Gaseous Krypton Fluoride

Mass spectrometric analysis (*1*) of krypton fluoride, prepared by J. G. Malm and C. L. Chernick by the electric discharge method with which A. V. Grosse *et al.* (*2*) first prepared KrF_4, yielded Kr^+ and KrF^+ ions as shown in Fig. 1 (*3*).

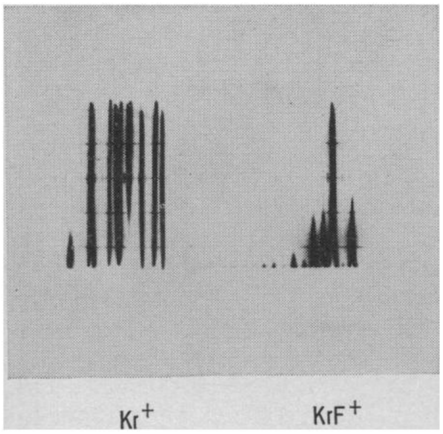

Fig. 1. Mass spectrum of krypton fluoride.

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References and Notes

1. M. H. Studier and E. N. Sloth, *J. Phys. Chem.* **67**, 925 (1963).
2. A. V. Grosse, A. D. Kirshenbaum, A. G. Streng, L. V. Streng, *Science* **139**, 1047 (1963).

3. Based on work performed under the auspices of the U.S. Atomic Energy Commission.

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Punishment and Shock Intensity

Abstract. *The degree of suppression of on-going, food-motivated behavior induced by punishing electric shock was exponentially related to the intensity of the aversive stimulus. No evidence for recovery from these effects during punishment sessions was observed.*

On-going behavior can be suppressed or eliminated for a time by punishment. In pigeons, there is a decline in response rate when electric shock is first introduced after each peck at a plastic disk for food reward, but the amount of this suppression has been reported to be unrelated to the intensity of the punishing stimulus (*1*) if the shock is of sufficient strength to induce any suppression at all. This result has not, however, been generalized to include other species. Moreover, the effects of continued exposure to punishment are not completely understood. The belief has predominated that behavior is suppressed so long as shock is present and that response rates return to preshock levels (recover) only when the punishment is withdrawn (*2*). Azrin, however, reported that recovery from the effects of what he called mild punishment can occur while the shock continues to follow each response (*3*) and that the degree of recovery is a function of the intensity of shock (*1*).

In Azrin's experiments, shock was delivered to the bird's pubis bone through implanted electrodes (*4*). Results with grid shock have recently been reported (*5, 6*) which indicate that brief exposure to punishment might have relatively permanent effects, in that rates do not return to preshock levels even after the punishment contingency is removed. For example, squirrel monkeys were trained (*5*) to press a lever to obtain food pellets on an intermittent schedule of reinforcement. A 0.5-sec, 1-ma shock was then introduced through the lever and grid floor after each response. The experimental sessions lasted for 8 hours. Bar pressing was completely inhibited for 20 days (160 hr) after a maximum of 70 shocks were received; even when the shock was disconnected, no responding occurred in 30 additional 8-hour experimental sessions. Storms *et al.* (*6*) trained hooded rats to work for food and later introduced a 1-ma shock after every response. This procedure again resulted in the complete suppression of food-maintained behavior. The rats were tested for 3 days without punishment after a 2-week rest period and no recovery was observed in three of the four animals.

There appears, in summary, to be some evidence in support of every possible effect of repeatedly exposing animals to punishing shock. Either recovery occurs while the punishment contingency is present (*1*), occurs only after the contingency is withdrawn (*2*), or does not occur at all (*5, 6*). It is likely that the discrepancies in experimental results are a function of intensity parameters, species differences in sensitivity to shock, length of the exposure period, or method of shock administration. The present investigation (*7*) was designed to test the first of these possibilities, that is, to relate both initial suppression (rate during the first day at each intensity) and recovery (rate during subsequent punishment sessions) to shock intensity.

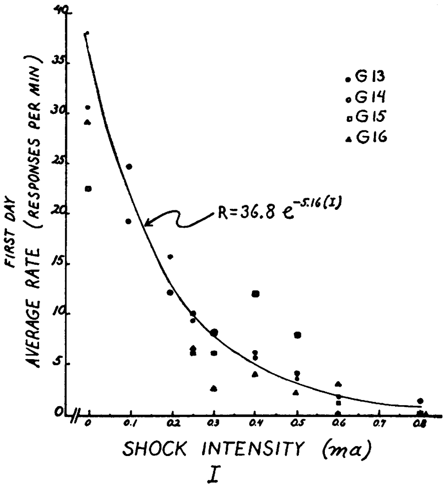

Fig. 1. Average rate of responding for four albino rats (G13, G14, G15, and G16) during the first 90-minute session at each shock intensity. Bar presses were intermittently reinforced with food at 1-minute intervals and regularly punished with shock. The curve was fitted by the method of least squares to the log of the mean rate and is for the equation indicated on the graph.

The situation studied is not uncommon in psychological laboratories and resembles that of Appel and of Storms *et al.* A strain of rats (Sprague-Dawley) obtained from the Holtzman Co., a box with a grid floor (R. Gerbrands model C), and a commercial shock generator and scrambler (Grason-Stadler model E1064GS) were used.

Four 90-day old male rats were placed on restricted food intake consisting of whatever food they received during the experimental sessions plus sufficient additional Wayne laboratory pellets to maintain them at a constant body weight. They were also trained to press a lever. Every response was initi-

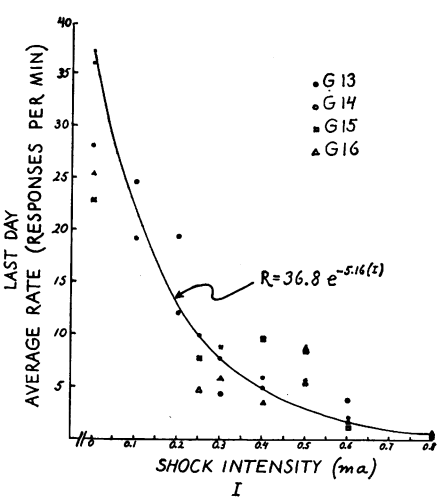

Fig. 2. Average rate of responding for the same rats during their last session at each shock intensity. The curve is the same as in Fig. 1.