The role of motivational and incentive levels in the determination of successive discrimination reversal (SDR) performance of Chukar partridge*

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The performances of Chukar partridge on a spatial successive discrimination reversal task was studied at two levels of drive (D) and at two levels of incentive (K). Variation in both D and K led to variation in errors across reversal problems. High D tended to increase errors, while high K yielded a decrement in errors.

Previous investigation of the effects of variation of motivational level (D) on SDR measures has shown that high D leads to an impairment in performance among squirrel monkeys (Gossette & Feldman, 1968), pigeons (Gossette & Hood, 1968), and ring-neck doves (Gossette & Hood, 1969). Similar variation in incentive level (K) has also been shown to influence SDR measures, with performance of pigeons (Gossette & Hood, 1968) impaired by low K. However, the effects of D and K have been studied only with species that display a relatively high level of SDR performance within their respective classes.

To provide a broader empirical base for generalization about the role of D and K in the control of SDR performance, and in particular to determine the effect of these variables upon species characteristically displaying a low level of SDR performance, e.g., high error scores, the spatial SDR performances of Chukar partridges were obtained under two levels of D and two levels of K. Previous work with this species has demonstrated that the Chukar, like other members of the Galliformes, typically produce a relatively high number of errors, as contrasted with other avian species, e.g., pigeon and magpie, with this methodology (Gossette, 1966).

METHOD

The Ss were 14 Chukar partridges approximately 12 months old at the time testing was initiated. All Ss were maintained on a conventional game bird diet, in individual caging, for at least 3 months prior to testing. During this period daily weights were obtained under ad lib feeding schedules. All Ss were tested in the same formboard box previously employed with pigeons and doves. Two levels of D selected were 10% and 30% reductions of ad lib body weights. Two levels of K selected were 2 grains and 12 grains of game bird ration. Each S was habituated to the test chamber and, over a period of

several days, trained by successive approximation to peck stimulus blocks to obtain game bird food from the underlying foodwells. During the pretraining period, food was available from both foodwells. A series of preference-testing and forced-responding sessions was provided to equalize response tendencies to both block positions. Then a position habit was established, Problem 1, with responding to the nonpreferred side always being reinforced. When a criterion of two or fewer errors on a given day was achieved, the reinforcement contingencies were reversed and training continued until criterion was again reached. In this fashion 11 reversals were obtained. One session of 20 noncorrection trials was given daily.

RESULTS AND DISCUSSION

The principal response measure selected for analysis was the total number of errors across 12 problems. Figure 1 shows the mean cumulative error function for each experimental group. As can be seen, there is a prominent difference between D conditions at low K, but minimal separation at high K. Kruskal-Wallis analysis of overall differences in total errors yielded a significance of $p < .01$. Figure 2 shows the cumulative error data for groups combined according to levels of K (across D levels) and to levels of D (K levels combined). As can be seen, variation in K exerts the greatest control over variation in SDR error scores, with high K yielding the lowest error score. However, variation in D can also influence error scores, with low D producing the lowest scores. To provide further information concerning the locus of the influence of D, an analysis of initial errors was conducted. In view of the usual finding that resistance to extinction is directly related to D, it appeared reasonable to expect that initial error, an abbreviated measure of extinction, might be similarly related to D. While the obtained relation was in the expected direction, with the high D group producing greater initial errors at both

levels of K, the difference failed to reach significance.

It is increasingly apparent that the comparative analysis of SDR performance is greatly complicated by the continued demonstration that both D and K are significant determinants of SDR performance, particularly if interspecies comparisons of absolute scores are attempted. The evidence now available, cited above, indicates that it is advisable to determine the range of variation of SDR measures as a function of both D and K for each species to be compared. Knowledge of such functions will then make it possible to equate species for D and K levels. While to date only two points along each function have been studied, it would appear that errors on SDR tasks are a decreasing function of K.

The role of D is less certain, for, while high D retards SDR performance, it seems likely that excessively low D will lead to a failure to respond. The two values of D tested to date, 30% and 10% to 5% body weight loss, appears to represent the widest practical variation of D that can be employed with most avian and mammalian species (Gossette, 1968). Twenty percent loss appears to be the highest loss that can be produced with goldfish.¹ Larger losses lead to a high mortality. Minimal losses produce an organism reluctant to respond. Preliminary investigation (Gossette & Hood, 1969) suggests that when species are properly equated along D and K functions, important interspecies SDR performance

Figure 1 Mean cumulative error function across 12 spatial SDR problems as a function of D and K.

Fig. 1. Mean cumulative error function across 12 spatial SDR problems as a function of D and K.

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Fig. 2. Mean cumulative error function across 12 spatial SDR problems for combined D and K levels.

differences can be delineated that reflect or parallel interspecies taxonomic separation. In view of the promise shown by SDR methodology in the calibration of interspecies performance differences, as contrasted with most other behavioral tests, it appears advisable to proceed with

the isolation of the functions relating D and K to SDR measures, both within and across species.

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NOTE

1. Gossette, R. L., & Kaplan, B. Percent body weight loss in goldfish over extended deprivation intervals. Paper submitted for publication.

promises to be increasingly popular as a laboratory S (Walters, Pearl, & Rogers, 1963). The data obtained thus far indicate many differences between the rat and the gerbil, especially in shock-motivated tasks. For example, Walters, Pearl, and Rogers found the gerbil superior to the rat in acquisition of a discriminated avoidance response in the Skinner box, whereas Boice, Boice, & Dunham (1968) report shuttlebox performance for the gerbil that is inferior to that of the rat. Data for the rat (Moyer & Korn, 1964) indicate that shock intensity has a great effect on the acquisition of an avoidance response; low levels of shock are insufficient to motivate the S, but high levels of shock elicit responses that are incompatible with the appropriate avoidance response. Similar effects are probably true for the gerbil.

The unconditioned response of rats to shock is well documented; at low levels of shock rats flinch and at higher levels they make locomotor responses that mask the initial flinch response (Hoffman, Flesher, & Abplanalp, 1964; Kimble, 1955; Thompson & Enter, 1967; Trabasso & Thompson, 1962).

The present experiment investigated the effects of shock intensity on the unconditioned response to shock in gerbils. Because the gerbil's feet and tail are covered with hair, animals were tested both before and after the tail, scrotum, and feet were shaved.

SUBJECTS

The Ss were six male Mongolian gerbils (*Meriones unguiculatus*) approximately 70 days of age obtained from the Ridlow Pet Shop. The Ss were housed one to a cage on ad lib food and water.

Shock intensity and unconditioned responding in the gerbil*

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Six male gerbils were tested for their unconditioned response to shock (0.0-0.9 mA in 0.1-mA steps) before and after shaving the tail, feet, and scrotum. Results indicated that the gerbils were more sensitive after shaving than before. The Ss under both conditions made flinch responses at low intensities of shock, reaching a maximum of 0.1 mA and then declining. The Ss under both conditions showed an increase in locomotor responses from 0.0 mA to 0.9 mA. The response topographies for both the flinch and locomotor responses were similar to those of the rat (Trabasso & Thompson, 1962) but were displaced toward low shock intensities.

Fig. 1. Mean percent flinch and locomotor responses before and after shaving at each shock level.

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Recently the gerbil has been introduced into the psychology laboratory and