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Effectiveness and Efficiency of Constant-Time Delay and Most-to-least Prompt Procedures in Teaching Daily Living Skills to Children with Intellectual Disabilities

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Abstract

This study is aimed at comparing the effectiveness and efficiency of constant-time delay and most-to-least prompt procedures in teaching daily living skills to children with mental retardation. Adapted alternating treatment design was used. The outcome shows that both procedures were equally effective in teaching the daily living skills. However, the most-to-least prompt procedure is more efficient than a constant-time delay procedure in terms of total training time, number of trials and training errors. Both strategies are found to have similar effectiveness in maintenance and generalization for daily living skills.

Key Words

Constant-time Delay, Most-to-least Prompts, Skill Training, Daily Living Skills, Mental Retardation.

When preparing a curriculum for children with intellectual disabilities, teachers must consider the applied method in terms of being both effective and efficient (Miller & Test, 1989; Snell, 1982). Efficiency in teaching can be defined both as an effective conclusion of teaching by a teaching method and as providing a skill without losing time, making errors and struggling less than with any other curriculum (Tekin-İftar & Kırcaali-İftar, 2004). Therefore, if the effectiveness of prompt procedures used in teaching differs with regard to the teaching period required for gaining skills, then the number of teaching sessions, the number of errors made by the student, and the preserving and generalization of the skills gained is very important. Since the information on one procedure is more effective and efficient than another one, this allows for the possibility to achieve more tasks in less time for people working with children with intellectual disabilities (Hughes & Frederick, 2006; Snell, 1982; Zhang, Cote, Chen, & Liu, 2004). Thus, valuable teaching time is used more effectively.

Response prompts, as a response to a certain stimulus, are ways of behavior offered by the teacher to their students for providing the correct response (Özyürek, 1996; Wolery, Ault, & Doyle, 1992). The different response prompts used in teaching settings are physical help prompt, verbal prompt, sign prompt and modeling (Özyürek, 1996; Varol, 1996).

In teaching to use the constant-time delay, after giving the task direction of the skill, the constant-time delay is allowed to pass before the prompt is offered, with the aim that the student achieves the skill independently. The prompt procedure of time delay consists of two stages: (*1*) teaching procedure of zero second delay and (*2*) teaching procedure of 4–5 seconds delay. As the prompts given to the student to achieve the skill stages are removed in terms

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of time, no change is made in the form or amount of the prompt for removing the prompt. For example, there is no alternating from the physical help prompt to the verbal help prompt. Throughout the teaching sessions, teaching is done with the prompt determined for the student before teaching, and this procedure is carried on until the student achieves the skill stages independently within the limits of determined time without needing the prompt (Ault, Wolery, Doyle, & Gast, 1989; Gast, Ault, Wolery, Doyle, & Belanger, 1988; Schuster, Gast, Wolery, & Guiltinan, 1988; Schuster, Morse, Ault, Doyle, Crawford, & Wolery, 1988; Snell & Gast, 1981; Tekin-İftar & Kırcaali-İftar, 2004; Varol, 2005; Wolery, Holcombe, Cybriwsky, Doyle, Schuster, & Ault, 1992).

Teaching by most-to-least prompts, is designed as decreasing the prompt to its ultimate removal after beginning to teach with offering the prompt that gets the individual reacting correctly. Most-to-least prompts in teaching made by most-to-least prompts can be achieved in three ways: (*a*) merely exchanging the kind; (*b*) merely exchanging the amount; (*c*) exchanging each two of the prompts that will get the student to react correctly. By removing the prompt in terms of kind, the amount or both, the purpose is allowing the student to achieve independence (Ault et al., 1989; Cooper, Heron & Heward, 1987; McDonnell & Ferguson, 1989; Schuster & Morse et al.,1988; Tekin-İftar & Kırcaali-İftar, 2004; Varol, 1996, Varol, 2005; Wolery, Holcombe et al., 1992).

McDonnell and Ferguson (1989), in teaching the skills to use an ATM and cash a cheque, have compared the effectiveness and efficiency of constant-time delay and most-to-least prompts. As a result of this comparison, it has been found out that most-to-least prompts are more efficient than constant-time delay, in terms of the amount of the teaching procedure used for gaining skills, the percentage of errors made and the teaching time required.

Miller and Test (1989), in teaching the skill to do the laundry, have compared the efficiency and effectiveness of constant-time delay and most-to-least prompts. As a result of this comparison, it has been found that, since the sessions' number was less than the other and the subject made less errors during the teaching time, constant-time delay is more efficient than most-to-least prompts.

Aykut (2007), in teaching the daily living skills, has compared the effectiveness and efficiency of constant-time delay and most-to-least prompts. As a result of this comparison it has been found that both procedures were equally effective in teaching daily living skills. In the acquisition of sewing skill the most-to-least prompt procedure was more efficient than the constant-time delay procedure in terms of training errors through criterion and training time through criterion. In the acquisition of cooking ready-made soup, the constant-time delay procedure was more efficient in terms of total training time through criterion and number of trials through criterion, although there was no significant difference between the two procedures in terms of training errors through criterion. In this research, Aykut did not make a probe during the first three most-to-least training trials and made one at the beginning of the fourth trial, then carried on teaching. At the end of this research, teaching by most-to-least prompts, he suggested that the research should be repeated by making a probe at the beginning of each trial.

From the research literature that compares constant-time delay with most-to-least prompts, we get an impression that these research results are not consistent with one another. Therefore, we get an impression that we need more research to identify whether the effectiveness of these two prompt procedures used in skills training differ from one another and which one is more efficient. Also the course of "social adaptation skills" of the program for children with moderate disabilities emphasized that daily living skills are crucial to be gained by the children (Milli Eğitim Bakanlığı [MEB], 2001).

Purpose

The study is aimed to answer the following questions: (*a*) are constant time delay and the most-to-least prompting procedures effective in teaching daily living skills (sewing skill and cooking ready-made soup) (*b*) which procedure is more efficient in terms of instructional trials, instructional time and number of instructional errors through criteria (*c*) will both procedures result in the maintenance and generalization of acquired skills?

Method

Design

Cooking ready-made soup and sewing skill of the subjects are dependent variable of the study. Most-to-least prompt procedure and constant-time delay procedure are the independent variables of the study. The design of the study is the adapted alternating treatment model of single subject ex-

perimental designs. Alternating treatment model is used to compare the effect of two or three method on the same dependent variable (Tekin, 2000).

Subjects

Four students from TSK. Gülsav Special Education Primary School and Rehabilitation Center Primary School are the subjects of the study. Teacher interviews and skill control list are confirmed to students. Four students were later determined and two of these four students were chosen as main subjects and other two students as substitute.

Settings

The study was conducted in a room determined by the institution. During the training, the trainer and the subject sat side by side, turning their backs to the wall, so that the trainer was to the side of the subject while he did his work. The kitchen of the institution was used for cooking skill. During the training, the trainer and the subject are side by side so that the trainer is situated where the subject's work is to be done.

Trainer

The study is conducted by the researcher.

Materials

In the stages of collecting data concerning the baseline, instruction, and maintenance, a piece of white thin linen cloth of fifteen was given with one corner already plied, a needle sharper than a coarse muslin and a black thread which is drawn into this needle about 17 cm as double plied was used. At the level of generalization, a different color and size of materials were used. During teaching the cooking ready-made soup, a blue, medium sized teflon saucepan with two handles, a glass, a wooden spoon and some cream of mushroom soup were used. At the level of generalization, another kind of ready-made soup and a saucepan of a different colour and size were used.

Task Analysis

Task analyses have been made for both the skills to cook ready-made soup and sewing skill. Each of two task analyses consisted of 12 skill steps.

Experiment

Experimental procedure in the study consists of baseline session, generalization baseline session, the sessions of independence after instruction, probe of independence after instruction, maintenance, and generalization sessions.

In the study, instructional materials of skill were developed according to constant-time delay and most-to-least prompts applied for the subjects to gain sewing skills and the ability to cook ready-made soup in the instructional sessions.

The instructional sessions took place over two days in which an instructional session of 30 minutes was made each day that consisted of two instructional trials for each skill with the two subjects. Between two instructional sessions there was a break of ten minutes. In each of the instructional sessions, firstly the subjects were taken from the classroom to the study place and at the end were taken back to the classroom back again. In the study, instruction of the skills for sewing started for the first subject by constant-time delay and for the second, by most-to-least prompts. On the same day, the skill to cook ready-made soup was taught to the first subject by most-to-least prompts and for the second subject by constant-time delay. Finally, on the same day, both skills were taught to each subject changing a skill by using one method and then the other within one session. The choice of which subject, which skill and which method should be used was determined by the method of equal probability.

Baseline

The baseline data were collected in three different sessions on three different days for each subject. One more session was performed on the fourth day, thus baseline data were collected for generalizing. Each session started by taking the subjects out of the classroom and in the end each subject was taken back to the classroom back again.

Training Sessions

A most-to-least prompting strategy and time delay training were the two interventions used with each student. Each intervention was counterbalanced across students. Students received two instructional trials on each of the task analyses during each session. The appropriate prompt model was determined as being the model and this prompt was used with the verbal prompt.

Constant-time Delay

Before the teaching began, the necessary materials were provided so that they were to hand for the students. The trainer provided the same materials for herself, too. The trainer introduced the materials to the student by showing them, named the study, and explained the rules, pointing out the reward the student would be given. Then the student was asked to show the materials one by one. After the materials were introduced, the teacher asked the student, 'Are you ready?' and a verbal expression or gesture was required as an answer, to be given by the student. If he said he was ready, or nodded, the instructional procedure started by saying 'Well done. Very good, Then let's begin to study.'

0 Second Delay: In 0 second delay after the trainer gave the task direction of the skill to the student, she presented the prompt to demonstrate each of stage of that skill. There were three kinds of student responses during the instructional procedure: correct response after the prompt; incorrect response after the prompt; and no response. The trainer reinforced verbally all the correct responses after the prompt by using the constant reinforcement schedule. When the student gave an incorrect response after the prompt, the trainer brought the student back to his earlier position at the skill stage at once and said 'Stop, wait, and follow me,' and after that she demonstrated again. She reinforced verbally immediately when the student responded correctly. When the student waited without doing anything after the prompt was presented, the trainer ignored the fact that the student did not respond and demonstrated again. She reinforced verbally immediately when the student responded correctly.

In 0 second delay, the constantly reinforcement schedule was used to reinforce the student's behavior of working well. In addition, at the end of each instructional trial the student was reinforced by a consolidating material that was seen to be effective earlier (playing with a remote control car, watching himself on the camera and listening to a Walkman). While the student engaged in a favorite activity, the trainer arranged the setting for the next instructional trial.

Until the student completed the skill stage when the prompt to demonstrate was given once for each stage in the task analyses, 0 second delay instructional sessions were continued.

4 Seconds Time Delay Procedure: When it was continued with the 4 second time delay procedure instructional sessions, the trainer gave the task direction of the skill and then waited for the student to react while counting '1001, 1002, 1003, 1004' without talking. In a 4 second time delay procedure, five kinds of responses were realized: correct response within 4 seconds; incorrect response within 4 seconds; no response within 4 seconds; incorrect response after 4 seconds following the prompt and no response after 4 seconds following the prompt. When the student responded correctly within 4 seconds, the trainer gave immediate verbal reinforcement to the student. When the student gave the incorrect response within 4 seconds, the trainer said, 'stop, you must wait,' and brought him into his earlier position of the skill stage and waited for the 4 seconds to pass, then presented the prompt to demonstrate the same skill stage.

When the student did not respond within 4 seconds, the trainer presented the prompt to model for the same skill stage once the 4 second finished. When the student responded incorrectly or did not respond after the prompt was given again, the trainer presented the prompt to demonstrate the same skill stage one more time.

In 4 seconds time delay instructional trials, the differential reinforcement procedure was used for the student to respond correctly. That is to say, the correct responses given by the student before the prompt were given reinforcement, whereas the incorrect ones given after the prompt was given were not reinforced. In addition, at the end of each instructional trial the students were reinforced by a consolidating material that was seen to be effective earlier (playing with a remote control car, watching himself on the camera and listening to a Walkman). While the student engaged in a favorite activity for some time, the trainer would prepare the setting for a second instructional trial.

Most-to-Least Prompting Strategy

Before the instruction began, the necessary materials were placed so that they were to hand for the students. The trainer put the same materials in front of him. The trainer introduced the materials by showing them to the student, named the study, and explained the rules by pointing out a consolidating material of the activity previously determined as effective for the student. After that, the student was asked to show the materials before him one by one. After the introduction of the materials had finished, the trainer said to the student, 'If you are ready, let's start to study. Are you ready?' The student was required to answer verbally or by gesture and imitation. When the student

said he was ready or nodded, the instructional procedure began by saying to the student, 'Well done. Very good. Then let's start studying.'

The instructional session in which most-to-least prompt were used began by presenting the instructional trial, which was the first stage of the prompt to demonstrate and explain of all the skill stages. If the student completed the skill stages with the given prompt correctly, in the next instructional trial the prompt that was removed from the next stage was presented. By reducing the demonstrated act in three stages (in the first stage, explaining all of the skill stages and telling him what to do; in the second stage, explaining half the skill stage and telling him what to do; and in the third stage, explaining the skill stages and initiating the act, but not doing the next step and telling him what to do.), the student was assisted to do the skill stage with verbal prompts. After the student was able to do the skill stage with verbal prompts, the verbal prompts were reduced, by allowing the verbal expression to be replaced by the action of the skill stage in the second stage, and by allowing the verbal expression to be replaced by the action in the third stage. Before each instructional trial in which most-to-least prompts were used, the task direction of the skill was given to the subjects, and by giving occasion to the subjects to react to the skill stages before the prompt was presented the probe was made. When the student realized the skill stage independently after the task direction was given, he was reinforced verbally; when not, instruction was carried on with the prompt presented during the relevant stage.

In the instruction session in which most-to-least prompts were used five kinds of student response were realized: correct response before the prompt; correct response after the prompt; incorrect response before the prompt; incorrect response after the prompt; and no response. During the sessions, a constant reinforcement schedule was applied. The trainer reinforced verbally all the correct responses before and after the prompt. When the student tended to react incorrectly after the prompt, the trainer brought him to his earlier position of the skill stage immediately and told him, 'Stop. Wait, and follow me,' and then gave him the same prompt again. When the student responded correctly, she reinforced him verbally straightaway. When the student stood still without doing anything after the prompt was presented, she ignored the fact that the student did not react and gave him the same prompt again. When the student responded correctly, she reinforced him verbally once again.

In addition, at the end of each procedure the student was reinforced with a consolidating material or activity (playing with a remote control car, watching himself on the camera, and listening to a Walkman) which was seen to be effective earlier. While he engaged in his favorite activity, the trainer prepared the setting again for the second trial.

Maintanence Session

Maintenance sessions were conducted 1, 2 and 4 weeks after the end of the intervention. These sessions were conducted just like the baseline sessions. The reinforcement was delivered only on the correct completion of the task. No instruction procedure was used during the maintenance session.

Generalization Sessions

Generalization sessions were made to evaluate the subjects in terms of effectiveness to generalize the skills of swimming cloth and cooking ready-made soup gained with different materials and people. These sessions were also conducted just like the baseline sessions. The reinforcement was delivered only after the correct completion of the task. No instruction procedure was used during maintenance sessions.

Reliability

Inter-observer agreement and procedural reliability data were gathered during at least 20% of each experimental session for each participant by an independent observer. Inter-observer agreement was used across all subjects during probes (baseline, maintenance, independent trials and generalization sessions were 100%). Also inter-observer agreement during instruction was 100 %. Procedural reliability was 100 %. The teacher showed 100 % compliance with the steps of each experimental session across 2 students.

Social Validation

Social validity form was applied to the classroom teacher to evaluate the functionality of the target skills and effectiveness of teaching methods. Classroom teachers expressed positive opinions about the questions in the form.

Results

Two of the subjects, at the end of the instruction for each procedure, managed to achieve both daily living skills at a level of 100%. As a result, we got the impression that the instruction by both procedures was efficient enough for the first subject to gain daily living skills. It was seen that the subjects retained the daily living skills gained by constant-time delay and the most-to-least prompts (sewing, heating ready-made soup) at a level of 100% for 1, 2, and 4 weeks and generalized the daily living skills.

The collated efficiency data were examined to see whether one procedure differed from another in terms of efficiency (*a*) instructional trials to criterion; (*b*) instructional time to criterion; (*c*) number of instructional errors to criterion. The subjects managed to achieve both skills in 3 instructional trials by constant-time delay, at the end of a teaching time of 29 minutes in total and with only one error made by the second subject, whereas they managed to achieve two instructional trials by most-to-least prompts, at the end of a teaching time of 28 minutes in total with 0 error. Although we got the impression that there was no difference in efficiency between these procedures, it was seen that in providing daily living skills to the subjects, most-to-least prompts were more efficient than constant time delay, in terms of instructional time to criterion, number of instructional errors to criterion and number of instructional trial until the criterion was met.

Discussion

At the end of the study, we got the impression that instruction made by each procedure did not produce any difference in terms of effectiveness in providing daily living skills (sewing skills and cooking ready-made soup) for the students.

Although we had the impression that both procedures did not differ from one another in terms of efficiency, we saw that in providing daily living skills for the student most-to-least prompts were more efficient than constant-time delay, with regard to instructional trials employed until the objective was met, the number of errors made until the objective was met and the instructional time until the objective was met.

Also constant-time delay and most-to-least prompts did not differ from one another when it was observed the retention of daily living skills gained (sewing skills and cooking ready-made soup) after 1, 2 and 4 weeks, and constant-time delay and most-to-least prompts did not differ from one another in term of the generalizing of the daily living skills gained (sewing skills and heating ready-made soup) for different settings, material and people.

Also, the results of this study are very similar to earlier studies using the most-to-least procedure and constant-time delay procedure (Atmaca, 1996; Batu, Ergenekon, Erbaş, & Akmanoğlu, 2004; Birkan, Yılmaz, Konukman, & Erkan, 2005; Bozkurt, 2002; Chandler, Schuster, & Stevens, 1993; Colozzi & Pollow, 1984; Cuvo, Jacobi, & Sipko, 1981; Cuvo, Leaf, & Borakove, 1978; Demir, 1996; Diler, 2000; Çuhadar, 2002; Griffen, Wolery, & Schuster, 1992; Özen, 1995; Schuster & Griffen, 1991; Schuster, Morse et al., 1988; Snell, 1982; Tekin-İftar et al., 2001; Wheeler, Ford, Nietupski, Loomis, & Brown 1980; Wolery, Holcombe et al., 1992; Zhang et al., 2004).

When we consider the data of efficiency; Miller and Test (1989) in teaching the skill to laundry and to dry by washing machine for 4 students with mental retardation; McDonnell and Ferguson (1989) in teaching the skill to use ATM and to cash a check for 4 students with mental retardation; Aykut (2007) in teaching the skills sewing skill and cooking ready-made soup have compared the effectiveness of constant-time delay and most to least prompt in concluding the three studies we observe that both most to least prompts and constant-time delay are effective for the students to gain the aimed skills.

McDonnell and Ferguson (1989) concluded that in teaching how to use ATM and cash a cheque to 4 students with mental retardation most-to-least prompts were more efficient than constant-time delay in terms of less instructional time, fewer instructional sessions, and lower percentage of student errors.

Miller and Test (1989) concluded that in teaching laundry skills to 4 students with mental retardation constant-time delay was more efficient than most-to-least prompts, in terms of less instructional time, fewer instructional sessions, and lower percentage of student errors.

Aykut (2007) concluded that in teaching daily living skills constant-time delay was more efficient than most-to least prompts with regard to the amount of instructional trials required until the objective was reached, its total instructional time until the objective was met, and most-to-least prompts were more efficient than constant-time delay in the amount of errors made until the objective was met.

Considering the data of efficiency of these studies, McDonnell and Ferguson (1989) concluded that most-to-least prompt were more efficient than constant time delay (in terms of the number of sessions,

mistakes and instructional time) whereas Miller and Test (1989) concluded that constant-time delay was more efficient than most-to-least prompts (in terms of the number of sessions, errors and instructional time). Aykut (2007) concluded that constant-time delay was more efficient than most-to-least promp in terms of the amount of instructional trials needed until the objective was met and the total instructional time required until the objective was met. Most-to-least prompts were more efficient than constant-time delay in terms of the amount of errors made until the objective was met. Finally, this study completed by Aykut paralleled that of McDonnell and Ferguson (1989). Although there were no differences in the conclusion of the studies in terms of effectiveness to provide all the aimed skills in each procedure, we get the impression that these two procedures were not consistent with each other in terms of efficiency, the number of trials, errors and instructional time. We think that the chosen prompt or procedure was not the cause of this. The cause might be a difference in the earlier psychomotor experiences of the subjects or a difference of experiences in their mental abilities. In this study, the second subject achieved the sewing skill by needing more instructional time and procedures than the first subject and made errors by means of constant-time delay. Moreover, the cause may be a difference in the earlier psycho-motor experience of the student or a difference in the level of mental ability.

Finally, we might suggest to the teachers and people who work in this field that they apply these two prompt procedures together when teaching chained tasks, because the two procedures do not differ from one another in terms of effectiveness and efficiency, and also do not have any difference in terms of retention and generalization of the skill gained.

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