NOTES

A technique for converting from intravenous drug self-administration to liquid reinforcement

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A rapid inexpensive technique for changing from intravenous drug self-administration (DSA) to liquid reinforcement is described. Utilizing a standard peristaltic-type infusion pump typically used in DSA experiments and a specially designed drinking cup, the changeover from intravenous DSA to liquid reinforcement can be accomplished in a few minutes at a cost of less than \$10.

Investigators at this laboratory as well as others working on intravenous drug self-administration (DSA) in monkeys have often used traditional Skinner box methods to study reinforcement effects. The usual solution to the problem of using appetitive reinforcers has been to purchase either commercial pellet dispensers or water dippers. These devices, although highly reliable, are expensive and often require considerable retooling in the experimental chamber. We have found that a peristaltic drug infusion pump can readily be adapted to deliver other reinforcers to the subjects with virtually no experimental downtime or expense.

Figure 1 shows the arrangement of the intelligence panel in our chronic self-administration chambers. On the left-hand side of the panel, a standard primate response lever (BRS-LVE, Beltsville, Maryland 20705) is mounted. A liquid reinforcement cup, designed by the authors, is mounted on the right-hand side of the panel. By substituting a citrus drink (Tang®, General Foods) for the previously used drug solutions, and by connecting the output of the pump to the reinforcement cup, we are able to switch immediately from intravenous drug reinforcement to a liquid reinforcer.

The most difficult aspect of the changeover was finding a suitable reinforcement cup that the monkey could neither remove nor destroy. The cup that was developed is shown in Figure 1. A piece of aluminum stock measuring 7.6 x 7.6 x 5.1 cm is tooled with a 5.1-cm-diam depression, 1.27 cm deep, drilled in the

7.6 x 7.6 cm side. A standard drill bit leaves the depression sufficiently concave that the subject is able to consume the rewards rapidly with little or no difficulty. The cup is fastened to the intelligence panel by three ¼ x 20 in. bolts. A fourth hole is drilled in the intelligence panel to coincide with the liquid input hole in the cup, such that the tubing from the liquid pump can be connected to the cup on the outside of the chamber. This arrangement has been utilized in this laboratory for 2 years with no serious problems. Occasionally the reinforcement line leading from the pump to the cup becomes clogged. However, by simply running warm tap water through the system at the end of each day, clogging is avoided.

The advantages of this system over more conventional appetitive reward systems are several. First, the changeover time is minimal and can be accomplished with no undue hardship or loss of experimental time. Second, the system is quite economical, in that the only external piece of equipment not normally available in standard DSA laboratories is the reinforcement cup. The total cost (labor and materials) to produce these cups is less than \$10. Comparable commercially available liquid reinforcement systems are currently selling for well over \$100. Third, experimental manipulations such as reinforcement volume and the availability of several rein-

Figure 1. Picture showing relationship of the drinking cup to the response lever and stimulus light.

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forcers are exceedingly simple. Fourth, by using a sweetened citrus drink (e.g., Tang®, General Foods), the experimenter can switch immediately from intravenous drug reinforcement to a liquid reward, since we have not found it necessary to restrict food or water

consumption or establish a deprivation rhythm in order to obtain adequate responding.

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