

*A SUPERVISORY STRATEGY TO IMPROVE WORK
PERFORMANCE FOR LOWER FUNCTIONING RETARDED
CLIENTS IN A SHELTERED WORKSHOP*

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A multiple component strategy was investigated for aiding staff responsible for supervising production of lower functioning retarded clients on contract tasks in an institution-based sheltered workshop. The strategy was assessed in a combined multi-element, multiple baseline across groups design with a reversal component. Production performance increased during the production supervisory strategy with all 16 clients, with the range of increase varying from a few percentage points to 150% of baseline production. Both the clients and staff (responsible for conducting the research) preferred working under experimental conditions rather than under baseline conditions which approximated those found in "typical" sheltered workshops.

DESCRIPTORS: retardation, supervision of sheltered work, work rate, workshop performance, vocational behavior

Several experiments have investigated factors to improve production performance of retarded clients working on various sheltered workshop tasks. Reviews of this literature (Bellamy, 1976; Gold, 1973) indicated that the variability in the production rate can be influenced by specific reinforcement contingencies, supervisors' instructions, organization of work area, modeling and social facilitation from partners, and distractions in the work area. However, no one variable studied was effective for all clients, and many of the experiments reported only temporary effects. On the basis of that literature, Martin and Pallotta-Cornick (1979) suggested guidelines for abstracting a multiple component

production supervision strategy (PSS) that might be applied to maximize work rates of retarded clients on workshop tasks, while at the same time increasing reinforcement density for the clients above that typically observed in sheltered workshops.

Following these guidelines, a pilot investigation by Martin, Leonhart, Pallotta-Cornick, Yu, Suthons, and Quinn (Note 1) examined a PSS in a multiple-baseline design across tasks with lower functioning retarded clients in a sheltered workshop. Although the PSS produced large increases in production for 5 of 8 clients on one task, and small increases in production for 7 of the same 8 clients on a second task, several difficulties were noted.

Following the Martin et al. findings (Note 1), the PSS was modified and was investigated in the present research using less favorable staff/client ratios, a regular workshop setting and work periods, and clients with a greater range of work rates and diagnoses. This research used a combined multi-element, multiple baseline across groups design, with baseline and reversal phases. In addition, a preference test was conducted to "socially validate" (Kazdin, 1977; Wolf, 1978) the acceptability of the procedures from the point of view of the clients.

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METHOD

Clients, Setting, and Work Task

Sixteen institutionalized retarded individuals were studied. The mean age of the clients was 33.5 years (ranging from 20 to 53), and all had previous workshop experience. Eight of the clients were classified as severely retarded, seven as moderately retarded, and one as mildly retarded.

The clients were residents of the Manitoba School, a provincial institution for the retarded, and they were part of a group of 40 clients who worked in a workshop for approximately 5 hours per day, 5 days per week. The workshop measured 14 m by 6 m and contained five large production tables, 2.7 m by 1 m each. The 16 clients studied were equally distributed around two of these tables.

Throughout the experiment the clients were supervised by one of two experimenters, each of whom had taken university courses in behavior modification and had previous experience working with the retarded.

Throughout the study the data were collected on clients' performance while they prepared airline coffee packs (inserting an appropriately folded napkin, a sugar bag, and a stir stick in a plastic bag).

Baseline

The baseline conditions described below were selected to model as closely as possible the typical supervisory conditions in existence in the three sheltered workshops at the Manitoba School, and following the guidelines recommended by Azrin (1977), were standardized for comparison purposes.

The clients' workday was divided into four sessions, two each morning and two each afternoon, one before and the other after the clients' coffee break within each one-half day. Approximate durations of the sessions were 30, 105, 45, and 90 min, respectively. A prebaseline period

of adaptation for both clients and experimenters occurred during the first two weeks.

At the start of each session, the experimenter ensured that the session materials were appropriately placed and the clients were seated in their previously assigned seats. The experimenter then instructed the clients to start work. During the sessions, the experimenter supplied raw materials to the clients as needed, and counted and recorded data.

General work prompts. Work prompts were given on a variable interval of 5 min. They consisted of general statements such as, "O.K., guys, let's get to work" and were given from the end of the work table. The experimenter placed a check on a posted data sheet following each work prompt, which prompted the experimenter to give the required number of work prompts within a session.

Corrective feedback. If the experimenter observed a client making a product incorrectly, or that the last product lying on the receiver tray was incorrect, the experimenter pointed out the error, gave instructions to correct it, and provided social approval for the correction. Instances of corrective feedback were recorded.

Weekly pay. During the adaptation and baseline phases, clients received weekly pay on Fridays based upon their production for the week at the ratio of one cent for every three coffee packs. This pay scale was based on the workshop policy that 80% of the gross earnings from the contract be paid to the clients. No comments were made during the week regarding their cumulated earnings. Each Friday, clients were told that the money could be spent at the store (described later), or kept by the clients to be spent at any other time or place. The other clients in the workshop also received weekly pay on Fridays as part of the regular workshop routine.

Independent Variables

The PSS consisted of environmental engineering to reduce distractions, a set of verbal and

visual prompts to increase production, and consequence management including reinforcement for on-task behaviors as well as for production.

Reduction of distractions. A large cross-shaped partition of one-half inch plywood, approximately .6 m high, was used to divide a production table into four sections with two clients to a section.

Initial instructions. Prior to the start of each session using the PSS, a set of instructions was added to the instructions typically given to the clients. Although the exact content of the instructions varied, they prompted the clients to work hard, to look at their picture prompts (described below), to make lots of coffee packs to earn pennies in order to buy "goodies" after work, to make as many as they could, and to start.

Picture prompts. Because of the low level of functioning of many of the clients, pictures and mounted items were used to complement the verbal instructions in regard to the relationship between individual products, groups of products in receiver trays, and money that could be earned for such production. They were posted on the partition in front of each pair of clients during each PSS session.

Reinforcement system for productivity. The reinforcement system was a pay system based directly on productivity. As during baseline, clients continued to receive one cent for each three coffee packs. However, reinforcement was given during each day following the completion of a fixed number of items, rather than in one lump sum at the end of the week. This number varied from client to client but was always set as a multiple of three, both for the experimenter's convenience and to ensure that the clients were the ones to benefit directly from any increase in productivity.

To establish and maintain the relationship between number of items completed and the receipt of money, several feedback tactics were developed. First, a special receiver tray was attached to the partition in front of each client. Receiver trays for the coffee packs were made

from plastic boxes 30 cm by 14 cm by 11 cm, and contained cardboard dividers which divided the box into a number of sections.

Because the clients produced at different rates, individual ratios were calculated for each client depending on the average hourly rate of production during baseline. This ratio determined the size of the sections in the receiver trays in terms of how many coffee packs each section of a receiver tray would contain. The ratios varied from three to twelve, and were all multiples of three, except for one client whose ratio was one. In general, the ratios were chosen so that clients would complete approximately four to six ratios per hour, based on baseline performance.

The second type of feedback provided was in the form of a frequency bar graph. A graph for each client and task was made (approximately 21 cm by 27 cm) and placed in front of each client. Each graph plotted the pennies earned per session by the client and accommodated 25 sessions.

At various intervals throughout a session, the experimenter collected the products from the completed sections of the receiver tray of a client, converted the quantity of products produced to pennies, then directed the client's attention to the graph as the staff put x 's into the spaces of the graph paper, one x per penny, thus forming the bar graph. The experimenter encouraged the client to try and get his "line of x 's" higher than the previous session. For example, if a client filled a section in his receiver tray which completed a ratio of 12, he received four x 's and, immediately after, was given four cents. From Sessions 11 through 30, the money earned was placed by the experimenter into small plastic bags which were attached to the partition in front of the client. After Session 30, the experimenter handed the pennies to the clients, who placed them into the bags themselves.

When the PSS was introduced for half-days for a table, the clients of that table cashed in their pennies at the end of that half-day. When the PSS was introduced to both tables all day

long, all clients cashed in their money at the store at the end of the day, and clients were encouraged to leave the pennies earned in the morning in the plastic bags until the end of the day when they could be cashed in.

The store consisted of a cupboard which contained a variety of snack foods such as cookies, peanuts, assorted candies, soft drinks, fruit juices, and gum. Prices approximated the real value of the items.

Social approval contingent upon on-task behavior. In addition to the reinforcement system for production, the experimenter provided additional social praise to clients for being on task. The clients were praised on approximately a variable interval schedule of 5 min. This was controlled by the presence of a data sheet which required 16 checks approximately every 5 min, indicating one instance of social praise per client per interval.

Typically, the experimenter circulated around the production tables praising clients who were on task and commenting on the fact that they were working hard or that they were doing a good job.

Interobserver Reliability

A total of 14 IOR assessments were taken throughout the study, with 7 IOR assessments made for each table, and at least one IOR assessment made per table per phase. During each of the reliability assessments, the two experimenters independently counted and classified the products of a session as correct or incorrect. Procedural reliability measures were taken for instances of general work prompts, corrective feedback, and interactions between experimenter and clients. These were measured by one experimenter observing the other who was responsible for supervising the session, with both recording instances of these behaviors. An IOR calculation of a variable was based on the ratio of the number of agreements to the number of agreements plus disagreements of that variable and multiplied by 100.

A Social Validation Assessment of the Intervention Strategy

A two-choice selection situation similar to that described by Mithaug and Hanawalt (1978) was used to evaluate the clients' preference for working under typical workshop conditions (baseline conditions of this experiment) versus working with the PSS.

The preference testing for each client was conducted on four separate occasions over a two-day period, just prior to the reversal phase. The specific testing arrangements were as follows: First, the two tables at which the clients typically worked in the sheltered workshop were rearranged so as to be perpendicular to their usual placement. One chair only was placed at each of the two tables. The PSS table was on the left side for two tests, and on the right side for two tests. Second, each client was individually brought from a separate room to the workshop area and positioned at the end of, and equidistant from, the two tables. From that point the client was instructed, "We want you to work in the workshop for a while. You can work at this table (while pointing to the left-hand table), or at this table (while pointing to the right-hand table). Now please sit down and work." Following a period of approximately 5 to 10 minutes during which the client worked at one of the tables under the contingencies of that table, the staff member said, "Thank you for working. Let's go back upstairs now," and the client was then returned to the separate room. Third, during the two days of the test, all 16 clients continued their daily work activities but in a separate room from the sheltered workshop where the previous data had been gathered. In this room, there were two tables and one of the tables was set up for baseline conditions and the other for PSS conditions. Each client was given two preference tests just after working in the separate room on baseline conditions, and two preference tests after working in that room on PSS conditions. An experi-

menter and an additional observer independently scored the choices of the clients.

RESULTS

Average Number of Items Produced Hourly for Production Table One

The mean number of units produced by each client during the baseline sessions for both morning and afternoon periods for Production Table One was 19. These results, as shown in Figure 1, indicated a stable baseline and very little difference between morning and afternoon sessions.

At Session 11 for afternoon sessions, the PSS was introduced to Production Table One. An immediate and substantial influence of the PSS, relevant to the previous baseline and to the ongoing baseline in the other one-half of the day in Phase II, was observed as shown in Figure 1.

The mean hourly production for clients of Production Table One under PSS was 32. The baseline for the morning sessions of Production Table One continued throughout Phase II (35 more sessions), and the mean number of units produced per hour was 17.

A replication of the control exerted by the PSS was observed when the independent variable was introduced for the second one-half day for Production Table One in Phase III (Figure 1). During this phase there were 28 morning sessions and 29 afternoon sessions with an overall average of 34 units produced per hour.

Phase IV for Production Table One showed an immediate decrease back to original baseline levels with an overall mean of 21 units produced per hour (Figure 1).

Concerning the individual performance of the clients of Production Table One, the group results were representative of seven of the eight

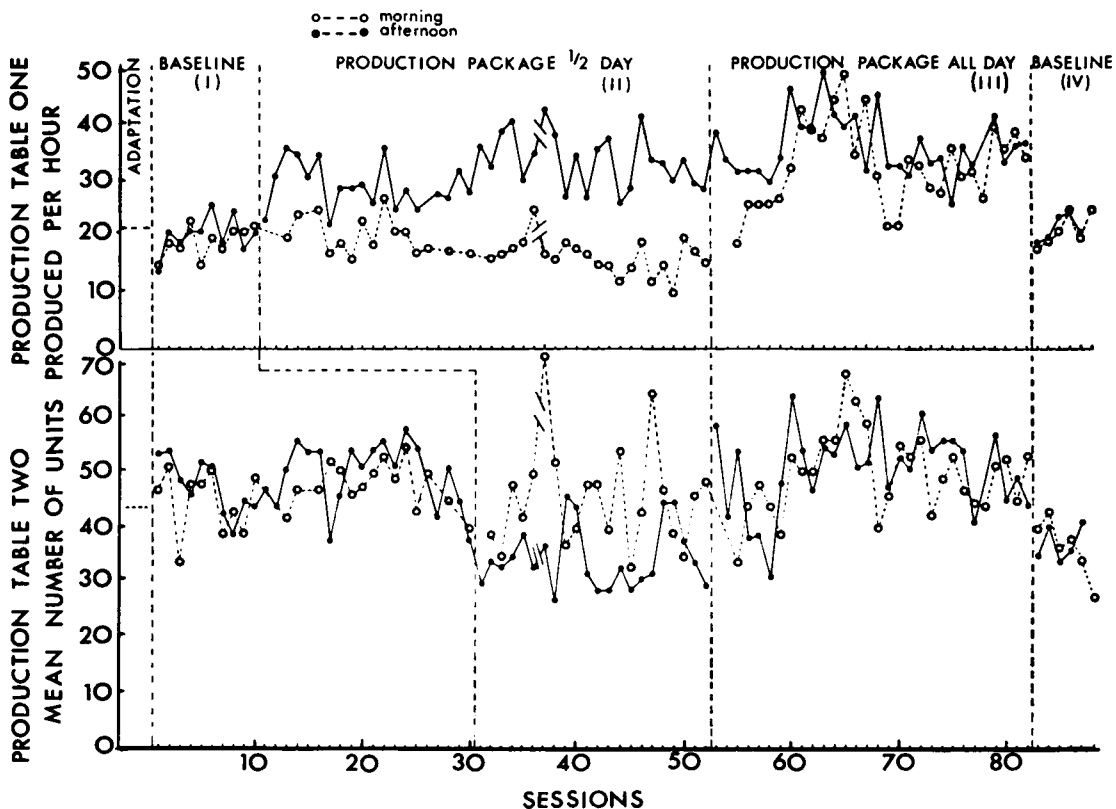


Fig. 1. The mean hourly production rates of the clients from Production Table One (top graph) and Production Table Two (bottom graph).

clients with the following qualifications: Clients 2, 5, 6, and 8 showed a greater size of effect than the group means; Clients 1, 3, and 4 showed a smaller size of effect than the group means; Client 1 did not show any reversal effect in Phase IV. Client 7 who was only slightly affected by the PSS, showed very low rates throughout.

Average Number of Items Produced Hourly for Production Table Two

The mean results for Production Table Two, as can be seen in Figure 1, showed that the baseline performance was generally higher and more variable than for Production Table One. During this phase the mean units produced per hour by each client was 44. A decreasing trend during the last several sessions during the morning and afternoon periods of baseline was also observed. When the PSS was introduced for the morning sessions, it produced a clear effect relative to the ongoing baseline sessions in the afternoon, but no effect relative to the original baseline. The PSS in the morning was in effect for 21 sessions and the mean units produced per hour was 47. The ongoing baseline sessions in the afternoon totaled 22 sessions and the mean units produced per hour was 34.

Figure 1 shows a replication of the effects of the PSS with Production Table Two in that the

production performance was higher in both the morning and afternoon sessions of Phase III relative to the baseline sessions of Phase II. These effects of the PSS were substantiated when the performance during the reversal to baseline condition (Phase IV) decreased to a level comparable to that observed during the baseline sessions of Phase II.

The individual results for Production Table Two showed directional replications of the mean results for six of the eight clients, with the remaining two clients showing similar performance with the exceptions that their production was relatively low during Phase I, and showed only a slight reversal during the last phase.

Percentage Production Increases with PSS

A comparison of the mean performance of each client during the PSS to their respective mean production rate across all baseline sessions (from Phases I, II, and IV) showed a consistent difference in favor of the PSS for all clients (see Table 1). The combined mean increases in hourly production rates for all clients under PSS was 55%.

Percentage of Errors per Hour

The errors of the clients were minimal throughout the study and were completely un-

Table 1

Percent production increases with PSS when comparing baseline sessions across all phases to PSS sessions across all phases.

Client	Production Table One			Client	Production Table Two		
	Mean hourly rate of all baseline sessions	Mean PSS hourly rate	Percent increase		Mean hourly rate of all baseline sessions	Mean PSS hourly rate	Percent increase
1.	17	28	65	1.	13	17	30
2.	32	51	59	2.	57	89	39
3.	25	31	24	3.	43	58	35
4.	25	34	36	4.	25	36	44
5.	8	20	150	5.	37	56	51
6.	12	30	150	6.	41	48	17
7.	2	3	50	7.	26	32	23
8.	26	50	92	8.	58	62	7
	$\bar{x} = 18$	$\bar{x} = 31$	$\bar{x} = 78$		$\bar{x} = 38$	$\bar{x} = 50$	$\bar{x} = 31$

affected by changes in production rates due to the PSS. The mean error rates for all clients across all phases was .6%.

Interobserver Reliability

The mean percentage of agreement for the separate categories were as follows: counting production, 98%; counting errors, 93%; giving general prompts, 100%; giving corrective feedback, 91%; counting the number of interactions with clients, 96%; preference choices, 100%.

Preference Testing

Of the total of 64 choices that were made (four choices per client times 16 clients), 75% of the choices were for the PSS table. Seven clients chose the PSS table on all four preference tests. Three clients chose the PSS table on three occasions and the baseline table on one occasion. Five clients selected each table on two occasions. One client selected the baseline table three times and the PSS table once.

DISCUSSION

Mean production for all clients across their PSS sessions was higher than their respective means computed across all baseline sessions. The PSS produced a sizable effect in the mean production of Table One, as demonstrated by the various phases of the experiment. However, the mean effects observed for Production Table Two were smaller. Several reasons might account for the small effect with Production Table II, including high original baselines that may have been near the maximum rates possible; a decreasing trend near the end of the original baseline, perhaps due to extraneous variables; the clients working on Production Table One were generally of a lower functioning level than the clients on Production Table Two. It is possible that the PSS, as it is currently structured, may affect lower functioning clients to a greater degree than higher functioning clients.

Several observations in addition to the preference assessment indicate that the PSS was de-

sired from the point of view of the clients. First, during Phase II, when PSS was in effect on half-days, there was a higher rate of absenteeism during the half-days scheduled for baseline as compared to the half-days scheduled for PSS. Second, after the PSS was first introduced during afternoons in Phase II for Production Table One, the experimenters recorded an average of three comments per day in favor of the PSS (from one or both of the production tables), while no comments were made by the clients against the presence of the PSS, although no IOR measures were available for these observations. Third, the PSS clearly structured the environment to increase greatly the frequency with which the clients came in contact with potential reinforcers on desired contingencies. Concerning the monetary pay, clients under PSS received pay frequently throughout the day contingent upon production whereas clients on baseline (and therefore typical workshop) conditions received pay at the end of the week. In addition, the PSS increased the frequency with which the supervising staff member interacted with the clients from an average of 2.3 interactions per client per hour during baseline to an average of 9.2 interactions per client per hour during PSS.

Following the completion of the study, the two experimenters who had responsibility for implementing the PSS were asked to write out "how they felt" about supervising clients under baseline conditions and PSS conditions. Both experimenters presented several reasons why they preferred working under PSS conditions, and why they felt that the PSS was much better for the client. Their highly positive reactions must be qualified by the observation that both had prior training in behavior modification, and one of the experimenters was a part-time graduate student at the University of Manitoba.

The improved production that was observed during experimental phases in the presence of the PSS did not endure when the PSS was removed in the final reversal phase. Thus, if contact with the PSS was viewed as a step toward

potential community work station placement of clients currently participating in sheltered workshop programs, then the problem of programming for generalization would have to be addressed (e.g., see Martin & Pear, 1978). However, such a step is of a very low level of probability for most lower functioning retarded individuals. Rather, some form of sheltered work program is a more realistic habilitative goal for such individuals (Bellamy, Horner, & Inman, 1979). Therefore, a strategy like the PSS that might become a regular feature of sheltered workshop supervisory systems would appear to be highly desirable. The likelihood of adoption of such strategies by workshops is enhanced by the fact that the PSS was manageable in the current study with one experimenter supervising 16 clients, a staff/client ratio that is less favorable than that found in most sheltered workshops for lower functioning clients (Greenleigh Associates, Note 2).

REFERENCE NOTES

1. Martin, G., Leonhart, B., Pallotta-Cornick, A., Yu, D., Suthons, E., & Quinn, G. Investigations of a production technology for improving vocational competency of the trainable mentally retarded. A paper presented to the Third National Congress of the Council for Exceptional Children, Winnipeg, Manitoba, October 19, 1978.
2. Greenleigh Associates. The role of the sheltered workshop in the rehabilitation of the severely handicapped. Report to the Department of Health, Education and Welfare, Rehabilitation Services Administration, New York, 1975.

REFERENCES

- Azrin, N. A strategy for applied research: Learning based but outcome oriented. *American Psychologist*, 1977, **2**, 140-149.
- Bellamy, G. T. Habilitation of the severely and profoundly retarded: A review of research on work productivity. In G. T. Bellamy (Ed.), *Habilitation of severely and profoundly retarded adults*. Eugene: University of Oregon Center on Human Development, 1976.
- Bellamy, G. T., Horner, R. H., & Inman, D. P. *Vocational habilitation of severely retarded adults: A direct service technology*. Baltimore: University Park Press, 1979.
- Gold, M. W. Research on the vocational habilitation of the retarded: The present, the future. In N. R. Ellis (Ed.), *International review of research in mental retardation* (Vol. 6). New York: Academic Press, 1973.
- Kazdin, A. E. Assessing the clinical or applied importance of behavior change through social validation. *Behavior Modification*, 1977, **1**, 427-451.
- Martin, G., & Pallotta-Cornick, A. Behavior modification in sheltered workshops and community group homes: Status and future. In L. A. Hamerlynck (Ed.), *Behavioral systems for the developmentally disabled: Institutional, clinic, and community environments*. New York: Brunner/Mazel, 1979.
- Martin, G., & Pear, J. *Behavior modification: What it is and how to do it*. Englewood Cliffs, N.J.: Prentice-Hall, 1978.
- Mithaug, D. E., & Hanawalt, B. A. The validation of procedures to assess vocational task preferences in retarded adults. *Journal of Applied Behavior Analysis*, 1978, **11**, 153-162.
- Wolf, M. M. Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis*, 1978, **11**, 203-214.

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