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A Component Analysis of a Self-Management Program for

Improving Work Rates of Mentally Handicapped Persons

by

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A COMPONENT ANALYSIS OF A SELF-MANAGEMENT PROGRAM

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Abstract

This study compared three self-control strategies for increasing the production of mentally handicapped persons in a sheltered workshop. The three strategies compared were self-monitoring versus self-monitoring plus goal-setting versus self-monitoring plus goal-setting plus self-administration of tokens (SRP). Two clients showed maximum productivity during SRP phases. A third client showed maximum productivity during self-monitoring. A fourth client experienced only baseline and SRP phases. While that client showed maximum productivity during baseline, performance was highly variable throughout. The cumulative results of this study with those reported by Hanel and Martin (1980) and Jackson and Martin (1983) suggest that self-control procedures have much to recommend them for improving the productivity of mentally handicapped persons in sheltered work settings.

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I would like to thank Dr. Garry Martin, my supervisor, for his support and advice through all stages of this research. I would also like to thank the other members of my committee, Dr. J. Pear and Dr. G. Lowther for their cooperation and for their constructive criticisms. I wish to express my sincere appreciation to Scott Paterson and his staff at Skills Unlimited for their cooperation and patience. I also wish to thank Patricia Gonzalez and Andrea Didenko for their help in data collection, and Claudia Milton for typing the manuscript.

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Figure 1. Mean productivity per hour for the four subjects across experimental phases.

A Component Analysis of a Self-Management Program for

Improving Work Rates of Mentally Handicapped Persons

The development of a normalization goal for the mentally handicapped

has led to the establishment of sheltered workshops where these

individuals can receive remuneration for the jobs they perform. Research

has focussed on identifying variables to increase work rates of clients

as well as on developing training technologies to teach complex tasks to

these clients (Martin & Pallotta-Cornick, 1979). The strategies that have

been developed to increase productivity can be categorized as either staff-

managed contingencies or self-management techniques that are taught to

clients. Research from both categories is described below.

Staff-Managed Systems to Increase Productivity

On the basis of literature concerning production performance, a

production supervisory strategy (PSS) has been suggested (Martin & Pallotta-

Cornick, 1979). The PSS has been applied by the staff of sheltered workshops

to maximize the work rates of lower functioning, mentally handicapped clients.

The PSS includes partitioned work tables to facilitate on-task behaviors.

Staff are required to interact frequently with the clients and maintain

feedback charts for each individual client on a daily basis. The reinforcement

system is a pay system based directly on productivity in which the client

is reinforced with a certain amount of money each day following the completion

of a fixed number of items. Since the clients produce at different rates,

individual ratios are calculated for each client depending on the average

hourly rate of production during baseline. The ratios are chosen so that

the clients can complete approximately four to six ratios per hour, based

on baseline performance. In addition to the reinforcement system for production, the clients are provided with additional praise for being on-task. A data sheet present at all work tables prompts staff to praise clients on a variable interval schedule of 5 minutes for a total of 16 checks. The PSS was found to effectively increase work rates of eight clients in a sheltered workshop, and production rates decreased to baseline levels when the PSS was removed (Martin, Pallotta-Cornick, Johnstone, & Goyos, 1980). Although staff involved in this study expressed preference for the PSS to baseline conditions, there may be a lower probability that the PSS would be implemented in sheltered workshops in the community because it involves a high response cost for staff dealing with higher functioning clients producing at higher rates. Consequently, it would be desirable to explore strategies that would increase production levels without using the PSS.

Self-Control Procedures with Mentally Handicapped Persons

Self-control procedures are being used increasingly as components of training programs for mentally handicapped individuals. These procedures have the advantage of facilitating the independence of the handicapped from parents and helping professionals (Mahoney & Mahoney, 1976). Self-management techniques may be a viable alternative to the PSS. Jackson and Boag (1981) and Dennis and Mueller (1981) have reviewed 21 studies using self-control procedures with the mentally handicapped. The studies included in these reviews report success in increasing on-task behavior (Shapiro & Klein, 1980), appropriate verbalizations (Nelson, Lipinski & Boykin, 1980) and in decreasing nail-biting (Jackson & Patterson, 1979) using self-management

techniques. More recently, self-management techniques have been used to
reduce disruptive behaviors in mentally handicapped clients. Gardner,
Cole, Berry and Nowinski (1983) taught moderately retarded clients to
self-monitor, self-evaluate, and self-consequate their own work-related
behavior in order to decrease their verbal aggression. Using a combined
reversal and modified changing criterion design, they were able to
demonstrate that the self-management techniques had reduced the target
behavior. In an extension of this study, Gardner, Clees and Cole (1983)
trained a disruptive adult to self-monitor, self-evaluate, self-consequate
and self-instruct in order to decrease a class of inappropriate
verbalizations, namely verbal ruminations. Using a combined treatment
withdrawal and modified changing criterion design, they found that
ruminative behaviors decreased with this intervention. Rosine and Martin
(1983) used a self-management strategy incorporating self-instruction,
self-recording and self-praising to decrease the undesirable behaviors of
three mentally handicapped clients. Using a multiple baseline design across
subjects, the undesirable behavior of tongue chewing was decreased for two
clients, as was the problem behavior of 'sticking out the tongue' for the
third client.

Self-Control Procedures to Increase Production

Self-control techniques have been used to improve and maintain
productivity on repetitive work tasks with mildly, moderately, and severely
mentally handicapped individuals (Helland, Paluk & Klein, 1976; Zohn &
Bornstein, 1980; Litrownik & Freitas, 1980; Hanel & Martin, 1980). Hanel
and Martin (1980) used a multiple component self-regulation package (SRP)

consisting of self-monitoring, self-administration of reinforcement and goal-setting procedures to increase production level of clients in a sheltered workshop. The eight clients under SRP increased their production an average of 43%. This study was replicated by Jackson and Martin (1983) with modifications to increase the efficiency of the SRP. The clients used self-charting for the self-monitoring condition as opposed to the less efficient marble dispensing apparatus used by Hanel and Martin (1980). Rather than having the experimenter set the goals, as in the Hanel and Martin study, Jackson and Martin (1983) had the clients set their own goals, in consultation with the researcher. Jackson and Martin also examined some of the components of the SRP individually. Within each of three subjects, they compared client performance on self-monitoring to their performance on self-monitoring plus goal-setting, and then to their performance on self-monitoring plus goal-setting plus self-administration of reinforcers. The results replicated Hanel and Martin's (1980) finding that the SRP increased the productivity of mentally handicapped clients. The self-monitoring plus goal-setting treatment was more effective than self-monitoring alone, but neither of these was as effective as the SRP.

The Jackson and Martin study was the first experiment to do a component analysis of self-control packages used for improving work rates of mentally handicapped persons. However, their study did not control for possible sequence effects of the treatment phases, i.e., for all subjects, the self-monitoring phase was followed by the self-monitoring plus goal-setting phase, which in turn was followed by the SRP phase.

The purpose of the present study is to further analyze the components

of the SRP by systematically replicating Jackson and Martin's study, with modifications in the research design to control for order of treatment components. A component analysis of the SRP can perform two functions: first, it may add to the body of literature that indicates that the self-management technology that is used with normal persons can be generalized to mentally handicapped persons (Mahoney & Thorensen, 1974); second, it may provide sheltered workshop staff with a self-control package with fewer necessary components to increase work rates among their clients.

An issue that was not addressed by either Hanel and Martin (1980) or Jackson and Martin (1983) was that of self-reinforcement. Self-reinforcement has been defined by Bandura (1976) as the self-administration of freely available rewards contingent upon performances which meet self-adopted standards. Goldiamond (1976) and Catania (1975, 1976) argued that the term 'self-reinforcement' implies that it is functionally analagous to positive reinforcement, as seen, for example, in the operant lab where the experimenter determines when the subject will be reinforced for the behavior it is performing. These authors, as well as Sohn and Lamal (1982) argue that self-reinforcement does not function as external reinforcement does. In an external reinforcement paradigm, the subject never has the opportunity to short circuit the contingency to receive reinforcement, as in a self-reinforcement paradigm. In other words, in the latter paradigm, the subject may not emit the appropriate response, and yet self-administer the reinforcer. Thus, increases in behavior should not be attributed to just self-reinforcement. Catania and Goldiamond suggest that what produces the increases in behavior in self-reinforcement situations are contingencies

that prevent short circuiting. In cases where contingencies to prevent short circuiting exist, it can be misleading to refer only to self-reinforcement as it implies that the controlling variables are the same as those that may be operating in paradigms using external reinforcement (Martin & Pear, 1983). This research will not be concerned with this particular conceptual issue. Rather, the operational procedures of the self-administration of reinforcers will be applied and examined as a component of a self-management package. In addition, experimenter-managed contingencies that may or may not influence short circuiting will be described although not deliberately manipulated.

Method

Subjects

The clients were two male and two female mentally handicapped persons. They were employed at Skills Unlimited, a training centre and sheltered workshop in Winnipeg, Manitoba. Subject 1 was a 36 year old male, with an IQ of 51 (WISC), and had worked at the workshop for five years. Subject 2 was a 26 year old female, with an IQ of 55 (WAIS) and had worked at the workshop for four years. Subject 3 was a 34 year old male, with an IQ of 44 (workshop files, test unknown) and had worked at the workshop for six years. Subject 4 was a 25 year old female, with an IQ of 69 (WAIS) and had worked at the workshop for four years.

The clients had had experience in assembling the work task. However, their supervisors indicated dissatisfaction with their production rates and recommended them as candidates for this research.

Setting

This study was conducted at Skills Unlimited, a sheltered workshop located in Winnipeg, Manitoba. The workshop area was divided into two

sections by two large plywood material shelves. There were five production tables in one section of the workshop and seven production tables in the other. Other equipment such as weighing scales, sealers, etc. were located in different parts of the workshop.

The clients were seated two-to-a-side at a production table which measured 31.5m by 1.22m. Cross structured wooden dividers, measuring 3.51m by 1.22m by .61m were placed on top of the production table providing a visual block in front and to the side of each client. On their section of the production table, each client had a bin, measuring .27m by 1.08m. The bin was divided into three compartments. The third compartment was used to collect production. A nail on the divider held pre-marked bags. The workshop's material handler, also a sheltered employee, ensured that the clients always had sufficient material. There was always a great deal of activity in the workshop and popular music was often played over the workshop's radio.

A "Marathon" stop watch was used to clock the sessions. Digital watches were used to time the clients' out-of-seat behavior.

Experimental Task

The task which the clients performed was the assembly of ceiling tile clips. It involved counting 50 ceiling tile clips with the help of a specially constructed jig. These clips were placed in pre-marked bags, measuring 13.2cm by 23.1cm. A bag containing approximately 50 nails was also placed in the pre-marked bag. The bags of nails were assembled by other workshop employees.

Experimental Sessions

Session characteristics. Sessions lasted 30 mins. in duration, and occurred several times per day over a six month period.

Specifically, seven sessions were run on Tuesday, Thursday and Friday; four sessions were run in the morning and three sessions were run in the afternoon. On Wednesday afternoons, four sessions were run.

The subjects were supervised by regular workshop staff on Mondays and on Wednesday mornings, when experimenters were absent. On the days when data were collected, the experimenters informed the staff when they were ready to begin sessions. At this point, supervisory responsibility of the experimental subjects was assumed by the experimenters. The experimenters also informed staff when they had finished sessions for the day. At that point, staff resumed supervision of the subjects.

During baseline, sessions were begun when the experimenter said, "O.K., it's time to get to work." When the session was over, the experimenter said, "I'd like to collect the bags you've made. Please stop working." The clients' bins were then cleared of all the products they had made.

During inter-session breaks, clients continued to work, however they had very little interaction with the experimenter. Products which were assembled during this time were cleared away immediately prior to the beginning of the next session.

Experimenters. The author conducted sessions on Tuesday mornings, Wednesday afternoons, and all day Thursdays. Another female experimenter performed inter-observer reliabilities on Tuesday mornings and ran sessions alone on Tuesday afternoons and all day Fridays. From the beginning of the study, both experimenters were in full control of all experimental contingencies. The other experimenter is presently enrolled in the Master's program in psychology at the University of Manitoba.

A female student enrolled in an introductory behavior modification course also participated in this study. She was trained to run sessions and perform inter-observer reliabilities.

Dependent Variable

Production rate. Session durations were approximately one-half hour. Exact durations were timed. Out-of-seat durations were also timed. The number of bags produced in two consecutive 30 minute sessions was divided by the actual number of seconds in the sessions, and the dividend was multiplied by 3600 to yield the productivity rate per hour.

Percentage of correct production. A correctly assembled bag was one that was three-quarters full of clips, and contained one bag of nails. The bag was considered three-quarters full if the level of clips reached the bottom portion of the label on the bag. The quality of production was determined by dividing the number of bags correctly assembled in a session by the total number of bags produced in a session, multipled by 100.

Characteristics of Self-Control Phases and Training

Each client received 20 to 30 minutes of training, on a one-to-one basis. The author trained all four clients. Training took place in an unused room in the building. During training of a client, the other clients worked on the experimental task at the production table. All materials and the jig required to assemble the product were placed in bins on the table in the training room. The self-monitoring form consisted of a 21.59cm by 27.94cm sheet of paper with 12 rows of 12 squares per row. This self-monitoring form and pencil were placed by the jig for all training phases. When a client was being trained in self-monitoring plus goal-setting,

the experimenter marked a red goal line. During training on the SRP phase, a plastic container full of poker chips and an envelope with the client's name on it were placed in close proximity to the self-monitoring sheet and pencil. Errors in task assembly were not recorded during training.

Self-Monitoring Training. When a client was being trained to self-monitor, the experimenter began the training session by saying, "O.K., I'm going to show you how to count the number of bags you've made. Do you know how to make a checkmark?" If the client responded negatively, or did not respond at all, the experimenter modeled it, and then asked the client: "Johnny, please make a checkmark." If the client recorded accurately, then the experimenter said, "Very good. Now you know how to make checkmarks. Will you now make a bag for me, please?" The experimenter sat in front of the client and as soon as he or she had finished assembling a bag, the experimenter said, "After you've made a bag, I want you to put a checkmark in the first box of the row at the bottom of the sheet." Once the client did this, the experimenter said, "One checkmark means you've made one bag. Now make me another bag." After four bags had been made (each followed by the prompt to make a checkmark) the client was told to, "Please put a checkmark in the box after you make a bag. Now make as many bags as you can. If you finish the boxes in one row, I want you to start on the next row." At the end of the training trial, if the client had self-monitored appropriately, praise was administered. After four consecutive trials where the client had marked checkmarks appropriately without a prompt from the experimenter, he or she was considered trained in self-monitoring.

Self-monitoring phase. During the self-monitoring phase, the client

was required to put a checkmark in the first box in the bottom row of a
self-monitoring form after assembling a bag of ceiling tile clips. As
the client continued to self-monitor, the checkmarks in the boxes visually
represented the productivity occurring in the session (see Appendix).
The client was praised at the end of the session for self-monitoring
accurately.

The percentage of accuracy in self-monitoring sessions was assessed
by determining the number of bags in the collection bin and the number
of checkmarks on the self-monitoring form. The smaller of these figures
was divided by the larger and multiplied by 100.

When accuracy in self-monitoring fell below 85%, clients were given
an individual booster session in which they practiced appropriate self-
monitoring behavior. The session occurred right after the decrease in
self-monitoring accuracy was detected and before another session began.
The booster session was also conducted in the room used for training. At
the beginning of the session, the experimenter said, "O.K., you're going to
practice marking in a checkmark after you've made a bag. Now make some bags
please, and make sure you mark in a checkmark in the box after you've made
the bag." If the client did not draw a checkmark in the box within a few
seconds of making the bag, he or she was prompted to do so and subsequently
praised. When four consecutive bags were accurately self-monitored, the
booster session ended, and the client returned to the production table.

Self-monitoring plus goal-setting training. In the self-monitoring plus
goal-setting phase, the client was taught to self-monitor as described (if
the client had not learned to do so previously). The experimenter then

told the client, "I want you to make even more bags than you made before.
So, we're going to set a goal for you." The experimenter drew a red
horizontal line at the bottom of the fourth box in the last row. Then
the client was told, "Please make bags, and mark checkmarks in the boxes.
Stop when you've made a checkmark in the box with the red line drawn in it.".
When the client had made the bags, self-monitored appropriately and had
reached the goal, the experimenter said, "Very good. You just reached your
goal. Every time you mark a checkmark in the box with the red line or the
ones next to it, you will have reached your goal." In order to encourage
the client to participate in the goal-setting process, the experimenter said,
"O.K., how many bags do you want to make? Do you want to make 3, 4, or 5
bags?" When the client had made a selection, the experimenter underlined
the appropriate box with a red pencil and said, "Go ahead, work hard and
reach your goal." The goal-setting process was repeated twice with praise
contingent on reaching the goal and self-monitoring accurately.

Self-monitoring plus goal-setting phase. In the self-monitoring plus
goal-setting phase, the client was required to set a goal with the aid of
the experimenter. The client was encouraged to set a goal greater than
the one that had been reached in the previous session. For example, the
experimenter said, "O.K., you made ('x' number) bags last time. How many
bags do you want to make?" If the client wanted to set a goal lower than
that which had been reached in the previous session, the experimenter
suggested that the client set the same goal that had been reached in the
previous session. The goal was marked off on the self-monitoring form with
a red line on the bottom of the appropriate box. The client then monitored
production on the self-monitoring form. At the end of a session, if the

client reached or exceeded the goal, and had self-monitored accurately,
he or she received praise: "Good for you! You're working so hard.",
and pats on the back from the experimenter.

Self-regulation package training. In the self-monitoring plus goal-
setting plus self-administration of token reinforcement phase (SRP), the
client was taught to self-monitor and set goals as described (if he or she
had not learned to do so previously). The experimenter asked the client,
"Do you want to set a goal of 3, 4, or 5 bags?" Again, when the client
made the selection, the experimenter underlined the appropriate box with
red pencil and said, "O.K., work hard and reach your goal." As soon as
the client had marked in a checkmark in the underlined box, the experimenter
said, "Good! Now I want you to take one chip out of the container and put
it in your envelope. Each chip is worth a quarter--so every time you reach
your goal, you can make a quarter. If you make more bags than your goal,
you'll get a quarter for each extra bag you make." This process was
repeated over two trials, with praise administered at the end of each trial
where the client had accurately self-administered token reinforcers
appropriately. During training and on the first day of the SRP phase only,
tokens were exchanged for quarters at the end of each half hour session.
At the end of the first day, and on the beginning of the second day, the
client was informed that tokens could be traded in for quarters only at the
end of the day from that point on.

Self-regulation package phase. During SRP phases, the client was
required to set a goal with the aid of the experimenter, self-monitor
appropriately, and self-administer a token reinforcer when the goal was
reached. One goal was set per session. At the end of the session, if the

client had self-monitored and self-administered token reinforcers appropriately, then the experimenter said, "Good for you! You're earning lots of quarters today!" The percentage of accuracy in the self-administration of token reinforcers component was assessed by counting the number of checkmarks on the self-monitoring sheet (including the box underlined in red, and any checkmarks after it), and the number of tokens in the envelope. The smaller of these figures was divided by the larger and multiplied by 100.

When accuracy in self-administering token reinforcers fell below 85%, clients were given a booster session in which they practiced the appropriate self-administration behavior. The session occurred right after the decrease in self-administration of token reinforcer accuracy was detected and before another session began. The booster session was also conducted in the room used for training. At the beginning of the session, the experimenter said, "O.K., you're going to practice how to give yourself chips when you've reached or gone past your goal." The experimenter then set a goal of 2 or 3 bags and said, "O.K., go for your goal and when you reach your goal, give yourself a chip." In the next session, the client was encouraged to go past the goal: "I want you to reach your goal, and make one more bag than your goal. Remember, you get one chip for reaching your goal and another chip for the bag you made past the red line." When the client had accurately self-administered token reinforcers for two consecutive checks, he or she returned to the production table.

Self-regulation plus back-up reinforcers training. This phase was introduced after the production rates of Subjects 1 and 2 failed to increase significantly with the introduction of the SRP. It was surmised that monetary

reinforcers were not effective with these clients. Therefore, it was
decided to provide a variety of edible and activity reinforcers instead of
quarters. An informal interview was conducted with the experimenter, the
two clients, and a member of Skills Unlimited's staff. The clients were
asked what types of foods and what kinds of activities they liked. A list
was drawn up for each client, and the experimenter determined the value of
a certain number of tokens based on two criteria: (1) expense, and (2)
desirability of the reinforcer to the client. The list of reinforcers and
their values for each of the clients is seen in Table 1.

Insert Table 1 about here

The introduction of the SRP plus back-up reinforcers phase did not
coincide for the two clients. The training session involved explaining
to each client the value of the different numbers of tokens. For example,
one client was told, "For one token, you can buy a pack of gum." A
pictorial representation of the tokens and their respective values was
posted on the partition facing the client. On the first day of the sessions,
if the client had earned a token, he or she was accompanied by the
experimenter to the cafeteria where a reinforcer was picked out and paid
for with the token(s). After the first day, if the client's reinforcer was
one to be purchased from the cafeteria, the tokens were cashed in at the
last break before the experimenter left for the day. If the reinforcer was
one involving a workshop activity or job (e.g., working in the wood shop),
arrangements were made so that the clients could engage in this activity
for at least 15 to 20 minutes before the working day ended.

Table 1

List of back-up reinforcers and their values

Subject	Number of Tokens	Reinforcer
1	1	package of gum
	2	candy bar; chips
	3	can of coke
	4	work in woodshop
2	1	package of gum
	2	candy bar; chips
	3	can of coke
	4	working with Jean
	5	work in sewing room

Self-regulation package plus back-up reinforcers phase. During the SRP plus back-up reinforcers phase, the client was required to set a goal with the experimenter, self-monitor appropriately and self-administer token reinforcers when the goal had been reached. However, a list of reinforcers and their values was posted on the partition in front of the client. The system was designed so that even if the client had reached only one goal in the day's sessions, a back-up reinforcer could be purchased. Here, as in other phases, praise was contingent on accurate self-monitoring, and appropriate self-administration of token reinforcers.

Additional Variables Controlled Through the Experiment

General prompts. General prompts were given to begin or to continue the work session. During the baseline phase, clients were generally instructed as follows: "O.K., it's time to get to work. Let's work hard." This occurred at the beginning of the first session. During the experimental phases, each client received specific prompts, as follow:

At the beginning of the sessions in the self-monitoring phase, the experimenter would indicate, "O.K., make sure you mark in the number of bags you make."

At the beginning of each session in the self-monitoring plus goal-setting phase, a client is this phase was asked, "How many bags do you want to make this session? You made ('x' number) bags last time." If the client indicated a number lower than the number made in the previous session, the experimenter said, "I know you can make more bags than that! Let's go for it! Try making (1 or 2 bags more than made in the previous session) bags." If the client agreed, the experimenter underlined the appropriate box with red pencil. The client was then told, "O.K., work hard, and try

to go past the red line." If the client did not want to make even one more

bag than was made previously, the experimenter said, "O.K., make as many

bags as you made last time, but I want you to really work hard and go past

the red line."

The experimenter presented the same prompts at the beginning of

sessions in the SRP phase as desctibed in the self-monitoring plus goal-

setting phase. In addition, the experimenter said, "You're going to earn

lots of quarters today! Remember you'll get a quarter for reaching your

goal, and a quarter for each bag you make past your goal.

The prompts for the SRP plus back-up reinforcers phase were the same

as those outlined for the SRP phase, but the client was also told,

"Remember, if you earn ('x' number) tokens, you can get ('x' reinforcer)."

Verbal interactions. Interactions other than those required by

experimental procedures were recorded. Interactions were classified into

three categories, namely positive interactions concerning production, e.g.,

whenever the client reached a goal, praise was provided; general positive

interactions, e.g., when a client was asked how he or she was feeling; and

negative interactions, e.g., when the client acted out, the experimenter

typically asked the client to resume working. Typically, these interactions

were initiated by the experimenter. Three types of verbalizations were

not recorded; inter-client verbalizations, clients' comments that the

experimenter did not respond to, and interactions of workshop staff with

the clients.

Corrective feedback. Clients were given periodic feedback for errors

in order to maintain the quality of production. If a client was observed

making an error in the assembly of the ceiling tile clips, instructions
were provided as to the nature of the error and correction was requested.
If the client was unable to respond accurately to this instruction, the
correct taks assembly was modeled, and the client was praised when the
product was made correctly.

Corrective feedback was also given regarding the appropriate use of
the self-regulation device and the self-monitoring form. Feedback was
given when the client failed to self-monitor after assembling a bag, when
checkmarks were marked in more boxes than necessary, and when self-administration
of token reinforcers occurred inappropriately (i.e., giving too many or too
few tokens). Specifically, the experimenter said, "I'm sorry, (client's
name). You didn't reach your goal yet--why don't you try again next time."
The experimenter then removed the token from the envelope and replaced it
in the container. If a client made an error in self-monitoring (marked in
more boxes than appropriate), similar instructions were given. Specifically,
the experimenter said, "I'm sorry, you marked in too many boxes--why don't
you try again next time."

Workshop pay system. In addition to experimental contingencies,
clients received a pay cheque at the end of the week (on Fridays) ranging
from $2.00 to $5.00 depending upon the client's rate of pay. This pay
system was in effect throughout the duration of the experiment.

Experimental Design

A modified multiple baseline design across clients was used in
conjunction with a reversal-replication design (for a description of these
designs, see Martin & Pear, 1983). The production of each client was

monitored across baseline conditions, self-monitoring of production, self-monitoring plus goal-setting for production, SRP, SRP plus back-up reinforcers for production and through individual reversal and replication phases. Clients received treatment conditions in different orders, as shown in Table 2.

Insert Table 2 about here

Presentation of each condition was staggered across each client. As no new phase for each client was coincidental with the initiation of a new phase of another client, consistent differences in production rates across clients were attributed to experimental manipulation and not to influences from clients experiencing other phases.

Social Validation of the SRP

The purpose of this evaluation was to assess clients' preference for baseline conditions versus SRP conditions. The preference tests took place the day after the study ended, and were conducted during one morning. All four clients were tested at this time. The author carried out the preference testing.

The testing was conducted in a room in the building (not the room used for training). Two production tables were set up (except for Subject 2, for whom three production tables were set up). For Subjects 1, 3, and 4, the preference test had them choosing between the conditions in baseline versus those in the SRP plus back-up reinforcers condition. Subject 2 was given these choices because her average production rates in the self-

Table 2

Number of Days in Experimental Phases

Subject 1	Subject 2	Subject 3	Subject 4
BL = 12 days	BL = 12 days	BL = 22 days	BL = 78 days
SM = 18 days	SMGS = 8 days	SRP = 27 days	SRP = 12 days
SMGS = 8 days	SRP = 17 days	SMGS = 8 days	BL = 5 days
SRP = 20 days	SRPBR = 17 days	SM = 11 days	
SRPBR = 10 days	SM = 17 days	SRP = 28 days	
BL = 18 days	BL = 9 days		
SRP = 13 days	SM = 4 days		

Index

BL = Baseline

SM = Self-monitoring

SMGS = Self-monitoring plus goal-setting

SRP = Self-regulation package

SRPBR = Self-regulation package plus back-up reinforcers

monitoring condition and in the SRP plus back-up reinforcers condition were very similar.

Each table in the room contained either the components of the SRP (with a self-monitoring sheet, pencil, poker chips, an envelope, production bins, and materials being visible), or the components of baseline (with only the production bins and the materials to assemble the ceiling tile clips being visible). A chair was positioned in the middle of each table. The subjects were brought individually into the room. The experimenter stood between the two tables, approximately .76m away. The experimenter always stood to the left of the subject. The subject was then asked, "Where would you like to work? You can work here (pointing to the left) and mark off the bags you've made, reach your goal, and earn chips, or you can work here (pointing to the right)." The subject usually pointed to the location of his preference and said, "Over here." The experimenter then said, "O.K., go sit down and work." If the client chose the SRP condition, the experimenter set a goal of 3 bags, and the subject worked for 10 minutes at this location. If any tokens were earned, they were exchanged for quarters, as in the regular SRP conditions. For Subject 2, the SRP table was modified by posting the sheet indicating the value of the tokens, and a third production table was set up that contained the components of the self-monitoring condition (with the production bins, materials, a self-monitoring sheet and a pencil being visible). The experimenter and the subject stood between the three tables, and the experimenter asked, "Where would you like to work? You can work here (pointing to the left) and mark off the boxes you've made, reach your goal, and earn chips to buy what you

want, or you can work over here (pointing to the middle) or you can work over here (pointing to the right) and mark off the number of bags you've made on the sheet." If the client chose the SRP plus back-up reinforcers condition, and earned tokens, they were exchanged for the reinforcer of appropriate value.

Subjects, 1, 3, and 4 were given four preference tests respectively. In two of the tests, the SRP components were located on the table on the left hand side of the client, and in the other two tests, the SRP components were located on the right hand of the client. For Subject 2, three preference tests were conducted, with the SRP components appearing either on the table to the left of the client, in the middle, or on the right of the client.

A questionnaire was administered to two of the workshop staff. One staff member was in charge of client supervision on the workshop 'floor', and the other staff member was responsible for client evaluation and training. They were both asked to rate the significance of the demonstrated increases in production for Subjects 1, 2, and 3. The SRP was briefly described, and they were asked if they would implement the package in the form it was used in the study, or if modifications to the package would be necessary before they would support implementation (see Appendix B).

Reliability Assessments

The two experimenters, or one of the experimenters and the undergraduate behavior modification student periodically recorded concurrently in order to assess interobserver reliability (IOR). Observations were carried out so that neither observer could determine what the other had recorded. IORs were calculated on several variables, as described below.

Total session production. At the end of the session, the experimenter collected the bags in the clients' bins and placed them on a separate table. The total number of bags were then counted and recorded. The second observer then independently tallied the number of bags made. To calculate IORs, the agreements on the total number of bags counted was divided by the number of agreements plus disagreements times 100.

Quality of production. When the client's production was being counted, bags were randomly checked to ensure that no errors were being made. The bags were placed on a separate table and examined to ensure that the bag of nails had been inserted, and that the bag was full of clips. During reliability assessments, each client's production was independently checked. To calculate IORs, the agreements on the number of bags assessed as correct was divided by the number of agreements plus disagreements times 100.

Length of sessions. After the clients had been instructed as necessary, the experimenter started a stop watch. The second observer also had a stopwatch, and as she listened to the experimenter finish giving instructions, she started her stopwatch. She stood some distance away from the experimenter, so that she would not see the stopwatch being started. The stopwatches were stopped independently after a 30 minute interval had passed. IORs on the length of the sessions were calculated by dividing the smaller number of minutes by the larger, and multiplying by 100.

Length of time spent out-of-seat. When a client left the seat to use the washroom, get a drink of water, etc., the amount of time spent out-of-seat was recorded. Reliability assessments were conducted on this measure also (as this affected total session length). The digital watches were used to time out-of-seat behavior. When a client moved the chair and got

out of it, the timer was started; it was stopped once the client had sat down in the chair. During reliability assessments, the watches were started independently. Out-of-seat intervals of less than 5 seconds duration were not considered in the calculation of session length. Generally, this type of out-of-seat interval reflected occasions when the client had dropped material and had got out of the chair to retrieve it, or when he or she stood up to signal to the 'material handler' that more materials were needed. Sessions where the client was gone for longer than 20 minutes were discounted (as in the case of the client who had a short meeting with his vocational counsellor). IORs for this measure were calculated as described in 'length of sessions.'

Accuracy of self-monitoring. During all experimental conditions, the accuracy of self-monitoring was determined by counting the number of bags the client had made, and comparing this value to the number of boxes in which the client had put a checkmark. When a session had finished, the experimenter went up to the client, counted the number of boxes checked off, transferred the production made to a table and counted it. After the experimenter had finished checking and recording one client's production, the second observer independently counted the number of boxes marked, as well as the number of bags that had been made. Accuracy was determined by comparing the number of bags monitored to the number produced, by dividing the smaller number by the larger and multiplying by 100.

Social validity. A workshop staff member independently assessed clients' preference for either SRP or baseline conditions on three of the tests. The percent reliability on this measure was calculated by dividing the total number of agreements by the number of disagreements plus agreements, times 100.

Results

The mean hourly production per day for each client across experimental conditions is presented in Figure 1. Here, the "mean line" represents the average production per hour within a phase.

Insert Figure 1 about here

The first subject produced an average of 15.90 bags per hour during Baseline I. During the self-monitoring phase, productivity rose to an average of 18.56 bags per hour. The self-monitoring plus goal-setting phase also produced an increase to an average of 19.54 bags per hour. The SRP was slightly less effective in increasing productivity than the SRP plus the back-up reinforcers phase (an average of 20.34 bags per hour for the former versus 20.95 bags per hour for the latter). The productivity level in Baseline II did not diminish completely to the level seen in Baseline I. The reintroduction of the SRP (determined to the 'best' of the treatment phases) did not produce an increase in productivity level relative to the second baseline (an average of 18.89 bags per hour). The second subject produced an average of 10.51 bags per hour during Baseline I. During the self-monitoring plus goal-setting phase, productivity decreased to an average of 9.67 bags per hour. The introduction of the SRP produced a very slight increase (9.72 bags per hour) relative to the self-monitoring phase, but productivity levels were still below that seen in Baseline I. The SRP plus the back-up reinforcers phase produced an increase in the average number of bags assembled (13.17 bags per hour) relative to baseline.
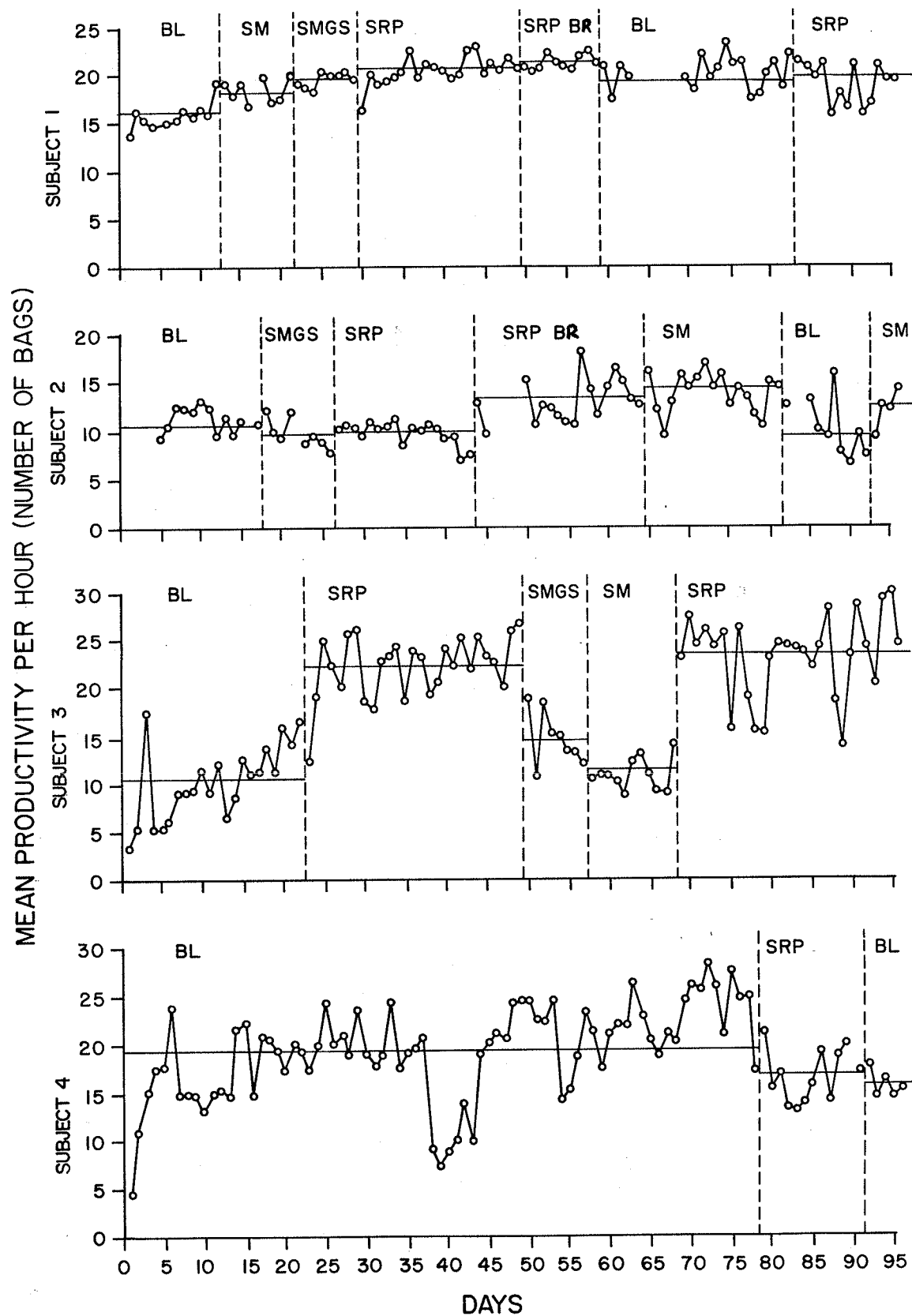
Figure 1. Mean productivity per day for the four subjects across experimental phases.

In the self-monitoring phase, an increase in productivity is seen, to an average of 13.83 bags per hour. The productivity level in Baseline II did diminish to the level seen in Baseline I. The reintroduction of the self-monitoring phase (determined to be the 'best' of the treatment phases) did not produce an increase in productivity level relative to the second baseline (an average of 12.04 bags per hour). The third subject produced an average of 10.17 bags per hour during Baseline I. In the SRP phase, productivity increased to an average of 22.10 bags per hour. The self-monitoring plus goal-setting phase produced a decrease in productivity level to an average of 14.63 bags per hour. The self-monitoring phase also decreased productivity levels even further, to an average of 11.02 bags per hour. The reintroduction of the SRP (determined to be the 'best' of the treatment phases) produced an increase in productivity level relative to the self-monitoring phase (an average of 23.22 bags per hour). The fourth subject was initially considered to be a control; however, when the introduction of the SRP produced varying results in the other subjects, the SRP was introduced to this subject also. The fourth subject produced an average of 19.14 bags per hour during Baseline I. The introduction of the SRP produced a decrease in productivity levels to an average of 16.32 bags per hour. When conditions were reversed to Baseline II, productivity levels dropped further (an average of 15.37 bags per hour).

In summary, during baseline phases, the mean production rate per hour averaged across all clients was 14.78 bags per hour (ranging from 10.17 bags per hour to 18.91 bags per hour). The mean production per hour averaged for the three clients who experienced the self-monitoring phase was 14.37 bags per hour (ranging from 11.02 bags per hour to 18.56 bags per hour). The mean

production per day averaged across the three clients who experienced the
self-monitoring plus goal-setting phase was 14.61 bags per hour (ranging
from 9.67 bags/hour to 19.54 bags/hour). During the SRP phase, mean
production per day averaged across all clients was 17.12 bags per hour
(ranging from 19.72 bags/hour to 22.67 bags/hour). Two clients experienced
an SRP plus back-up reinforcers phase, and their mean production per day
was 17.06 bags per hour (ranging from 13.17 bags/hour to 20.95 bags/hour).

Percent increases in productivity relative to baseline for all
experimental phases, across all clients, are presented in Table 3.

Insert Table 3 about here

Here, the average production per day across a phase and its replication
(if a replication occurred) is shown, with percent increases calculated
relative to these averaged production rates. Generally, for one client,
the SRP produced a mean increase of 120.74%. For a second client, the SRP
produced a very small increase of 6.98%. For a third client, a modified
version of the SRP, the SRP plus back-up reinforcers, produced an increase
of 15.02%. For a fourth client, the SRP produced a decrease in productivity
of 14.73%.

Quality of Production

The quality of production was determined for baseline and all treatment
phases. Percent correct bags assembled in baseline for Subjects 1, 2,
and 3 was 100% and for Subject 4 was 98.4%. In all treatment phases,
Subject 1 maintained quality of production at 100%. Subject 2 showed
a slight decrease to 97.9% in the SRP plus back-up reinforcers phase, but

Table 3

Average Productivity Per Hour Per Phase(s) and Percent

Increases or Decreases in Productivity Relative to Baseline

Subject 1		Percent Increase		Subject 2		Percent Increase
BL*	18.48			BL*	11.45	
SM	18.56	.43%		SMGS	9.67	-15.55%**
SMGS	19.54	5.74%		SRP	9.72	-15.11%
SRPBR	20.95	13.37		SRPBR	13.17	15.02%
SRP*	19.77	6.98%		SM*	13.49	17.82%

Subject 3		Percent Increase		Subject 4		Percent Increase
BL	10.27			BL*	18.91	
SRP*	22.67	120.74%		SRP	16.32	-14.73%
SMGS	14.63	42.45%				
SM	11.02	7.30%				

Index: BL = Baseline

SM = Self-monitoring

SMGS = Self-monitoring plus goal setting

SRP = Self-regulation package

SRPBR = Self-regulation package plus
           back-up reinforcers

* = the value represents an average of the
     production per day in both the phase and
     its replication

** = a negative sign in front of a number
      denotes a percentage decrease in
      productivity relative to baseline

otherwise maintained quality of production at 100%. Subject 3 also

showed a decrease in quality of production to 95% in the initial SRP

phase and in the replication of the SRP phase (96%). Subject 4's

quality of production was 90% during SRP, and 91% in Baseline II. The

quality of production was checked an average of one session per day for

all clients. When IORs were being done, each session's production was

checked.

Accuracy of Self-Monitoring and Self-Administration of Token Reinforcers

Mean accuracy of Subject 1 was: 97.2% in the self-monitoring condition;

100% in the self-monitoring plus goal-setting condition; 100% in the SRP

phase; 95.4% in the SRP plus back-up reinforcers phase; and 100% in the

replication of the SRP phase. The accuracy of the second subject fell

below 85% in the self-monitoring plus goal-setting condition. Prior to

session 127 of the self-monitoring plus goal-setting condition, a booster

session was given. Mean accuracy in the phase was 88.7%. Mean accuracy

in the SRP, SRP plus back-up reinforcers, self-monitoring and replication

of the self-monitoring phases were 89.5%, 85%, 87%, and 88.3, respectively.

For the third subject, mean accuracy in the SRP, self-monitoring plus

goal-setting, self-monitoring and the replication of the SRP phases were

88.6%, 90%, 91%, and 87.8, respectively. The fourth subject's mean

accuracy in the SRP phase was 89%.

Frequency of interactions

The average number of interactions per day with each client is presented

in Table 4. The frequency of interactions were kept relatively constant

across phases.

Insert Table 4 about here

Table 4

Average Number of Interactions per Day per Phase Across Clients

Subject 1	Subject 2	Subject 3	Subject 4
BL = 2.6	BL = 3.1	BL = 3.2	BL = 1.9
SM = 2.0	SMGS = 3.2	SRP = 3.4	SRP = 2.1
SMGS = 2.8	SRP = 3.5	SMGS = 3.1	BL = 2.0
SRP = 2.5	SRPBR = 3.4	SM = 3.2	
SRPBR = 2.2	SM = 3.3	SRP = 3.5	
BL = 2.3	BL = 2.8		
SRP = 2.3	SM = 3.2		

Index

BL = Baseline

SM = Self-monitoring

SMGS = Self-monitoring plus goal-setting

SRP = Self-regulation package

SRPBR = Self-regulation package plus back-up reinforcers

Social Validation of the SRP

The results of the four preference tests given to Subjects 1, 3, and 4 showed that Subjects 1 and 4 preferred baseline conditions to SRP. Subject 3 chose SRP conditions every time. Subject 2, with whom three tests were conducted, chose the SRP plus back-up reinforcers phase every time.

Two workshop staff at Skills Unlimited were asked to fill out a questionnaire regarding the efficacy of the SRP. Both indicated satisfaction with the increases in production rate observed, but one indicated that the SRP would have to be changed so that less staff management was involved.

Interobserver Reliabilities

Mean percentage of interrater agreements was calculated for the following measures.

Of 97 checks made on length of sessions, mean agreement was 99.21%. Of 103 checks made on length of out-of-seat behavior, mean agreement was 97. 94%. Of 97 checks made on quality of production, mean agreement was 98.45%. Of 67 checks made on accuracy of self-monitoring and self-administration of token reinforcers, mean agreement was 99.37%. Of 97 checks which were made on ratings of verbal interactions, mean agreement was 96.35%. In a total of 97 checks which were made on total session output, mean agreement was 99.49%.

Discussion

The findings described in this study indicate several things. First of all, the SRP (with self-monitoring, goal-setting and self-administration of token reinforcers) can enhance the productivity levels of some mentally

handicapped workers. The mean productivity of one client increased

significantly as a function of the SRP. For a second client, a very small

increase in productivity was seen in the SRP phase. Two clients

experienced a decrease in productivity levels when the SRP phase was

introduced. The small increase in productivity seen with the second client

may have been due to a ceiling effect, i.e., this client may already have

been working at his maximum capacity when the SRP was implemented. For

one of the clients who experienced a decrease in productivity with the

SRP, the effect may have been due to poor choice of reinforcers, i.e., it

was assumed that monetary reinforcers would be equally effective for all

clients. This explanation is supported when this client's performance on

the SRP plus back-up reinforcers phase is noted. Increased productivity

resulted when the client was presented with a range of edible and activity

reinforcers. The other client's productivity level varied dramatically

throughout the course of the experiment (ranging from 3 bags per hour to

31 bags per hour). These variations were not correlated with changes in

phases for the other clients. The SRP may have had an inhibitory effect

for this client; perhaps with a different self-monitoring and self-

reinforcement system, greater improvements in productivity level would

have been seen. We can postulate that the differences in effectiveness

of the SRP across clients may be related to within subject variables such

as differences in experience with handling money, etc. Future research

should attempt to ensure that these differences are minimized so that

increased productivity can be attributed to the effects of the SRP and

its components alone.

The results of the social validation tests reflect, to a certain

degree, performance on the SRP and its components. Only one subject

consistently chose SRP conditions over baseline. This was a subject for whom money was a very effective reinforcer . Two subjects chose baseline conditions and only one of the two showed a decrease in productivity as a function of the SRP. It was suggested that for this client, SRP may have had an inhibitory effect. The other subject, however, did show slightly increased production rates when the SRP conditions were instituted. This client expressed a dislike for the self-monitoring component of the package. A self-evaluative process such as this could be more aversive than trading in poker chips for money is reinforcing. The last subject chose the SRP plus back-up reinforcers condition over the SRP and baseline phases, which again suggests the greater reinforcement value of edibles versus money for this client.

The component analysis of the SRP provides us with important information regarding the effects of order of presentation of each component. For one client, both self-monitoring and self-monitoring plus goal setting produced increases in productivity. For a second client, self-monitoring plus goal setting decreased productivity to below baseline levels. However, when a self-monitoring phase was introduced following the SRP plus back-up reinforcers phase for one subject, an increase in production relative to both baseline and SRP plus back-up reinforcers levels was seen. The latter finding suggests an order effect. A possible explanation for this effect is that the experimenters or the self-monitoring system may have become conditioned reinforcers for the client, i.e., our presence and self-monitoring were paired with the presentation of reinforcers (edibles). Thus the client maintained productivity levels in the self-monitoring phase to a little above that seen in the SRP plus back-up reinforcers phase.

A third client's productivity level decreased in both self-monitoring plus goal setting and self-monitoring phases relative to the SRP phase. This is most likely because money was a very effective reinforcer for this individual. Praise was also effective in maintaining productivity levels above baseline rates in both the self-monitoring plus goal setting and self-monitoring phases. The increase in productivity seen when the SRP phase was reintroduced confirms the effectiveness of monetary reinforcers for this individual.

Previous baseline levels were not recovered for two subjects. These clients were able to hear the experimenter set goals with, and praise other clients, and this may have contributed to the inability to recover baseline levels of production rate.

Albion (1983) commented in his review article on the need for component analyses of self-control procedures. This is the second study to do a component analysis of the SRP, and the first to examine the effects of order of presentation of the components. The cumulative evidence from this research and the related studies by Jackson and Martin (1983), and Hanel and Martin (1980) are summarized in Table 5. It indicates that:

1) the increase in productivity brought about by the SRP
    is not due to an order effect. Where the SRP did have
    an effect, it produced an average increase of 63.86% (this
    study), 31.8% (Jackson & Martin, 1983), and 43% (Hanel &
    Martin, 1980).

2) if a trainer wants a 'best bet' strategy, the SRP should
    be used. In 12 out of 14 subjects, SRP was effective, with
    a modified SRP (SRP plus back-up reinforcers) affecting the
    13th subject.

Insert Table 5 about here

Where comparisons of individual components have been made (this research; Jackson & Martin, 1983):

a) with self-monitoring alone, of 5 subjects compared, 2 experienced an increase in productivity. With one subject, this could have been due to an order effect.

b) with self-monitoring plus goal-setting, of 5 subjects, 2 experienced an increase in work rates, and both could be due to an order effect, and

c) finally, the SRP was best for 3 out of 5 subjects and a modified SRP was equally effective for the fourth.

A package such as the SRP still requires a great deal of staff management, and it is not very likely that a sheltered workshop would implement the package as it is described in this study. To make self-control procedures more amenable to workshop implementation, we need to examine ways in which mentally handicapped individuals could be trained to take greater responsibility for the management of such a package, and ways to make the SRP more cost-effective. The next step would be to empirically determine the effectiveness of a SRP that involved daily, rather than half-hourly goal setting, and a self-reinforcement strategy that could be incorporated into an existing workshop pay system. Shapiro and Ackerman (1983) present another question that needs to be empirically researched. They found that self-monitoring procedures were effective in increasing productivity levels of only a few of their mentally handicapped

Table 5

Cumulative Results of Research Using Self-Regulation

Package to Increase Work Productivity

Author; Year	Number of Subjects	Experimental Comparison	Mean Production Increase in SRP versus BL (%)
Hanel & Martin, 1980	8	Multiple baseline, multi-element design were combined to compare BL and SRP phases.	All clients showed increased productivity in the SRP phase with a mean increase of 43%.
Jackson & Martin, 1983	3	Modified multiple baseline design across clients was used to compare BL phases to SM, SMGS and SRP phases respectively. All clients received the 4 conditions in the order described.	All clients showed maximum productivity in the SRP phase, with a mean increase of 31.8%.
Srika-meswaran	4	A modified multiple baseline design across clients was used to compare BL to SM, SMGS and SRP phases respectively. Two clients experienced an SRP plus back-up reinforcers phase. Clients received treatment conditions in different orders.	One client showed maximum productivity in the SRP phase, with a mean increase of 120.74%. One client showed maximum productivity in the SRP plus back-up reinforcers phase, with a mean increase of 15.02%.

workers. They suggest that variables which best predict for whom self-monitoring would be most effective need to be identified. We can take this a step further and say that we also need to identify the variables which would best predict for whom a package such as the SRP would be most useful.

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Self-Monitoring Form

NAME:											
DATE:											

Appendix B

Social Validation Questionnaire

Please indicate answer with a checkmark in appropriate blank:

1) Do you think it is important to experiment with ways of increasing
   worker production? Yes _____   No _____

2) Take a look at the baseline and 'best condition' data for the following
   subjects. Do you think that the increases are worthwhile? (Check either
   W? or Not W?)

	BL	Self-regulation package	% increase	W?	Not W?
Client 1	15.9 bags/hr	20.34 bags/hr	28%	_____	_____
Client 3	10.27 bags/hr	22.10 bags/hr	115%	_____	_____

	BL	Self-monitoring	% increase	W?	Not W?
Client 2	10.51 bags/hr	13.83 bags/hr	32%	_____	_____

3) A 115% increase (Client 3) in production using the self-regulation package
   requires that someone: a) meet with the client for a few minutes every half
   hour and sets goals; b) check his self-monitoring sheet to ensure that he
   has marked the number of bags he's made (every half hour); c) ensure that
   he is self-reinforcing (i.e., self-administering tokens) properly; d)
   praise him for reaching his goals and performing step (c) properly; e) cash
   in his tokens at the end of the day. Would you be willing to continue the
   procedure in its present form? Yes _____   No _____

   Comments:

4) Would you be willing to continue the procedure in a modified form. This may
   involve goal-setting sessions twice each morning and each afternoon; checking
   the self-monitoring sheet and self-reinforcement procedures on these
   occasions; praising the client for appropriate behavior on these occasions
   and cashing in tokens at the end of the day. Yes _____   No _____

   Comments:

5) A 32% increase (Client 2) in production using only a self-monitoring sheet requires ensuring, every half hour, that the client is marking in the bags made correctly, and administering contingent praise. Would you be willing to continue the procedure in its present form?
Yes _____   No _____

Comments:

6) Would you be willing to continue the self-monitoring procedure in a modified form? This would involve checking the clients' self-monitoring sheet twice each morning and each afternoon and praising the client, if appropriate, on these occasions. Yes _____   No _____

Comments: