

METHODS

ACTIVE AVOIDANCE WITHOUT DISCRIMINATION CONTROL AS MODEL FOR STUDYING THE PROTECTIVE ACTION OF DRUGS IN EMOTIONAL STRESS

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By plotting histograms of distribution of the frequency of intervals between pressing a lever (the active-avoidance method without discrimination control) it is possible to assess fine changes in the character of operant activity arising in rats through emotional stress. The design of a simple multichannel apparatus for inducing and studying active avoidance in several animals is described.

KEY WORDS: Operant behavior; emotional stress; tranquilizers.

Convenient and adequate models for assessment of the protective action of drugs on psychomotor activity, which lies at the basis of many types of human occupational activity, when disturbed by emotional stress have not yet been adequately developed. One such model is the method of active avoidance without discrimination control in rats, described previously [2]. When this method is used the experimental conditions require the animal to perform a skilled movement of pressing a level in a certain rhythm, and also to respond quickly to resumption of painful electrical stimulation should the warning pressure be delayed. This method is distinguished by relative simplicity of the experimental program. The method can also be used to carry out observations simultaneously on several animals. For all these reasons it is a convenient model with which to study the effect of emotional stress and also to investigate the protective action of drugs against stress in relation to psychomotor activity. The method enables several different forms of stressor to be studied [1]. To evaluate the effect of emotional stress and also the protective action of drugs against the effects of stress on operant behavior of rats under the conditions of this model it is useful to construct histograms of distribution by frequency of the whole range of intervals between pressings on the lever carried out in the course of one hour by the trained animals. Previously only warning pressings were taken into account [3]. To teach a large group

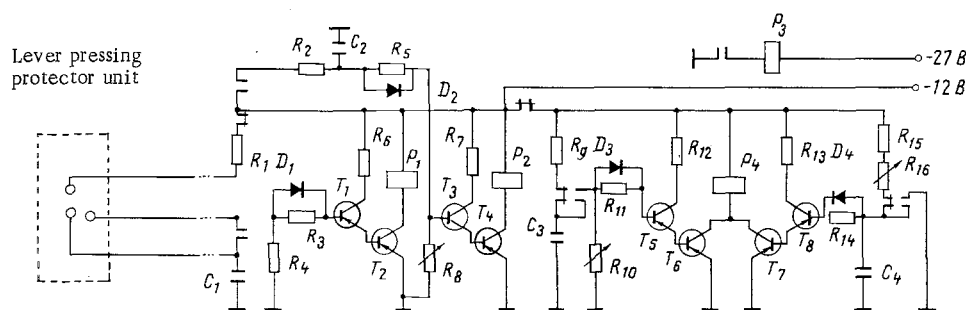


Fig. 1. Electrical circuit of one channel of the programming system. R_1, R_4) 1.1 k Ω ; R_2) 220 Ω ; R_3, R_5, R_{11}, R_{14}) 200 k Ω ; R_6, R_7, R_{12}, R_{13}) 100 Ω ; R_8, R_{10}, R_{16}) 47 k Ω ; R_9) 3 k Ω ; C_1, C_3) 50 μ F; C_2, C_4) 400 μ F; D_1 - D_4) D_{220} ; T_1 - T_8) MP42B; P_1, P_2, P_4) RES 9 relay, certificate PC 4524200; P_3) PC 13 relay, certificate PC 4.523.017.

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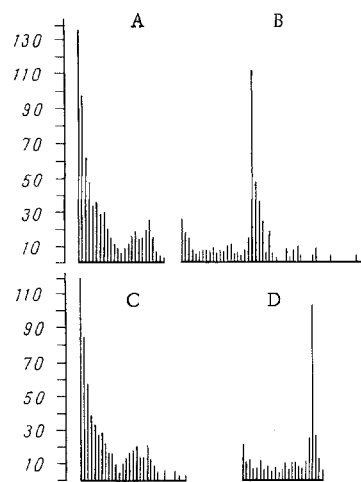


Fig. 2. Effect of immobilization stress and protective action of diazepam bands on operant activity. Two types of operant behavior during emotional rest (warning and avoidance). Abscissa, number of intervals of different duration; ordinate, duration of intervals (interval between classes 1 sec). A) Initial histogram of distribution by frequency of intervals between pressing on lever (corresponds to predominant warning on painful electrical pulses); B) after immobilization stress; C) after immobilization stress plus diazepam (0.5 mg/kg, 30 min before immobilization); D) histogram corresponding to predominant avoidance of painful electrical stimulation under conditions of emotional rest.

of animals skill in avoidance, and also to carry out the experiments with several rats at the same time, it is convenient to use a nine-channel programmed system, with a wide range of regulation of the parameters of the experimental program, designed by the present writers, which is simple and reliable in use. The electrical circuit of one channel of the programming system is shown in Fig. 1. The design of the system includes an output to a unit automatically measuring intervals between pressings on the lever (free contacts of relay P₃). The histograms given in Fig. 2 reflect two types of operant behavior; predominant warnings or avoidance of painful electrical stimulation [2]. The effect of immobilization stress (60 min) on the histogram (Fig. 2B) is manifested as a marked decrease in the number of short intervals between pressings (1-2 sec) and an increase in the number of intervals equal in duration to the delay of stimulating pulses (20 sec.).

Under these circumstances the number of intervals of long duration increases considerably. Administration of the tranquilizer diazepam leads to normalization of operant behavior, and this is clearly reflected in the histogram (Fig. 1C). The use of the apparatus and method of analysis of the results described above enables individual difference in the response of animals to stresses to be detected and drugs to be administered depending on the character of operant activity under conditions of emotional rest.

LITERATURE CITED

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