Determinants of polydipsia: VII. Removing the drinking solution midway through DRL sessions¹

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Abstract

Three rats were run on DRL 30 for food. When a bottle containing drinking solution ran dry midway through sessions, disrupting licking, bar-press spacing worsened in two Ss. Over similar sessions, both Ss recovered baseline timing performances during dry-bottle periods. In one of these, licking at the dry tube appeared. In a session with a dry bottle throughout, all Ss showed good timing. In a session with the bottle removed, the S that had learned to lick the dry tube showed disruption in timing. Data are consistent with a mediating role for licking.

Problem

Our earlier studies on excessive drinking on dry-food reinforcement schedules (Segal & Deadwyler, 1965a, b; Segal & Oden, 1965; Segal, Oden, & Deadwyler, 1965a, b, c) suggest that (1) drinking becomes part of an adventitiously reinforced response chain which (2) is partly under the control of discriminative stimuli that are not physiologically thirst-inducing, and which (3) may serve a mediating role on a DRL bar-pressing schedule. This experiment investigates further the possibility that drinking facilitates timing on a DRL food schedule.

If drinking facilitates timing, preventing drinking should disrupt timing. The experimental design was to provide only enough drinking solution for the first

part of each DRL session. Thus, we were able to observe day by day the differential effect of allowing and preventing drinking.

Method

Three adult, male, albino rats, maintained at 80% of ad lib weight, were trained for about 9 months on a DRL 30 sec. bar-pressing schedule for 45 mg Noyes peanut pellets, and were exposed to extinction sessions, a variety of drinking solutions, and injections of amphetamine.

The conditioning chamber contained a food cup, bar, and water bottle, mounted on three walls. The chamber was housed in a sound-resistant shell in a sound-resistant, air-conditioned room containing white masking noise. Sessions lasted for 100 reinforcements.

Days 1-20: The water bottle was filled with 40 cc of 0.3% NaCl solution (A-2), 35 cc (A-3), or 20 cc (BC-2). These amounts were roughly half what the Ss normally drank in 100-reinforcement sessions. Day 21: The bottle was emptied before the start of the sessions. Day 22: The bottle was removed from the chamber. Day 23: The bottle was replaced, and contained enough drinking solution to last the entire sessions.

Results

Figures 1-3 show the results. The top records show day 1. Arrows indicate probable points when the bottle ran dry, as judged by the change in the character of the licking (L) records. As licking disappeared, unreinforced bar presses increased for A-2 and A-3, but not for BC-2.

The second set of records shows behavior on day 20. Although licking changed in character, or disappeared entirely, when the bottle ran dry, bar pressing did not show a change comparable to that seen on day 1; rather, it remained relatively stable throughout the session, for all Ss.

The third set of records shows the result of providing a dry bottle from the start of the session. A-2 and BC-2 did not lick; A-3 continued to lick the dry tube, as it did in the preceding session. All Ss showed good timing.

Results for day 22, with the bottle out of the chamber, are in the records marked 3/15. A-2 and BC-2, who did not lick at the dry tube in the preceding session, were not disrupted by removing the bottle. A-3, who did lick at the dry tube, showed some disruption in timing when the tube was removed.

Fig. 1. Bar pressing, licking, and reinforcements, A-2, days 1, 20, 21, 22, 23.

Results for day 23, with the full bottle present, are in the last set of records. All Ss showed good timing, and all drank, A-3 drinking the most consistently.

Discussion

On day 1, preventing licking disrupted timing in A-2 and A-3; we conclude that licking facilitated DRL timing in these Ss. However, licking was not a necessary condition for DRL timing: BC-2's timing was unaffected by the experimental manipulations, and A-2 recovered over sessions from the initially disrupting effects of emptying the bottle midway through sessions. Thereafter, it was unaffected by further experimental manipulations of licking. Only A-3 appears to have continued using licking as a mediating response throughout the experiment. It licked both at wet and at dry tubes, and showed poorer timing when wet- and dry-tube licking was prevented. It is important to note that preventing licking did not abolish the spaced character of bar pressing in any S. The role of licking was never more than facilitatory, and does not account for spaced responding on a DRL schedule.

It is interesting that even BC-2 and A-2 drank when drinking solution was present. Apparently, drinking was part of a conditioned response chain. S^Ds for drinking were food (all Ss), operation of the food dispenser (A-2 and A-3), and bar presses, reinforced or not (A-2 and A-3) (see Segal & Deadwyler, 1965a). Part of the reinforcement of licking came from contact with the drinking solution, for A-2 and BC-2 did not lick a dry tube. This may indicate thirst-reduction as a reinforcer, but it may also indicate the reinforcing

Fig. 2. Bar pressing, licking, and reinforcements, A-3.

Fig. 3. Bar pressing, licking, and reinforcements, BC-2.

effects of contacting a wet tube, irrespective of thirst (see Segal & Oden, 1965). Part of the operant reinforcement of licking must also have come from the correlation between drinking and food-reinforcement of the next bar press. The evidence for this is especially strong in A-3, who licked persistently even at a dry tube.

If, as appears to be so, A-2 and A-3 used timing cues arising from licking, then it is perhaps inappropriate to speak of the licking as adventitiously related to food reinforcement. On the contrary, if licking facilitated timing, then its reinforcement on a DRL schedule was not adventitious; it was merely unprogrammed.

References

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Note

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