MOUTH-OPERATED FOOD AND WATER MANIPULANDA FOR USE WITH MONKEYS¹

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Experimental procedures involving chronic intravenous catheterization in monkeys require that the animal is restrained in such a way that its hands are not allowed to reach its head. Under these conditions, it has been found helpful to use a manipulandum that a monkey can operate with its mouth, which will provide almost immediate food or water reinforcement. Using such manipulanda, food and water reinforced fixed ratio responding have been programmed on a multiple schedule with shock-avoidance and intravenous self-administration of morphine. Figure 1 shows a cumulative response record for a subject stabilized on FR 50 with the water manipulandum. The ratio performance leading to food and water is not distinguishable from hand-operated telegraph key records.

The manipulandum in use in our laboratory is presented in Fig. 2 along with a circuit programmed for continuous reinforcement. It is constructed from 1/16 in. flexible sheet aluminum, secured with #8 brass bolts, washers and nuts. The housing encloses a micro-switch (f), a 28v dc pilot lamp assembly (c), and a stainless steel drinking tube³ (e). The animal operates the switch by pressing down on the tube with its mouth. This forces the

Fig. 1. Sample cumulative record for a monkey responding on the water manipulandum on a FR 50 schedule.

inner bracket to pivot on the spacers (a), and press against the switch. The force required to close the switch is adjustable with a screw-spring arrangement (b). The manipulandum used for water reinforcement is coupled with

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³Parts list with sources and approximate costs:

Stainless steel drinking tube. Wahman and Co.	\$.60
DV-S standard type switch. General Control Co.	\$1.90
Pilot light assembly #81410-11.	
Dialight Corporation	\$2.50
Solenoid valve #38302, 115 V/60 cycle.	
Allied Control Co.	\$9.00
Regulator valve. Watts Regulator Co.	\$9.00

Fig. 2. Schematic diagram of the water manipulandum and a circuit programmed for continuous reinforcement. The capacitor value used was 75 ufd with a 2500 ohm resistor.

a 115v-10 w solenoid valve³ (g) controlling the water flow into the drinking tube. The duration of the ac pulse to the solenoid valve can be used to control the volume of water given per reinforcement. A pulse length of approximately 0.5 sec to deliver 1.5 cc of water has been used. The pilot light (c) can be programmed as a response-feedback light or a variety of other stimulus functions (discriminative stimulus, conditioned reinforcer).

The food manipulandum is constructed of the same materials, substituting a piece of $\frac{3}{8}$ in. copper tubing for the drinking tube. The dimensions of the aluminum housing are increased accordingly. The upper end of the copper feeder tube connects directly with a coil spring tube descending from a pellet feeder. Thus, depression of the copper tube can be followed by direct delivery of the pellet into the animal's mouth.