice arms (one black and one white) were 21 in. long x 4 in. wide. The gray of the start arm extended 4 in. into each choice arm. The entire maze was 6 in. high and was covered by 1/4 in. hardware cloth, which was painted the same brightness as the section of the maze which it covered.

Exposure boxes were constructed of wood and measured 1 ft. in each direction. A hardware cloth lid covered each box. All interior surfaces were painted either flat black or flat white. In one end of the box a guillotine type door 2 in. x 6 in. was arranged so that the box could be placed against the end of the start arm of the maze. Thus the exposure box was the start box.

Procedure. Thirty animals (half male and half female) were randomly assigned to each pre-exposure brightness (black or white). Ten animals in each exposure group were randomly assigned to each of three exposure times (10 min., 20 min., or 30 min.). Thus there were six groups of 10 animals each. Water was removed from the animal's home cage approximately 20 hr. before the test phase of the experiment but food was available at all times. The experimenter carried animals individually in a standard carrying cage to the experimental room where the animal was placed in the exposure box. During the exposure period the experimenter remained well away from the exposure box. At the end of the exposure interval the experimenter grasped the rat firmly and oriented it toward the door which was then opened. As soon as the door was closed behind the rat a stop watch was started. A choice was considered to have been made and the stop watch was stopped when the animal had all four feet in an arm of the maze. The choice and latency were recorded and the animal was returned to its home cage.

Males and females were run on alternate days. At the conclusion of each day's operation the maze and exposure boxes were washed with hot water. Thus, at the start of each day there was little residue in terms of odors.

Results

Of major interest in this study is the choice data shown in Table 1. Thirty-eight of the 60 animals turned into the non-exposed alley of the T-maze. This out-

Table 1. Number of animals selecting the non-exposed brightness.

Exposure Brightness	Exposure Time (min.)	Male	Female	Total
White	10	5	4	9
	20	5	3	8
	30	5	3	8
Black	10	1	1	2
	20	3	2	5
	30	3	3	6
		22	16	38

come (63% choice of the non-exposed brightness) is significantly different from the expected 50% choice of the non-exposed brightness ($X^2=4.26$, $df=1$, $p<.05$, or $z=2.07$, $p=.038$, double tailed). This finding is most important because it is the only indication that exposure to a stimulus outside the maze will result in later effects on choice behavior. This is in agreement with Glanzer's theory but it conflicts with the outcome of Walker's (1955) study.

Considering only the males, the selection of the non-exposed brightness is even more marked than for all animals. Twenty-two of 30 males (73%) chose the non-exposed brightness which leads to the conclusion that exposure does significantly affect later choice behavior ($z=2.37$, $p=.018$). For females the amount of alternation does not differ significantly from chance. Even though the sex difference does not attain significance ($z=1.61$, $p=.1074$) it seems advisable to use only males in studying alternation behavior, since the effect is significant for males but not for females. Finally, it should be pointed out that animals exposed to white chose the non-exposed brightness significantly more often than did black exposed animals ($z=3.22$, $p=.0012$).

Glanzer (1953) and Dember & Fowler (1958) indicate that exposure time should be directly related to alternation or the selection of the non-exposed stimulus. However, the data in Table 1 do not support this hypothesis since there is no significant difference in the number of animals selecting the non-exposed brightness as a result of the variation in exposure time.

Latencies of the choices were also measured but these measures did not differ as a function of any of the experimental conditions.

Discussion

In direct contrast with the Walker et al (1955) study the present study shows that extra-maze pre-exposure does significantly affect choices. This outcome, in conjunction with the results from Glanzer (1958) and Dember (1960), indicates that neither active choice, nor stimulation in a particular place, is critical for determining later choice behavior. This study is in part a replication of the Walker study but it corrects some of the faults in that study. In particular, the animals were presented with a choice shortly after the exposure to one of the stimuli. Additionally the introduction of new stimuli was minimal and controlled. Here it is worthwhile to point out that two new stimuli were introduced. First the animal was required to go through a gray start arm of the maze. A second source of novel stimulation resulted from the experimenter's seizing the animal and pointing it toward the door of the maze. This procedure was used to precisely control the exposure time but may have introduced undesired extraneous stimuli.

Surprisingly, exposure time does not appear to be an important variable in determining the animal's choice. Obviously the exposure times selected resulted in a more or less asymptotic effect of pre-exposure time. In view of the discrepancy between Walker's study and this one it can be suggested that the critical exposure time is between 45 sec. and 10 min.

References

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Note

1. Data reported in this study were collected while both authors were at Western Illinois University. These data formed the basis of a senior research paper by the junior author. A form of this report was presented at the annual meeting of the Southeastern Psychological Association at New Orleans, La., in April, 1966.