GENERAL DISCUSSION

Both increased incentive and increased deprivation were associated with higher response rates in the punishment phase, although it was unclear if the differences between prepunishment and punishment rates were affected similarly. Suppression in the punishment and conditioned suppression procedures appears to be affected similarly by differences in food deprivation but not by differences in sucrose concentration. The finding that increased incentive has little effect on conditioned suppression, at least within the 8%-32% range, but a large effect on resistance to punishment within the same range and the inconsistencies in the literature reviewed in the introduction raise problems for Estes's theory (1969), which explains the amount of suppression in conditioned suppression and punishment situations as being determined by a conflict between appetitive and aversive motivation.

These data bear on another aspect of conflict theory. Since punishment was scheduled on a FR schedule, it might be supposed on a variety of grounds (Brody, 1968; Bower & Miller, 1960) that response rates would be highest at the beginning of the ratio and decline as the ratio ran out. Despite extensive exposure to the FR 200 schedule in the present studies, however, there was no evidence in the cumulative records of differential response rate as a function of position in the ratio, except for short postshock pauses. These data are in accord with the results of other studies which indicate that no negative acceleration occurs between shocks in FR punishment situations when the manipulandum is not part of the shock circuit (Azrin, Holz, & Hake, 1963; Hendry & Van Toller, 1964).

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The effects of chlorpromazine on self-punitive behavior*

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After usual treatment conditions were instated to produce the self-punitive behavior phenomenon, different dose levels of chlorpromazine (or appropriate amounts of saline) were administered to different groups of rats. The overall effects of the drug were suppression of performance. The most interesting result occurred at the low dose level, in that only the punished group was affected by the drug. These findings support the Mowrer-Brown theoretical explanation of self-punitive behavior. In addition, these findings indicate that the self-punitive paradigm has promise as a drug-screen technique.

One possible consequence of punishment is suppression of the punished response. Whenever punishment facilitates the response, however, this particular kind of maladaptive behavior is called self-punitive, or vicious circle, behavior (Brown, Martin, & Morrow, 1964). During the past few years, most of the necessary and sufficient conditions for the production of self-punitive behavior have been isolated (see review by Brown, 1969). At the same time, the Mowrer-Brown theoretical explanation, which emphasizes motivational and reinforcement aspects, has been strongly supported. Within the Mowrer-Brown explanation, it is presumed that there are at least three sources of contribution to the motivational level operating in the self-punitive situation: (1) the punishment itself, (2) conditioned fear, and (3) residual emotionality.

Based upon the reasoning that a significant reduction in motivation should lower response strength, several attempts have been made to stop self-punitive behavior by reducing the level of motivation. Martin (1968) and Ervey (1969) reduced residual emotionality by removing the S from the test situation for a time and thus decreasing self-punitive behavior. Since major tranquilizers presumably lower motivation, different dose levels of chlorpromazine were used in the present study in an attempt to stop self-punitive behavior. Miller, Murphy, & Misky (1957) have shown that fear-reducing properties of chlorpromazine were not attributable to motor and/or sedative effects of the drug at dose levels near 1.2 mg/kg.

SUBJECTS

The Ss were 108 naive female rats of the CFE strain obtained from Carworth Labs. The Ss were received as weanlings and were handled daily for 1 week. When Ss weighed approximately 90 g, they were housed in individual cages with food and water available ad lib. When used in the experiment, Ss weighed

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Fig. 1. Resistance to extinction, as measured by number of responses and alley speed, of all groups of punished and nonpunished Ss at each dose level.

approximately 135 g and were deprived of food for 24 h prior to the experimental session.

APPARATUS

The main apparatus was a straight runway and has been described in detail elsewhere (Martin, 1969). The white startbox (12 x 12 x 8 in.) and alley (72 x 12 x, 8 in.) had a grid floor through which shock could be administered. The black goalbox (12 x 12 x 12 in.) had a wooden floor. Guillotine doors separated the compartments. Hunter Klockcounters and appropriately placed photocells permitted the measurement of starting and alley times.

PROCEDURE

The study was run in three phases. Each time a dose level of drug was tested, the appropriate saline-injected control groups were also run.

Acquisition

Before any treatment condition was imposed, S was given 33 shock-escape (1.0 mA) trials with a 30-sec intertrial interval. Before the 34th acquisition trial, S was given an interperitoneal injection of chlorpromazine (.3, 1.2, or 5.8 mg/kg) or an equivalent volume of saline.

Extinction

After the 35th shock-escape trial, S received either punished extinction conditions or nonpunished extinction trials. During nonpunished extinction, shock was no longer present in any portion of the apparatus. In the punishment condition, S encountered shock in the 18 in. of the alley immediately in front of the startbox. Up to 100 extinction trials were administered unless S met the criterion for extinction (failure to enter the goalbox within 60 sec).

A control procedure was instituted to guard against the possibility that the drug rendered S unable to perform the response, i.e., groups of Ss were run which were given 100 more shock-escape trials after the administration of the drug.

RESULTS

Extinction performance in number of responses to extinction and in feet per second (alley speed) during punished and nonpunished conditions are presented for each group at the different dose levels in Fig. 1.

First, it should be noted that punishment resulted in the usual self-punitive phenomenon at each dose level (.30 dose, $F = 34.09$, $df = 1/33$,

$p < .001$; 1.20 dose, $F = 17.18$, $df = 1/25$, $p < .001$; 5.82 dose, $F = 15.86$, $df = 1/20$, $p < .001$). It may be seen that the effect of the drug, in general, was to suppress extinction performance (.30 dose, $F = 20.93$, $df = 1/33$, $p < .001$; 1.20 dose, $F = 15.79$, $df = 1/25$, $p < .001$; 5.82 dose, $F = 18.73$, $df = 1/20$, $p < .001$). The interaction of Drug by Punishment was also significant at each dose level (.30 dose, $F = 13.15$, $df = 1/33$, $p < .001$; 1.20 dose, $F = 13.14$, $df = 1/25$, $p < .001$; 5.82 dose, $F = 10.62$, $df = 1/20$, $p < .001$).

At the lowest dose, the nonpunished chlorpromazine group was not significantly lower than the nonpunished saline group.

DISCUSSION

Once again, punishment of an aversively motivated response during extinction produced self-punitive behavior. The results also showed that chlorpromazine was effective in stopping self-punitive behavior.

The assumption that chlorpromazine reduced fear, and thus reduced the strength of response, is supported by the data. The fear-reduction explanation, and thus the Mowrer-Brown one, is more strongly supported than a general activity-reduction hypothesis, since there was no significant difference between the nonpunished drug and saline-injected groups at the low dose level.

These effects, observed at the low-dose level, were interesting also because they showed that the self-punitive punishment procedure shows promise as a method for determination of the presence of a drug when other methods show no behavioral effects. These results suggest that the self-punitive paradigm might prove useful in drug-screening programs.

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