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PSYCHOLOGY OF THE SCIENTIST: X. OBSERVER BIAS IN CLASSICAL CONDITIONING OF THE PLANARIAN[1]

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Summary.—Three groups of undergraduate volunteers were given differential expectancies about *S*'s behavior prior to their observations of planaria undergoing conditioning. Group HE ($n = 5$) received a high response expectancy, Group LE ($n = 5$) a low response expectancy, and Group HLE observed one planarian under each expectancy condition. Group HE reported 18% contractions and 49% head turns in 100 trials whereas Group LE reported but 9% and 9.9%. Group HLE reported 15.4% contractions and 30% head turns under high expectancy instructions, but only 4.8% and 15.4% under low expectancy instructions. Analyses of the effect of instructions between Groups HE and LE and within Group HLE both yielded significant *F* ratios ($P < .001$). Although it is unwise to generalize from naive volunteers to sophisticated investigators, it is clear that response recording in planaria should be made less ambiguous, perhaps by taking photographic records.

A number of recent experiments (e.g., Rosenthal & Fode, 1963) demonstrate that *E*'s expectations about *S*'s behavior can influence the experimental outcome. The present experiment is a further investigation of this phenomenon in which the observers' expectations were manipulated by a casual statement about *S*'s behavior delivered just prior to the observations.

METHOD

Subjects.—*Os* were 17 student volunteers enrolled in introductory psychology, all of whom were familiar with classical conditioning procedures and terminology. All received class credit for participation. The class was contacted by one of the writers (L.C.) and asked to help in a conditioning experiment because L.C. was visually handicapped to the extent that he could not observe the movements of the planarian. *Ss* were 34 planaria (*Dorotocephala Tigrina*) all of which had received 50 light-shock training trials (3-sec. light, 1-sec. shock which terminated simultaneously) prior to the experimental session.

Apparatus.—A V-shaped trough, 10 in. long, ½ in. wide and ¼ in. deep was cut into each of two blocks of white acrylic plastic which were placed in a vibration free experimental booth. The troughs were filled with cured water and fitted at each end with electrodes through which a 6-v DC current, passed through an inductorium, could be presented. A gooseneck lamp, housing a 100-w bulb, was placed 10 in. directly over the troughs and served as the CS.

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Procedure.—*O*s were randomly assigned to one of three groups: a high response expectancy group (Group HE, $n = 5$), a low response expectancy group (Group LE, $n = 5$), and a group run under both conditions (Group HLE, $n = 7$). In Groups HE and LE each *O* ran two *S*s simultaneously in two blocks of 50 trials with an interblock interval of 5 min. In Group HLE each *O* ran two *S*s successively, each for a single block of 50 trials, one *S* following high expectancy instructions, the other following low expectancy instructions. Each trial consisted of a 3-sec. light and a 1-sec. shock, both of which terminated together. The instructions to all *O*s were as follows:

This is an experiment in classical conditioning. In this case the unconditioned stimulus is a shock and the conditioned stimulus is a light. The data sheets have three columns marked contractions, head turns, and no response. You will record only those anticipatory responses during the period of the conditioned stimulus alone. If no response occurs during this period you will place a check mark in the no response column.

Then *O*s in Group HE were told: "*S*s have already been conditioned and will probably show a high response rate." *O*s in Group LE were told: "*S*s have not been conditioned and with only 100 trials you shouldn't expect too much from them." *O*s in Group HLE were given both instructions, one before each *S*; the high set was given first to 3 *O*s and second to 4 *O*s.

Following the differential instructions each *S* was given 5 shocks to familiarize *O* with the apparatus and the unconditioned response of *S*, after which paired trials were begun.

Results

In Group HE a contraction was reported on 18% of the trials, whereas in Group LE a contraction was reported on only .9% of the trials. Head turns were reported to occur on 47.4% of the trials by Group HE, but only 9.9% by Group LE. Group HLE reported 15.4% contractions under high instructions, but only 4.9% under low and 30% head turns under high, but only 15.4% under low.

An analysis of variance (Lindquist, 1953) of response frequencies for Group HE and LE, in which Trials (Blocks were 1-25, 26-50, 51-75, 76-100) and Response Class were the within-*S* variables and Instructions was the between-*S* variable, yielded significant effects for Instructions ($F = 56.91$, $df = 1/8$, $P < .001$), Response Class ($F = 135.66$, $df = 1/56$, $P < .001$), and their interaction ($F = 41.59$, $df = 1/56$, $P < .001$), but not for Trials or interactions with Trials. The I × RC interaction resulted because Instructions had the greater effect on the reports of frequency of head turns. A second analysis of response frequencies for Group HLE yielded significant effects for Instructions ($F = 12.56$, $df = 1/42$, $P < .005$), Response Class ($F = 12.56$, $df = 1/42$, $P < .005$), but not for their interaction, nor any effects attributable to Trials ($Fs < 1.00$).

Discussion

It is quite clear that *O*'s expectations have a large effect on the incidence of reported responses, although the effect was somewhat attenuated in the group that ran under each condition. For two reasons it seems most probable that these effects were due to differences in response criteria; first, the differences did not develop over trials as might be expected if *S*s were being affected by differences in *O*'s behavior toward them, and second, *E*'s own observations of planaria (not, perhaps, unbiased) lead to the suspicion that separating an anticipatory response from spontaneous activity at one end and the unconditioned response at the other end of a short 2-sec. interval can be a difficult task. In short, *O* is placed in an ambiguous perceptual situation wherein expectancies or hypotheses in large part determine the critical response.

It is perhaps unwise to generalize from this sample of naive volunteers to the trained and sophisticated investigator, but, on the other hand, the expectancies maintained by the latter are not likely to be less strong than those manipulated in the present study. In some investigations double-blind techniques have been used, but these are only possible if the experimental treatments can be introduced prior to nondifferential behavioral testing. Clearly, an investigation into the effects of, say, partial reinforcement on conditioning in planaria could not be done using the double-blind method because the difference in the experimental treatments would be immediately obvious to *O*. One alternative to the danger of *O*'s hypotheses partially determining the report of a response is to reduce the ambiguity of the situation by permanently capturing the behavior on film and examining this record with slow motion projection. Under these conditions a response could unambiguously be determined by establishing a critical deflection point on the projected image.

References

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