TECHNICAL NOTE

*AN AUTOMATED SYSTEM FOR REINFORCING AND
RECORDING RETARDATE WORK BEHAVIOR¹*

The analysis of retardate work behavior and related behavior (*e.g.*, sitting for long periods of time, cooperating with others, *etc.*) requires workers, tasks, work areas, precise control of contingencies, and accurate, reliable recording. Although a sheltered workshop, particularly one in an institution, offers a somewhat captive group of workers and a place for them to work, the other requirements are not easily met. Available tasks are often influenced by circumstances (production quotas must be met if the shop is to stay in business) not under the experimenter's control. With assembly type tasks, the supply of parts is often unpredictable, a fact which may preclude the carrying out of long-term research projects. Precise control of contingencies and accurate, reliable recording are difficult to achieve. Using a research assistant to carry out these operations is not only inefficient, but it introduces an unwanted and unmeasurable variable. A system that overcomes the above-mentioned problems was built and tested in a sheltered workshop (Tate and Baroff, 1967) located in a state institution for the retarded.

The system was composed of a work-station where the task was performed; a virtually unlimited supply of components (they could be used again and again) for a task that was automatically recorded when it was completed; and a console where a research assistant could start and stop experimental sessions, schedule contingencies, and collect data. The task was the loading of twenty 0.25-in. by 1-in. brass cylinders into 20 fuse holders mounted on a plastic sheet. A piece of zip cord connected the series-wired fuse holders to a plug. In practice, a worker took an empty task board (Fig. 1), plugged it into the socket at his work-station, and loaded the fuse holders by placing a cylinder on top of each holder and pressing down firmly until it snapped into place. The circuit (28 v) was made when all 20 cylinders had been properly placed.

The system included 12 work-stations. Each station consisted of a flat work area with 12-in.-high partitions

on three sides. The stations were arranged back to back in two rows of six each with an 18-in.-wide and 24-in.-high tunnel separating them. On the partition facing the worker were mounted a receptacle for the task board plug, an electrically operated counter with remote reset, and four panel lights, each a different color. A penny box with a clear plastic door, which was actually the end of a chute extending from a penny dispenser mounted in the tunnel, was also built into the partition.

The system was wired to function in the following manner: a green panel lamp at the work-station signaled when a session started; after a board was filled, a yellow lamp came on for about 1 sec at the work-station and a counter operated at the console. If the circuit had been primed to deliver a reinforcer, the completion of the task produced the above events and, in addition, a light in the penny box came on for about 20 sec, a penny was ejected into the box, and the worker's counter operated. The worker then unplugged the board, placed it on a shelf, and took another empty board.

Fig. 1. Two work stations with task boards plugged into sockets. The light rectangle at the left of each task board is the penny box with a clear plastic door held on by wing-nuts. Directly above each board are the counter and four signal lamps.

¹This work was supported by the North Carolina Division of Vocational Rehabilitation. The system was built in the spring of 1967 when the author was a research psychologist at Murdoch Center, James F. Elliot, MD, Superintendent. I am indebted to Mrs. Carol Wyatt and Mr. Edward Latta for their invaluable assistance in building and testing the system, and to Professor John B. Wolfe for his suggestions concerning the manuscript. Reprints may be obtained from the author, Department of Psychology, University of Mississippi, University, Mississippi 38677.

Fig. 2. The console composed of 12 identical units mounted vertically. From top to bottom each unit contains a running time meter, a counter, a status indicator, and switches. To the left of the console is shown a part of the control cabinet.

The console (Fig. 2) consisted of 12 identical units, one for each work-station. Each unit contained a running time meter for recording session length, an electrically operated counter for recording number of tasks completed, and a status indicator. During the system test the status indicator was used to signal which reinforcement schedule was in effect, when a circuit was primed to deliver a reinforcer, when a reinforcer was delivered, and when power was available to a work-station. Other functions are, of course, possible. Each panel unit also contained toggle switches and pushbuttons which were used to start and stop sessions, switch to different reinforcement schedules, provide manual or automatic reinforcement, and reset the work-station counters.

The control circuitry was composed of standard items including relays, pulse formers, interval programmers, and timers. The only possibly unique feature was the design to prevent the worker from cheating. When a task board was filled, a relay locked up

for 40 sec, cutting the power to the board. Attempts by a worker to cheat, either by pulling the board plug and reinserting it, or by removing a cylinder and replacing it, were thus extinguished.

Although no research has yet been carried out with the system, a brief test was run to see if it worked. Eight institutionalized retardates (age range: 16-25, $mdn = 19$ years; I.Q. range: 40-67, $mdn = 57$) altogether worked 500 manhours on the task. Except for minor problems, the system functioned as planned.

Obviously, more sophisticated and versatile systems could be built. Even this simple system, however, appears to offer many possibilities for research and training. For example, productivity could be studied as a function of various variables including schedules of reinforcement, quantity of reinforcement, cooperation between workers, supervisor behavior, competition between workers, and the effect of different supervisors. In training retardates, it could be used to develop persistence at a task, to bring them quickly under control of reinforcers to be used in future training, and to develop desired rates of working and cooperative behavior. For example, cooperative behavior could be fostered by programming the system so that reinforcers would be contingent on two or more workers completing a task at about the same time. Another strategy would be an assembly line in which each worker placed a cylinder in a fuse holder and passed it to the next worker, and so on down the line until the board was complete. At the completion, all members of the group would receive reinforcement simultaneously.

The uses of the system will probably be more limited by the imagination of the researcher than by the apparatus, for it includes the essentials for carrying out an endless number and variety of studies, not only with retardates, but possibly with psychotics and some physically handicapped persons as well.

REFERENCES

- Tate, B. G. and Baroff, G. S. Training the mentally retarded in the production of a complex product: a demonstration of work potential. *Exceptional Children*. 1967, 33, 405-408.

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Received 26 February 1968.