

USING A CONSTANT DELAY TO TEACH LEISURE SKILLS TO CHILDREN WITH DEVELOPMENTAL DISABILITIES¹

*USANDO UNA DEMORA DE TIEMPO CONSTANTE PARA
ENSEÑAR HABILIDADES DE PASATIEMPO A NIÑOS CON
RETARDO EN EL DESARROLLO*

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ABSTRACT

The effectiveness of 4-s constant delay procedure to teach leisure skills to seven children with developmental disabilities was examined with a multiple probe design across behaviors and replicated across subjects. Results showed that the procedure was effective on teaching all children with developmental disabilities to perform leisure skills. Furthermore, these skills were maintained with at least 90% of accuracy over a four-week period. The generalized effects of the procedure were also positive. Training generalized from the trainer to another teacher with at least 77% of accuracy.

Keywords: Leisure skills; constant delay; developmental disabilities.

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RESUMEN

Con un diseño de Línea Base múltiple de conductas y replicaciones a través de sujetos, se examinó la efectividad de un procedimiento con 4 segundos de demora constante para enseñar habilidades de pasatiempo a niños con retardo en el desarrollo. Los resultados mostraron que el procedimiento fue efectivo; en un periodo de cuatro semanas las habilidades de pasatiempo se mantuvieron al menos en el 90% de eficacia. Los efectos generalizados también fueron positivos, mostrando un 77% de eficacia en la generalización del entrenador al maestro.

Palabras clave: Habilidades de pasatiempo, demora constante, retardo en el desarrollo.

Leisure skills can be defined as personally chosen self-entertaining and interactional skills an individual performs at his/her personal free time (Bigge, 1991; Heyne and Schleien, 1994; Turnbull, Turnbull III, Shank, and Leal, 1995). Usually, an individual engages in leisure activities to free himself/herself from the routines of work, school, or home. Leisure activities are expected to enhance emotional, social, intellectual, and physical wellbeing of individuals from all ages (Heward, 1996; Heyne and Schleien, 1994).

When individuals with developmental disabilities are considered, the benefits of learning appropriate leisure skills are numerous. Major benefits are cited in the literature as follows: (a) enhancement of social interaction and community involvement, (b) acquisition of new motor skills, (c) increase in physical healthiness and wellbeing, (d) enhancement of educational outcomes (e.g., communication skills; problem solving skills, etc.) included in IEPs, (e) increase in adaptive behaviors and decrease in maladaptive behaviors (e.g., body-rocking, hand-flapping, etc.), especially during inappropriately occupied spare time. As a result of these positive influences, the quality of life of individuals with developmental disabilities as well as significant people around them increases (Heward, 1996; Heyne and Schleien, 1994; O'Shea, O'Shea, Algozzine, and Hammitte, 2001; Schleien, Meyer, Heyne, and Brandt, 1995; Wehman and Scheien, 1981). However, research indicates that many individuals with disabilities spend their spare time passively by engaging in activities such as watching TV, listening to music, etc. (Beirne-Smith, Ittenbach, and Patton, 1998; Kregel, Wehman, Seyfarth, and Marshall, 1986).

Individuals with normal development usually learn leisure skills by rather natural procedures such as observation and trial-and-error. Unlike normally developing individuals, individuals with developmental disabilities can only learn these leisure skills when these skills are taught to them

very systematically (Heyne and Schleien, 1994; Heward, 1996). The first step in the teaching process is to decide on what to teach. The teacher should work with the student to find leisure skills that are age-appropriate and suitable for the student's abilities and interests (Heyne and Schleien, 1994). The next step is to find an effective and efficient procedure for teaching leisure skills.

There are several studies that have shown the possibility of teaching leisure skills to individuals with developmental disabilities. Schleien, Kieran, and Wehman (1981) taught playing dart; Hill, Wehman, and Horst (1982) taught playing pinball; Horst, Wehman, Hill, and Bailey (1981) taught playing frisbee, operating cassette tape recorder, and playing bowling; Halle, Gabler-Halle, and Bemben (1989) taught aerobic skills; Cameron and Capello (1993) taught hurdle; Stainback, Stainback, Wehman, and Spangiers (1983) taught specific sport skills to individuals with developmental disabilities.

Constant time delay procedure, an errorless teaching procedure in which the stimulus control is transferred from a given stimulus condition (teacher assistance) to other stimulus conditions (target stimulus), is a promising alternative for instructing individuals with developmental disabilities. In constant time delay procedure, the instructor presents a target stimulus; waits the specified fixed amount of delay interval; and presents the controlling prompt. This prompt is then

faded by systematically inserting a fixed amount of time between presenting the target stimulus and providing controlling prompt that will ensure the student does the task correctly (Wolery, Ault, & Doyle, 1992, p. 48).

Research has shown that constant time delay is an effective instructional procedure in teaching students with various disabilities such as autism (Ault, Wolery, Gast, Doyle, & Eizanstant, 1988), moderate and severe mental retardation (Browder, Morris, & Snell, 1981; Wall & Gast, 1997; McIlvane, Withstandley, & Stoddard, 1984), multiple disabilities (Kleinert & Gast, 1982; Wolery, et al., 1992), learning disabilities (Mattingly & Bott, 1990; Stevens & Schuster, 1987), and developmental disabilities (Schoen & Sivil, 1989). This procedure is also effective when teaching students with a wide range of ages from infancy to adulthood (Kleinert & Gast, 1982; Schoen & Sivil, 1989). Furthermore, it is possible to utilize this procedure for teaching discrete behaviors (Alig-Cybrivsky & Schuster, 1990; Gast, Doyle, Wolery, Ault & Baklarz., 1991; Mattingly & Bott, 1990; McIlvane et al., 1984; Schuster et al., 1990; Stevens & Schuster, 1987; Tekin & Kyrcaali-Iftar, in press) as well as chained behaviors (Browder, Snell, & Wildonger, 1988; Chandler, Schuster, & Stevens, 1993; Hughes,

Schuster, & Nelson, 1993; Wall & Gast, 1997; McDonnell, 1987; Schuster, Gast, Wolery, & Guiltinan, 1988).

In two studies, constant time delay procedure was utilized to teach leisure skills to individuals with developmental disabilities. In one study (Zhang, Gast, Horvat, and Dattilo, 1995), lifetime sport skills were taught to adolescents with severe to profound intellectual disabilities. In another study (Wall and Gast, 1997), playing UNO, croquet, and horseshoes were taught to adolescents or young adults with moderate to severe intellectual disabilities. Acquisition and maintenance data of both studies revealed that constant time delay procedure was very effective for teaching leisure skills to subjects with developmental disabilities.

The purpose of the present study was to investigate the effectiveness of constant time delay procedure on teaching leisure skills (i.e., playing golf, hot shot basketball, pin knocking, pool, frisbee) to children with developmental disabilities. Also, the maintenance and generalization effects of the procedure were assessed in the study.

METHOD

Participants and Settings

Students

Seven children with developmental disabilities (one female and six males) served as subjects in this study. The ages of the children varied from 6 to 13 years when this study was initiated. None of these subjects were under physical medication and had a history with constant time delay.

Onur was a 7 years and 5 months old male with autism. He was a mainstreamed student at first grade at a public school. He was having individualized special education support service for three years. He knew reading and writing and some of the simple functional academic skills such as addition, subtraction and reading the clock. He had difficulty with initiating and maintaining social interactions.

Yesim was a 13 years and 10 months old female with developmental disabilities. She was a mainstreamed student at fifth grade at a public school. She never had special education services. She knew reading and writing and some functional academic skills.

Metin was a 6 years old male with down syndrome. He had receptive and expressive language skills. He has been attending at a university unit. He received simple instructions such as "take", "bring", and etc.

Fatih was a 9 years and 3 months old male with down syndrome. He was having 1:1 and group support services form a university unit. He had

some color and shape concepts. He had difficulty with following instructions and showed inappropriate behaviors such as crying and screaming during instruction.

Erdem was a 9 years and 3 months old male with down syndrome. He had group support services for 5 years from the same university unit as Fatih did. He was a mainstreamed student at third grade at a public school. He knew reading and writing and some of the functional academic skills. He had articulation problems.

Tarkan was a 7 years old male with down syndrome. He was attending the same university unit as Fatih and Erdem did plus a private special school half a day during weekdays. He had color and shape concepts. His major weakness was in verbal communication. Whenever he had difficulty with verbal communication he used symbolic communication.

Ahmet was a 10 years and 11 months old male with developmental disabilities. He was attending the same university unit for 3 years. He also had low vision. He was able to follow colorful and bigger objects with his eyes. He had difficulty with verbal communication. He used one word sentences to explain his needs. He needed physical prompting to exhibit some of the self-care skills such as dressing, grooming, and fine motor skills.

The researcher could not reach any test scores indicating the adaptive behavior functioning levels of the subjects.

The prerequisite skills which students needed for this study were as follows: (a) ability to pay attention to audio and visual stimuli for at least 5 minutes, (b) ability to motorically imitate each step of the task analyses, (c) following verbal instructions such as answering questions, asking questions, (d) agreeing to participate in a systematic teaching process, and (e) the ability to attend a task for up to 15 min. All students had the prerequisite skills for this study.

Trainers

Four trainers all of whom were special educators implemented this study. The first author designed the study, second author took place a role for developing task analyses for the leisure skills, and rest of them implemented the procedure to teach the leisure skills. The first two authors have Ph.D. in special education and the rest of the authors were enrolled in a graduate program in special education while this study was in progress. The trainers did not have any history about delivering systematic instruction with constant time delay.

Settings

All probe, instructional, maintenance and generalization sessions occurred in the university unit consisting of two rooms (8 m X 8 m). Hot shot basketball and pin knocking were taught in one room and the rest of the leisure skills were taught in another room. The first room had seven rectangular tables (120 cm X 40 cm) and chairs. There was a blackboard, a teacher desk, an overhead projector, and a bookcase in this room. Moreover, a portable basket was placed in the room. The other room had a small kitchenette, two cupboards, one wardrobe, three tables for kindergartners and chairs, and two tables and chairs for older kids and adults. Moreover, a blackboard, a tool set, a kitchen set, and an ironing set were available for the kids in this room. Every single session took approximately 30 min. during instruction. No other persons were available during the study hours in these rooms. All sessions occurred in 1:1 instructional format.

Materials

A pinball set, a basketball set, a pool set, a golf set, a frisbee set, and a dart set were used in this study. There were two sets of materials for teaching playing pool, one set for the subject and one set for the trainer. During the teaching of other leisure skills, one set was shared by the trainers and subjects. A handycam camera, data collection forms, and reinforcers were also available during the study.

Task Analyses

The task analyses were developed by all authors by either performing the tasks by themselves or by observing the children with normal development performing the skills. Then, all of the authors got together and reviewed the task analyses by performing these skills. Some modifications and revisions were done. These task analyses can be described as follows:

Playing pool

1. Puts the triangle on the midpoint of the table.
 2. Puts the balls other than the white ball in the triangle.
 3. Puts the white ball on the white point.
 4. Gets behind the white ball.
 5. Gets the pool stick.
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6. Puts his/her hand on the pool, while his/her fingers touching the pool.
7. Holds the pool stick from the thicker part while his/her thumb is on the pool stick.
8. Puts his/her four fingers together and separates his/her thumb with an angle of 45°.
9. Throws the ball which is out of the triangle towards the other balls.
10. Gets behind a ball.
11. Puts his/her hand behind the ball and puts his/her fingers altogether on the pool.
12. Holds the pool stick from the thicker part while his/her thumb is on the pool stick.
13. Puts his/her four fingers together and separates his/her thumb with an angle of 45°.
14. Throws the ball through the pool stick in order to hit another ball.

Pin knocking

1. Gets the first pin.
2. Places the first pin on the line.
3. Gets the second pin.
4. Places the second pin on the line.
5. Gets the third pin.
6. Places the third pin on the line.
7. Gets the fourth pin.
8. Places the fourth pin on the line.
9. Gets the fifth pin.
10. Places the fifth pin on the line.
11. Gets the sixth pin.
12. Places the sixth pin on the line.
13. Gets the ball.
14. Stands at the line by placing one food ahead of the other food.
15. Bends forward.
16. Throws the ball towards the pins.

Playing hotshot basketball

1. Bends and holds the ball with two hands on each side of the ball.
2. Lifts the ball towards his/her belly.
3. Stands at the line while facing the basket.
4. Lifts the ball towards his/her chest.
5. Lifts the ball above his/her head.

6. Looks towards the basket while holding the ball.
7. Throws the ball into the basket.
8. Gets the ball off the floor.
9. Goes to the line.

Playing golf

1. Puts the ball on the start line.
2. Gets the putter.
3. Stands at a distance one foot away from the line.
4. Holds the putter.
5. Walks towards the start line.
6. Bends until the putter touches the floor.
7. Hits the ball softly with the putter.
8. If the ball stays in the circle, puts the ball in the hole with a maximum of three shots.
9. Puts the flag in the flag hole if the ball gets into the hole.
10. If the ball does not get into the hole, gets back to the start line with the ball.
11. Puts the ball into the hole with a maximum of three shots.

Playing dart

1. Gets the dart from the teacher.
2. Goes to the line.
3. Puts his/her dominant foot one step ahead.
4. Holds the dart with his/her dominant hand.
5. Lifts the dart towards the ear level.
6. Aims the target.
7. Throws the dart.

Playing frisbee

1. Holds the frisbee.
2. Goes to the start line.
3. Twists his/her arm at the elbows.
4. Twists his/her wrist towards his/her body.
5. Throws the frisbee by looking at the target person or floor.
6. Gets the frisbee off the floor.

Experimental Design

A multiple probe design across three leisure skills and replicated across seven subjects was used to assess the effectiveness of the 4-s constant time delay procedure in teaching the three chained leisure skills to the children with developmental disabilities. The procedure was introduced to teach one leisure skill at a time. Experimental control was built in when subject responding was at or near to the baseline levels during full probe conditions before the intervention was introduced and the criterion was reached only after the intervention was introduced (Kýrcaali-Iftar & Tekin, 1997; Tekin & Kircaali-Iftar, 2001; Wolery, Bailey & Sugai, 1988). Correct responses during probe and treatment sessions were both reinforced so the design allowed the researchers to measure the effectiveness of the procedure.

EXPERIMENTAL PROCEDURES

General Procedures

A 1:1 instructional format was used during all experimental sessions. There were probe, instruction, maintenance and generalization sessions in the study. A probe condition was implemented before the training of each target behavior and after the criterion was reached in training of that target behavior for a minimum of three probe sessions. After the probe condition, instruction was introduced to teach target behaviors respectively. Also, maintenance and generalization sessions were conducted. There were two training sessions per week. The timing for the sessions was determined by the availability of the trainers' and the subjects' schedule.

Probe Conditions

Probe sessions occurred prior to training each target behavior and after the criterion was met in that target behavior. Each probe condition had a minimum of three consistent probe sessions. A single opportunity format was used during probe sessions (Brown & Snell, 2000). That is to say, the teacher presented the task direction and recorded the subject's response to the steps of the task analyses. When the subject initiated an incorrect response she/he was interrupted by the teacher and the subject's response was recorded as incorrect. Moreover, the following steps in the task analysis were recorded as incorrect. The trainer took his/her place in accordance with the target behavior and said, "We will start to learn

playing pool. Ready to work?" Once an affirmative response was received, the trainer delivered the task direction, "Play pool." Then the trainer waited 5 s for the subject to initiate a response. The number of correct steps performed independently was recorded. When the subject initiated an incorrect response, performed an incorrect response, or no response, his/her response and the rest of the steps in the task analysis were recorded as incorrect. There were correct and incorrect responses during probe sessions. Correct responses, defined as initiating a correct step of the task analysis within 5 s and correctly completing the step, resulted in descriptive verbal praise. Incorrect responses, defined as (a) not initiating a step within 5 s, (b) initiating an incorrect step of the task analysis, resulted in ignorance. Subjects' attention and their cooperation behaviors were reinforced at the end of each session.

Constant Time Delay Instructional Conditions

Leisure skills were taught by using a 4-s constant time delay procedure within a total task presentation format (Brown and Snell, 2000). Two training sessions occurred per week for each subject and three trials were conducted in each session. Two types of delay intervals were used: (a) 0-s delay interval, and (b) 4-s delay interval. At the beginning of teaching each leisure skill, a 0-s delay interval was implemented until the subject performed the target behavior 100% correct. 0-s trials were conducted as follows. The trainer had materials ready, explained the rules, secured the subject's attention, after receiving an affirmative response to the question, "..., ready for learning to play pool?", the trainer presented the task direction, "..., play pool.", and presented the controlling prompt immediately. The controlling prompt was determined according to the performance and characteristics of each subject and target behavior individually. Typically, verbal prompting, physical plus verbal prompting and modeling plus verbal prompting were used. However, the same prompting was used for each subject during training. The 4-s delay trials were implemented in the same manner as 0-s delay except the trainer waited subjects 4-s before providing controlling prompt. In other words, the trainer waited subjects 4-s to respond after presenting the task direction. In the absence of response during 4-s, the trainer provided the controlling prompt.

There were five types of subject responses during instructional sessions. There were two types of correct responses (waits and anticipations) and three types errors (nonwait, wait and no response). Correct waits were defined as completing a step of the task analysis correctly within 15 s after the prompt. Anticipations were defined as initiating a step of the task analysis before the prompt and completing the response correctly within

15 s. Correct anticipation responses were counted toward criterion. There were three types of nonwait errors: (a) initiating a step of the task analysis before the prompt but performing it incorrectly (topographical errors), (b) initiating a step of the task analysis before the prompt but not completing it within 15 s (duration error), or (c) performing a different step of the task analysis (sequence error). Wait errors were defined as completing the response incorrectly or completing the response within 15 s of the prompting. No response was defined as not initiating a response within 4 s of the prompt. Both types of correct responses, correct anticipations and correct waits, resulted in descriptive verbal praise. When the subject performed each leisure skills at a criterion level an object reinforcer was provided. The criterion was at least 90% correct responses before the prompt for a minimum of three consecutive sessions. All incorrect responses were resulted with ignorance and providing the task direction of the next step. The inter-trial interval was 4 seconds. A continuous reinforcement (CRF) was used toward criterion and fixed ratio (FR11 for pin knocking, FR9 for hotshot basketball, FR11 for playing golf, FR7 for playing dart, FR7 for playing frisbee) (completion of the entire skill). Subjects' attention and their cooperation behaviors were reinforced at the end of the sessions.

Maintenance and Generalization Sessions

Maintenance sessions were conducted one, two, and four weeks after the final full probe condition. Maintenance sessions were conducted in an identical manner to probe sessions except reinforcements were thinned (VR3 were used during the first maintenance session, FR7, FR9, and FR11 were used during the rest of the maintenance sessions) during maintenance.

Generalization across persons was examined by a pre-post test design in the study. These sessions occurred before training and at the end of teaching each targeted leisure skill. Generalization sessions were conducted just like probe sessions but with another trainer.

One to one teaching arrangement and single-opportunity method were used both in maintenance and generalization sessions.

Reliability

Inter-observer reliability data were collected during at least 31% of all experimental sessions (20% of full probe and training sessions; 33% of maintenance sessions; and 50% of generalization sessions). Inter-observer reliability was calculated by using point by point method with a formula of the number of agreements divided by the number of agreements

plus disagreements multiplied by 100 (Tawney & Gast, 1984; Tekin & Kircaali-Iftar, 2001).

The mean percent of the inter-observer agreement for Onur during probe conditions was 98% (94% to 100%); during instruction was 93% (86% to 100%), 94% for playing frisbee, 93% for playing dart, and 86% for playing golf; during maintenance was 90%; and during generalization was 100%.

The mean percent of inter-observer agreement for Yesim during probe conditions was 99% (96% to 100%); during instruction was 100% for all skills, and during maintenance and generalization were 100%.

The mean percent of inter-observer agreement for Metin during probe conditions was 97% (63% to 100%); during instruction was 89% (79% to 100%), 100% for playing hot shot basketball 100%, 89% for playing frisbee, and 79% for playing golf; during maintenance and generalization were 100%.

The mean percent of inter-observer agreement for Fatih during probe conditions was 99% (97% to 100%); during instruction was 89% (88% to 93%), 88% for playing frisbee and playing golf, and 93% for playing pool; during maintenance was 98%, and during generalization was 83%.

The mean percent of inter-observer agreement for Erdem during probe conditions was 100%; during instruction was 95% (92% to 100%), 94% for playing frisbee, 92% for playing pool, and 100% for playing golf 100%, and during maintenance and generalization were 100%.

The mean percent of inter-observer agreement for Tarkan during probe conditions was 98% (88% to 100%); during instruction was 97% (95% to 100%), 95% for playing frisbee, 97% for playing golf, and 100% for playing pool. He was unable to attend maintenance and generalization sessions due to his health problems.

The mean percent of inter-observer agreement for Ahmet during probe conditions was 97% (75% to 100%); during instruction was 89% (84% to 93%), 93% for playing pin knocking, 84% for playing hot shot basketball 84%, and 91% for playing frisbee and, during maintenance and generalization were 95%.

Independent variable reliability (procedural reliability) was calculated by dividing the number of teacher behaviors observed by the number of teacher behaviors planned and multiplied by 100 (Billingsley, White & Munson, 1980; Tekin & Kircaali-Iftar, 2001). The following teacher behaviors were observed for procedural reliability during training session: (a) having the materials ready, (b) securing the subject's attention, (c) delivering the task direction, (d) delivering the controlling prompt in time (if appropriate), (e) waiting for the response interval, (f) delivering the correct behavioral consequences, (g) waiting for the inter-trial interval, (h) provid-

ing praise for attention and cooperation. The same steps were observed during probe, maintenance, and generalization sessions except delivering the controlling prompts in time.

Procedural reliability measures resulted in an overall percentage of 89% (87% - 92%) during probe conditions for the first teacher with Onur and 83% (80% - 85%) with Yesim. Procedural reliability measures resulted in an overall percentage of 92% (86% - 94%) during instruction with Onur and 95% with Yesim (92% - 98%). This teacher implemented maintenance and generalization sessions with 100% accuracy with both subjects.

Procedural reliability measures resulted in an overall percentage of 100% during probe conditions for the second teacher with Metin. Procedural reliability measures resulted in an overall percentage of 95% (89% - 99%) during instruction. This teacher implemented maintenance and generalization sessions with 100% accuracy with Metin.

Procedural reliability measures resulted in an overall percentage of 97% (95% - 100%) during probe conditions for the third teacher with Fatih and 97% (90% - 100%) with Erdem. Procedural reliability measures resulted in an overall percentage of 98% (97% - 99%) during instruction with Fatih and 100% with Erdem. This teacher implemented maintenance and generalization sessions with 100% accuracy with both students.

Procedural reliability measures resulted in an overall percentage of 84% (75% - 88%) during probe conditions for the fourth teacher with Ahmet and 99% (88% - 100%) with Tarkan. Procedural reliability measures resulted in an overall percentage of 99% (92% - 100%) during instruction with Ahmet and 96% with Tarkan (75% - 100%). This teacher implemented maintenance and generalization sessions with 100% accuracy with both students.

RESULTS

Time Delay Instructional Data

Probe and training data for Yesim, Onur, Fatih, Erdem, Metin, Ahmet, and Tarkan are shown in Figure 1 through 7 respectively. The open circles represent the percentage of correct responding during full probe and instructional sessions, maintenance and generalization session. As seen in Figures 1 through 7, all subjects met the criteria after the introduction of 4-s constant time delay. These data revealed that constant time delay was effective on teaching leisure skills to the children with developmental disabilities.

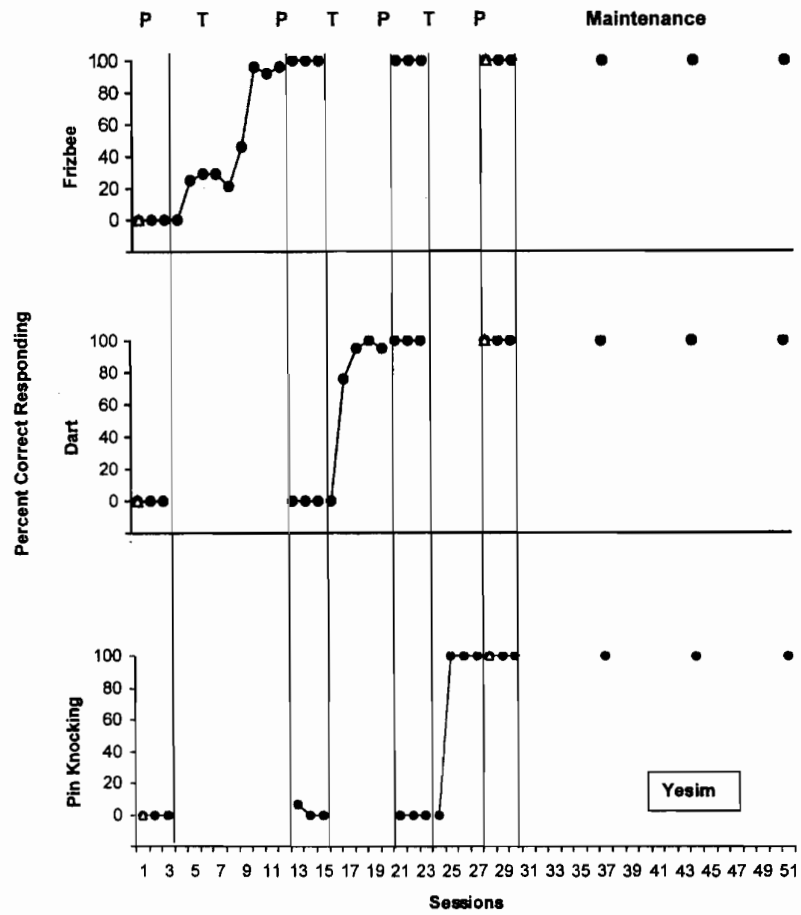


Figure 1. Percentage of correct responses after the prompt for Yesim during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

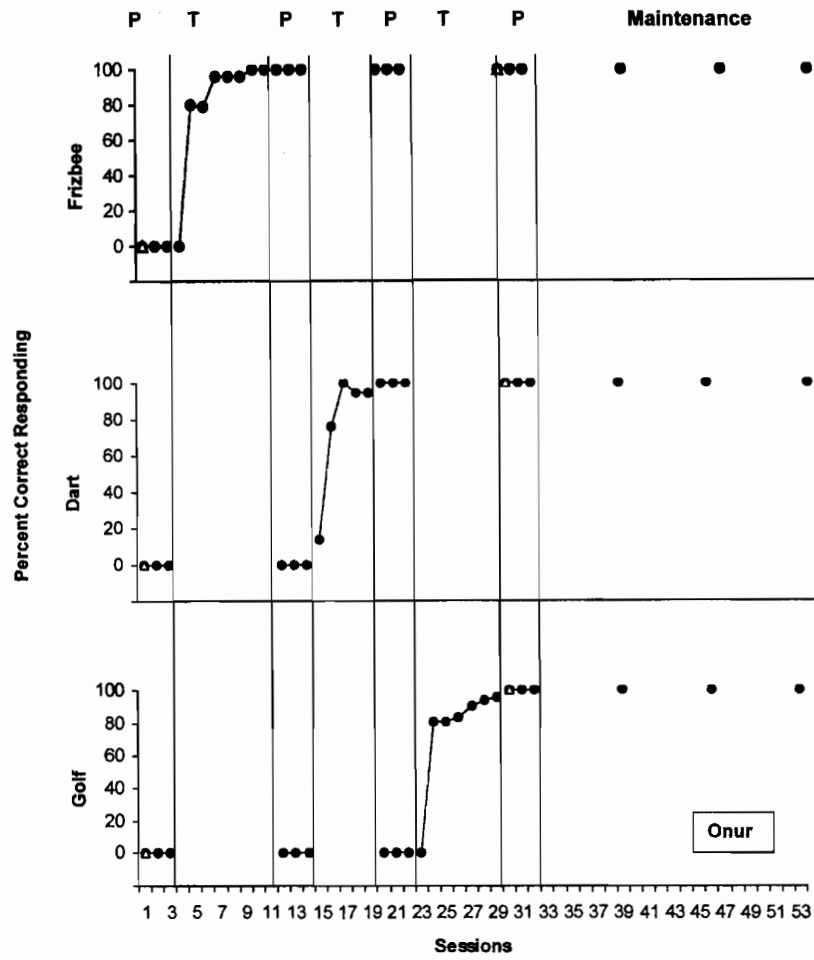


Figure 2. Percentage of correct responses after the prompt for Onur during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

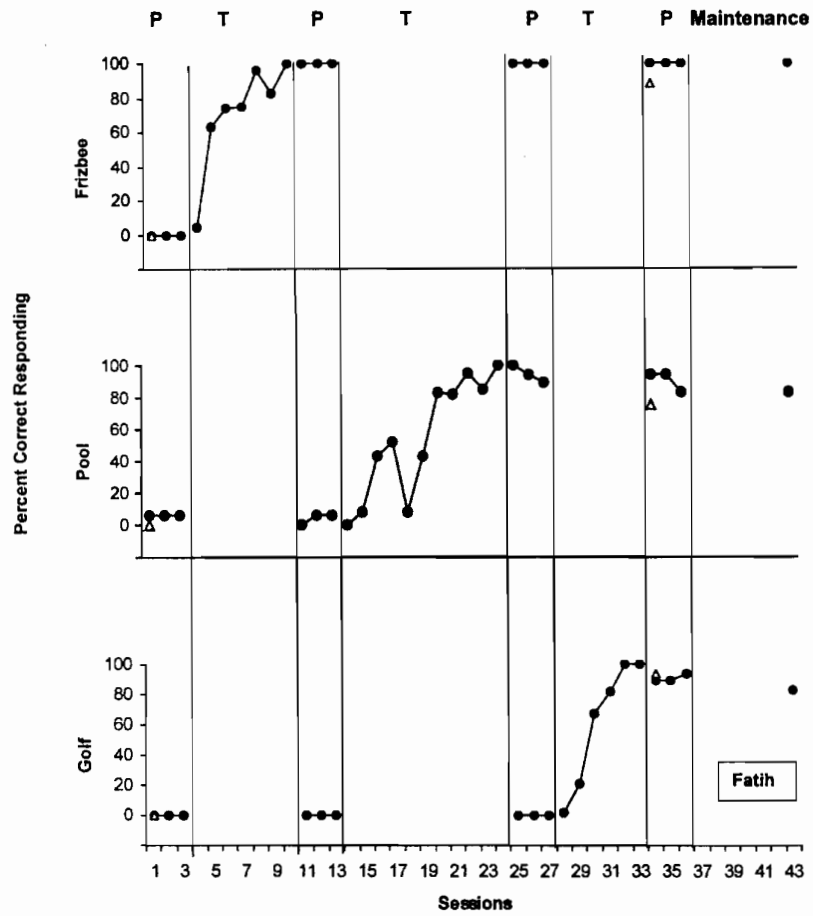


Figure 3. Percentage of correct responses after the prompt for Fatih during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

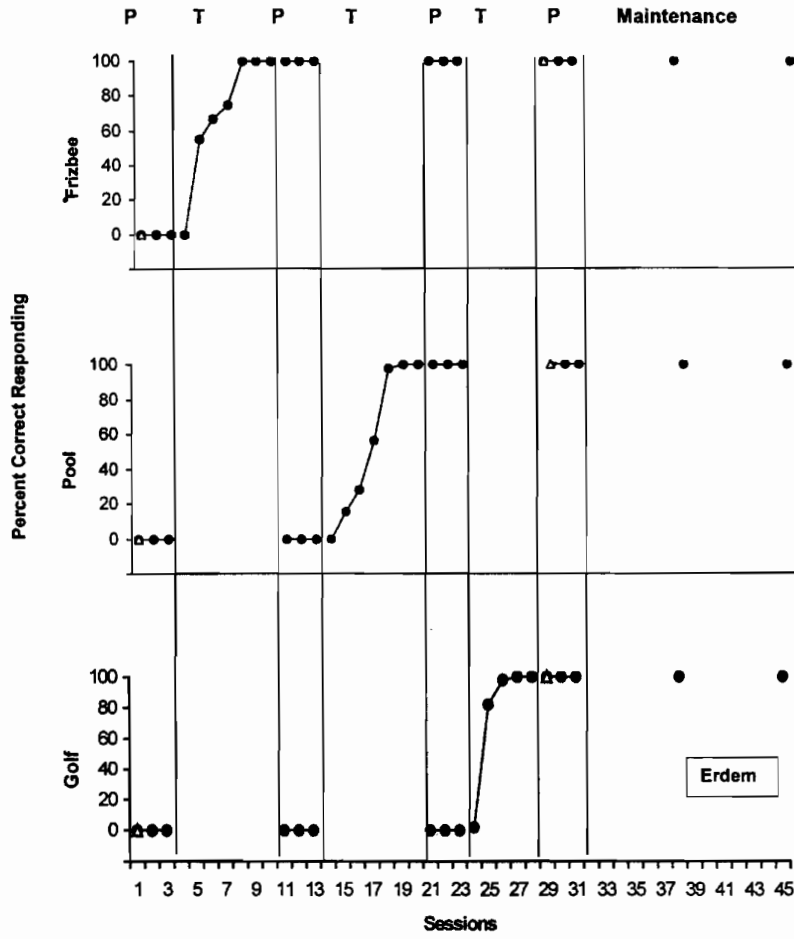


Figure 4. Percentage of correct responses after the prompt for Erdem during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

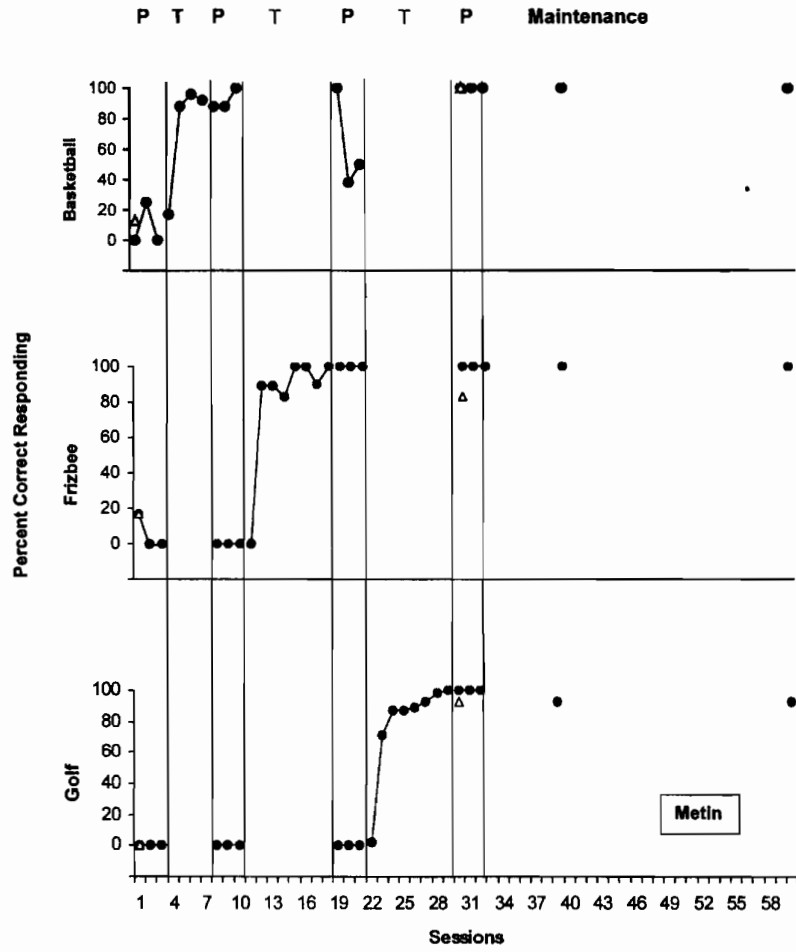


Figure 5. Percentage of correct responses after the prompt for Metin during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

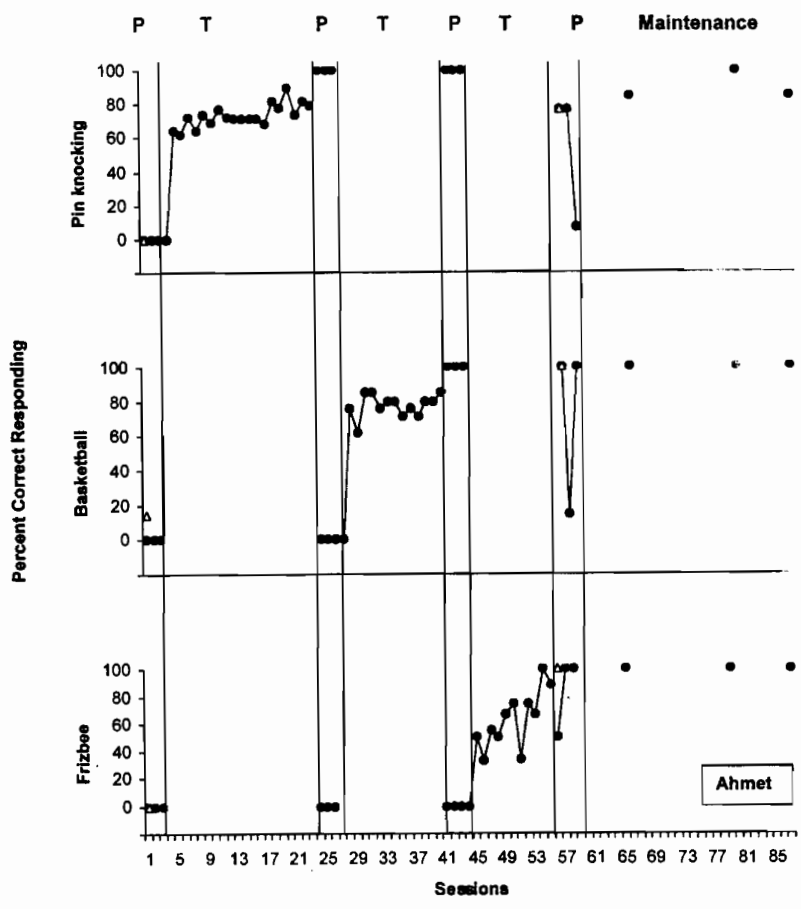


Figure 6. Percentage of correct responses after the prompt for Ahmet during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

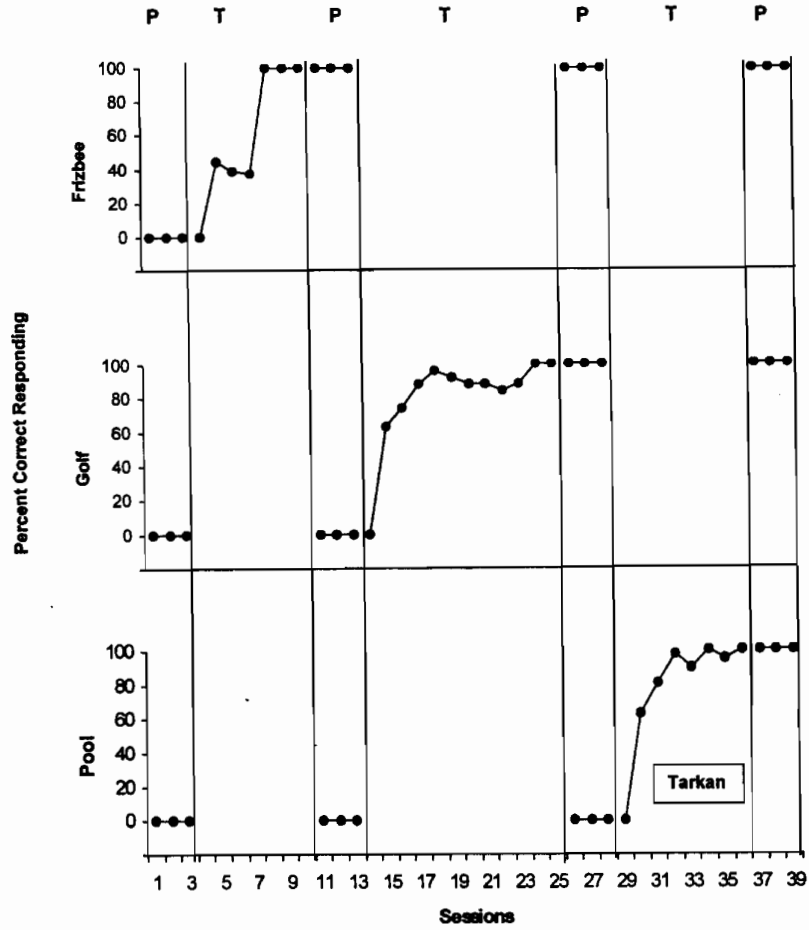


Figure 7. Percentage of correct responses after the prompt for Tarkan during full probe, instructional, maintenance, and generalization probe sessions. Closed circles represent correct responses during full probe, instructional, and maintenance sessions. Open triangles represent correct responses during generalization sessions.

The instructional data for each subject, the number of training sessions, the number and percentage of training errors, amount of training time are in Table 2. As seen in Table 2, a total of 174 training sessions and approximately 14 hours and 10 minutes training time were required for all students to reach criterion on three leisure skills.

TABLE 2
Instructional data for each student through criterion

Students	Behaviors	# of sessions thru criterion	Errors thru criterion	Training time thru criterion
Yesim	Frizbee	9	%1	00:34:04
	Dart	5	%0	00:10:24
	Pin knocking	4	%0	00:33:32
Total		18		01:18:00
Onur	Frizbee	8	%3	00:22:20
	Dart	5	%1	00:10:55
	Golf	7	%7	00:48:33
Total		20		01:21:48
Fatih	Frizbee	7	%7	00:26:26
	Pool	11	%7	01:23:21
	Golf	6	%5	00:28:31
Total		24		03:18:38
Erdem	Frizbee	7	%4	00:23:32
	Pool	7	%3	00:42:10
	Golf	5	%5	00:25:14
Total		19		01:30:56
Metin	Basket shoot	4	%5	00:10:42
	Frizbee	8	%6	00:22:48
	Golf	8	%11	01:05:05
Total		20		01:37:35
Ahmet	Pin knocking	20	%18	02:55:06
	Basket shoot	14	%9	00:32:00
	Frizbee	12	%12	00:37:24
Total		46		04:24:30
Tarkam	Frizbee	7	%3	00:23:34
	Golf	12	%4	00:45:55
	Pool	8	%4	00:36:22
Total		27		01:45:51
Grand total		174		14:7:18

Yesim needed 18 training sessions to reach criterion on three leisure skills. A total of one hour and 18 minutes training time was required to reach criterion on all three leisure skills. Onur needed 20 training sessions

to reach criterion on three leisure skills. A total of one hour and 21 minutes training time was required for Onur to reach criterion on all three leisure skills. Fatih needed 24 training sessions to reach criterion on three leisure skills. A total of three hours and 38 minutes training time was required to reach criterion on all three leisure skills. Erdem needed 19 training sessions to reach criterion on three leisure skills. A total of one hour and 30 minutes training time was required to reach criterion on all three leisure skills. Metin needed 20 training sessions to reach criterion on three leisure skills. A total of one hour and 37 minutes training time was required to reach criterion on all three leisure skills. Ahmet needed 46 training sessions to reach criterion on three leisure skills. A total of four hours and 24 minutes training time was required to reach criterion on all three leisure skills. Tarkan needed 27 training sessions to reach criterion on three leisure skills. A total of one hour and 45 minutes training time was required to reach criterion on all three leisure skills. Percentage of training errors which occurred during training sessions were between 0% and 18%.

Maintenance and Generalization Data

Maintenance data were collected one, two, and four weeks after the instruction had stopped. Maintenance data showed that the subjects maintained the leisure skills taught to them at criterion level one, two, and four weeks after the instruction.

Generalization data showed that all subjects generalized the leisure skills taught to them across people to a certain extend (77% and 100%).

DISCUSSION

The purpose of this study was to investigate the effectiveness of a 4-s constant time delay procedure to teach leisure skills to children with developmental disabilities. Maintenance and generalization effects of the procedure were also investigated. This study showed that the procedure was effective on teaching leisure skills to the subjects. In addition to these finding, maintenance and generalization effects of the procedure were also positive. In other words, the 4-s constant time delay procedure was effective on maintenance and generalization of acquired the leisure skills.

Based on the data collected and analyzed, several findings are worthy of discussion. First, the error rate during instruction was minimal, except for one student (i.e., Ahmet). It was between 0% and 18%. It is cited in the literature that the error rate during training of a chained task is usually between 5% and 10% (Schuster, Gast, Wolery & Gultinan, 1988; Schuster

and Griffen, 1990). The highest error rate in this study occurred during training with Ahmet (i.e., 18%). It can be argued that Ahmet's vision problem and muscle weakness might be the reasons for having a relatively high error rate. In order to control this error rate, some modifications were done. For example, the training materials were wrapped with a highlighted and colored paper to enhance Ahmet's vision. Also, to control his muscle weakness, physical help was provided by the teacher. Except Ahmet's error rate during training, the findings of this study are consistent with the previous research findings.

Second, since this study was conducted with four teachers and seven subjects, and three leisure skills were taught to the subjects, some modifications were required for the task analyses of the leisure skills. Each teacher and subject had some preferences and priorities over the steps of the task analyses. So teachers modified and individualized the task analyses during the study.

Third, although all teachers in this study had experience on teaching various discrete and chained skills to children with developmental disabilities, they all utilized the constant time delay procedure for the first time. However, the teachers implemented the procedure easily. It can be said that constant time delay is a "teacher friendly" procedure. When procedural reliability is taken into consideration, the above comments are supported. In other words, procedural reliability data make evident the ease of using constant time delay procedure on teaching leisure skills.

The findings of this study provide several needs and recommendations for future research. First, this study was conducted with 1:1 teaching arrangement and single opportunity method was used during baseline evaluation. This study can be replicated with group teaching arrangement and/or multiple opportunity method in natural settings. Furthermore, some instructional parameters such as observational learning, and instructive feedback presentation would be planned in future studies to extend the effective and efficient instruction literature.

Second, although there is not any study examining the effects of constant time delay procedure on reducing the occurrences of inappropriate behaviors during teaching, the trainers of the present study reported that inappropriate behaviors rarely occurred during teaching. It can be argued that subjects do not experience failure as often as in other traditional teaching procedures since a controlling prompt is provided to the subjects during constant time delay procedure. Hence, the subjects might be claimed to experience less frustration. Further studies can be planned to examine the occurrences of inappropriate behaviors during instruction with constant time delay.

In conclusions, the results of the current studies and the previous study cited in this manuscript show that constant time delay procedure is effective on teaching chained tasks to individuals with various disabilities.

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