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A Comparison of Outcome Reinforcement Contingencies and Process Reinforcement Contingencies Using Concurrent Training with the Severely Mentally Impaired

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A COMPARISON OF OUTCOME REINFORCEMENT CONTINGENCIES
AND PROCESS REINFORCEMENT CONTINGENCIES USING
CONCURRENT TRAINING WITH THE SEVERELY
MENTALLY IMPAIRED

by

Nancy Lonsberry

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
June 1990

A COMPARISON OF OUTCOME REINFORCEMENT CONTINGENCIES
AND PROCESS REINFORCEMENT CONTINGENCIES USING
CONCURRENT TRAINING WITH THE SEVERELY
MENTALLY IMPAIRED

Nancy Lonsberry, M.A.

Western Michigan University, 1990

This study compared the effectiveness of Outcome and Process reinforcement contingencies using concurrent training to teach severely mentally impaired students to perform component tasks. Each student was trained to assemble a four-piece apparatus using either the Outcome contingency or the Process contingency. The Outcome method was defined as a contingency where the final outcome of a component task has been achieved and a reinforcer is delivered contingent upon that outcome. The Process method was defined as a contingency where reinforcement occurs after the performance of each step in the sequence and when the final outcome of the task has been completed. Data were collected on the number of sessions required for skill mastery and the percent of mastered skill maintenance at one- and three-month follow-ups.

Study results indicated no significant differences in training methods for skill acquisition. However, the data indicated that students trained by the Process method retained the skills they had learned more than students trained by the Outcome method.

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Nancy Lonsberry

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INTRODUCTION

There have been many studies conducted to show comparisons of teaching methods for the severely mentally impaired (Hoko & LeBlanc, 1988; Hourcade, 1979; Kayser, Billingsley, & Neel, 1986; McDonnell, 1987; McDonnell & McFarland, 1988; Panyan & Hall, 1978; Spooner, 1980; Zane, Walls, & Thvedt, 1981). Hoko and LeBlanc (1988) examined the use of trial and error conditions and stimulus equalization (error reduction procedure) to teach preschool children simple visual discriminations. Spooner (1980), Kayser et al. (1986) and Zane et al. (1981) compared the effectiveness of backward chaining and total task presentation in training severely mentally impaired individuals to perform tasks that involve the assembly of separate parts. Both the McDonnell and McFarland (1988) study and the Panyan and Hall (1978) study compared the effectiveness of forward chaining and total task presentation to train severely mentally impaired individuals to perform component tasks. Hourcade (1979) examined the difference in effectiveness of modeling, physical guidance, and modeling followed by physical guidance while using total task presentation to teach severely mentally impaired individuals to assemble a three-piece unit.

Most of the above studies focused on the comparison of the two most widely used methods of training for the severely mentally impaired: serial and concurrent training. These methods are used to train tasks with more than one component leading to a desired outcome. Kayser et al. (1986) defined serial training as instruction in which each behavior in a chain must be mastered before moving on to the next, such as backward chaining which begins with the last step of the complex task, or forward chaining which begins with the first step of the complex task. Concurrent training was defined as a total task

approach in which all steps of the task are presented. To illustrate an example of serial (forward chain) training, a can of pop is presented to the subject. The trainer prompts the subject to touch the tab in as many trials as necessary for the subject to master touching the tab when presented with the can of pop. When this step is mastered, the next step of pulling up the tab is presented to the subject. When mastery is reached at this step, bending the tab over is presented to the subject and so on. Using the same example to illustrate concurrent training, a can of pop is presented to the subject. The subject is instructed through the entire sequence of behaviors necessary to open the can. Mastery at each step is not required. The steps in the task sequence are presented to the subject sequentially.

There appears to be an ongoing debate among researchers as to which of these two methods of instruction is the more effective in teaching the severely mentally impaired. Though results have been mixed, a preponderance of recent research evidence supports concurrent training as more timely, less aversive, and more efficient in skill maintenance and generalization (Kayser et al., 1986; McDonnell & McFarland, 1988; Panyan & Hall, 1978; Spooner, 1980).

McDonnell and McFarland (1988) found that concurrent training was not only more efficient than forward chaining (serial) in the number of sessions required to establish mastery of a task which resulted in better maintenance of the task, but that the students who received concurrent training made substantially fewer errors than the students who had received forward chain (serial) training. Four moderately to severely mentally impaired students were taught to use a commercial washing machine and a laundry soap dispenser. The task of using the washing machine consisted of six steps. Use of the laundry soap dispenser also required six steps. An alternating treatment, within subject design was used where each student received forward chain

(serial) training to learn one of the component tasks (using the washing machine or using the soap dispenser) and concurrent training to learn the other task. The number of training trials required to establish reliable performance of these activities with forward chain training was more than double that of the concurrent training. The average number of errors performed during forward chaining was also more than double the average number of errors during concurrent training. Spooner's (1980) findings support this conclusion. In his study, the effectiveness and efficiency of the backward chaining procedure and the total task presentation procedure were compared. Eight severely mentally impaired individuals were taught vocational assembly tasks using one of these two training methods. Skill acquisition was more rapid for subjects who received the concurrent (total task) training method than for subjects who received the serial (backward chain) training method.

Kayser et al. (1986) also found the concurrent method to be superior to the serial method for training moderate to severely mentally retarded children to make a snack independently. This study compared backward chaining and total task presentation training methods in a multiple baseline-crossover design. Eight mentally impaired children were taught to make a simple snack (peanut butter and cracker) under both training conditions for a predetermined number of sessions. The task analysis for snack preparation consisted of 11 components. One-half of the children began training under the backward chaining condition, followed by training under the total task presentation condition. The other half began training under the total task condition, followed by training under the backward chaining condition. The data for this study indicate a substantial difference favoring concurrent (total task) training for three children and differences of lesser magnitude for two other children. No significant difference between

methods was found for three of the children. Of the eight subjects, six made consistently more progress toward independent performance of the experimental task with total task training than with backward chain training. An analysis of training time for each training condition indicated that total instructional time for concurrent training was considerably less than for serial training.

Panyan and Hall (1978) conducted a study comparing forward chaining and concurrent training methods to teach two severely mentally impaired women two component tasks (tracing letters and vocal imitation). Each subject was exposed to the serial and concurrent format twice in an ABAB or BABA sequence. Both tasks, tracing letters and vocally imitating sounds, were presented to each of the women. The results showed that both training methods had similar effects in terms of response acquisition and retention, but concurrent training appeared to promote improved generalization to untrained items.

Zane et al. (1981) compared the use of prompts (given prior to or in conjunction with the subject's response) and feedback (given after the subject has made a response) while training mentally impaired subjects with serial and concurrent methods. Twelve moderately or severely impaired individuals were participants in this study. Four vocational assembly tasks were presented to each subject under four different learning conditions: (1) backward chaining with prompts, (2) backward chaining with feedback, (3) total task presentation with prompts, and (4) total task presentation with feedback. The analysis for each task consisted of nine components. Prompting the subject before the response was made was found to be more effective when using either backward (serial) chaining or total task (concurrent) presentation than delivering feedback after a response is made. The most effective and efficient method of the four utilized in this study was

concurrent training with prompts. This method involved less time to skill acquisition than any of the other three methods used.

McDonnell (1987) supports this finding of the use of instructional assistance (prompts) before responding as a more effective teaching method than instructional assistance (feedback) after responding has occurred. In his study, four severely mentally impaired students were taught to purchase snack items in a convenience store and a fast food restaurant using concurrent training with either a constant time delay or an increasing prompt hierarchy assistance procedure. The increasing prompt hierarchy strategy was designed to provide assistance following a student's incorrect response on an activity step. When an error occurred, the trainer provided increasing levels of assistance to the student using a standardized hierarchy of prompts until he or she performed the activity step correctly. Time delay training consisted of a two-phase, constant time delay procedure. This procedure was applied independently to each step of the chain. It differed from the increasing prompt hierarchy training in that assistance was provided prior to the student's response. Prompts were faded by systematically increasing the temporal delay between the presentation of the stimulus for each step and the presentation of the trainer's prompt(s). Both strategies resulted in independent performance in the convenience store and fast food restaurant. Comparisons of the performance data indicate that students who received time delay training (prompts) in either of the instructional settings averaged fewer training sessions and fewer instructional trials to reach independent performance than students who had received increasing prompt hierarchy training (feedback).

In addition to the use of prompts, reinforcement has also been shown to be an important aspect of the analysis of optimal training methods be they concurrent or serial. For the purposes of the present

study, this researcher is explicitly testing the importance of the way reinforcement is administered relevant to the performance of the task. The two ways which were investigated are defined as an Outcome reinforcement contingency and a Process reinforcement contingency. An Outcome contingency is in effect when the final outcome of a component task has been achieved and a reinforcer is delivered contingent upon that outcome. A Process contingency is in effect when reinforcement occurs after the performance of each step in the sequence and when the final outcome of the task has been completed.

Koop, Martin, Yu, and Suthons (1980) conducted a study comparing two reinforcement strategies using concurrent training for a vocational assembly task with the mentally impaired. One of the reinforcement strategies was referred to as minimal social approval (i.e., "good") after correcting discrimination errors. The trainer avoided eye contact with the subject. Correct responses were met with silence, except for completion of the last step on each trial, which was followed by "good" and an occasional pat on the back. The other reinforcement strategy was referred to as social plus edible reinforcement (extra reinforcement). In this condition, short positive comments were contingent upon the subject's performance of a step at a level that was equal to or better than the best of his/her performance until criterion for that level was reached. In addition, subjects had the opportunity to earn edibles during performance of certain steps in the sequence of the task. The results indicated that the extra reinforcement strategy was the superior method in terms of training time, number of trials, and number of errors.

To exemplify a Process contingency, Azrin, Schaeffer, and Wesolowski (1976) utilized different kinds of items or events which were found to be reinforcing for severely mentally impaired individuals (such as food, praise, attention, walks, etc.) as they were learning

to dress themselves. In this study, concurrent training with what is presently called Process reinforcement contingencies was used. Reinforcement occurred on a near continuous basis while the student was engaging in the behaviors necessary to dress him-/herself. Seven students participated in this study, each of whom was trained to mastery after twenty hours of instruction.

An example of an Outcome contingency is exemplified by Hourcade (1979) who explored the use of concurrent training for teaching severely handicapped individuals a vocational assembly task. The difference in effectiveness of modeling, physical guidance and modeling followed by physical guidance was explored while using concurrent training to teach severely mentally impaired individuals a three-piece assembly task. In contrast to the use of Process reinforcement contingencies by Azrin et al. (1976), this study utilized what is presently being labeled as Outcome reinforcement contingencies where reinforcement is made contingent upon successful completion of the assembly task. The results of the study found no significant difference in effectiveness of the three concurrent training methods.

In reviewing the literature, it becomes apparent that the issues surrounding the effectiveness and the efficiency of the instructional techniques available to teach component tasks continue to be of central consideration for many researchers particularly those who are involved with the instruction of the mentally impaired. The controversy over the use of serial or concurrent training methods, prompts and/or feedback, and Process or Outcome reinforcement contingencies remain central to many empirical studies. The present research continues to explore the use of Outcome contingencies and Process contingencies to teach students component tasks. While working with the severely mentally impaired, it appeared that students receiving Process concurrent training learned the tasks in a more timely manner and that they appeared

to retain these skills more than students receiving Outcome concurrent training. A systematic analysis was needed to determine the difference in effectiveness of the two methods of concurrent training. This study compared the effectiveness of Outcome reinforcement contingencies and Process reinforcement contingencies using concurrent training (total task presentation) with the severely mentally impaired. Based upon preliminary observations by the researcher, it was predicted that concurrent training with Process reinforcement contingencies would be found to be more effective in skill acquisition and in skill maintenance than concurrent training with Outcome reinforcement contingencies. Specifically, it was hypothesized that subjects trained by the Process method would require fewer training sessions to reach skill mastery than those subjects trained by the Outcome method. In addition, it was hypothesized that subjects trained by the Process method would maintain their mastered skills longer than the subjects trained by the Outcome method.

METHOD

Subjects

Two groups of subjects were used, each containing eight students enrolled in an educational program for the severely mentally impaired. Subjects, whose ages ranged from 16 to 26 years, were drawn from a group of students who participated in a sheltered workshop program and who demonstrated the ability to perform fine motor tasks. These students had been previously assessed to function at the severely mentally impaired level. Sixteen students (14 male and 2 female) were selected who met the above criteria and who were randomly assigned to either the Outcome group ($N=8$) or the Process ($N=8$). Informed consent from a parent or guardian was obtained before the students participated in this study (see Appendix A). The Human Subjects Institutional Review Board approved the participation of these subjects in the present study (see Appendix B).

Setting

The study was conducted in the same area in which the subjects worked on a daily basis. All sessions were conducted between 9:00 and 11:30 in the morning to reduce variability in performance. Subjects sat at a table with the assembly materials in front of them.

Materials

The materials used in this study included a table, two chairs, and some pens which had component parts. A pen was chosen as the assembly task for this study because it had not been part of the

subject's vocational training program and therefore was an unfamiliar task requiring new performance skills.

Dependent Variable

The dependent variable in this study was the number of training sessions to gain mastery of the task. Skill mastery is defined as correctly assembling the pen in three consecutive sessions. A session was defined as an initial 5-minute probe followed immediately by a 15-minute instruction period. The independent variable was the specific teaching method used, either Outcome or Process.

Procedure

A pre-test was conducted with each subject to ensure that s/he was unable to assemble the pen. The pre-test consisted of giving each subject the pen components with the instructions to put it together.

A probe was used in which the subject's behavior was sampled during the initial 5 minutes of the session to determine whether mastery had been reached. During each session (probe plus training period), materials needed to assemble a pen were placed on the table in sequence (see Figure 1). The part to be handled first was placed on the subject's left; the next part to be used placed slightly to the right. All of the parts were placed in this left-to-right sequence for both groups of subjects. Sessions were scheduled for each subject three days a week and lasted approximately twenty minutes. For the first 5 minutes, a skill mastery probe was performed. The subjects were allowed to manipulate components of the pen unassisted. If the pen was assembled correctly a pass (+) was scored and no training session occurred that day. If any two parts were assembled incorrectly a fail was scored, the probe session was terminated, and a 15-minute training session began. Training sessions using either the Outcome

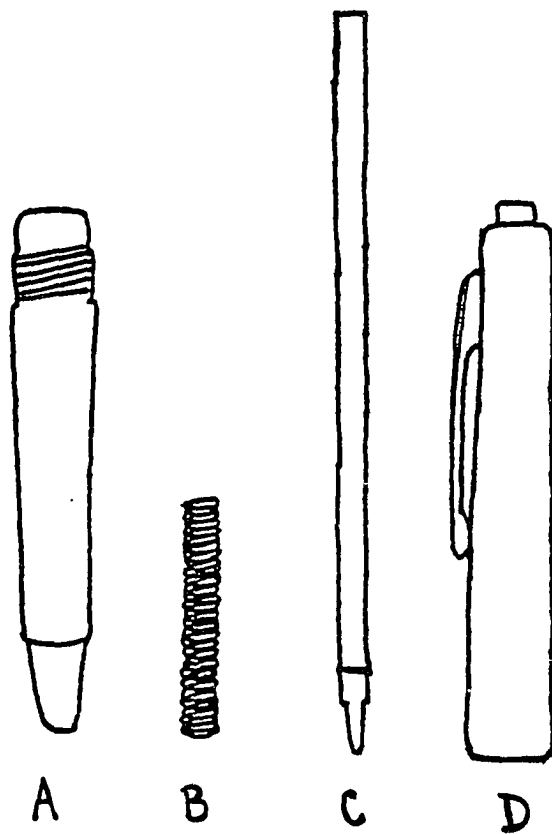


Figure 1. Diagram of Component Parts.

or Process method were conducted concurrently following each probe during which a subject failed to assemble the pen correctly.

Two investigators were used in this study, each investigator employing both instructional methods with four subjects from each group. Each investigator served a dual role of either observer or trainer. While one investigator was serving as a trainer, the other was serving as an observer during the probe. In order to control for investigator variability, a set of guidelines was developed describing the appropriate sequence of behaviors that was to be demonstrated by the subject during the task. Tables 1 and 2 (see Appendices C and D) show the sequence of specific skills required of the subjects and the guidelines followed by the investigator during training under the Outcome or Process method. To increase the standardization of presenting the method to the subjects, the investigators engaged in three rehearsal sessions prior to the onset of training the subjects. Interobserver reliability was obtained by calculating a coefficient of agreement between the two investigators' independent scoring of the correctly assembled pens. For the present study, interobserver reliability was 100%.

Outcome Reinforcement Contingency

When a response was judged to be incorrect by the trainer, the sequence was interrupted and the subject was redirected to the correct step in the sequence. The trainer redirected the subject by tapping the correct part, giving the correct part to the subject, or physically guiding the subject to assemble the parts. If the task was being performed correctly, the subject was allowed to continue uninterrupted. A reinforcer was delivered when the task was completed. Items used for reinforcement included edibles (candy, chips, juice, pop, etc.), baseball cards, stickers, and verbals ("good job," "that's right").

Students were given the opportunity before each session to select reinforcers for which they were going to work.

Process Reinforcement Contingency

The same procedure was followed as in the Outcome group. When a response was judged to be incorrect by the trainer, the sequence was interrupted and the subject was redirected to the correct step in the sequence. If the task was being performed correctly, the subject was allowed to continue uninterrupted. Reinforcers were presented to the subject after each step in the sequence and when the task was completed. A reinforcer was administered by placing it on the table or handing it to the subject when the subject had one hand free. During times when the subject needed both hands to assemble the pen, verbal reinforcers were delivered.

RESULTS

It was hypothesized that subjects in the Process group would require fewer training sessions to achieve mastery than would the subjects in the Outcome group. Figure 2 represents the group percentage for mastery over 17 sessions. The Outcome group gained 100% mastery in 17 sessions with a mean of 9.25 and a standard deviation of 5.60. The Process group gained 100% mastery in 12 sessions with a mean of 8 and a standard deviation of 2.73. A t -test was used to determine statistical significance in a group comparison ($t=0.568$, $df=14$). There was no significant difference in training time between the two groups ($p<0.579$).

It was also hypothesized that subjects in the Process group would maintain their skill mastery longer than the subjects in the Outcome group. One- and three-month follow-ups were conducted to determine whether students were able to retain the skills they had gained. Students were instructed to complete the task (one probe trial) and their performance was recorded as a pass or fail. The passes and fails were coded with a numerical value (pass = 1, fail = 0). For the one-month follow-up, three of the eight subjects (37.5%) of the Outcome group (mean of 0.375, standard deviation of 0.517) and seven of the eight subjects (87.5%) of the Process group (mean of 0.875, standard deviation of 0.345) had retained skills to mastery. A t -test was conducted to compare the two groups after one month ($t=2.256$, $df=14$, $p<0.041$). There was a statistically significant difference in group performance for this period (see Figure 2). After three months, one of the eight subjects (12.5%) of the Outcome group (mean of 0.125, standard deviation of 0.354) and seven of the eight subjects (87.5%) of the Process group (mean of 0.975, standard deviation of 0.354) had

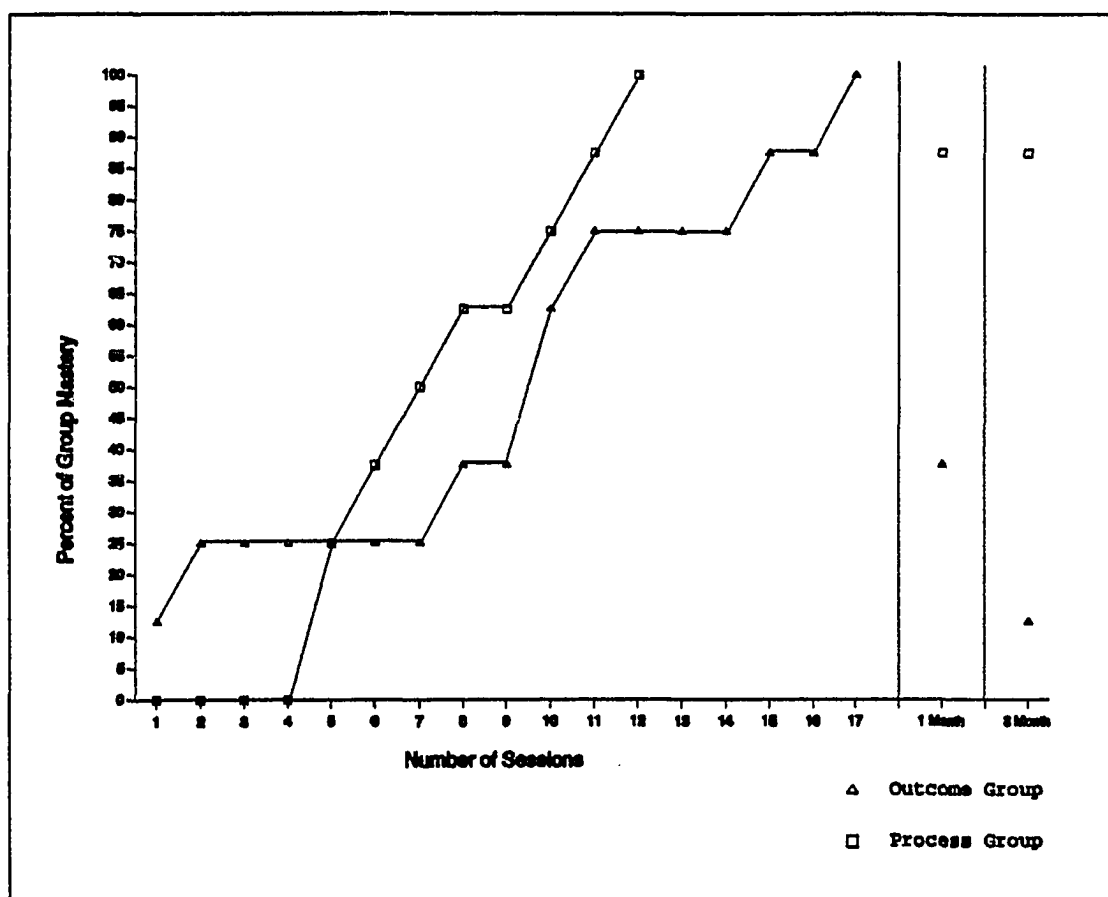


Figure 2. Number of Subjects' Training Sessions to Achieve Mastery Under Outcome and Process Reinforcement Contingencies.

retained skills to mastery. A t -test was conducted to compare the two groups after three months ($t=4.243$, $df=14$, $p<0.001$). There was a statistically significant difference in group performance during this period (refer to Figure 2).

DISCUSSION

This study was conducted to compare the effectiveness of two training methods. It was hypothesized that subjects trained by the Process method would require fewer training sessions to achieve skill mastery than subjects trained by the Outcome method. The data for the two training groups show that the Process group reached 100% mastery in 12 sessions with a mean of 8 sessions and the Outcome group reached 100% mastery in 17 sessions with a mean of 9.25 sessions. This difference was not significant. Subjects were unable to achieve mastery using either of the two training methods within a comparable period of time.

The results from the Koop et al. (1980) study indicated that the extra reinforcement strategy was the superior method in terms of training time, number of trials, and number of errors. The present study was similar to the Koop et al. (1980) study in terms of one method having limited reinforcement available to the subject and the other method having reinforcement after every step in the task sequence. The results of the present study do not support the findings of Koop et al. In this study, it was found that both reinforcement strategies were sufficient to teach subjects a skill to mastery and there was no significant difference in training times for either group.

Similarities of the Outcome and Process methods may have contributed to their absence of significant difference. Each method consisted of the presentation of a task with several component steps. These steps were presented to the subjects sequentially. During task training, each group was exposed to antecedent prompts and post-response feedback. Reinforcers were delivered after the final component of the task was performed for each group.

The use of antecedent prompts has also been found to be an effective training method. Bennett, Gast, Wolery, and Schuster (1986), Day (1987), McDonnell (1987), and Zane et al. (1981) studied the effectiveness of the use of antecedent prompting to facilitate learning for the mentally impaired. These studies found antecedent prompting to be more effective for training tasks with the mentally impaired than delivering feedback after the incorrect response had occurred. Both Day (1987) and McDonnell (1987) found that the use of feedback after the occurrence of an incorrect response improved the subject's performance as opposed to training without prompts or feedback.

The use of prompts and feedback for both the Process and the Outcome method may have contributed to each method's success in training the subjects to assemble the pen by facilitating stimulus control through guidance. This idea is supported by Zane et al. (1981) whose study examined the effectiveness of prompts and feedback during instruction of a component task. The use of reinforcement after the completion of the task also may have contributed to each method's success by reinforcing the subject's behavior leading to the final step in the sequence.

It was hypothesized that subjects in the Process group would maintain their skills longer than subjects in the Outcome group. The follow-up results indicate a significant difference in performance between groups. Subjects who were trained by the Process method maintained their skills to mastery longer than those subjects trained by the Outcome method. After one month, seven out of eight subjects in the Process group and three out of eight subjects in the Outcome group demonstrated skill mastery. After three months, seven out of eight subjects in the Process group and one out of eight subjects in the Outcome group demonstrated skill mastery.

Differences between the two methods may have contributed to the difference in follow-up results. The presentation of reinforcement differed between groups. In the Outcome group, a reinforcer was delivered immediately following the completion of the task. No reinforcers were administered during the performance of steps in the task sequence. In the Process group, reinforcers were delivered immediately following the completion of the task, but they were also delivered immediately following each step in the task sequence.

Martin and Pear (1983) refer to a stimulus-response chain as a sequence of discriminative stimuli and responses in which each response except the last produces a discriminative stimulus. A common definition for the discriminative stimulus is a stimulus condition in the presence of which a response is reinforced and in the absence of which it is not (Michael, 1980; 1987). Michael (1987) suggests that one response may produce the discriminative stimulus for the next response which may in turn produce the discriminative stimulus for still another response, and so on until the final response in the chain is followed immediately by some form of unconditioned or conditioned reinforcement.

The sequence of responses required by the subject to assemble the pen is a stimulus-response chain. The completion of each step in the sequence served as a discriminative stimulus which set the occasion for the next response. When subjects in the Outcome group performed a step incorrectly, they were redirected to the correct step in the sequence. This feedback was used to help subjects to discriminate the correct response. When subjects in the Outcome group performed a step correctly, they were able to continue uninterrupted. When subjects in the Process group performed a step incorrectly, they were redirected to the correct step in the sequence. As with the Outcome group, this feedback was used to help subjects to discriminate the correct response. When subjects in the Process group performed the steps

correctly, a reinforcer was delivered immediately after each step. Each discriminative stimulus following a successfully completed step was paired with a reinforcer. In the Outcome group, the uninterrupted assembly when the task was being performed correctly may have had a reinforcing effect to strengthen the stimulus-response chain, but no primary reinforcers were used at this time.

According to Fantino and Logan (1979), the more similar the discriminative stimulus is to the reinforcer at the end of the chain, the more potent it will be in maintaining behavior. The events which occurred during task performance for the Outcome group were feedback, prompts and uninterrupted assembly. Though the discriminative stimuli for these events may have had some reinforcing value, they did not closely resemble the reinforcer delivered at the end of the chain (pop, candy, etc.). The events which occurred during task performance for the Process group were feedback, prompts, and the deliver of a reinforcer at the completion of each step. The reinforcer which was delivered at the end of each step was of the same type of reinforcer delivered at the end of the chain (pop, candy, etc.). The difference in the presentation of reinforcers conceivably created a similarity between the reinforcers and the discriminative stimuli which may explain the Process group's superior maintenance of performance skills. This finding supports Fantino and Logan's (1979) explanation of the value of discriminative stimuli in maintaining behavior.

Not only does the stimulus change produced by a response in a chain become the discriminative stimulus for the next response, it also functions as conditioned reinforcement for the response which produced it (Michael, 1987). Bersh (1951) studied the conditioned reinforcing strength of a stimulus as a function of the number of pairings of that stimulus with primary reinforcement. His results showed that the greater the number of pairings, the more potent the conditioned

reinforcer. In the Outcome group, one reinforcer was presented after the last step in the task sequence was completed. In the Process group, a total of thirteen reinforcers were presented during task performance and task completion. The greater number of stimulus-reinforcer pairings may have given the conditioned reinforcers (discriminative stimuli) in the task sequence for Process subjects more reinforcing value than those in the Outcome group.

It appears that Process and Outcome training are equally effective methods of instruction for the severely mentally impaired in terms of the number of training sessions needed to gain performance mastery according to the findings of this study. The Process method appears to be more effective than the Outcome method in terms of skill maintenance.

Appendix A
Informed Consent Form

Informed Consent for Participation in an Investigation

My name is Nancy Lonsberry. I am conducting a thesis research study to fulfill a requirement for my masters degree in Clinical Psychology from Western Michigan University. I am an instructional aide at Croyden Avenue School and I have worked with (subject's name) in the workshop.

(subject's name) has been selected to participate in this research study. I am investigating the effectiveness of two teaching methods. I am hoping to find an efficient and effective way of training students who are mentally impaired.

(subject's name) will be assigned to one of two groups. Each group will be instructed by one of two teaching methods to learn a vocational assembly task. Since (subject's name) works in the work activity center at school, the work required in this study will be familiar to him/her.

Each subject will be instructed to perform some simple assembly skills to put together a ball-point pen. Data will be taken on the number of sessions which are required before the subject is able to assemble the pen correctly. This study will be conducted three days a week at Croyden Avenue School. Participation in this study will not affect (subject's name)'s educational program. He/she will still receive the same instruction during the school day as described in his/her individual educational program.

This research is of minimal risk to (subject's name). The work required for this study is similar to tasks required in his/her vocational sessions in the workshop. If (subject's name) shows any sign of discomfort or does not wish to participate in the research study at any time during the investigation, he/she may discontinue participation without any negative impact on his/her educational program at Croyden Avenue School.

Any information obtained through this investigation will be considered confidential. The data from this experiment will be used for scientific presentations and publications, but at no time will (subject's name) be identified as a subject participating in this study.

Participation in this study is voluntary. Although I strongly recommend (subject's name)'s participation to be committed to the entire study for maximum accuracy in determining the effectiveness of a teaching method, participation may be discontinued at any time without consequence.

Questions or complaints regarding this research or (subject's name)'s rights may be directed to Nancy Lonsberry at 668-2744 or 381-0845.

YOUR SIGNATURE BELOW INDICATES THAT YOU UNDERSTAND THE ABOVE INFORMATION AND GIVE YOUR PERMISSION FOR (subject's name) TO PARTICIPATE. A copy of this form will be given to you.

Parent/Guardian Signature

Date

Signature of Investigator

Signature of Witness

Appendix B

**Human Subjects Institutional Review Board
Research Approval**

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

Date: November 6, 1989

To: Nancy Lonsberry

From: Mary Anne Bunda, Chair *Mary Anne Bunda*

This letter will serve as confirmation that your research protocol, "A Comparison Study of Outcome-oriented and Process-oriented Concurrent Training with the Severely Mentally Impaired", has been approved with an amended Consent Form as expedited by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application. You must seek reapproval for any change in this design.

The Board wishes you success in the pursuit of your research goals.

xc: C. Koronakos, Psychology

HSIRB Project Number 89-10-15

Appendix C

Table 1. A Description of the Sequence of Specific Skills
Required of the Subject and Guidelines Followed by the
Investigators During Training Under the Outcome Method

Table 1

A Description of the Sequence of Specific Skills Required of the
Subject and Guidelines Followed by the Investigators During
Training Under the Outcome Method

Outcome (Reinforcement After Completion)

1. Pick up A.
2. Pick up B.
3. Put B into A's larger hole.
4. Pick up C.
5. Insert ballpoint end of C into A's larger hole.
6. Pick up D.
7. Put D on C.
8. Screw D on A while pushing them together.
9. Give reinforcer when product is finished correctly.

Outcome Rules

1. Tell the student to "put it together."
 2. Students are to assemble uninterrupted unless an error is made.
 3. When an error is made, the student is interrupted and re-directed to the correct work piece.
 4. When the pen is completed, give reinforcer.
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Appendix D

Table 2. A Description of the Sequence of Specific Skills
Required of the Subject and Guidelines Followed by the
Investigators During Training Under the Process Method

Table 2

A Description of the Sequence of Specific Skills Required of the Subject and Guidelines Followed by the Investigator During Training Under the Process Method

Process (Reinforcement After Each Step)

1. Pick up A at midpoint.
2. Touch larger hole opening.
3. Pick up B.
4. Insert B into larger hole of A.
5. Touch larger hole opening.
6. Pick up C at midpoint.
7. Tap ballpoint on table.
8. Insert ballpoint part of C into opening.
9. Pick up D at midpoint.
10. Put D on C.
11. Push D on A.
12. Twist D while pushing on A.
13. Screw D on A until completely assembled.

Process Rules

1. Tell the student to "put it together."
 2. After each step the student completes correctly, give reinforcer.
 3. If an error is made, the student is interrupted and re-directed to the correct step. When this step is completed, give reinforcer.
 4. When the pen is completed, give reinforcer.
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