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Effects of conditioned and predictive stimuli on the fly-away escape response in a two-way shuttle box

Alena V. Savonenko and **Kazimierz Zieliński**

Institute of Mental Health of RAMS, Tomsk, Russia; Department of Neurophysiology., Nencki Institute of Experimental Biology, 3 Pasteur St., 02-093 Warsaw, Poland; Email: ziel@nencki.gov.pl

INTRODUCTION AND METHODS. A strong tendency not to return to the previously shocked compartment of a shuttle box was proposed as the main factor retarding two-way avoidance learning (1). It has been shown that the fly-away, rapid escape from an electrified grid, a species-specific defensive reaction of the rat, was observed at the very beginning of avoidance training. Subsequently latencies of the escape response increased, reflecting the conflict situation (2). Here, the modulatory role of a darkness (D) stimulus on the fly-away escape response is studied. Three groups each of 25 experimentally naive male rats were trained under unsignalled escape (Esc), signalled escape (Esc_D), or avoidance (Av_D) procedures. Only shock was presented in Esc, compound shock and darkness in Esc_D, and darkness preceded for 5 s and then accompanied shock in Av_D. The nominal 1.6-mA scrambled pulsed DC shock (50 Hz pulse rate) on the grid floor could be terminated (escaped) by running to the opposite compartment or prevented (avoided) by the same response during the signal-shock interval.

RESULTS AND DISCUSSION. The first escape latency was shortest in the Esc_D and longest in Av_D groups ($P<0.05$, Kolmogorov-Smirnov test; Fig. 1A). Simultaneous presentation of D and shock, presumably enhanced the fly-away escape response because of the higher energizing role of a compound. In contrast, the initial presentation of D in the delayed CS-US contingency may elicit an orienting reflex which interferes with the fly-away reaction. The gradual dissipation of group differences with continued presentation of the stimuli (Fig. 1B) supports this conclusion. During the first 10 trials there were no reliable changes in escape latencies in groups Esc_D or Esc. In contrast, curvilinear changes were revealed in group Av_D: the escape latency on trial 1 was longer than on trials 2, 5, and 6, whereas the escape latency on trials 5 and 6 were shorter than on each of trials 8, 9, and 10 (Kolmogorov-Smirnov test, $Ps<0.05$). The mean frequency of avoidance responses during these trials was small (0.024/trial). An even earlier increase in escape latency using the avoidance procedure was found with a more salient warning signal (3). Thus, differing from these escape procedures, the avoidance procedure induced the lengthening of escape latencies as early as the first 10 trials of training.

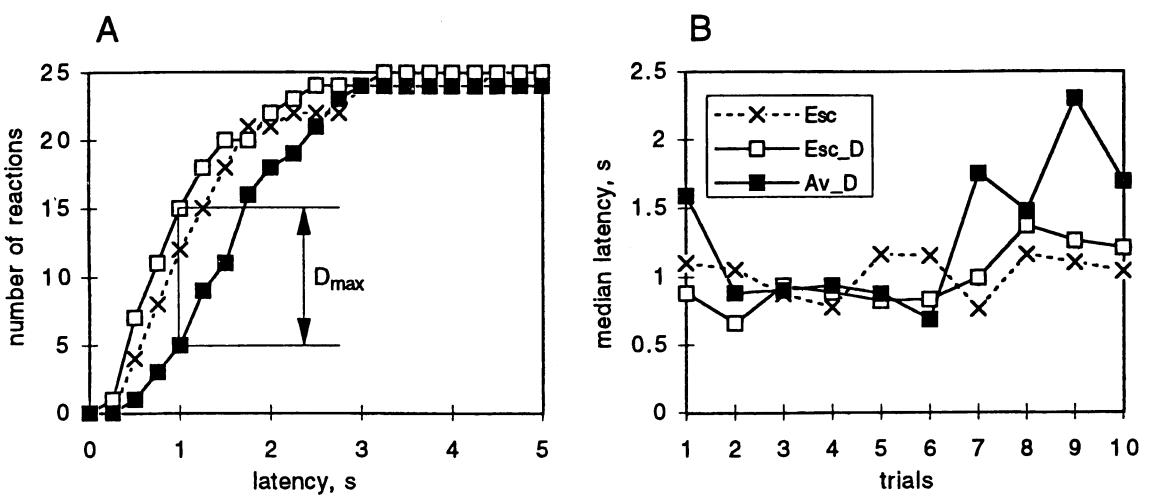

Fig. 1. Cumulative distribution of the first escape latency (A) and changes of median escape latency during the first 10 trials (B) during avoidance (Av_D), signalled (Esc_D) and unsignalled escape (Esc) procedures.

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