

THE UNIVERSITY OF MANITOBA

A COMPARISON OF SEVERAL PAY AND FEEDBACK CONDITIONS
TO INCREASE PRODUCTION RATES ON A PACKAGING TASK
AT A SHELTERED WORKSHOP FOR SEVERELY AND MODERATELY
RETARDED CLIENTS

by

Amalia Andery

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Abstract

Several pay and feedback conditions were compared as to their effects on production rates and accuracy on a packaging task by severely and moderately retarded clients working in a sheltered workshop.

Eight retarded clients in a sheltered workshop were studied. The subjects were exposed to five different conditions: fixed weekly payment (Baseline I), fixed half-hour payment (Baseline II), fixed half-hour payment plus an ongoing quantity feedback system (Ongoing Feedback Condition), FR-10 payment every half hour (Ratio Reinforcement Condition), and finally FR-10 payment every half hour combined with an ongoing quantity feedback system (Ratio Reinforcement Plus Ongoing Feedback Condition).

All subjects were exposed to Baseline I and II conditions during the first experimental phase. In subsequent phases, six subjects were exposed to the three experimental conditions in a multi-element design with a staggered introduction of the conditions within each subject and a counterbalancing of the introduction of conditions across subjects. An ABAB design was also achieved for these subjects by the addition of weekly probes during which subjects were returned to the Baseline II condition during sessions on the fifth day of each week. The remaining two subjects continued on Baseline II condition throughout these phases. In the final experimental phase, a multiple baseline component was accomplished by returning the six subjects to Baseline II condition and placing the two control subjects on the experimental condition that combined ratio reinforcement with ongoing feedback.

The results indicates that four of the six subjects exposed to all three experimental conditions, plus the two control subjects showed highest production

ii.

rates (in comparison to Baseline II) when the Ratio Reinforcement Plus Ongoing Feedback contingency was in effect. Experimental conditions did not affect the subjects' accuracy throughout the study.

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Introduction

In working with retarded individuals in sheltered workshops, two main concerns arise - to train these clients on various tasks and to increase and maintain their production at acceptable levels.

Reviews of the literature concerning procedures to increase production rates in sheltered workshops for the retarded (Bellamy, 1976; Martin & Pallotta, 1977) indicated that production is affected by variables such as instructions from the supervisors preceding work, modelling and social facilitation from partners, features of the working set, supervision style, and consequences contingent on working.

Bellamy, Inman and Schwartz (in preparation) reviewed studies dealing with reinforcement contingencies concerning work behavior of severely and profoundly retarded adults. Some of their conclusions were that work rates are affected, among other variables, by contingent positive reinforcement for work behavior and contingent punishing consequences for low rates. Brown, Frank, Fox, Vockluk, York and Sontag (1974) compared no payment with weekly payment, weekly payment and choice of task and weekly payment based on rates of production. The authors found an increase in production on the last condition.

Weekly payment was compared with daily payment and session payment (every 15 minutes) in a study published by Brown, Bellamy, Perlmutter, Sackowitz and Sontag (1972) and work rates increased when subjects were paid every session. In this study, subject payment in all phases was based on production rates.

As has been shown, ratio schedules yield higher rates of responding (Martin & Pear, 1978; Ferster & Skinner, 1957) than schedules based solely on time passing. Some of the contingencies resulting from fixed ratio reinforcement are (a) that the high rates of reinforcement occurring in small fixed ratio schedules may be due to a high frequency of reinforcement, and (b) that the responses emitted since reinforcement may be a conditioned reinforcer and a discriminative stimulus so that at any point in a fixed ratio schedule a response may be reinforced as it is in a chain of responses (Ferster & Skinner, 1957).

Thus, according to research data, payment in shorter intervals (session vs. weekly), payment based on rates of responding, and a system that maximizes the double function of every response (conditioned reinforcer and discriminative stimulus) in a fixed ratio schedule are variables that should affect production rates of retarded individuals in sheltered workshops.

However, typical workshop pay is either a fixed amount of money at the end of a weekly period, or occasionally, a fixed amount at the end of a day. Therefore, this study compared several pay and feedback conditions as follows:

1. fixed pay at the end of a week;
2. fixed pay at the end of a session;
3. pay based on production rates at the end of a session;
4. fixed pay at the end of a session with ongoing quantity feedback;
5. pay based on production rate at the end of a session with ongoing quantity feedback.

Method

Subjects

Eight subjects were selected from one of the Northgrove sheltered workshops at the Manitoba School for Retardates. Criteria for selection was low production on the airline pack packaging task (to be described below). The subjects' characteristics are summarized in Table 1.

Insert Table 1 about here

Setting

Subjects worked in the training area of a workshop which is a room separated from the area where other clients worked. Subjects were seated at a table measuring 2.4 m by 1.2 m. The table had a wooden box in the center that was 2.3 m long, 20.3 cm wide, and 16.5 cm high, and which was divided into nine compartments where the items required for the task were kept. At the left side of each subject there were two 27.9 cm by 12.7 cm plastic boxes, 11.4 cm high, into which the subjects placed the finished product. Four subjects sat on each side of the table (see Figure 1).

Insert Figure 1 about here

General Procedure

There were six to eight daily sessions in all phases, each lasting one-half hour. Before the start of each session, the experimenter gave

Table 1

Some Characteristics of the Subjects

Subjects	Age	Diagnosis	I.Q. (Test)	Years of Institutionalization
A. Ross	29	Down's syndrome	less than 20 P.P.V.T.	22
B. Gerald	34		84 Weiss	3
C. Richard	24	Down's syndrome	approx. 26 Stanford-Binet	11
D. Sam	42	Severe mental retardation	39 W.A.I.S.	22
E. Greg	23	Encephalopathy due to birth injury	3 yr 0 mo P.P.V.T.	15
F. Paul	26	Mild mental retardation due to prenatal causes	54 Slossan	16
G. Ken	22	Encephalopathy	2 yr 4 mo P.P.V.T.	12
H. Ross	29	Down's syndrome	less than 20 P.P.V.T.	22

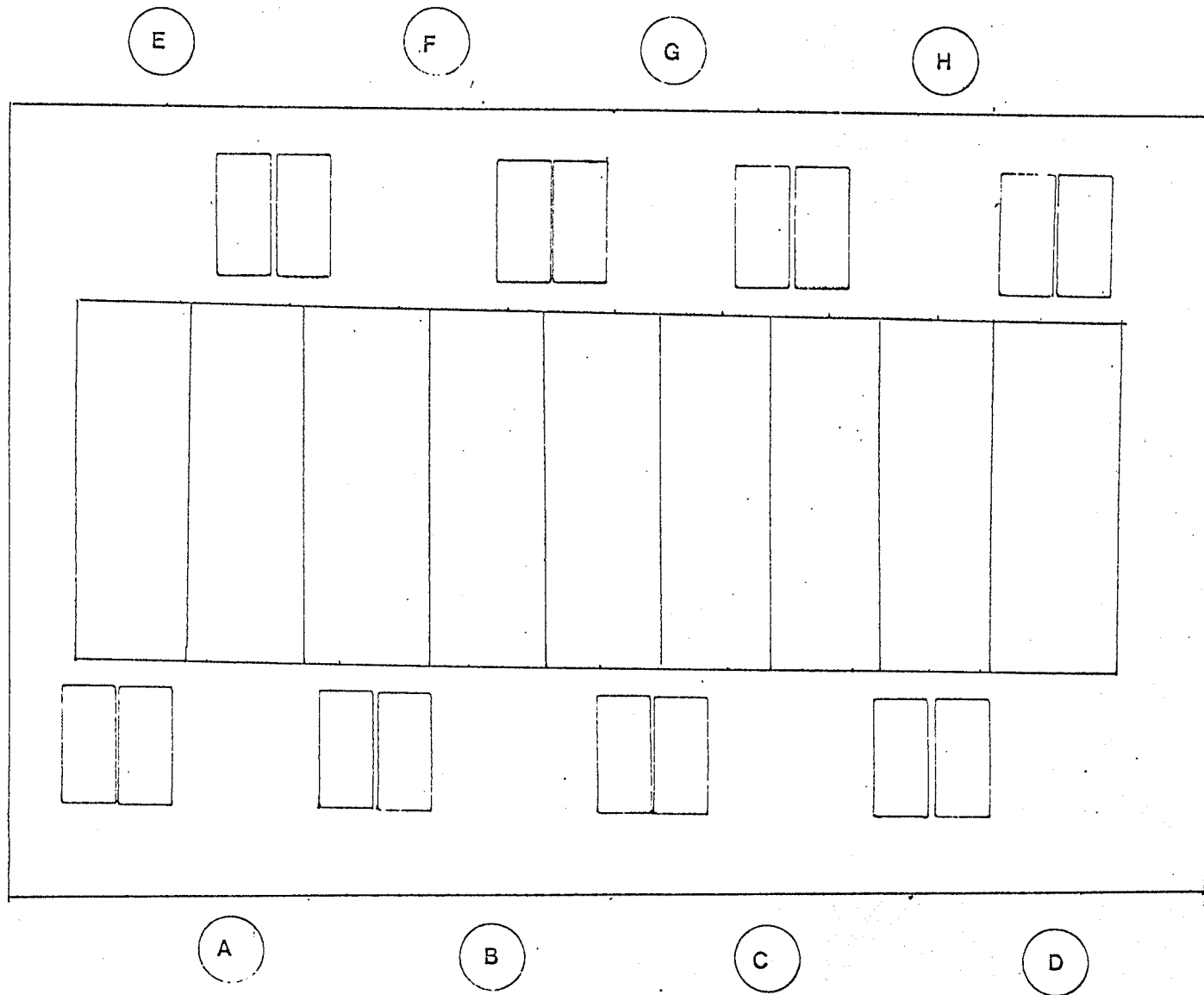


Figure 1. Seating arrangement for the subjects.

each subject instructions concerning the duration of the session and the contingencies in effect. All subjects started at the same time upon the experimenter's signal. A timer rang at the end of a half-hour period and subjects stopped working. The experimenter either paid and collected the subject's production at the end of the session, or counted the items produced, paid the subject and collected subject's production. A new session was then started.

All phases, except for Baseline I, were in effect until the subjects achieved stability criteria on that contingency, or for a maximum of 24 sessions. Criteria for stability was five consecutive sessions with no more than 20% variation on production among sessions and no increasing trends.

Data Collection and Stability Criteria

Subjects worked on a packaging task throughout the experiment. The packaging involved putting a napkin, sugar package, and a plastic stick into a plastic bag. The chain for the task is described in Table 2.

 Insert Table 2 about here

Sessions lasted one-half hour. At the end of each session, the experimenter collected the packages made by each subject and put them in individual bags or boxes. The experimenter counted the packages made by each subject as well as how many packages had errors.

Reliability was obtained by having another person count the subject's production independently. Reliability was taken at least once during each phase with 100% agreement on all sessions.

Table 2

Chain for the Task: Packaging an Airline PackSteps

1. Pick up napkin.
2. Fold napkin lengthwise in two.
3. Fold napkin in two.
4. Pick up plastic bag.
5. Insert napkin in the bag.
6. Pick up plastic stick.
7. Put stick in the bag.
8. Pick up sugar.
9. Put sugar in the bag.
10. Put bag in the box.

Experimental Contingencies

Throughout the experiment, the subjects experienced the following sets of contingencies, with only one set of contingencies in effect during any one session.

Baseline I. Subjects started working upon instruction and stopped when a timer signalled the end of the work period. At the end of each session, subjects' production and errors were counted. At the end of each week, subjects received 60¢ as pay. Payment was made after the last session of the day.

The boxes where subjects put their finished product were blue in color.

The following instruction was given before each session: "I want you to work as fast as you can from now on. When I say so, you start. When you hear the bell, finish the package you are working on and stop. I'll come around and then collect your packages. You will be paid at the end of the week, on Friday, as last week. Start."

Baseline II. At the end of each session, subjects' production and errors were counted by the experimenter. When the timer sounded, the experimenter went around the table collecting each subject's production and putting it into a box. The experimenter then paid each subject 2¢ and said, "Here is your pay". The experimenter did not count the subject's production then.

The boxes where subjects put their final product were blue.

The following instructions were given before each session: "I want you to work as fast as you can from now on. When I say so, you start.

When you hear the bell, finish the package you are working on and stop. I'll come around then and collect your packages. I will pay you 2¢ (which was shown) then. Start to work now".

Ratio Reinforcement. At the end of each session, subjects were paid 1¢ for every 10 packages made. The experimenter went to each subject when the session was over, counted the subject's production out loud in the subject's presence, and paid him at every 10 packages saying, "...8, 9, 10. Here is 1¢. 1, 2, ...9, 10. Here is another cent...". The extra packages (one to nine packages) were put back in the subject's box and the experimenter said, "I'll pay for these next time when you complete 10 packages." The recorded production during the half-hour session included these packages. In the next session, those packages were not counted.

Boxes where the finished product were put were yellow during this condition.

The following instructions were given at the onset of each session: "I want you to work as fast as you can. Start when I say so. When you hear the bell, finish the package you are working on and stop. After you stop, I'll pay you 1¢ (which was shown) for every 10 packages you make. Start to work now".

Ongoing Quantity Feedback. At the end of each session, subjects were paid a certain amount of money. The amount received in each session was determined as follows: the average production of the subject during Baseline II divided by 10 was the number of cents the subject received during the first five sessions. For example, average on baseline = 10 packages per half hour; pay on ongoing quantity feedback contingency = 1¢. Every

five sessions, a new average was calculated on the last five sessions and the amount of money earned on the next five sessions was based on this average.

Boxes where the subjects put their finished products were divided by partitions in four rows, each row containing 10 slots. Each slot fit one package (see Figure 2). The boxes were blue as during Baselines I and II.

 Insert Figure 2 about here

When the timer sounded, the experimenter collected the subject's production and put it into a box. The experimenter then paid the subject and said, "Here is your pay". The experimenter did not count the subject's production in the subject's presence.

The instructions given during this phase were as follows: "I want you to work as fast as you can. Put each of your packages in each of those slots (experimenter showed the subject). Start working when I say so. When you hear the bell, finish the package you are working on and stop. After you stop, I'll collect your packages and I'll pay you ____ (the amount for the session was said and shown) cents. Start to work now".

Ratio Reinforcement Plus Ongoing Quantity Feedback. Subjects were paid 1¢ for every 10 packages completed. Payment occurred every half-hour (and the end of each session). Boxes where the subjects put their finished product were divided into four rows with 10 slots each as described above (Ongoing Quantity Feedback) and were yellow as during the Ratio Reinforcement Condition. At the end of the session, the experimenter counted the production

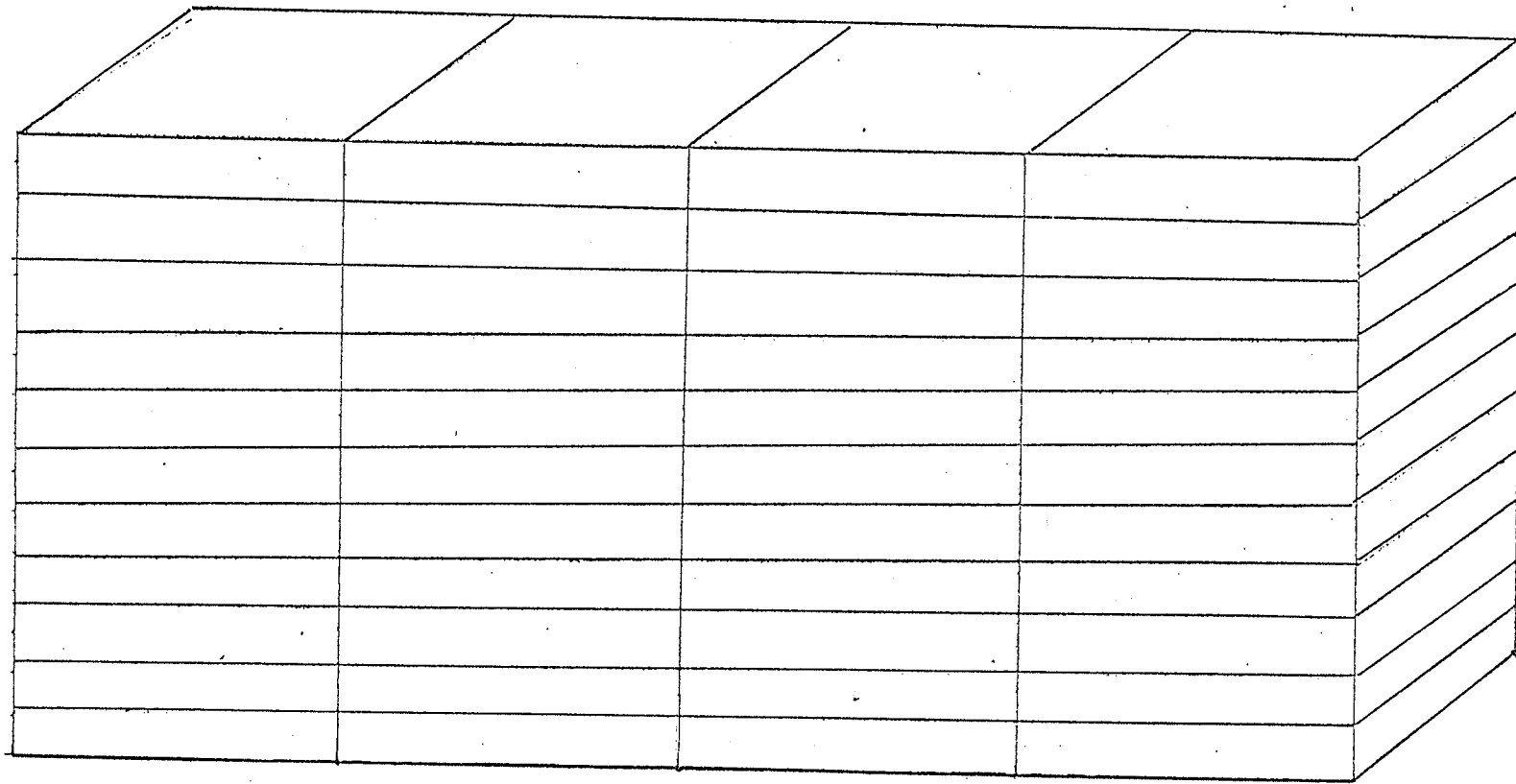


Figure 2. Schematic of the box for finished products.

in the subject's presence by pointing to the completed rows and paid 1¢ for every 10 packages saying, "1, 2, ...9, 10 - one row - 1¢. 1, 2, ...9, 10 - one row - another cent ...". The experimenter put each cent in front of each row. The one to nine extra packages were put in the first row and the experimenter said, "I'll pay for these next time if you complete the row or whenever you complete it". The recorded production for the half-hour session included these packages. In the next session, these packages were not recorded on the data sheets.

The following instructions were given during this phase: "I want you to work as fast as you can. Put each of your packages in each slot (the experimenter showed the subject). Start when I say so. When you hear the bell, finish the package you are working on and stop. After you stop, I'll come around, count how many rows you completed (the experimenter showed the rows) and I'll pay you 1¢ for each row. Start to work now".

Dependent Variables

Two dependent variables were taken into account in this experiment. One was production rate, which was measured by the number of packages a subject completed during one session. The other was the percentage of accuracy which was measured by the number of packages with errors divided by the total number of packages a subject made in one session times 100.

Research Design

The basic design was a multi-element design with counterbalancing of procedures among subjects. An ABA design was also achieved with a return to baseline on the last week, and with one day of probes per week during which there was a return to baseline. In addition, two subjects remained

on baseline throughout the experiment and were exposed to the combined ratio reinforcement plus ongoing quantity feedback experimental phase during the last week, providing a multiple baseline component to the design.

Phase I. Subjects were exposed to two baseline conditions. Baseline I lasted two weeks with subjects being paid weekly. Baseline II lasted for 24 sessions and subjects were paid a fixed amount of money at the end of each session.

Phase II. After Baseline II, six subjects were exposed to one of three contingencies; (1) ratio schedule of reinforcement, (2) ongoing quantity feedback, (3) ratio schedule of reinforcement with ongoing quantity feedback, while two other subjects remained on Baseline II throughout the experiment.

Phase III. After 24 sessions, the next phase was introduced for each of the six subjects who were exposed to an experimental condition in Phase II. During this phase, subjects were exposed to two of three contingencies. The first three sessions of the day were under one contingency and the last three sessions under another contingency. The order of presentation was alternated every day. This procedure was followed for 24 sessions on the contingency most recently introduced.

Phase IV. During the fourth phase, the six subjects were exposed to all three experimental contingencies. Each contingency was in effect for one-third of the sessions of the day for each subject, and the order in which the contingencies were presented was randomized daily. The order on which contingencies were introduced for each subject is shown in Table 3.

Insert Table 3 about here

Table 3

Contingencies in Effect for Each Client Across Phases

Phases Client	I		II	III	IV			V	
A	BL ₁	BL ₂	R	R F	R	F	FR	BL ₂	BL ₁
B	BL ₁	BL ₂	R	R FR	R	FR	F	BL ₂	BL ₁
C	BL ₁	BL ₂	F	F R	F	FR	R	BL ₂	BL ₁
D	BL ₁	BL ₂	F	F FR	F	R	FR	BL ₂	BL ₁
E	BL ₁	BL ₂	FR	FR R	FR	R	F	BL ₂	BL ₁
F	BL ₁	BL ₂	FR	FR F	FR	F	R	BL ₂	BL ₁
G	BL ₁	BL ₂	BL ₂	BL ₂	BL ₂			FR	BL ₁
H	BL ₂	BL ₂	BL ₂	BL ₂	BL ₂			FR	BL ₁

Notes:

1. During phases II, III, and IV, there was one day of probes per week when all subjects were exposed to Baseline II condition.
2. During Phase III, each contingency was presented for one-half of the daily sessions. The order of presentation was changed daily.
3. During Phase IV, each contingency was introduced for one-third of the daily sessions. The order of presentation was randomized.

R = Ratio Reinforcement
 F = Ongoing Quantity Feedback
 FR = Ratio Reinforcement plus Ongoing Quantity Feedback

In addition, one day per week during Phases II, II, and IV there were probes when Baseline II was introduced for the day for all subjects.

Phase V. After criteria was achieved on the fourth phase, subjects were returned to Baseline II conditions for 50 sessions. Contingency 3 (ratio schedule and quantity feedback) was applied to the two subjects who remained on Baseline during Phases II, II, and IV. Subjects 7 and 8 were exposed to contingency 3 for 24 sessions.

Finally, all subjects were exposed to Baseline I conditions for one week.

Results

The overall means for each contingency for each subject are presented in Figure 3. The dotted curve represents the mean production rates during

 Insert Figure 3 about here

Baseline II conditions, with the middle points showing the mean production for Baseline II probe sessions. As Figure 3 shows, excluding the variable performance during Baseline I, for Subjects 1, 2, 4, 5, 7, and 8, the highest production rates of the experimental conditions were the ratio reinforcement and ongoing feedback condition while for Subject 3, the highest production rate was during the ongoing feedback condition and for Subject 6, the ratio condition achieved the highest mean value.

The difference between Baseline II condition and the ratio reinforcement and feedback condition is very small for Subject 8 (.39 packages per

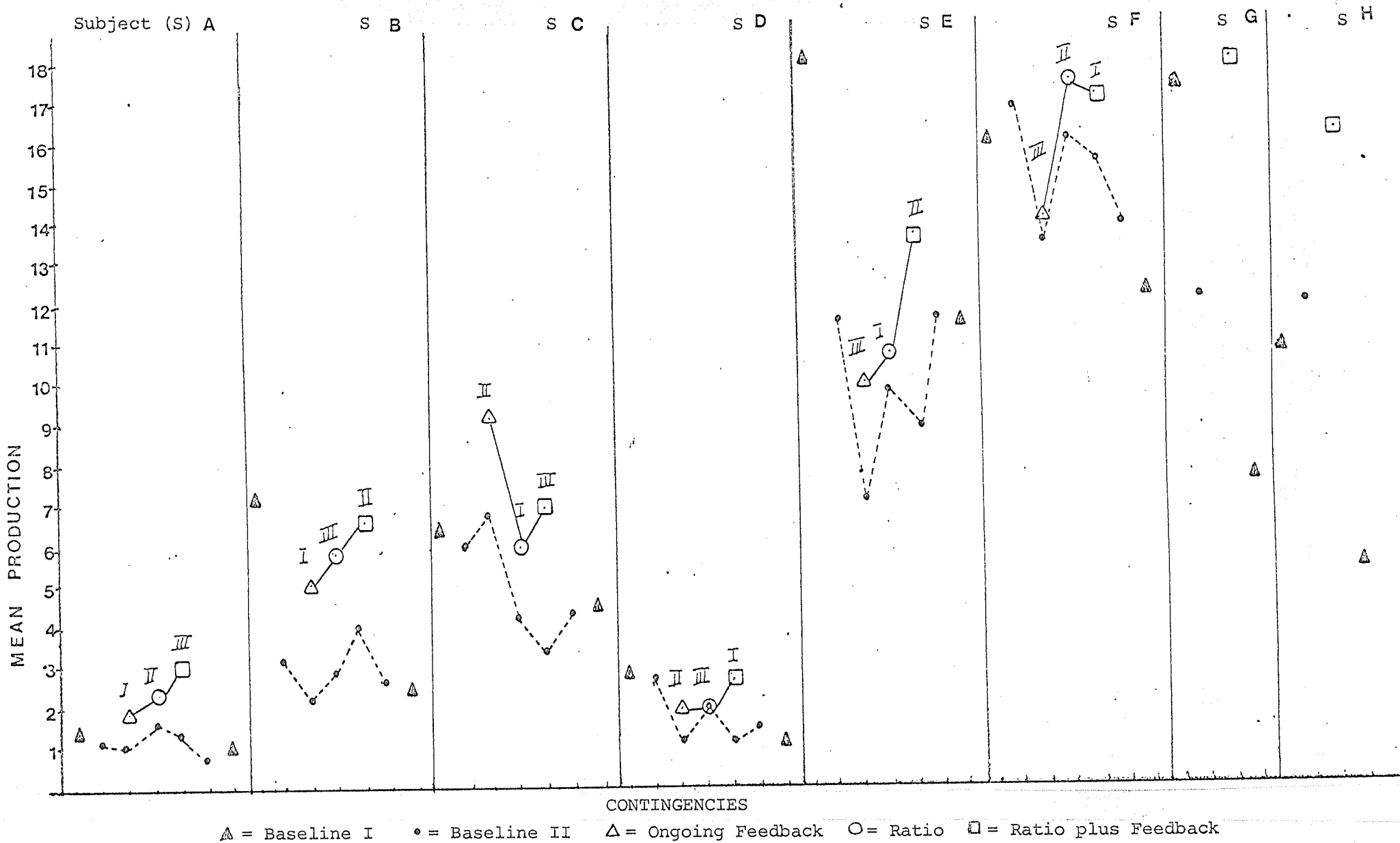


Figure 3. Mean production on each contingency for all subjects. The dotted curve represents Baseline II condition. The three middle points represent the mean production rates of the baseline probes during the corresponding phase. The Roman Numerals indicate the order in which each experimental condition was introduced.

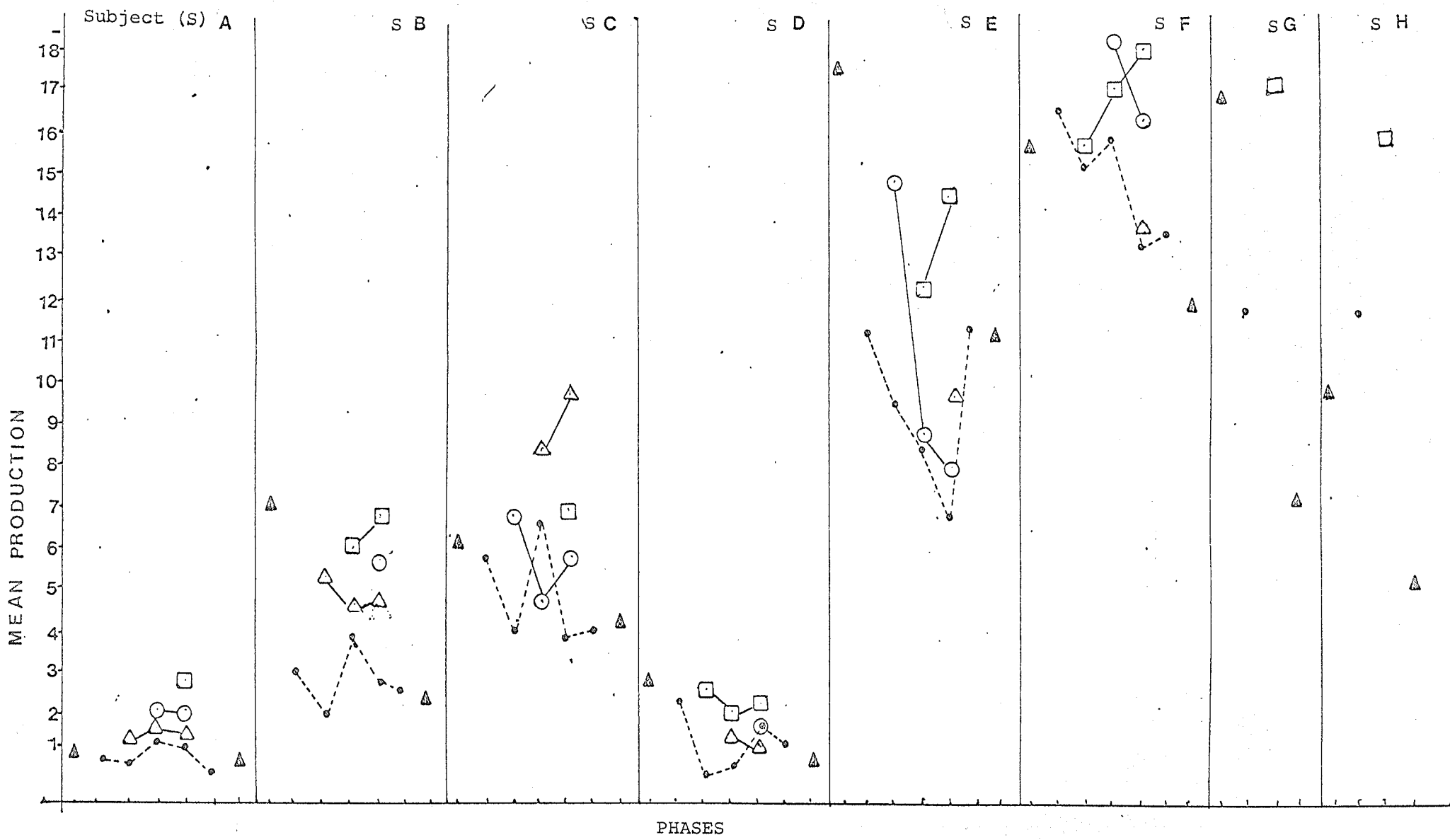
half-hour) thus indicating that the change in the behavior was not likely due to the experimental conditions.

Figure 3 also shows that for all subjects, except Subjects 6 and 8, there was a decrease in the production rates from Baseline I to Baseline II conditions on Phase I. Since the Baseline I condition was introduced at the beginning of the experiment, the decrease might be due to variables other than the ones being controlled. When Baseline I was reintroduced during Phase V, all subjects showed production rates equal to or smaller than during Baseline II conditions during Phase V and all subjects, except Subject 1, made smaller than Baseline I levels during Phase I. Also, all subjects showed a decrease in their production rates from the first introduction of the Baseline II condition in Phase I to the last introduction of the same condition in Phase V, which might indicate a decreasing trend in production as time passes, due to other variables than the contingencies under control of the experimenter.

The mean production rate on each contingency during each phase is presented in Figure 4. Each experimental condition is presented in one,

 Insert Figure 4 about here

two, or three phases as a result of the multi-element design and due to the counterbalancing of order on the experimental condition each subject had different conditions operating in each phase. The dotted curve, indicates Baseline II conditions and its three middle points are the mean rates for the probe sessions during each corresponding phase. Again, Subjects 1 and 2 show an effect on each experimental condition as compared to Baseline



▲ = Baseline I ○ = Baseline II △ = Ongoing Feedback ○ = Ratio □ = Ratio plus Feedback

Figure 4. The mean production for every contingency during each phase as shown for every subject. The 3 middle points on the Baseline II condition represent the mean production rates during Baseline II probes on the correspondent phases.

II levels. The effects seem to be quite stable across phases. For Subjects 4, 5, and 6, the production rates during the ongoing feedback condition are comparable to the highest rate for the Baseline II condition, thus indicating that this contingency did not have an effect that produced higher rates of responding than Baseline II levels for these subjects. Although the mean production rate on the ratio reinforcement plus ongoing feedback conditions for Subject 3 is only slightly higher than the largest mean rate on a Baseline II condition (.29 packages per half-hour) on the phase that the ratio reinforcement and ongoing feedback is introduced, the mean rate of production on the Baseline II condition probes decrease to one half its previous level. This indicated that the ratio reinforcement plus ongoing feedback condition was effective in maintaining the behavior at a level of production twice as large as in a Baseline II condition.

Subject 6 showed a larger overall mean production rate on the ratio reinforcement condition, than on the ratio reinforcement plus ongoing feedback condition in Figure 3. Figure 4 shows that there seemed to be an increasing trend on the production rates for the ratio reinforcement plus ongoing feedback condition while it seems to be a decreasing one for the ratio reinforcement condition.

Subjects 2, 4, and 5 showed an effect on the ratio reinforcement plus ongoing feedback condition when compared to the other experimental conditions and to Baseline II condition, but they never achieved the same level of production as in Baseline I condition. This shows a consistent but small effect of the variables under study not only in absolute terms (number of packages per half hour) but also when compared to their initial performance.

All data is presented in means because the subjects' production rates did not vary too much within conditions with almost no occurrences of very extreme values. The means for production rates are thus, representative of actual rates.

Figures 5 and 6 show the cumulative production rates during each

 Insert Figures 5 and 6 about here

condition for the most stable subject and the least stable one, respectively. As can be seen, Figure 5 shows a steady pattern of responding while Figure 6 shows periods of almost no responding followed by periods with much higher rates of production.

In order to provide a different visual perspective of a subject's day-to-day variability, Figure 7 shows the frequency graph of the production of

 Insert Figure 7 about here

of the most stable subject (averaged every two sessions) across all phases for all conditions of the experiment. The dotted vertical lines indicate the points at which Baseline II probes were initiated and terminated. The full vertical lines indicate the termination of each phase. The lowest production rate in one session for this subject is six packages and the highest is 26 packages, yielding a range of 20. This subject had a production rate smaller than 10 packages only twice, showing a very stable pattern of responding.

Table 4 shows the mean percentage of accuracy for every condition

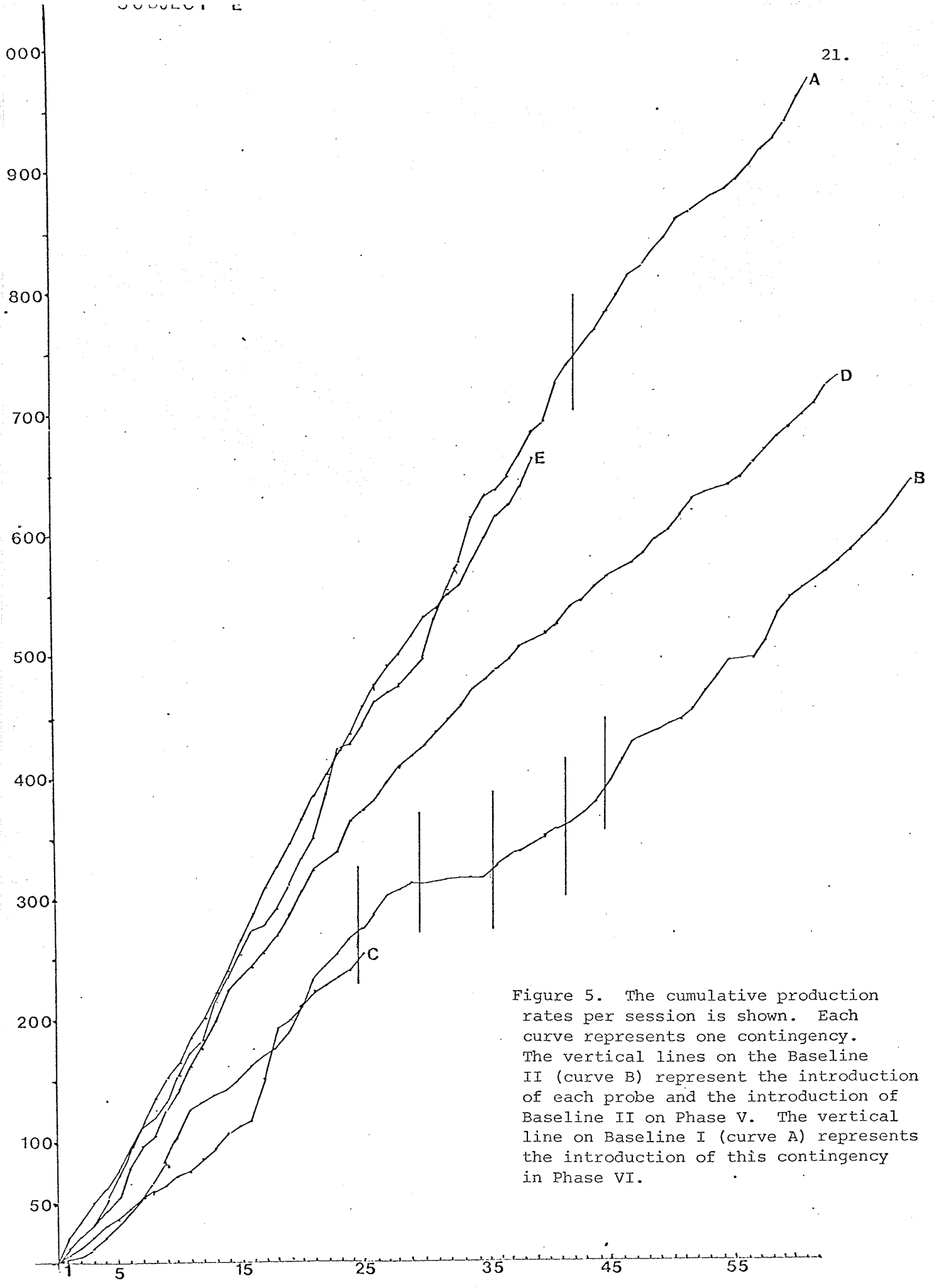


Figure 5. The cumulative production rates per session is shown. Each curve represents one contingency. The vertical lines on the Baseline II (curve B) represent the introduction of each probe and the introduction of Baseline II on Phase V. The vertical line on Baseline I (curve A) represents the introduction of this contingency in Phase VI.

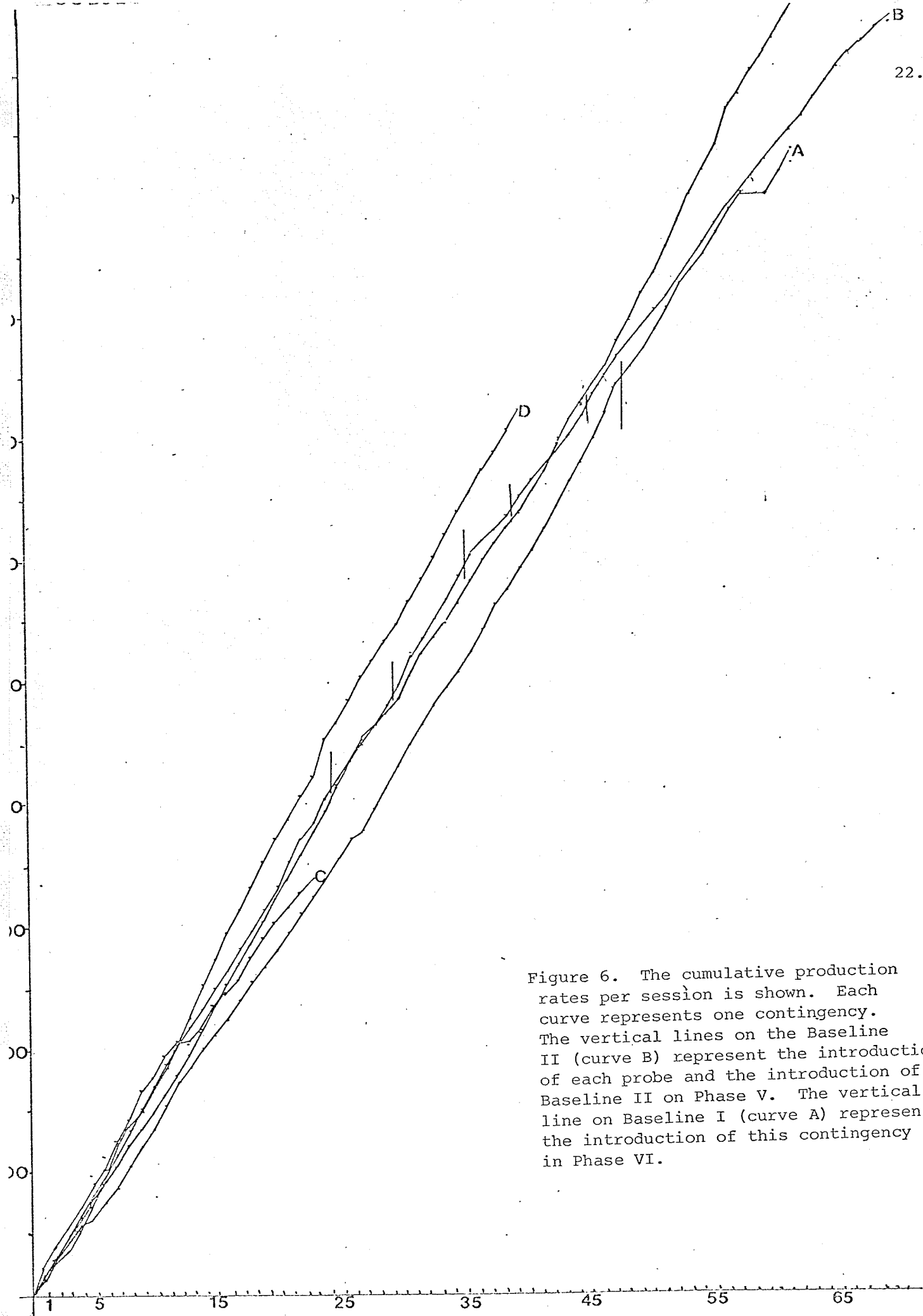
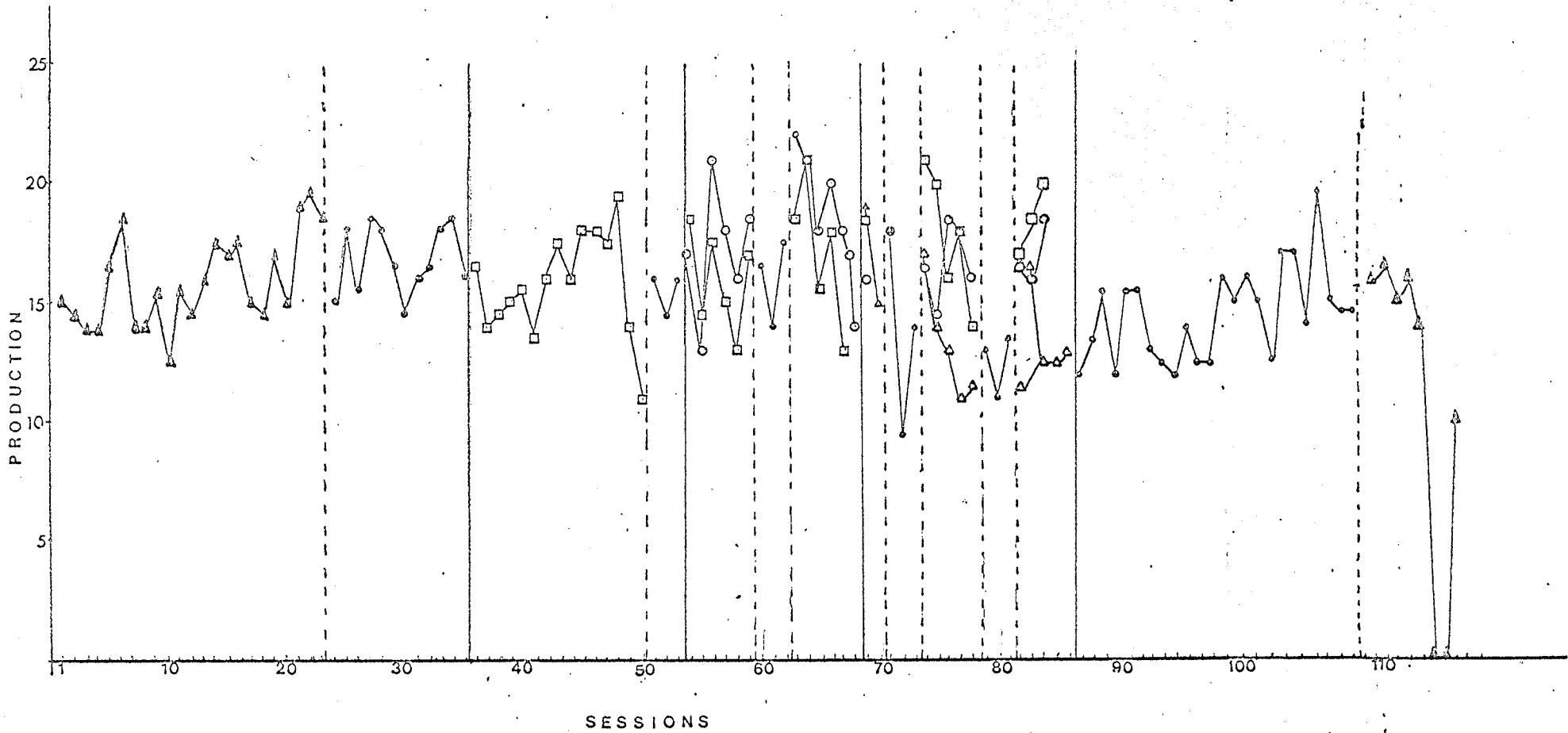


Figure 6. The cumulative production rates per session is shown. Each curve represents one contingency. The vertical lines on the Baseline II (curve B) represent the introduction of each probe and the introduction of Baseline II on Phase V. The vertical line on Baseline I (curve A) represents the introduction of this contingency in Phase VI.

SUBJECT F.



▲ = Baseline I ♦ = Baseline II △ = Feedback Condition ○ = Ratio Condition ◻ = Ratio plus Feedback

Figure 7. The average production of every two sessions is shown. The dotted lines separate the probes from experimental phases and Baseline I from Baseline II. The full lines separate phases.

Insert Table 4 about here

for all subjects. Table 4 suggests that the variables manipulated did not affect accuracy. The error rates are relatively stable within subjects across all different conditions. Both high and low accuracy levels were maintained during this experiment.

In summary, the results showed a consistent but small effect of the ratio reinforcement plus ongoing feedback condition. The ongoing feedback condition alone seemed to be less effective than the ratio reinforcement condition and in four of six cases, no more effective than Baseline II condition. But, subjects that did not show any effect on the ongoing feedback condition (Subjects 1, 4, 5, and 6) showed a larger effect on the ratio reinforcement plus ongoing feedback condition, while the subject that showed some effect on the ongoing-feedback condition (Subject 2) and a larger effect on the ratio reinforcement condition, showed an even larger effect on the ratio reinforcement plus ongoing feedback condition. This data indicates that a fixed ratio of reinforcement schedule combined with a feedback system that may maximize the double function of each response (as a discriminative stimulus and conditioned reinforcer) on the schedule is more effective than each component separately, and should receive additional investigation.

Discussion

The data presented indicates that a combination of an ongoing quantity feedback system and a fixed ratio schedule of reinforcement increases production rates on a packaging task more than either variable alone.

Table 4

Mean percentage of accuracy for every contingency for all subjects.

Subjects	Conditions				
	Baseline I	Baseline II	Feedback	Ratio	Ratio plus Feedback
A	100	97.94	100	100	100
B	99.79	99.60	-	-	100
C	99.80	100	100	100	100
D	53.69	56.00	54.92	55.42	59.08
E	99.59	100	100	100	99.75
F	70.59	67.80	70.28	69.57	73.63
G	100	99.88	-	-	100
H	66.24	68.26	64.41	66.21	61.08



Although the results are small, we can have confidence in them due to the design. The multi-element design and the counterbalancing of the order in which the experimental conditions were introduced show that each condition's production rates were independent of each other, and not dependent on the order in which they were introduced.

The Baseline II probes and the reversal during Phase V show that results can be replicated for short and longer periods of time. The probes give us confidence that the subjects' production rates under the various experimental conditions were indeed in many cases higher than their baseline levels at given times. There were four days of probes during the experiment. Two were on Friday, one on Monday and one on Thursday, thus indicating that the lower rates during the probes are not due to contingencies operating only on certain days of the week such as the approach of the weekend.

The multiple baseline component achieved by maintaining Subjects 7 and 8 on Baseline II condition from Phases I to IV and introducing the ratio reinforcement plus ongoing feedback condition on Phase V showed that Baseline II rates were maintained fairly stable throughout the experiment and that the introduction of one of the experimental conditions after long periods of time still led to results similar to the other six subjects.

There are a few variables that might have been responsible for the effects observed being relatively small, such as: (a) the fact that payment only occurred every one-half hour instead of immediately after completion of each ratio as in typical fixed ratio schedules; (b) the jump from a schedule of reinforcement based on time passing, when the requirement for reinforcement is the emission of only one response, to an FR-10 might be too large for some individuals. Stretching the ratio gradually over a period

of time might lead to higher rates of responding as is suggested by previous research (Ferster & Skinner, 1957; Martin & Pear, 1978).

The data also indicated that increasing production rates of some subjects on an ongoing feedback system paired with a schedule of reinforcement based on time passing is not as efficient as a fixed ratio schedule of reinforcement. The fact that ratio schedules of reinforcement lead to somewhat higher productions of retarded individuals working in sheltered workshops than schedules solely based on time passing confirms previous findings such as those reported by Bellamy et al. (in preparation), and Brown et al. (1974).

The higher production rates achieved on the condition when an ongoing feedback plus fixed ratio reinforcement was operating than on the other experimental conditions also corroborates the hypothesis that a system that maximizes the double function of every response (a discriminative stimulus and a conditioned reinforcer) occurring in a fixed ratio of reinforcement should be more effective in increasing production rates than either component alone.

It is plausible to assume that the ongoing quantity feedback system, when combined with the fixed ratio schedule of reinforcement was maximizing the discriminative stimulus and conditioned reinforcer functions of every response and not functioning in other ways because the same feedback system, when combined with an interval schedule of reinforcement did not have any effect on Subjects 4, 5, and 6 and almost no effect on Subjects 1 and 2, as compared to their Baseline II levels. On the other hand, all five subjects showed production rates well above Baseline II levels during the ongoing feedback plus ratio reinforcement condition.

Subject 2's high production rates during the ongoing quantity feedback condition could be due to peculiar variables such as preference for color.

The overall high production rate during the first introduction of Baseline I as compared to the introduction of Baseline II, the experimental conditions, and the reintroduction of Baseline I might be due to a variety of reasons, such as a change in the physical environment (change of rooms, of peers at the table, and of supervision), the effect of the introduction of instructions and the use of a bell to initiate and terminate sessions. All of these factors possibly influenced the rate of responding on Baseline I. In any event, it seems that a "novelty effect" was responsible for an increase in production rates and this should be investigated further.

The data also showed that during the last phase when Baseline II was reintroduced the mean production rates were smaller, for all subject, than on the first introduction of Baseline II in Phase I. This data seems to corroborate the points stated above.

Error rates were not affected by the manipulation of schedule of reinforcement and/or the ongoing feedback system. This could lead us to conclude that an increase in production rates does not affect error rates but this can only be stated when related to small increases. Larger production rate increases might lead to larger error rates. Manipulation of feedback for errors and success as well as contingencies such as response cost should be investigated in dealing with error rates.

Social reinforcement contingent upon task behavior should be further studied as to whether or not it is an important component in the increase of production rates, i.e., by socially reinforcing on-task behavior, we increase on-task behavior but to what extent this reflects an increase in

the production rates is not known.

It is also important to mention that variables such as modelling (having one or more high performance workers at a table) would probably influence performance, and variables such as instructions and other discriminative stimuli associated with the schedule of reinforcement in effect should also be more closely investigated, because all those variables probably are important components in increasing production rates.

Based on casual observations from this study, some recommendations for studies dealing with production rates in workshops for retarded individuals would be:

(a) Deal with undesirable behaviors that are incompatible with working and if possible do not rely on extinction because the behavior will likely be maintained by peers.

(b) The environment should be engineered in such a way as to make physical contact among the subjects difficult (to avoid aggression) but at the same time not to isolate each subject.

(c) The environment should also be engineered so as to facilitate task completion by having all components necessary to the task near to the subject, and in the subject's view, but at the same time minimizing the chances of the subject engaging in inappropriate behaviors. For instance, the use of dispensers located in front of the subject which would release only one item at a time (napkin, sugar, etc.) might decrease the probability that the subjects would play with the items.

In summary, this study found that a fixed ratio of reinforcement plus an ongoing quantity feedback system seemed to be effective to some extent

in increasing production rates on a packaging task for retarded individuals and that either variable alone is not as effective.

Further research in this area might deal with variables such as immediacy of reinforcement after completion of the ratio, a gradual increase in the required ratio, social reinforcement contingent on on-task behavior, the engineering of the physical environment, and the investigation of variables such as instructions and S^D s that signal the schedule of reinforcement in effect, for all these variables might influence the overall production rates of individuals working in sheltered workshops.

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