

THE UNIVERSITY OF MANITOBA

SELF-MONITORING AND SELF-ADMINISTRATION  
OF TOKEN REINFORCEMENT IN A PRODUCTION  
TASK WITH RETARDED MALE ADULTS IN  
A SHELTERED WORKSHOP

by

Frank Hanel

A Thesis

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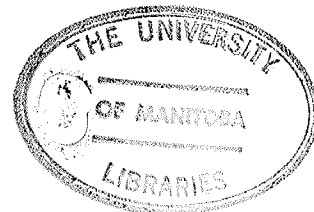
A dissertation submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
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MASTER OF ARTS

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## ABSTRACT

Although many studies have demonstrated the effectiveness of self-regulation strategies with non-retarded populations, relatively few studies have examined their value for retarded workers in vocational settings. A Self-Regulation Package (SRP), which incorporated self-monitoring and self-reinforcement procedures, was investigated as a strategy for increasing the productivity of sheltered workshop clients. A combined multiple-baseline, multi-element, reversal-to-baseline design was used to evaluate the SRP. As a function of the presence of the SRP, production of the 8 clients increased by an average of 43% (range: 19 - 60). Social validation procedures revealed that clients preferred to work under SRP conditions versus baseline conditions. Since many workshops for the retarded have client/staff ratios which do not readily permit staff to undertake additional duties, the adoption of self-regulation strategies could represent an effective and acceptable means of assessing and improving individual rates of production.

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### Introduction

Several recent reviews (e.g., Bellamy, 1976; Martin & Pallotta-Cornick, 1979) indicate that researcher activity with the retarded in sheltered-workshop settings has emphasized the examination of variables intended to increase productivity. Some of the types of variables most frequently studied include the effects of antecedent events, consequent events, and general setting characteristics.

When behavioral strategies involving such classes of variables have been applied in sheltered workshops, they were usually administered by researchers or workshop staff. A relatively unexamined possibility is that retarded workers could self-administer such strategies to increase their productivity. When individuals arrange environments in order to change their own behavior, such procedures are called either self-control, self-management, or self-regulation strategies.

Two effective components in self-regulation strategies are self-monitoring and self-reinforcement. These procedures have been frequently used in studies with non-retarded populations. For example, Mahoney (1974) evaluated the effectiveness of self-reinforcement and self-monitoring procedures in obese adults. He found that self-monitoring alone produced small, transient weight reduction. A goal-setting component implemented in conjunction with self-monitoring did not improve weight losses. When self-reinforcement, which permitted participants to retrieve a portion of their money deposit, was added to the above procedures significant weight decrements resulted.

In other circumstances, self-monitoring alone has been shown to be effective. Komaki and Dore-Boyce (1978) illustrated this point in an investigation using undergraduate students who were either highly motivated or lowly motivated, as assessed in questionnaires, to increase their verbal participa-

tion in group discussions. Self-monitoring the frequency of verbalizations produced significant increases in talking for highly motivated students but not for those who were lowly motivated.

Self-regulation procedures have also been demonstrated to be effective in applications with retarded individuals. For example, Shapiro and Klein (in press) taught mildly retarded children to assess and reinforce their own on-task behavior during pre-academic tasks. Teacher-administered instructions and gestural stimuli were faded until children could independently determine on-task behavior, then fading techniques were used to teach them to self-administer token reinforcers. The procedure was found to increase on-task behavior when it was self-reinforced. As well, collateral effects were observed in improved task performance, accuracy of self-assessment, and diminished problem behavior.

Working with mildly retarded adolescents in a classroom setting Nelson, Lipinski, and Boykin (1978) showed that students' rates of appropriate verbalizations could be raised using a self-monitoring procedure. Following training in the use of a counting device, which was either held in the hand or worn on the belt, self-monitoring of classroom comments produced small but reliable increments in their rate of occurrence. In an earlier study in a similar setting Nelson, Lipinski, and Black (1976) trained moderately and mildly retarded adolescents and adults to self-monitor the frequency of either positively-, negatively-, or neutrally-evaluated behavior. During the self-monitoring condition, participants recorded target behaviors on index cards. The results indicated increases in positively-evaluated behavior (talking), significant decreases in neutrally-evaluated behavior (object-touching), and equivocal changes in negatively-evaluated behavior (face-

touching).

Simpson (1978) trained two moderately retarded school children in procedures involving a combination of self-monitoring, self-administration of token reinforcers, self-instructions, goal-setting, and visual feedback. The children were taught to: instruct themselves to cease an undesirable behavior and to praise themselves upon its cessation; record occurrences of the undesirable behavior using wrist-counters; reinforce this behavior by transferring token pegs on a pegboard. At the end of each session, data were posted on a frequency graph and bonus points (pegs) were awarded for a decrease in behavior relative to the level of behavior which occurred on the previous day. In addition, a bonus was available for achieving low-levels in undesirable behaviors, but the author did not specify the minimal level of behavior required to meet this criterion. The pegs were converted to back-up reinforcers at the end of each session. The self-regulation package produced immediate and marked reductions in each of the targeted behaviors. During a 2- to 4-week follow-up period, two of the three undesirable behaviors continued to decrease, while the third behavior gradually returned to its pre-training level. The implications of the follow-up data are unclear, however, since the conditions under which they occurred (for example, whether wrist-counters were available to the children) were not described.

Although self-regulation procedures have been used extensively with non-retarded populations and to a much lesser extent with retarded individuals, very little research has been conducted which examined these procedures in the modification of vocational skills in the retarded. Only three such investigations were located. Two of these studies examined the role of self-administered token or edible reinforcement in vocational tasks, and

the third assessed the effects of self-monitoring supervisory behavior in a sheltered workshop.

Helland, Paluck, and Klein (1976) compared self-administered reinforcement with experimenter-administered reinforcement in two groups of mildly retarded workers engaged in a paper-collating task. The self-administered group was trained to praise themselves and simultaneously select monetary or edible reinforcers (located in a pile in front of them) after each set of 10 that were collated. The second group was trained under identical conditions except that their praise, money, and edible reinforcers were dispensed by the experimenter. The findings showed that self-administered reinforcement was as effective as experimenter-administered reinforcement, each group increasing productivity three-fold over baseline rates.

Horner, Lahren, Schwartz, O'Neill, and Hunter (1977) evaluated the relative efficacy of self-administered tokens versus supervisor-administered tokens upon the duration for task assembly in a severely retarded client. Supervisors delivered tokens and praise for work completion during baseline phases. In experimental phases the client delivered his own tokens. Upon assembly of a 10-part test adapter, the client operated a lever which pushed a token onto his work bench. The self-regulation strategy was assessed in an ABAB reversal design which revealed that assembly time was reduced by approximately 50% during phases in which reinforcement was self-administered. While these data indicate that self-administered tokens were more effective than supervisor-delivered tokens and praise, some qualification of these findings is necessary. Some of the effectiveness of the procedure may be attributed to the sound of a bell which sounded as each token was self-administered.

The only study available which focused upon self-monitoring in a

vocational setting was conducted by Goyos (1978). In this study, one moderately retarded worker and one mildly retarded worker were trained to identify the on-task behaviors of other workshop clients working on three different tasks. The workers were instructed to supervise 11 clients, praising or otherwise interacting with them as much as possible whenever clients were on-task and to record these interactions using wrist-counters. Self-monitoring resulted in large increases in the number of on-task interactions initiated by both workers in each of the tasks performed by clients. The frequency of off-task contacts with clients did not vary substantially when the frequency of on-task interactions increased. Interestingly, clients' productivity did not change as a function of increased attention contingent upon on-task behavior. Several reasons given for this finding were possible ceiling effects occurring across conditions and the brevity of sessions (10 min each) relative to the duration of an entire work day.

These several studies suggest that a combination of self-monitoring and self-administration of reinforcement procedures may have some utility in altering behaviors of retarded workers. In a recent study, for example, Martin, Pallotta-Cornick, Johnstone, and Goyos (1979) combined a number of singly-effective variables into a supervisory production strategy which successfully increased the productivity of severely to mildly retarded workshop clients.

At present, the consistent assessment of productivity levels occurring in an individual workshop client is time consuming but feasible; an assessment of the performance of a number of clients on a consistent basis is difficult and very time consuming; regular assessment of performance and the frequent application of contingent reinforcement by workshop personnel is

a very improbable undertaking, given typical staff/client ratios found in sheltered workshops. A procedure which permits workers to monitor and reinforce their own production behaviors could be a valuable adjunct to vocational settings for the retarded.

Following the strategy adapted by Martin et al. (1979), the present investigation examined the effects of a self-regulation package incorporating both self-monitoring and self-administration of reinforcement techniques upon the productivity of retarded workers. The clients' preference for working under the package contingency relative to baseline conditions was also evaluated, as recommended by Kazdin (1977) and Wolf (1978).

#### Method

##### Subjects

Eight retarded adult males, ages 19 - 54 (mean = 28), participated in the study. As a group, they comprised severe to mild levels of retardation. To be included in the study, clients had to be available for daily work in the setting for a period of several months, and be free of serious impairments in vision, hearing, and manual dexterity. All had previous workshop experience and probable exposure to behavioral programs at some time. Several clients worked in institutional placements requiring light housekeeping duties. Individual client characteristics are presented in Table 1.

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Insert Table 1 about here  
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##### Setting

Procedures were carried out in the Northgrove occupational training center, one of two sheltered workshops located in the basement of a residential complex at the Manitoba School for the Retarded, Portage la Prairie, Manitoba. The

Table 1  
 Characteristics of Subjects

Client	Chron. Age	Time in Inst.	Test	Test Results	Institutional Diagnosis
1	21 yr	3 yr	WAIS	FSIQ 65	mildly retarded cause unknown
2	38 yr	23 yr	PPVT	SQ .25	severely retarded Down's Syndrome
3	20 yr	9 yr	WAIS	FSIQ 46	moderately retarded
4	54 yr	11 yr	WAIS	FSIQ 50	moderately retarded epilepsy
5	21 yr	8 yr	WAIS	FSIQ 65	moderately retarded cerebral palsy
6	19 yr	8 yr	WAIS	FSIQ 25	moderately retarded cause unknown
7	26 yr	12 yr	S-B	IQ 26	severely retarded Down's Syndrome
8	28 yr	6 yr	-	IQ 42	moderately retarded cause unknown



workshop was a large room containing five production tables, several racks and cupboards, and two office desks. Besides the experimenter, three staff supervised 30 to 35 clients, five days a week. The clients were seated four-to-a-side at a production table which measured 2.4 m by 1.2 m. Wooden bins containing product components were located on the bench in front of subjects. A bin measured 1.1 m by .19 m by .15 m and was divided into four compartments. Each bin was used by two workers. The workshop typically bustled with activity and noise as materials entered and left the shop and were distributed to clients' work tables. Popular music was often played over the workshop sound system and clients frequently sang aloud.

#### Apparatus

A "Mark Time" mechanical timer was used to clock sessions. A small bell inside the timer sounded when it timed out. In sessions in which the partition (see below) was not in place, the timer was positioned at the end of the work table at the start of each session. When the partition was in use, the timer was placed on the partition cross-piece. The timer was removed from the table at the end of each session.

A marble-dispensing device was used by clients during self-regulation sessions. The device was constructed of two pieces of 1.2 cm plywood. The larger piece was 25.4 cm by 30.5 cm and formed the backboard of the device; the smaller piece measured 10.2 cm by 30.5 cm and formed the base. Four 22 cm clear-plastic tubes (inside diameter = 16 mm) were mounted 3.2 cm apart on the front of the backboard. Facing the front of the device, the tube furthest left was positioned 1 cm from the left edge of the device. Since this tube served a goal-setting function, the surface behind and at the base was yellow (width of yellow surface = 4.3 cm). The remaining frontal surface of the

device was white, except for a heavy black line separating the yellow and white portions. Two numeral "10"s marked the heights of columns of 10 marbles. Fastened to the back of the device was an S-shaped glass tube (inside diameter = 16 mm) which was capable of holding 50 marbles. Blue and orange glass marbles, each 4.3 cm in diameter, were used. They fed by gravity into a cup-shaped depression in the lower end of a wooden lever. The lever, painted green for discriminability, was mounted on a pivot; when the lever was pressed downward, the marble was raised vertically and exited through a 2 cm hole to the front of the device. A dispensed marble was collected in a shallow, cork-lined coaster-receptacle (diameter = 8.6 cm) mounted on the base immediately below the hole. A small 3 cm by 4 cm cloth curtain covered the hole. Cork stoppers prevented marbles from leaving the goal-setting and S-shaped tubes. Two metal J-shaped hooks were fastened to the back of the device. This permitted the device to be easily attached and removed from a client's product bin. A piece of protective foam rubber 12 mm thick covered the back of the device. The device is illustrated in Figure 1.

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Insert Figure 1 about here  
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#### Experimental Task

Throughout the experiment clients assembled airline coffee packs. Prior to the experiment, all clients had had experience with this task. The task involved folding a dispenser napkin in half lengthwise, then folding the narrowed napkin, making its length approximately 1/3 shorter. The napkin was inserted into a 6.5 cm by 14 cm cellulose bag so that the folded portion was positioned at the top of the bag. A packet of sugar and a plastic stir stick were then placed in the bottom-front of the bag. The front of the

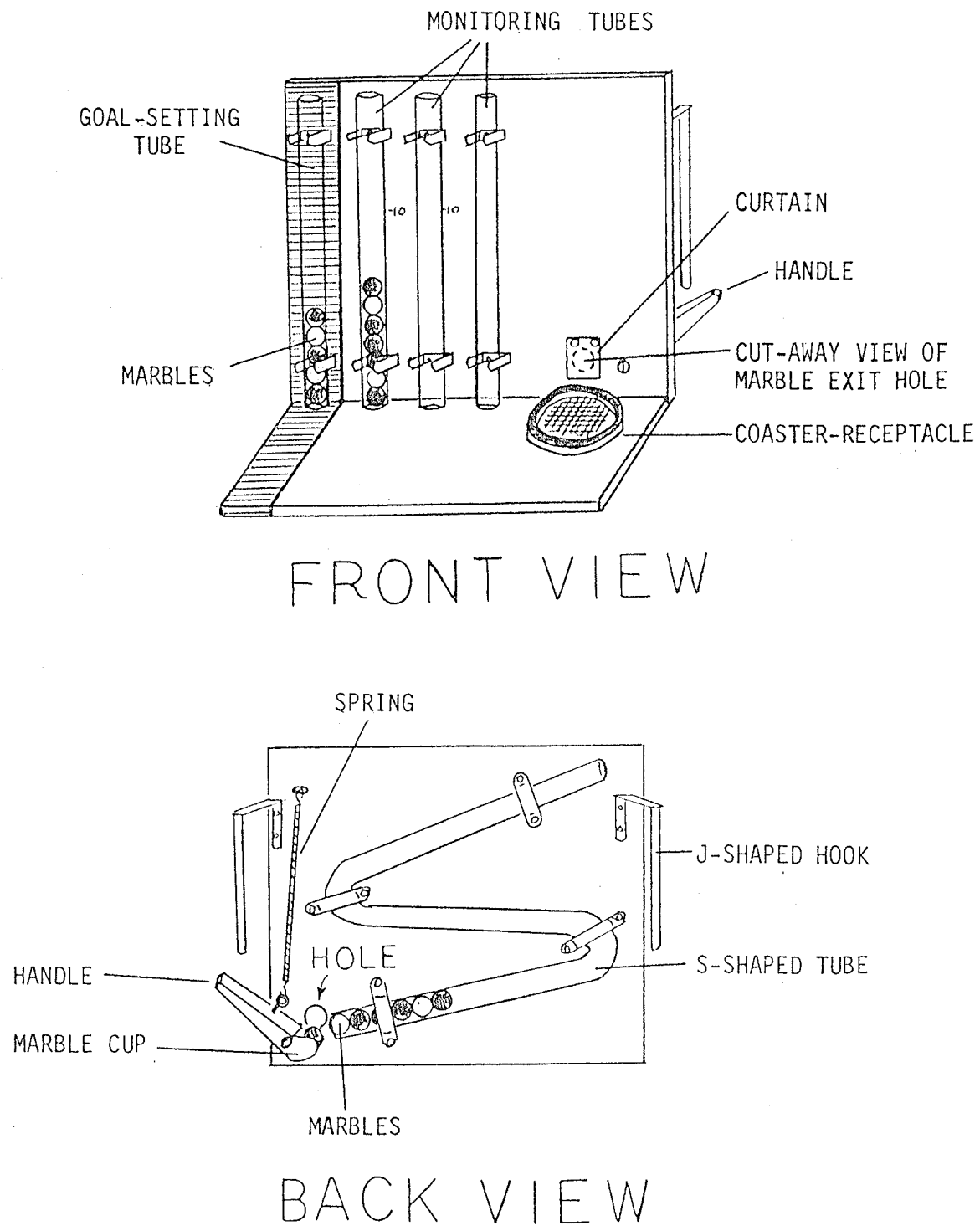


Figure 1. The marble-dispensing device. The upper panel depicts the front view; the lower panel depicts the back view.

bag was lettered and imprinted with a heavy blue mark. Assembled coffee packs were placed into a receiver tray located on the bench in front of the subjects.

### Experimental Sessions

Session characteristics. Six sessions were run daily, Monday through Wednesday, over a three-month period. Each session was 20 min long. Clients reverted to the supervision of regular workshop personnel during the two days of the week the experimenter was absent. During sessions 1 - 95, two sessions were held during the morning and four in the afternoon. Thereafter, three sessions were run in the morning and three in the afternoon.

At the beginning of each session, the experimenter announced: "O.K., everybody, I'm going to set the timer to begin a session." As the timer was set, the experimenter continued, "O.K., I've set the timer, now everybody go to work please", and placed the timer in its appropriate position on the production table. When the timer timed out, the experimenter asked: "Did everyone hear the bell? The session's over. Please stop working." The timer was removed and placed out of the clients' view.

At the end of each session, clients' receiver trays were removed and replaced with empty ones. Clients were permitted to continue working during intersession breaks, however, experimenter interactions with them at these times were minimal. Products which were assembled during intersession breaks were removed immediately prior to the start of the next session.

Experimenters. The author conducted all sessions up to and including session 121. Beginning with session 122, a female experimenter was gradually faded into the program over the next five sessions. To accomplish this, she delivered the fourth general prompt and the fourth series of on-task

reinforcements (described below) in session 122, then she delivered the third and fourth of these interactions in session 123, and so on, so that by the end of session 126 and in all subsequent sessions she was in full control of all experimental contingencies. During this fading procedure, she also gradually assumed other necessary functions such as dealing with problem behaviors and giving corrective feedback. The female experimenter was enrolled in a course in introductory behavior modification and was paid for her participation in the study.

### Controlled Variables

General prompts. In order to approximate the frequency of staff-client interactions which occurred in workshops in the Manitoba School, general prompts to begin or to continue to work were given four times each session at irregular intervals. For example, the experimenter approached the production table and addressed the entire group of clients as follows: "O.K., fellows, I want everyone to work as hard as you can this morning." These four prompts occurred in every session throughout the duration of the experiment. The first of these prompts immediately followed the setting of the timer.

On-task reinforcement. In every session clients received four individual instances of verbal praise, at irregular intervals, for working on-task. To be on-task a client had to be manipulating components of the assembly task or dispensing device leading to completion of the operation. During this procedure the experimenter moved from client to client, mentioned an individual by name and praised him for working. If an individual was off task, the experimenter ignored him, but returned to give praise when working resumed.

Verbal interactions. Any verbal interaction not required in other experimental procedures was recorded. Verbal interactions were typically

initiated by the experimenter or other staff since clients' non-work related verbalizations were usually ignored. Two types of verbalizations were not recorded: clients' comments to which the experimenter did not respond, and inter-client verbalizations.

Corrective feedback. To maintain or improve the quality of production, clients were given periodic feedback for errors. A client who was observed committing an error, or whose last-completed product was incorrectly assembled, was instructed regarding the nature of the error, the correct task assembly was modeled, and the client was given verbal praise for appropriate assembly behavior.

When the self-regulation device was being used, feedback was given pertaining to improper use of the apparatus, such as depressing the lever with too much force, placing a marble in the wrong tube, lifting the curtain covering the exit hole, failing to move a marble from the coaster-receptacle to the monitoring tube, and neglecting to self-monitor when a pack was assembled. Feedback in the latter case was initiated only if the client had not yet begun to assemble another pack.

Problem behaviors. Because clients sometimes engaged in behaviors which competed with desirable workshop behaviors, a procedure for dealing with undesirable behaviors was in effect. Clients' undesirable behaviors included causing another client to cease working, moving more than 2 ft away from a work station without permission, self-stimulation, swearing, having soiled hands or face, throwing work material on the floor, ripping napkins, being non-productive for several minutes, and so on. The experimenter did not intervene in every instance of problematic behavior, preferring at times to ignore it. When intervention was deemed necessary, the experimenter addressed

the client, described the infraction, suggested more appropriate behavior to engage in, and verbally praised improved behavior if it occurred within 1 min after the termination of the problem behavior. An instance of problematic behavior was recorded immediately, acting as a cue to the experimenter to provide and then record social approval contingent upon appropriate behavior.

Situational structuring. Following the advice of Martin and Pear (1978), a wooden partition was introduced for all sessions beginning in session 36. The partition was .52 m high and was constructed of 1.2 cm plywood. Its cross-shaped structure divided the production table into four sections with two clients seated in each section. The main function of the partition was not to pair subjects but to reduce between-client interaction during experimental phases.

Workshop incentive systems. Prior to and during the study, four clients (Subjects 3, 5, 6, and 7) were included in ward-sponsored programs which provided reinforcement contingencies for appropriate workshop behavior and productivity.

Whether a client's workshop behavior was acceptable was indicated on slips of paper carried by each individual. During the program the experimenter made this judgment, which was not data based. On the days when the program was not conducted, workshop personnel made this judgment. Also, Subject 3 was involved in a ward-sponsored program concerning aggressiveness and swearing and Subject 5 was in a similar program which concerned absences from the workshop. Appropriate behavior was consequted daily with brightly-coloured stars and geometrical shapes which were posted on charts. For all the programs described above, back-up contingencies were supplied on

clients' home wards. The extent to which the back-up contingencies were consistently applied could not be determined as wards kept no records of the transactions.

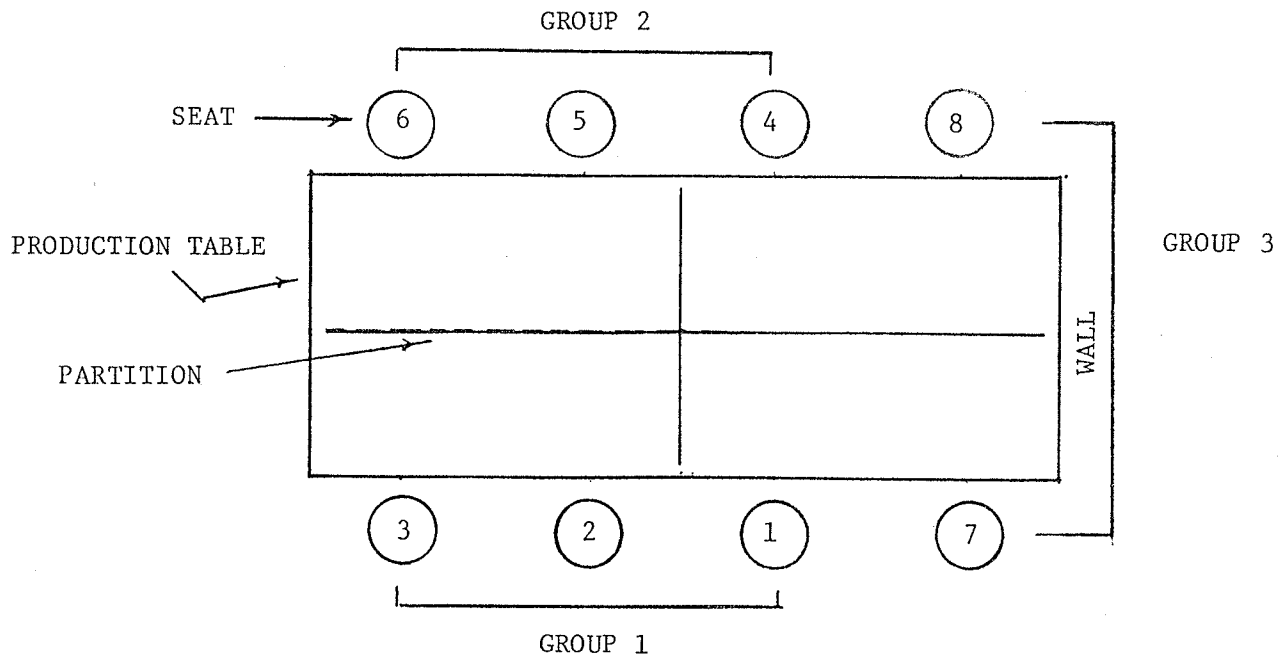
In addition to these contingencies, all clients received a stipend at the end of the week ranging from \$1 to \$3, depending on a client's rate of pay. This pay system was in effect prior to the program and was in effect up to session 96, at which time seven clients began receiving \$2 per week. The eighth client, Subject 1, began receiving \$3 per week. Payday was on Fridays, a day of the week in which the program was not run.

#### Experimental Groups

Clients were included in experimental groups according to production-rate data collected prior to baseline. Clients were observed assembling airline packs during three to five 20 minute periods under pre-experimental workshop conditions. They were not aware they were being observed. The three higher producing clients, Subjects 1, 2, and 3, formed Group 1. Mean rates of productivity per hour were 21, 17, and 14, respectively. Lower producing clients, Subjects 4, 5, and 6, formed Group 2. Mean production rates for these individuals were 3, 12, and 4 per hour, respectively. Group 3 was a delayed-treatment control group, formed by Subjects 7 and 8. Their mean hourly rates were 18 and 10, respectively.

Groups 1 and 2 were seated on opposite sides of the production table. Subject 7 sat on the same side of the table as Group 1 and Subject 8 was seated opposite him, with Group 2 subjects. The seating arrangement is depicted in the following diagram:





### Dependent Variables

Rate of production per hour. Productivity was calculated by dividing the total number of packs assembled in a session by the total session time (.33 hr), and rounding to the nearest whole number.

Percentage of correct production. The quality of production was determined by dividing the number of packs correctly assembled in a session by the total number of packs produced in a session, multiplied by 100.

### Self-Regulation Training

Each group received eight consecutive 20 minute training sessions. The author trained Groups 1 and 2 and the second experimenter trained Group 3. To begin a session, the self-regulation devices were attached to the bins in front of the clients. The experimenter instructed individual clients with statements such as, "I'm going to teach you how to count the packages you make. O.K., make a package." The experimenter positioned himself behind the clients