Sensory preconditioning of cats in a shuttle box avoidance situation

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The existence of sensory preconditioning is demonstrated in cats trained to respond to a visual stimulus at the 50% level in a hurdle-box, shock avoidance situation. A comparison is made of the paradigm and apparatus used in this study with other sensory preconditioning studies.

Sensory preconditioning (SPC), first noted by Brogden (1939) consists of the following paradigm: (a) contiguous presentation of two conditioning stimuli without reinforcement, (b) coupling only one of the CS to a reinforcement until some arbitrary criterion is reached, (c) testing the previously uncoupled CS's ability to elicit the response. Controls must include equal exposure to the test stimulus (i.e., unpaired presentations of conditioning and test stimuli) in the preconditioning phase.

SPC has been demonstrated in dogs, pigeons, rabbits, cats, rhesus monkeys, and human Ss (Seidel, 1959). Methods of training have included food reward, GSR response, and shock avoidance. Both inter- and intramodal stimulus paradigms have been used. Previous instrumental avoidance studies with cats have employed the Brogden-Culler wheel (1936) and have involved training to the 90% response level. In this study, cats were trained in a double-grid, hurdle-box to a lower criterion.

METHODS

The hurdle-box was divided into 20 x 18 in. compartments separated by an 8 in. barrier. Alternate rods on the grid floor and hurdle were connected to a stimulator and scrambler delivering variable voltage at .003 A. Visual stimuli were provided by a light source directly over the screen ceiling, and the auditory stimuli were provided by a white-noise generator.

Each group of four animals was familiarized with the box for two 3-h periods. During preconditioning the experimental group received four preconditioning trials (see Hoffeld et al, 1960) separated by 5 min intervals. During this time the light was presented for 6 sec with the auditory stimulus presented contiguously for the last 2 sec (Hoffeld et al, 1958). The control Ss underwent random preconditioning consisting of four 6 sec tones and four 2 sec light stimuli. No shocks were delivered to either group in this phase.

Twenty conditioning trials were administered each day to every animal until he made a CR to the 3 sec light CS on at least eight of the 20 trials. In practice, many animals skipped this 40% conditioning level (i.e., eight out of 20 correct), and the mean number of CRs for all animals was 50.6%. This criterion level was a departure from most animal studies, which have used 90% or greater as the arbitrary response level.

The day after an S reached criterion level, the auditory stimulus was presented without shock for 3 sec for 20 trials. The following day 20 trials of light were administered, as in the learning period, except that the shocks were omitted. Finally, animals which had given less than two responses when tested to the auditory stimulus were trained to respond to it to a 50% level to insure that the cats' hearing was adequate.

RESULTS

There was no significant difference between control ($\bar{X} = 321$) and experimental groups ($\bar{X} = 337$) in the number of trials to reach the 50% criterion during conditioning.

Demonstration of SPC in this study is the number of responses the cats gave to the trial stimulus after being conditioned to the light, compared to the number of responses given by the control group to the same auditory stimulus (i.e., generalization). Figure 1 illustrates the mean number of responses given by each experimental and control animal to the white-noise during the SPC demonstration. The difference between these two groups is significant at the $p < .05$ level (Mann-Whitney U Test). The final test to light showed no significant difference between experimental and control groups.

Those three cats that gave less than two responses to the tone during the testing period were easily trained to respond to the tone at the end of the experiment, thus indicating that deafness was not responsible for the low number of responses to the auditory stimuli.

DISCUSSION

In summary, SPC was observed in cats in a double-grid, shock avoidance, shuttle-box situation. SPC seems to have no effect on the subsequent acquisition of a CR to one of the preconditioned stimuli.

In a comparison of results Thompson & Kramer (1965), who used the same SPC procedure as in this study, except for a 90% criterion level and a Brogden-Culler rotating wheel apparatus, found that their cats demonstrated SPC and learned the avoidance response more quickly, taking on the average only 240 trials to reach the 90% level, compared with the cats in the shuttle box that needed 329 trials to achieve a 50% criterion. However, the cats in Thompson and Kramer's study were much more variable in the number of preconditioned responses to tone they displayed (1-12 vs 2-4). Thompson (1959) showed that cats without preconditioning training but conditioned to the 55% acquisition level to light (in the Brogden-Culler wheel) showed a significant number of responses to tone, in contrast to the control animals in this study (i.e., those without SPC), which show little or no stimulus generalization. Both aforementioned comparisons

Fig. 1. Mean number of responses to auditory stimuli during 20 SPC post-criterion testing trials.

between results obtained from the rotating wheel and the hurdle-box may be attributable to the differences in the nature of the required response. Running in the wheel is more spontaneous and less easily inhibited, whereas the hurdle-jump is more discrete and precisely defined.

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NOTE

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