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A Comparison of Time Delay and Decreasing  
Prompt Hierarchy Strategies on the Acquisition  
of Microwave Cooking Skills

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## Abstract

Six students evidencing moderate to severe handicaps were taught to prepare cheese fondue and biscuits in a microwave oven via either a constant time delay or decreasing prompt hierarchy assistance program. An alternating treatment design was used to explore the efficacy of treatments. Results revealed minimal differences between the two treatment strategies in terms of trials and sessions to criterion. All students were able to generalize the skills learned to a home kitchen environment.

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Persons manifesting severe disabilities frequently require additional clues when initially learning to perform tasks. These stimuli, which are provided in addition to naturally recurring stimuli, may be auditory, visual, physical or temporal in nature and are referred to as primes or prompts. Their purpose is to increase the likelihood that persons receiving instruction will manifest appropriate responses. Frequently, prompts are arranged in a hierarchy and delivered in ways that provide more aid, increasing assistance to the student, or less aid, decreasing assistance to the student. Less frequently, prompts have been combined in an hierarchy and delivered following a specific period of time if no response or an inappropriate response has occurred. This procedure is termed time delay and time delays may be progressive or constant in nature. The literature is replete with examples of how these prompting strategies have been employed in teaching persons with severe disabilities a

multitude of skills (Wolery, Ault, Doyle, & Gast, 1986). However, research systematically comparing the effectiveness of various prompting strategies is lacking.

Gentry, Day, and Nakao (1980) compared an increasing to a decreasing hierarchy of prompts in teaching four clients evidencing severe retardation to perform two-choice color discriminations. They noted that the decreasing assistance approach resulted in a lower error rate and higher correct response rate than the increasing assistance approach. Csapo (1981) attempted to replicate and extend the findings of the Gentry et al. study; however, his primary concern was in building fluency. Csapo's (1981) data revealed that the decreasing assistance approach resulted in low error rates and a fairly uniform increase in correct rates. However, the increasing assistance approach resulted initially in decreases in correct rates and more errors, but as training progressed the response rates rapidly increased. Renzaglia and Snell (1981) compared the effectiveness of a time delay as opposed to an increasing assistance procedure in teaching manual signs to individuals manifesting severe handicaps and found

the approaches were equally efficacious. In contrast to this finding, Bennett, Gast, Wolery, and Schuster (1986) found that students evidencing severe handicaps learned manual signs in fewer sessions, fewer minutes, and with fewer errors when taught using a time delay as opposed to an increasing assistance format. Likewise, Godby, Gast, and Wolery (1982) employed the same design and measures as Bennett et al. and also concluded that time delay was the more effective procedure. Schoen (1985) found that a graduated guidance procedure and decreasing assistance approach were equally effective in teaching students with moderate handicaps to wash their hands and drink from a fountain. Ault (1985) noted that three moderately retarded 8-11 year olds learned to read community signs equally well whether taught via a progressive or constant time delay procedures. Gast, Ault, Wolery, Doyle, and Belanger (1988) and McDonnell (1987) noted that a constant time delay procedure was more effective than an increasing prompt strategy in teaching reading food words and snack purchasing skills, respectively. Day's (1987) data revealed that adolescents exhibiting profound retardation made greater gains on training tasks when an antecedent prompting as

opposed to a consequent prompting procedure was employed. Miller and Test (1989) reported that a constant time delay procedure as opposed to a most-to-least strategy was more efficient in terms of instructional time and number of instructional errors in teaching students laundry skills.

In summary, it appears that time delay procedures as opposed to increasing assistance procedures; and decreasing assistance procedures as contrasted to increasing assistance procedures result in more rapid rates of task acquisition and lower rates of errors. Further, analysis of these studies indicates that: (a) discrete behaviors rather than chained behaviors were more frequently targeted for instruction, (b) the majority of clients receiving instruction were upper elementary and secondary students, and (c) few researchers have compared a time delay procedure to a most to least or decreasing prompt hierarchy. The purpose of this study was to compare how effectively young children evidencing moderate/severe retardation learn to perform daily living skills when instructed via a time delay procedure versus a most-to-least procedure. The dependent measures examined included: (a) trials

and errors to criterion and (b) the number of sessions/days to criterion.

### Methodology

#### Subjects

The subjects in this study were four males and two females ranging in age from 9 to 12 years. Examination of the school records revealed the range of IQ for the subjects to be 27 to 47. The males were classified as moderately mentally retarded and the females were classified as severely mentally retarded. The students were ambulatory and had mastered basic self-help skills. One student was non-verbal, one displayed autistic like behavior, and one frequently refused to comply with directions. The subjects lived in rural areas and resided at home with their parents.

They received their education in a self-contained classroom on a regular elementary school campus. None of the subjects had received prior training on the tasks targeted for instruction. In addition, parents gave their consent for training and agreed not to conduct microwave training in their homes until the study was completed.

### Materials and Activities

Task analyses were developed in order to teach the students to prepare microwaved cheese fondue and biscuits. Each task was composed of twenty-four steps and the tasks were judged by the teacher and experimenters to have equal degrees of difficulty. The steps were selected after observing several individuals prepare the aforementioned items in the microwave.

Materials included a microwave oven (Panasonic Model 1130) and various cooking paraphernalia.

### Settings and Trainers

The settings for the study were the kitchen area of a classroom and the teacher's home kitchen. Six undergraduate students majoring in special education, who had received two hours of training in data collection and instruction procedures, served as trainers.

### Measurement

In order to evaluate the effectiveness of the constant time delay and decreasing assistance procedures, several measures were obtained. They were: (a) the number of task steps completed independently by the students during probe sessions, (b) the number and



type of errors during probe sessions, and (c) the number of trials, errors and sessions to criterion.

### Procedures

Design. A multi-element, alternating within subject design (Tawney & Gast, 1984) was employed to examine the effects of the two prompting procedures. The children were trained daily on each of two tasks judged to be similar in difficulty by the researcher. The order of training was varied randomly and the assignment of training procedure to task was counterbalanced across children.

Generalization Probes. Prior to assigning the students to the treatment conditions a probe of the students' performance was conducted at the home site. A trainer escorted each student to the home kitchen site and assessed each student via the multiple opportunity probe method (Snell, 1983). The trainer said, "Let's make cheese fondue or a biscuit." If the student made no response in 5 seconds, the trainer scored step 1 on the task analysis as minus, prepared the student to perform the next step, asked the student, "What's next?", and waited 5 seconds for a response. If an inappropriate response or no response occurred, the

trainer then completed the step for the child and proceeded in this fashion until the child had an opportunity to perform each step.

Once the student had mastered the necessary skills, a follow-up probe was conducted. Baseline measures of each student's performance were obtained at the school classroom kitchen in the same manner as described above.

Training. Training was conducted using total task chaining and if a student failed to correctly perform within 5 seconds a step or steps he/she had previously mastered, even after being prompted, this lack of response was viewed as an error. The trainer then told the student, "No, that's not how you \_\_\_\_\_," physically guided the student through the incorrect step or steps, and ignored the student for 10 seconds. If the student, during each of 3 consecutive trials failed to correctly perform a previously mastered step, training was reinstated for that step. The trainer then began instruction on the next step and subsequent steps to be acquired in the chain according to the method detailed below for each of the treatment conditions. The student received verbal praise for both correct unprompted and prompted performance of steps being

trained and, of course, when finished consumed his/her creation. Training was conducted for 20 minutes per day Monday through Friday. Students' performances were probed every other day in the manner previously described.

Constant Time Delay. In order to fade prompts in this condition a constant time delay procedure was employed. During the first 3 training trials on each step to be learned, the student was asked to perform the skill. Immediately following the request, the student was given a verbal prompt or a model plus verbal prompt or a physical plus verbal prompt using only as much physical guidance as was necessary. During subsequent training on each step to be mastered, the trainer simply said, "Let's cook," waited five seconds and provided an individualized prompt if the student had not responded. The prompts selected were based upon previous observations of the students responses to prompting by the teachers.

Decreasing Assistance. The trainer initially paired full physical assistance with a verbal direction. Once the student performed a step correctly three times in succession the trainer provided only partial physical

assistance. After three correct responses, a demonstration of the step was provided by the instructor; next, a verbal direction was presented, and finally, the student was simply asked, "Show me how you \_\_\_\_\_." If the student failed to perform a step correctly after receiving six partial prompts, demonstrations, specific verbal requests, or general requests, the trainer reinstated training at the preceding level of prompting.

#### Reliability and Fidelity of Training

Interobserver agreement was obtained during 50% of the probe sessions for both the number of steps completed correctly by a student and the type of student errors. Mean interobserver agreement for (a) correctly completed steps was 93% (range 85% - 100%) and (b) topography of errors was 90% (range 78% - 100%).

Training fidelity data was collected during 33% of the training sessions. The chief researcher simply reviewed the steps and prompts each child was to receive on any given day and noted actions taken by the trainers and children. The fidelity of training for (a) the time delay procedures ranged from 83 to 100% (mean = 92%) and

(b) the decreasing assistance procedures ranged from 87 to 100% (mean = 94%).

### Results

An examination of Figure 1 reveals that all students learned to perform each microwave task at about the same rate and in approximately an equal amount of time regardless of the prompting strategy used.

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Insert Figure 1 about here

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An analysis of student error patterns indicates no major differences in the topography of errors made under either prompting condition or training task (see Table 1). Setting the times and forgetting to obtain a needed item proved to be the hardest tasks for the children to master. Other tasks for which the error rates were high included using too little of an ingredient and failing to blend the ingredient adequately. The most frequent type of error was no response.

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Insert Table 1 about here

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Table 2 presents the average number of trials, errors, and sessions to criterion. Here again, the data reveal that the prompting procedures resulted in about the same rate of learning. The error rate was fairly high for the decreasing assistance cheese fondue condition, however, closer inspection of the data indicates many of these errors can be attributed to one student who displayed several behavioral problems during early training sessions.

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Insert Table 2 about here

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Examination of the time-delayed trained students' ability to perform the tasks in a home kitchen after training revealed retention rates of 93% for biscuits and 95% for cheese fondue. Examination of the decreasing assistance trained students revealed 92% and 96% retention rates.

#### Discussion

The results clearly demonstrate that both the time delay and decreasing assistance strategies are equally effective in teaching students microwave cooking skills. This finding supports McDonnell's (1987) notion that the

point of application of the prompt in the instructional sequence is a key variable impacting on effectiveness. In each of the prompting procedures the prompts are delivered antecedent to the response. Therefore, it seems logical that both types of procedures would result in similar types of outcomes.

In addition, the findings indicate that the dimensions upon which assistances are faded seem to have little influence on rate of skill acquisition. It appears time delay employing a time dimension for fading and decreasing assistance using the dimension of assistance type for fading had similar effects on rates of acquisition.

Inspection of the children's errors indicated a fairly high error rate with most errors consisting of no self-initiated responses. It appeared in each condition that the students were simply waiting for help. A portion of these errors could have been due to the way in which they were previously trained, daily variations in the training environment (different trainers, utensils located in different places, etc.), or the length of the task and the complex nature of certain task steps.

Future researchers should consider comparing an increasing assistance, decreasing assistance and time delay procedure in order to arrive at more definitive conclusions regarding the type and placement of prompts. In addition, these studies should employ tasks that require a chain of behaviors for proper execution.

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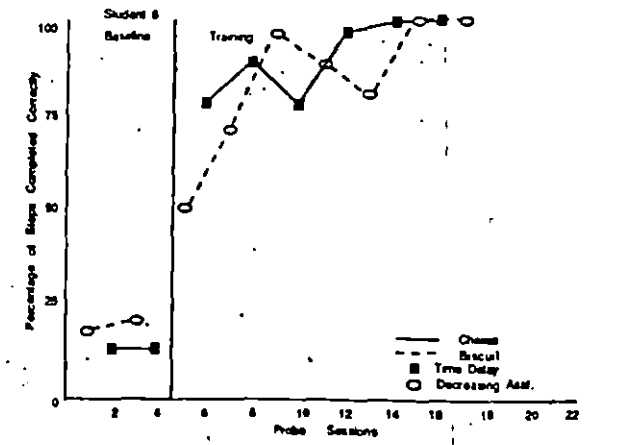
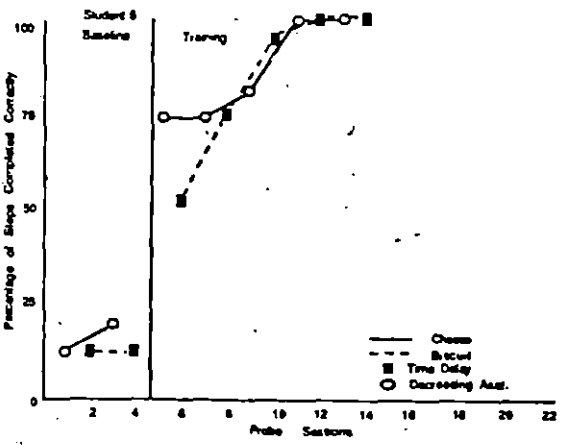
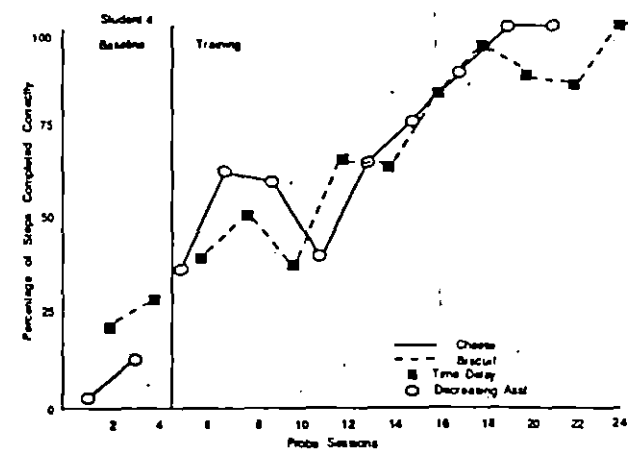
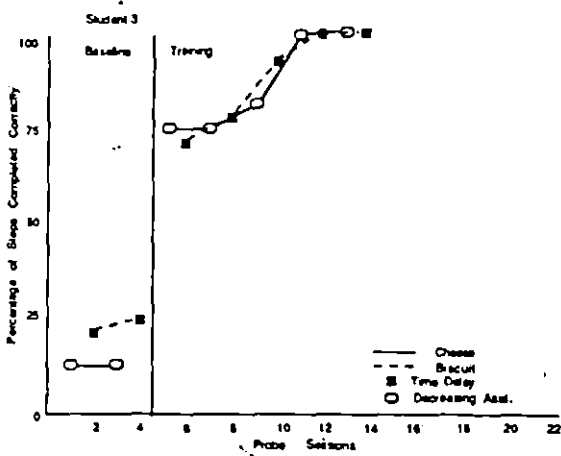
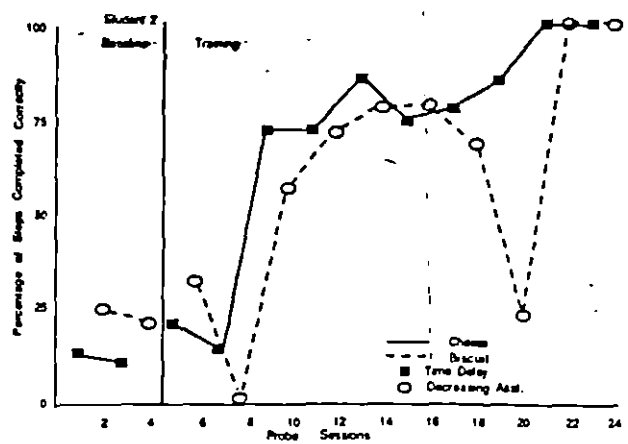
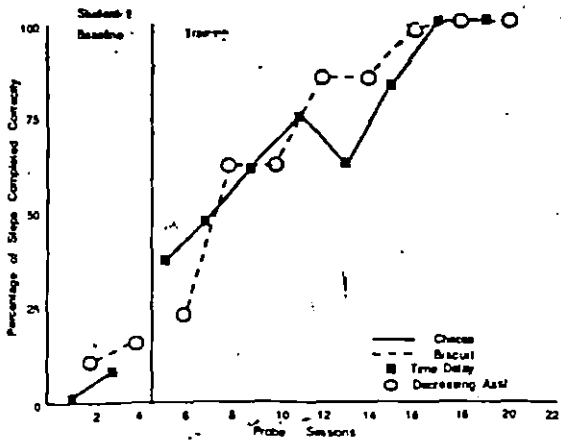


Figure 1. Correct Responding During Probe Sessions

Table 1

## Number and Types of Errors for Tasks and Conditions

ERROR	DECREASING ASSISTANCE		CONSTANT TIME DELAY	
	Cheese	Biscuit	Cheese	Biscuit
NR-No Response	102	145	95	57
1. Gathers wrong material	12	4	9	5
2. Forgets to obtain a needed item	20	29	21	20
3. Gets too many items	2	0	0	0
4. Takes items to wrong site	0	0	1	0
5. Pours ingredients on counter (not into bowl)	0	3	0	0
6. Uses too much of an ingredient	0	18	1	0
7. Uses too little of an ingredient	5	15	9	12
8. Fails to blend adequately	7	15	1	8
9. Obtains more than 1 paper holder/cup	0	2	0	2
10. Pours mix in area other than cup	0	5	0	0
11. Fails to place item on turntable	0	0	2	3
12. Sets dial to defrost	5	3	7	3
13. Turns dial back and forth	5	5	7	3
14. Sets dial to wrong time	31	15	39	13
15. Fails to measure out ingredients (e.g. dumps entire bag/box mix into bowl)	0	3	0	1
16. Tries to pour/empty ingredients without opening first	0	0	0	0
17. Other _____ (write in)	5	2	8	2

Table 2

Average Number of Training Trials, Errors and Sessions to Criterion

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Intervention	<u>Biscuits</u>			<u>Cheese Fondue</u>		
	<u>Trials</u>	<u>Errors</u>	<u>Sessions</u>	<u>Trials</u>	<u>Errors</u>	<u>Sessions</u>
Time Delay	16.7	90.3	15.3	14.6	74.7	14.0
Decreasing	15.3	78.3	14.3	17.6	120.6	16.3

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