Pre-exposure and stimulus choice: Effects of locale¹

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Rats pre-exposed to stimuli in one locale failed to show an effect from this pre-exposure when presented with the stimuli in a second locale. Pre-exposure in a locale did affect subsequent choice in that same locale. These results do not replicate a recent report of the effects of pre-exposure.

Stimulus satiation theory (Glanzer, 1953) predicts that exposure of an organism to one stimulus of a pair should make the organism show a preference for the other stimulus of the pair subsequently. This prediction should hold even when pre-exposure and choice take place in different locales.

Walker et al (1955) found no significant effect from pre-exposure in one locale on subsequent choice in a T-maze. However, they compared the observed alternation to an expected level of 50%. They made no attempt to measure position preferences in the maze and to calculate a modified expected level of alternation (Dember & Fowler, 1958).

Pate (1967) also reported no significant effect from pre-exposure in one locale on choice in a second locale. However, Pate & Anders (1967) have reported a significant effect. Although they use an alternation measure without correcting for position preferences, they do report sufficient data for an appropriate analysis to be made. Of 30 rats pre-exposed to white (W), 5 subsequently chose W while of 30 rats pre-exposed to black (B), 17 subsequently chose W ($\chi^2 = 3.89$, $df = 1$, $p < 0.05$). Detailed analyses indicate that only the males show an effect from pre-exposure.

The present experiments were designed to investigate these discrepant results, using appropriate statistical analyses.

STUDY 1

Procedure. The Ss were 30 male and 30 female rats from the Charles River Breeding Laboratories, strain CD, 95 days old. They were given ad lib food and water during these studies unless noted otherwise.

On Days 1 to 5 and 8 to 12 each rat was placed alone for four min in a wooden box 22 in. by 6 in. high covered with wire netting. On Day 15 a T-maze was constructed from three of these boxes and B inserts were placed on the walls of one arm and W inserts in the other arm. Each rat was given 3 min to choose to enter one arm.²

On Day 17 each rat was tested once for the effects of pre-exposure. The rat was placed in a box 11 in. by 6 in. by 6 in. high with B or W inserts for 5 min. The rat was then placed in the T-maze and allowed to enter one arm. On Day 24 each rat was again tested but was pre-exposed to the other stimulus to that pre-exposed on Day 17.

On Day 33 each rat was tested as on Day 17.

Results. The rats showed a significant position preference on Day 15. Of 57 choices 40 were to B ($z = 2.91$, binomial $p = 0.002$). There was no sex difference ($\chi^2 = 1.15$, $df = 1$, n. s.).

On Day 17, of the 30 rats pre-exposed to B, 21 subsequently chose B and of the 30 rats pre-exposed to W, 18 subsequently chose B ($\chi^2 = 0.29$, $df = 1$, n. s.).³

On Day 24, of the 30 rats pre-exposed to B, 13 subsequently chose B and of the 30 rats pre-exposed to W, 20 subsequently chose B ($\chi^2 = 2.42$, $df = 1$, n. s.).

On Day 33, of 29 rats² pre-exposed to B, 17 subsequently chose B and of the 30 rats pre-exposed to W, 16 subsequently chose B ($\chi^2 = 0.02$, $df = 1$, n. s.).

There were no sex differences on any of these days.

Discussion. This study failed to find a significant effect of pre-exposure in one locale on subsequent choice in a second locale. However, in the only report of such an effect, the rats were water-deprived and the effect seemed stronger the longer the pre-exposure (Pate & Anders, 1967). A second study was carried

out to see whether the effect could be obtained under these conditions.

STUDY 2

Procedure. The Ss were those of Study 1. On Day 37 each rat was tested once as on Day 17 of Study 1 except that (a) each rat was 24 h water-deprived and (b) each rat was placed in the pre-exposure box for 25 min.

Results. No effect of pre-exposure was found on subsequent choice in the T-maze. Of the 30 rats pre-exposed to B, 13 subsequently chose B and of the 30 rats pre-exposed to W, 11 subsequently chose B ($\chi^2 = 0.07$, $df = 1$, n. s.). No sex difference was found.

Discussion. This study, using conditions that should have been optimal for the appearance of the effect, failed to obtain a significant effect from pre-exposure on subsequent choice. The only difference in the present technique is that the rats were transferred from the pre-exposure box to the T-maze by hand whereas Pate & Anders (1967) raised a door connecting the box to the maze. In view of Pate's failure to replicate his own result (Pate, 1967) it is likely that there is no effect from pre-exposure to stimuli outside of the maze on subsequent choice in the maze. However, it was decided to investigate whether handling between the pre-exposure trial and the free choice trial would hinder the appearance stimulus avoidance after pre-exposure in the T-maze itself. The demonstration of this phenomenon would also serve as a comparison study to indicate that rats show stimulus-satiation effects under appropriate conditions.⁴

STUDY 3

Procedure. The Ss were those of Study 1. This study was carried out between the second and third tests of Study 1.

On Day 27 each rat was pre-exposed for 3 min in one arm of the T-maze. A portion of the T-maze near the choice point was blocked off for pre-exposure. The area produced was 11 in. long by 6 in. wide by 6 in. high, and so matched the size of the pre-exposure box used in Study 1. After pre-exposure, the rat was placed in a waiting cage for 30 sec while the maze was restored to its normal state. Then the rat was given a free choice trial.

On Day 31 the procedure was repeated with each rat now pre-exposed to the other stimulus to that pre-exposed on Day 27.

Results. The effects of pre-exposure depended upon the sex of the rat. Male rats showed no effect. When the 29 males² were pre-exposed to B, 13 subsequently chose B and when the 30 males were pre-exposed to W, 15 subsequently chose B. The effects of pre-exposure to B versus W were not significant on Day 27 ($\chi^2 = 0$, $df = 1$, n. s.) nor on Day 31 ($\chi^2 = 0$, $df = 1$, n. s.). Further, there was no consistency in the rats that alternated or repeated on the two days. Thirteen of 29 males made the same response (alternation or repetition) on both trials as compared with an expected number of 14½ ($\chi^2 = 0.31$, $df = 1$, n. s.).

The females showed a significant effect of pre-exposure. When the 30 females were pre-exposed to B, six subsequently chose B but when they were pre-exposed to W, 23 subsequently chose B. On Day 27 this difference was significant ($\chi^2 = 4.17$, $df = 1$, $p < 0.05$) and Day 31 replicated this result ($\chi^2 = 10.49$, $df = 1$, $p < 0.01$).

Discussion. Only the female rats showed an effect of pre-exposure in an arm of a T-maze on subsequent choice in the T-maze. This effect was obtained consistently. The only possible explanation that can be advanced is that the fear level of the male rats and the female rats may have differed. In a previous open-field test (Lester, 1968) the males had defecated more than the females. Although no rats defecated in the present experiment, a difference in fear level may have existed.

CONCLUSION

The present series of studies failed to find an effect from pre-exposure in one locale on subsequent choice in a second locale. This is in agreement with the majority of studies. However, pre-exposure in one locale does affect subsequent choice in that

same locale. In the present studies the pre-exposure locale size was the same in both situations and the handling between the pre-exposure trial and the free choice trial was in fact more extensive in the study which demonstrated an effect from pre-exposure in a locale on subsequent choice in that same locale. It is unlikely, therefore, that these variables affect the failure to obtain a pre-exposure effect when pre-exposure takes place in a different locale from the free choice locale.

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NOTES

1. This research was supported by Research Grant MH 14404-01 from the National Institute of Mental Health.
2. An entry was defined as made when all four paws of the rat had entered one arm. Rats were removed only from the stem of the T-maze to prevent maze "shyness" from developing. On occasions a rat escaped from the pre-exposure locale and so the data reported are for less than the number of rats in the study.
3. The animals did not show significant alternation of the choice made during the position preference test to the choice made on Day 17.
4. Walker et al (1955) used a conventional spontaneous alternation test as a comparison study, which is less appropriate than the present comparison study.