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Source: *Education and Training in Mental Retardation and Developmental Disabilities*, Vol. 37, No. 3 (September 2002), pp. 283-299
Published by: Division on Autism and Developmental Disabilities
Stable URL: http://www.jstor.org/stable/23880006
Accessed: 13-02-2018 10:43 UTC

Education and Training in Mental Retardation and Developmental Disabilities, 2002, 37(3), 283–299

Comparison of the Effectiveness and Efficiency of Two Response Prompting Procedures Delivered by Sibling Tutors

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Abstract: We used a parallel treatments design to compare the effectiveness and efficiency of a 4 s constant time delay and a simultaneous prompting procedure on teaching receptively identifying animals to children with mild and moderate mental retardation. The study had two purposes: (1) to determine if sibling tutors use these two instructional procedures reliably for instructing their younger siblings with mental retardation, and (2) to asses any differences between these two instructional procedures in terms of effectiveness and efficiency. Three children with mental retardation and their siblings who were trained as tutors participated. The two procedures were delivered alternately by tutor siblings. Results show that both procedures were effective in teaching receptively identifying animals to the children with mental retardation. Efficiency data showed that the differences between two procedures were minimal. Maintenance data collected 1, 4, and 5 weeks after training indicated no difference between the two procedures. When generalization data for the two instructional procedures across all sibling tutees were compared, stimuli taught with the constant time delay procedure resulted in higher levels of generalization for all sibling tutees. In conclusion, (a) both procedures were implemented reliably by all typical sibling tutors, (b) both procedures were effective on teaching receptively identifying animals, (c) simultaneous prompting was more efficient than constant time delay in terms of the number of training errors and training time through criterion, (d) no differences were evident based on maintenance data, and (e) constant time delay resulted in more generalization. Future research is needed to support these findings.

In recent years, there has been a tendency to promote involvement of family members and caregivers in systematic instructional processes in education, especially in special education (Hancock & Kaiser, 1996; Hemmeter & Kaiser, 1994; Tannock & Girolametto, 1992; Wall & Gast, 1997a). In most cases, however, parents are the only family members involved in these processes. When siblings are addressed, there are many research studies examining the effects, especially negative effects, of being a brother or sister of a sibling with a disability. However, little research exists examining the effects of sibling participation in providing systematic instruction.

Powell and Gallagher (1993) indicated numerous benefits of involving siblings in systematic instruction for both parties including: (a) enhancing and promoting positive interaction between siblings, (b) strengthening the generalization effects of the instruction, (c) providing instruction in more natural environments, (d) enhancing the consistency between school and home environments, (e) allowing sibling tutors to be role models for other siblings who want to participate in the instructional process, (f) decreasing the responsibility of and providing emotional support to parents, (g) allowing sibling tutors to

This study was supported by a grant from Anadolu University Research Fund (Project No: 980516). Authors are grateful to Dr. John Schuster for his insightful review and feedback. The first part of the study was presented as a poster session at the Annual Convention of Council for Exceptional Children in Charlotte, North Carolina in April 1999 and the second part of the study was presented as a paper session at the Annual Convention of Association for Behavior Analysis in Washington, DC in May 2000. The first author completed this study in partial fullfilment of the requirements of the Ph.D. degree in special education at Anadolu University. Correspondence concerning this article should be addressed to Elif Tekin, Research Institute for the Handicapped, Anadolu University, Eskisehir, Turkey, 26470. E-mail: eltekin@anadolu.edu.tr.

acquire a general understanding of the learning styles of their siblings, and (h) helping sibling tutors to gain insight about social problems which their siblings with disabilities may experience in their daily lives.

Powell and Gallagher (1993) also recommended guidelines for preparing a successful sibling tutoring program. According to them (a) the outcomes of teaching should be clearly stated, (b) neither sibling tutors nor sibling tutees should be forced to participate, (c) the educational environment should be designed to increase the possibility of success, (d) both sibling tutors and sibling tutees should be reinforced for their participation, and (e) sibling tutors should be older than their siblings with exceptionality.

Studies involving siblings as tutors have shown that it is possible to teach (a) sibling tutor candidates to use specific instructional strategies, and (b) a new interaction style to sibling tutors as well as sibling tutees. As a result, sibling tutees acquire new skills and behaviors (Cash & Evans, 1975; Miller & Cantwell, 1976; Powell, Salzberg, Rule, Levy, & Itzkowitz, 1983). Studies were planned and conducted to teach basic language skills (Bennet, 1973; Hancock & Kaiser, 1996), academic skills (Colletti & Harris, 1977; Schreibman O'Neill, & Koegel, 1983), social behaviors (Lobato & Tlaker, 1985; Swenson-Pierce, Kohl, & Eagle, 1987; Wall & Gast, 1997a,b) and social interaction skills (James & Egel, 1986; Miller & Miller, 1976). Although these studies regarding sibling tutoring showed that siblings delivered specific instructional strategies, very few of them (Wall & Gast, 1997a,b) reported procedural reliability data that indicates "the degree to which all relevant variables occur in accordance with the experimental plan" (Billingsley, White, & Munson, 1980, p. 231). Therefore, results without procedural reliability data should be interpreted cautiously.

In this study, we wanted (a) to teach sibling tutors to implement two near-errorless response prompting procedures (i. e., 4 s constant time delay and simultaneous prompting) reliably; and (b) to compare the effectiveness and efficiency of both procedures delivered by sibling tutors on teaching receptively identifying animals to sibling tutees with mental retardation.

The constant time delay procedure was first introduced by Touchette (1971) in order to measure the moment in which stimulus control was transferred from a given stimulus condition (teacher assistance) to other stimulus conditions (target stimulus). In the 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, & Eizenstat, 1988), moderate and severe mental retardation (Browder, Morris, & Snell, 1981; Maureen & Gast, 1999; McIlvane, Withstandley, & Stoddard, 1984), multiple disabilities (Kleinert & Gast, 1982; Wolery, Ault, et al., 1992), learning disabilities (Mattingly & Bott, 1990; Stevens & Schuster, 1987), and developmental disorders (Schoen & Sivil, 1989). This procedure also is effective when teaching students with a wide range of ages from infancy to adulthood (Kleinert & Gast; Schoen & Sivil). Furthermore, it is possible to utilize this procedure for teaching discrete behaviors (Alig-Cybriwsky & Schuster, 1990; Gast, Doyle, Wolery, Ault, & Baklarz, 1991; Mattingly & Bott, 1990; McIlvane et al., 1984; Schuster, Stevens, & Doak, 1990; Stevens & Schuster, 1987) as well as chained behaviors (Chandler, Schuster, & Stevens, 1993; Hughes, Schuster, & Nelson, 1993; Maureen & Gast; McDonnell, 1987; Schuster, Gast, Wolery, & Guiltinan, 1988).

In some studies constant time delay procedure had been implemented by expert trainers such as special and general education teachers. On the other hand, in some studies it had been implemented by peer tutors, parents or adult-siblings. There are four studies analyzing the effectiveness of constant time delay delivered by peer tutors in classroom settings (Collins, Branson, & Hall, 1995; Koury & Browder, 1986; Telecsan, Slaton, &

Stevens, in press; Wolery, Werts, Snyder, & Caldwell, 1994); and three studies involving adult-siblings, primary caregivers, and parents at home (Wall & Gast, 1997a,b; Wilson & Robinson, 1997). Results of the above studies have revealed the following conclusions: (a) peer tutors, adult-siblings, primary caregivers, and parents have delivered constant time delay procedure reliably, and (b) tutees acquired both discrete and chained skills through this procedure.

Simultaneous prompting, which is the second response prompting procedure examined in the present study, is known as a systematic form of the antecedent prompt and test procedure (Wolery, Ault, et al., 1992). In simultaneous prompting procedure, the target discriminative stimulus is followed immediately by presenting a controlling prompt.

Limited research investigating simultaneous prompting has shown that it is effective when teaching students with various disabilities and ages as well as teaching both discrete behaviors (Fetko, Schuster, Harley, & Collins, 1999; Fickel, Schuster, & Collins, 1998; Gibson & Schuster, 1992; MacFarland-Smith, Schuster, & Stevens, 1993; Schuster & Griffen, 1993; Singleton, Schuster, & Ault, 1995) and chained behaviors (Schuster, Griffen, & Wolery, 1992; Wolery, Holcombe, Werts, & Cipolloni, 1993).

There are similarities and differences between constant time delay and simultaneous prompting. First, both procedures are "user friendly," easy to implement, and low cost. Second, both procedures have resulted in low error rates during instruction. The error rate on teaching discrete skills with constant time delay is usually less then 5% (Schuster & Griffen, 1993) and with simultaneous prompting is usually between 1% and 3%. Therefore, it might be argued that the possibility of providing reinforcement to trainees increases and the possibility of inappropriate behavior decreases. Differences between these two procedures could be stated as follows: (a) constant time delay procedure has two types of correct responses whereas simultaneous prompting procedure has only one type of correct response; therefore, using differential reinforcement is recommended in constant time delay, (b) constant time delay requires two types of teacher behaviors (0 s trial and delay trial); whereas, there is only one type of teacher behavior in simultaneous prompting (i.e., constant time delay requires the teacher to shift teaching behavior from 0 s trials to delay trials); (c) constant time delay requires students to wait for the controlling prompt. Since both procedures are user friendly, easy to implement, and have lower error rates than traditional teaching procedures, it is important to find out whether or not they are equally effective and/or efficient in order to prefer one procedure over the other.

There is only one study comparing the effectiveness and efficiency of constant time delay and simultaneous prompting (Schuster et al., 1992). In this study, the procedures were used to teach sight words to students with moderate mental retardation. The findings indicated that both procedures were effective; however, simultaneous prompting was more efficient than constant time delay in terms of number of trials, number of sessions, and training time to acquisition. Furthermore, mixed maintenance results were obtained.

This study was conducted in order to clarify some of the research questions raised by the above studies. The purpose of the study was twofold: (a) to determine whether sibling tutors would deliver 4 s constant time delay and simultaneous prompting reliably on teaching receptively identifying animals, and (b) to evaluate the differences, if any, between the two procedures in terms of efficiency variables when teaching sibling tutees receptively identifying animals. Maintenance and generalization data for the acquired skills were analyzed and compared. Social validity of the study also was examined by obtaining sibling tutors' and their mothers' opinions about the procedures.

Method

Participants and Settings

Participants were one male and two female sibling tutors without cognitive disabilities and one male and two female sibling tutees with mild to moderate mental retardation. The sibling tutors were older than the sibling tutees. Names (pseudonyms) and ages of the sibling pairs were as follows: Ece (12)-Ceren (10); Eylem (11)-Selin (7); Ali (12)-Recep (10).

Ceren had moderate mental retardation whereas Selin and Recep had Down Syndrome. Ceren did not have verbal communication skills. She used gestures and vocalizations for communication purposes. Unlike Ceren, Selin and Recep were verbal. There were not any test scores about their adaptive behavior functioning in hand. Since Ceren was lower functioning than Selin and Recep, the criterion for her was determined lower (75% correct responding).

Prerequisite skills which sibling tutors needed for this study were as follows: (a) reading and writing accuracy, (b) following written and verbal instructions, (c) agreeing to participate in the systematic teaching process, (d) volunteering to deliver 4 s constant time delay and simultaneous prompting procedures to their younger siblings with mild or moderate mental retardation, and (e) selecting possible reinforcers.

Prerequisite skills for the sibling tutees were as follows: (a) ability to pay attention to audio and visual stimuli for at least 5 minutes, and (b) the ability to follow verbal instructions such as take, put, bring, show, etc.

All sibling pairs had the prerequisite skills for this study. Moreover, either sibling tutors or sibling tutees did not have a history with the use of using these instructional procedures.

The first part of the study (i.e., tutor training) was conducted in a small group teaching arrangement at a university unit, and the second part (i.e., teaching the tutees) was conducted in a 1:1 teaching arrangement. During the second part of the study the sibling pairs sat face to face at a table in a room by themselves in their own house.

Materials

During tutor training, index cards (12 × 20 cm), a tape recorder, and reinforcers were used to teach how to reliably use the instructional procedures. In the second part of the study, a stopwatch, a video camera, animal figures, and reinforcers were used for delivering the instructional procedures to the sibling tutees. Reinforcers were selected by the sibling tutors and consisted of objects such as accessories, toys, stationery items, etc. Animal sets per instructional procedures and sibling pairs are listed in Table 1. Furthermore, as generalization materials, animal figures were used differing from ones used during intervention in terms of size, color, or texture.

Screening Procedures

Before initial baseline conditions, the authors selected 21 animal names from a primary school science book and storybooks. The first author conducted screening sessions. Screening trials were implemented as follows: The researcher secured the subjects' attention and presented a possible target stimulus by asking, "Show me. Which one is Tiger?" and waited for 4 s for a response. The animal figures placed on a table and each target stimulus was presented along with two distracters. The size of animal figures was standardized in relation to their actual size. That is to say, the tiger figure was bigger than the sheep figure. Animal figures identified receptively with moderate accuracy were chosen as distracters whereas animal figures identified receptively with high accuracy were not used in the study. The same distracter animals were not used in consecutive trials. There were three trials for each possible target stimulus during screening sessions. Correct responses in 4 s were descriptively praised. Incorrect or no responses were ignored. Twelve unknown animals were determined for each tutee and then paired into six animal sets that were formed by matching the animal figures more frequently identified receptively (i.e., identified receptively at 33% accuracy) with the animal figures less frequently identified receptively (i.e., identified receptively less than 33% accuracy) by the subjects.

Experimental Design

The study had two parts. In the first part of the study, sibling tutors were trained to learn how to implement a 4 s constant time delay procedure and a simultaneous prompting procedure reliably by small group teaching arrangements. In the second part, a parallel treatments design (Gast & Wolery, 1988; Holcombe, Wolery, & Gast, 1994) was used to compare effectiveness and efficiency of the 4 s constant time delay procedure and the simultaneous prompt-

TABLE 1

Animal Sets by Sibling Pairs and Instructional Procedures

	Instructional Procedures	
Sibling Pairs	*CTD*	*SP*
Ece-Ceren	Tiger-Bear	Seal-Zebra
	Goat-Lion	Pig-Deer
	Camel-Cow	Hippopotamus-Sheep
Ezgi-Selin	Goat-Hippopotamus	Giraffe-Penguin
	Tiger-Horse	Zebra-Sheep
	Camel-Lion	Pig-Cow
Ali-Recep	Tiger-Bear	Horse-Camel
	Cow-Goat	Hippopotamus-Zebra
	Giraffe-Penguin	Pig-Sheep

ing procedure delivered by sibling tutors on teaching receptively identifying animals to sibling tutees.

A parallel treatments design is a combination of two concurrently implemented multiple probe designs. Effects of extraneous variables (e.g., instructors, time of the day, etc.) are counterbalanced and replicate the effects across behaviors. Independent variables were introduced to two animal sets at a time. A parallel treatments design assesses effects of two or more independent variables on two or more equal dependent variables. Each independent variable is assigned to its own teaching set that are equal in difficulty level and are not members of the same response or stimulus class. Experimental control occurs when (a) a distinct level of performance is consistently associated with each independent variable across dependent variables and subjects, and (b) the subject's performance level shows a change only with the application of the independent variable (Blackhurst, Schuster, Ault, & Doyle, 1996).

General Procedures

Screening sessions were conducted to identify target stimuli prior to experimental procedures. The significant persons in sibling tutees life were informed about not to practice to teach animals in order to control internal threat of validity. Sibling tutors were trained in three sessions how to deliver 4 s constant time delay and simultaneous prompting procedures reliably in a small group teaching arrangement. Using these two procedures reliably was taught with a (a) description, (b) modeling, (c) modeling of negative examples, (d) guided practice, and (e) feedback sequence (Telecsan et al., in press). After sibling tutors acquired the two procedures they started to deliver both procedures on teaching receptively identifying animals. Due to possible sequence effects of any comparison study, both procedures were delivered in an unpredictable sequence and each procedure was delivered for three consecutive sessions at the most. Six animal sets were taught to each sibling tutee with a total of 12 animals. One animal set was taught by one procedure to criterion before instruction on other set was initiated. Criterion was 100% correct responding before the prompt for two sibling tutees and 75% or above correct responding before the prompt for one sibling tutee. The first author collected the data during instruction. All sessions were tape recorded and an observer collected reliability data. Full and daily probe sessions were conducted for both procedures. Maintenance and generalization across materials data also were measured.

Sibling Tutor Training

Sibling tutors were trained through description – modeling - modeling of negative examples - guided practice - feedback sequence that

was developed by Telecsan et al. (in press). Both instructional procedures were taught in a small group teaching arrangement. Task analyses for both instructional procedures were developed and tutors were pre-tested according to the task analyses. Results of the pre-tests showed that the tutors did not have any experience or knowledge about either procedure. The first author taught them how to deliver the instructional procedures. First, instructional concepts (i.e., controlling prompt, target stimulus, response interval, inter-trial interval, reinforcement) were described verbally without any written materials. Sibling tutors were allowed to ask any questions during training. Sibling tutors were asked to give a written answer to questions about the descriptions of each concept. They received a score for each correct response and exchanged their scores for reinforcers. Second, the first author modeled simultaneous prompting and 4 s constant time delay procedures. Third, modeling of negative examples for both procedures were delivered and sibling tutors were asked to give a written response about every negative example, which was performed by the first author. Fourth, the researcher took the role of being a learner so all sibling tutors could be her teacher and deliver both procedures. The researcher delivered feedback to each sibling tutor until they delivered the procedures with 100% accuracy. Fifth, role playing was conducted and each sibling shifted roles of learner and teacher during role playing. The researcher delivered verbal feedback and/or social praise to each sibling tutor individually immediately after they delivered the procedures with 100% accuracy. Sixth, each tutor was required to tell the target animals' names with 100% accuracy.

Response Definitions and Data Collection

Procedural reliability data were collected by two independent observers to estimate whether sibling tutors delivered 4 s constant time delay and simultaneous prompting reliably. Task analyses were used by the observers to assess the occurrences and nonoccurrence of the planned steps in both procedures. The planned steps that sibling tutors were expected to demonstrate for 4 s constant time delay were (a) having the necessary materials ready, (b) securing sibling tutee's attention, (c) presenting the task direction, (d) providing the appropriate delay interval (waiting for 0 s or 4 s), (e) delivering the appropriate consequent events, and (f) providing the appropriate inter-trial interval (4 s). The planned steps that sibling tutors were expected to demonstrate for simultaneous prompting were (a) having the necessary materials ready, (b) securing sibling tutee's attention, (c) presenting the task direction, (d) providing the controlling prompt immediately after the task direction, (e) delivering the appropriate consequent events, and (f) providing the appropriate inter-trial interval (4 s). The planned steps that sibling tutors were expected to demonstrate for daily, full, generalization and maintenance probe sessions were (a) having the necessary materials ready, (b) securing sibling tutee's attention, (c) presenting the task direction, (d) delivering the appropriate consequent events, and (e) providing the appropriate inter-trial interval (4 s).

In both full and daily probe sessions, responses were scored as correct if the sibling tutee identified the animal figures receptively on the table within 4 s, or incorrect, if the sibling tutee did not identified the animal figures receptively on the table within 4 s, of asking the tutee to show the target animal. During training sessions with the simultaneous prompting, responses were scored as above, too. Four second constant time delay had five possible responses during training: (a) correct response before the prompt (i.e., the sibling tutee identified the animal figure receptively before the prompt was provided), (b) correct response after the prompt (i.e., the sibling tutee identified the animal figure receptively within 4 s after the prompt was provided), (c) incorrect response before the prompt (i.e., the sibling tutee identified the animal figure receptively before the prompt was delivered), (d) incorrect response after the prompt (i.e., the sibling tutee identified the animal figure receptively within 4 s after the prompt was delivered), and (e) no response (i.e., the sibling tutee had no response within 4 s after the prompt). Correct responses in daily probe sessions were counted toward criterion for both procedures.

Full Probe Conditions

Full probe sessions were conducted before training and after criterion was met for each animal set. All animal sets were probed during full probe sessions until stable data were recorded for three consecutive sessions. The sequence of presenting task directions were determined and written on a piece of paper by the first author and given to sibling tutors before the session started. Full probe sessions were implemented as follows: the sibling tutor collected the training materials, secured the sibling tutee's attention (e.g., "Are you ready? Look, we are gonna to study animals today. Shall we start?"), and then provided the target stimulus. After providing the target stimulus, the sibling tutor waited for 4 s by counting 1001-1002-1003-1004 silently. There were two distracters for each target stimulus during the probe sessions. Correct responses resulted in verbal praise; incorrect or no responses were ignored. The sibling tutors also delivered praise on a variable ratio schedule on the average of every three responses (VR3). Sibling tutors received verbal reinforcement by the first author at the end of each probe session that was implemented with at least 80% accuracy. Both sibling tutors and sibling tutees received verbal reinforcement for their attending and cooperative behaviors during the sessions by the first author.

Daily Probe Conditions

The simultaneous prompting procedure does not allow the student to respond independently to discriminative stimuli. Therefore, daily probe sessions were conducted to test for the transfer of stimulus control in simultaneous prompting. In order to compare the two instructional procedures equally, daily probe sessions were conducted for both procedures. Daily probe sessions were conducted before every daily training session. Animal sets that were currently being taught were probed in these sessions. There was no daily probe session before the first training session. Daily probe sessions were implemented just like full probe sessions except that only the currently trained animal set was assessed. The same procedure was followed regarding the sequencing the trials during daily probe sessions. Each correct response resulted in a verbal praise whereas incorrect or no responses were ignored by the sibling tutor. Sibling tutors received verbal reinforcement by the first author at the end of each probe session implemented with at least 80% accuracy. Both sibling tutors and sibling tutees received verbal reinforcement for their attending and cooperative behaviors during the sessions by the first author.

Four Second Constant Time Delay Procedure

All constant time delay sessions included 14 randomly sequenced trials. Each animal in an animal set was presented seven times. The first author determined the sequence of presenting the task direction and gave this sequence written on a paper to the sibling tutee. First two constant time delay session had 0 s trials (i.e., the task direction was presented with alternatives and the sibling tutors immediately provided the controlling prompt) for each animal and the rest of the sessions were conducted with 4 s delay trials (i.e., the task direction was presented with distracters and the sibling tutors waited the appropriate delay interval, then provided the controlling prompt). Correct responses (anticipations and waits) resulted in descriptive verbal praise on a continuous reinforcement schedule. Incorrect responses resulted in either the sibling tutor ignoring the response or re-providing the prompt and asking the sibling tutee to show the correct animal. The sibling tutors waited a 4 s inter-trial interval before presenting the next trial. Attending behaviors of both siblings received verbal reinforcement by the first author.

Simultaneous Prompting Procedure

All simultaneous prompting sessions included 14 randomly sequenced trials. Each animal in an animal set was presented seven times. The first author determined the sequence of presenting the task direction and gave this sequence written on a paper to the sibling tutee. During simultaneous prompting sessions the controlling prompt was provided immediately after the task direction (e.g., task direction

was presented with alternatives and the sibling tutor immediately provided the controlling prompt). Correct responses resulted in descriptive verbal praise on a continuous reinforcement schedule. Incorrect responses resulted in either the sibling tutor ignoring the response or re-providing the prompt and asking the sibling tutee to show the correct animal. The sibling tutors waited a 4 s inter-trial interval before presenting the next trial. Attending behaviors of both siblings received verbal reinforcement by the first author.

Generalization and Maintenance Probes

Generalization across materials probe sessions was conducted in 1:1 arrangement in a pretest-posttest manner. These sessions occurred before any training and at the end of teaching all animal sets. Maintenance data were conducted 1, 4, and 5 weeks after the final full probe session. Generalization and maintenance probe sessions were conducted by sibling tutors and implemented as were the full probe sessions.

Interobserver and Procedural Reliability

Interobserver reliability data were calculated using the point-by-point method in which number of agreements was divided by number of agreements plus disagreements and multiplied by 100. These data were collected during 30% of training, daily probe, and full probe sessions (at least one session per condition) and 50% of maintenance and generalization sessions. During daily probe, full probe, training, generalization and maintenance sessions the mean percent of agreement on all sibling tutees responding was 100%.

Procedural reliability which assesses the sibling tutors' compliance with the planned steps of each instructional procedure was measured during at least 33% of daily probe and full probe session and 50% of generalization and maintenance sessions. Procedural reliability data were calculated by dividing number of tutor behaviors observed by number of tutor behaviors planned and multiplying by 100 (Billingsley et al., 1980).

Social Validation

At the end of the study sibling tutors and mothers of the siblings were given a questionnaire that obtained opinions about the procedures, goals, and results of the study. Mothers and siblings were requested to complete this questionnaire individually. The sibling tutor version of the questionnaire was designed to reveal (a) whether they enjoyed the instructional procedures and acting as tutors, (b) the significance of the target behaviors, (c) which teaching strategy they would prefer to teach these target behaviors, (d) what, if any, were the most and least enjoyable components of the study, and (e) what, if any, were the outcomes of the study both for themselves and for their siblings. The mother version of the questionnaire had the same topics. Both questionnaires consisted of 3-point Likert-type items and five open-ended questions.

Results

Reliability Estimates

Procedural reliability data for both instructional procedures and probe sessions for each sibling tutor are presented in Table 2. Percentages of the sibling tutors' compliance with the planned steps in both instructional procedures were consistently high. Sibling tutors delivered 4 s constant time delay procedure with an average of 99% (range, 98% to 100%) compliance with the planned steps of the procedure. They delivered the simultaneous prompting procedure with an average of 99% (range, 98% to 100%) compliance with the planned steps of the procedure. Subjects delivered daily and full probe sessions with an average of 100% (range, 99% to 100%) compliance whereas they delivered maintenance probe sessions with an average of 96% (range, 94% to 97%) compliance, and generalization probe sessions with an average of 99% (range, 99% to 100%) compliance.

Effectiveness Data

Probe and training data for Recep, Selin and Ceren are shown in Figure 1, 2, and 3, respectively. The triangles represent the percentage

TABLE 2

Sibling Tutors' Procedural Reliability Data on Constant Time Delay, Simultaneous Prompting Procedures and Probe Sessions

Procedure	*Sibling Tutor*	*Have Ready Materials*	*Secure Attention*	*Present Task Direction*	*Deliver Controlling Prompt Appropriately*	*Deliver Consequences*	*Wait Intertrial Interval*
	Ali	100.0	100.0	95.3	95.3	100.0	100.0
Constant Time	Eylem	100.0	100.0	100.0	95.3	100.0	100.0
Delay	Ece	100.0	100.0	100.0	99.3	100.0	100.0
	Ali	100.0	100.0	98.8	95.3	98.9	100.0
Simultaneous	Eylem	100.0	100.0	100.0	98.3	100.0	100.0
Prompting	Ece	100.0	100.0	100.0	93.8	99.1	100.0
	Ali	100.0	100.0	100.0		97.4	100.0
Probe Session	Eylem	100.0	100.0	100.0		98.2	100.0
(full and daily)	Ece	100.0	98.2	96.4		76.8	100.0

of correct responding during full probe and daily probe sessions for both instructional methods. As seen in Figures 1 through 3, all sibling tutees met the criteria after introduction of both 4 s constant time delay and simultaneous prompting. These data revealed that both procedures were equally effective on teaching receptively identifying animals to sibling tutees with mild and moderate mental retardation.

Efficiency Data

Efficiency data, number of training sessions to criterion, number of training trials to criterion, percentage of errors to criterion, and total training time to criterion for constant time delay and simultaneous prompting are presented in Table 3. Findings about efficiency data are mixed. Four second constant time delay seemed to be more efficient than simultaneous prompting in terms of the number of training sessions to criterion and the number of training trials; whereas, simultaneous prompting seemed to be more efficient than constant time delay in terms of the percentage of errors and total training time.

Generalization and Maintenance

Generalization across materials data showed that higher generalization resulted with stimuli taught with constant time delay. Pretest generalization scores across all animal sets for constant time delay were 33% for Recep, 17% for Selin and 17% for Ceren; whereas, post test generalization scores across all animal sets for constant time delay were 100% for all subjects. Pretest generalization scores across all animal sets for simultaneous prompting were 17% for Recep and Selin and 0% for Ceren; whereas, post test generalization scores across all animal sets for constant time delay were 83% for Recep and Selin and 67% for Ceren. Ceren showed failure to respond during pretest generalization for simultaneous prompting.

Maintenance data showed that sibling tutees maintained the acquired animal names by both procedures at 1, 4, and 5 weeks after the final full probe session. Two sibling tutees maintained animal names with 100% accuracy and one sibling tutee maintained animal names with 75% accuracy and above after training had stopped.

Social Validity

All sibling tutors indicated without hesitation that they enjoyed delivering both procedures and enjoyed being tutors to their siblings with disabilities. Sibling tutors reported that they did not prefer one procedure to another. They also stated that, if asked, they would use

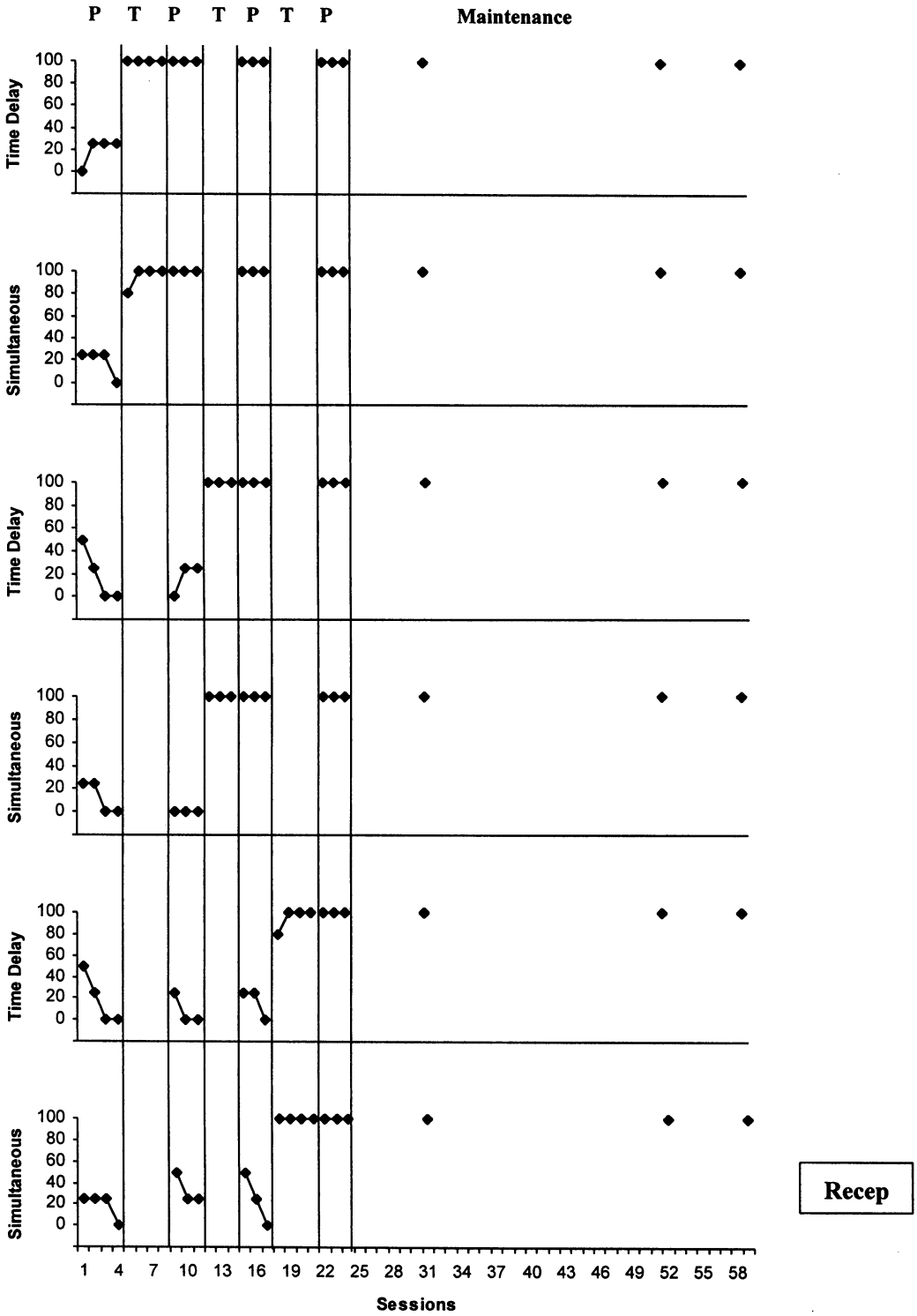

Figure 1. The percentage of animals identified receptively by Recep during full probe, daily probe and maintenance sessions. Training data are not plotted. P stands for probe sessions and T stands for training sessions.

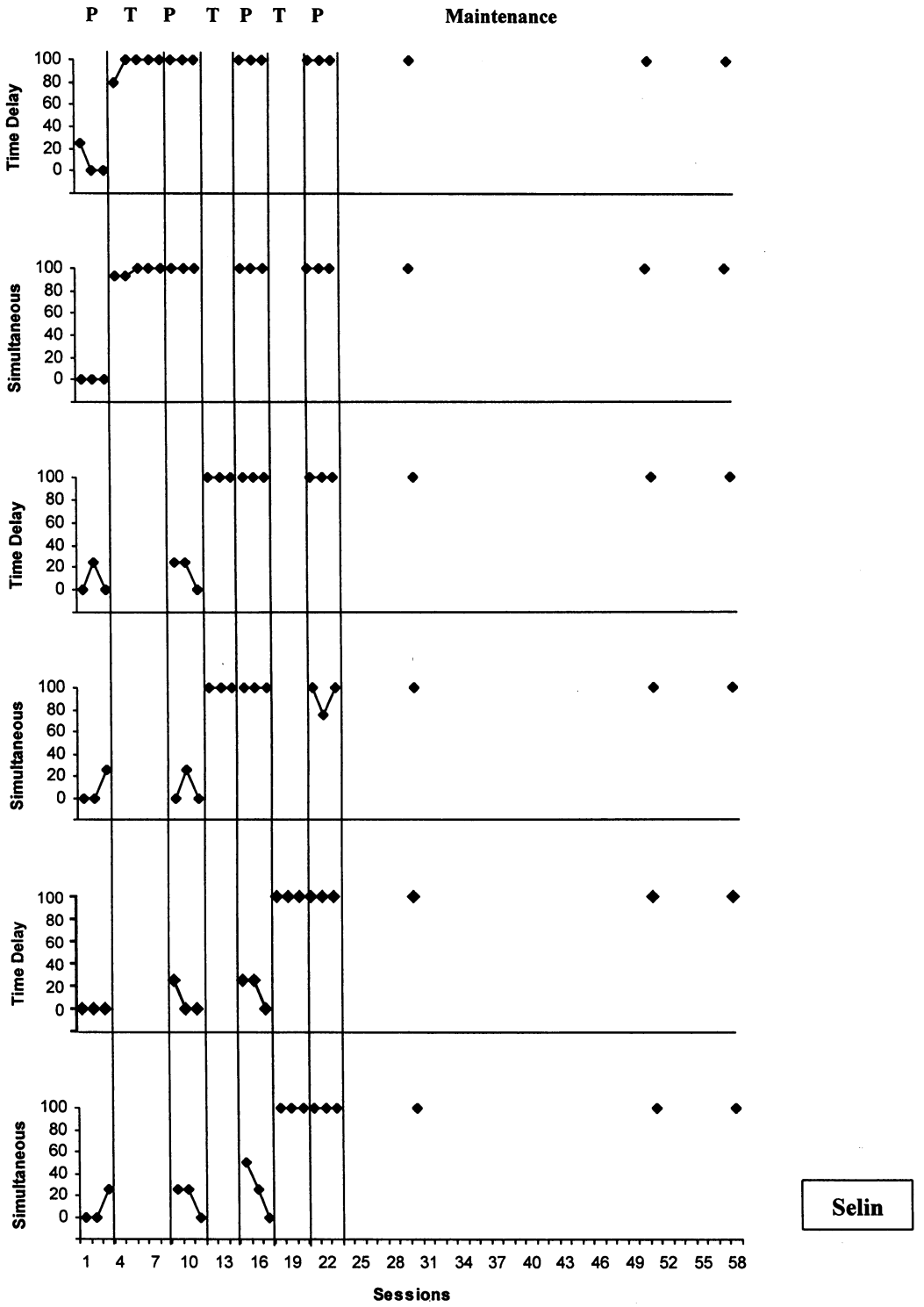

Figure 2. The percentage of animals identified receptively by Selin during full probe, daily probe and maintenance sessions. Training data are not plotted. P stands for probe sessions and T stands for training sessions.

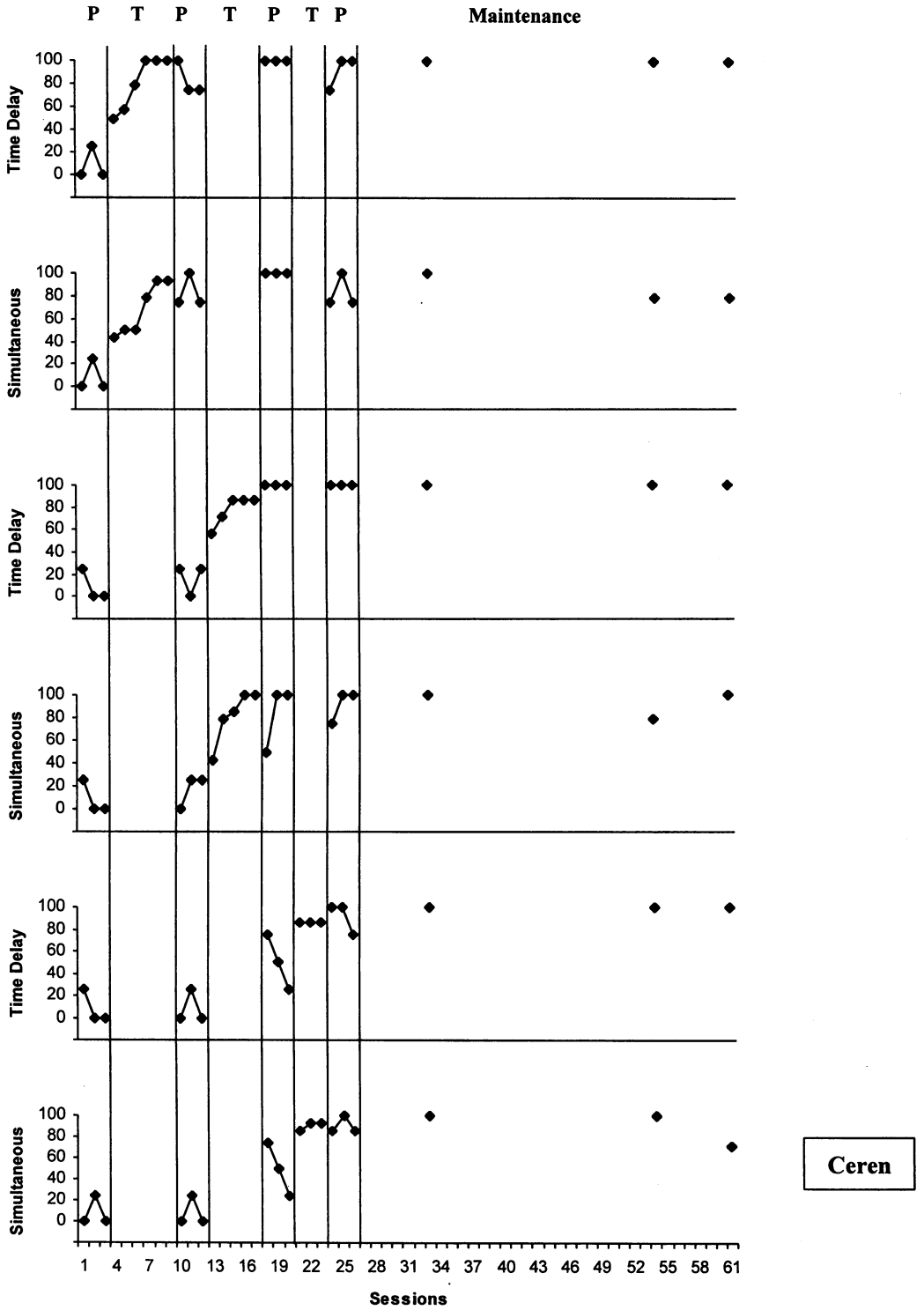

Figure 3. The percentage of animals identified receptively by Ceren during full probe, daily probe and maintenance sessions. Training data are not plotted. P stands for probe sessions and T stands for training sessions.

TABLE 3

Efficiency Data

Sibling Tutee	*Animal Set*	*# of training sessions through criterion*		*# of training trials through criterion*		*# of training errors through criterion*		*Training time through criterion (min:s)*	
		CTD	*SP*	*CTD*	*SP*	*CTD*	*SP*	*CTD*	*SP*
	1	1	2	14	28	0	1	3:20	5:54
Recep	2	1	1	14	14	0	0	3:04	3:25
	3	2	1	28	14	3	0	5:45	2:31
Total		4	4	56	56	3	1	11:09	11:50
	1	2	3	28	42	3	1	8:06	9:17
Selin	2	1	1	14	14	0	0	3:56	3:45
	3	1	1	14	14	0	0	5:33	3:25
Total		4	5	56	70	3	1	17:35	16:27
	1	3	4	42	56	4	3	10:48	10:35
Ceren	2	3	2	42	28	6	3	10:10	5:00
	3	1	1	14	14	5	4	1:40	2:46
Total		7	7	98	98	15	10	22:38	18:21
Grand Total		15	16	210	224	21	12	51:22	46:38

these procedures to teach to identify animals receptively to their siblings. They reported that there was nothing unpleasant about the study and it was "fun" working with the siblings. All three tutors stated that their siblings with disabilities learned animals as well as a positive interaction had been experienced between them and their siblings during this study. Tutors also mentioned that their teaching ability had shown progress and their self concept improved as a result of taking part in such an experience.

Social validity results of mothers indicated that (a) mothers liked both procedures and enjoyed their children being tutors and tutees in this study (mothers had a brief explanation about instructional procedures before the study had started), (b) they were happy to see that their children with a disability had a learning capacity, and (c) the most significant outcome of the study was the fact that both of their children used the concepts and skills they learned during this study in novel situations.

Discussion

The purpose of this study was (a) to investigate whether siblings of children with disabilities could implement constant time delay and simultaneous prompting reliably, and (b) to compare the effectiveness and efficiency of these procedures delivered by sibling tutors on teaching receptively identifying animals to their younger siblings with disabilities. Based on the results of this study several findings are worthy of discussion.

All sibling tutors implemented both procedures with a high degree of procedural reliability. These results are consistent with the previous studies investigating implementation of constant time delay by peer tutors (Collins et al., 1995; Koury & Browder, 1986; Telecsan et al., in press; Wolery et al., 1994). In addition, it also was evident that siblings implemented these procedures as reliably as adults (Wall & Gast, 1997a,b).

Effectiveness data show that both procedures implemented by sibling tutors were effective when teaching receptively identifying animals to their younger sibling tutees with mild and moderate mental retardation. The effectiveness results are consistent with results of the Schuster et al. (1992) study, which is the only comparison study on this topic. Furthermore, results of the present study are consistent with results of the studies investigating effectiveness of constant time delay and simul-

taneous prompting individually on teaching discrete skills (Alig-Cybriwsky & Schuster, 1990; Gibson & Schuster, 1992; MacFarland-Smith et al., 1993; Mattingly & Bott, 1990; Schuster et al., 1990; Singleton et al., 1995).

Maintenance data collected 1, 4, and 5 weeks after training showed no differences between constant time delay and simultaneous prompting. Two sibling tutees (Recep and Selin) maintained animals taught by the two procedures with 100% accuracy and one sibling tutee (Ceren) maintained the acquired names with 75% accuracy. In other words, it can be said that both methods are equally effective for maintenance. Readers should interpret maintenance results cautiously since correct responses at any probe sessions resulted in reinforcement. Higher generalization resulted with simultaneous prompting across all sibling tutees than with constant time delay. Consequently, results of the effectiveness data can be summarized as (a) both procedures delivered by sibling tutors were effective on teaching animal names, and (b) mixed results are obtained about maintenance and generalization data.

Analyses of the efficiency data of the study did not result in a conclusion as to which procedure to prefer. Results show that constant time delay was more efficient than simultaneous prompting in terms of the number of sessions through criterion and the number of trials through criterion whereas simultaneous prompting was more efficient than constant time delay in terms of the number of errors through criterion and the total training time through criterion. These conclusions were derived according to the grand total scores of the efficiency data. However, these conclusions do not change when individual totals of the subjects are taken into consideration (see Table 3).

Social validity data show that both sibling tutors and their mothers enjoyed participating in such a study. Social validity data are consistent with the findings of the previous studies conducted with siblings (Lobato & Tlaker, 1985; Schreibman et al., 1983).

There are several issues related to efficiency that are thought to be worthy of sharing with readers. First, it was observed that stimulus control is transferred from the controlling prompt to the target discriminative stimulus during 0 s trials of constant time delay across all sibling tutees. In other words, learning occurred during 0 s trials of constant time delay. Therefore, it might be thought that delay trials may not be necessary to implement for students to acquire behaviors. Second, since learning occurred during 0 s trials, a shift in teacher behaviors from 0 s trials to 4 s trials might not be necessary. Third, there are two types of student responses. As mentioned before, delivering differential reinforcement is recommended in constant time delay (Schuster et al., 1992; Wolery, Ault, et al., 1992). Therefore, when constant time delay and simultaneous prompting are compared in terms of delivering consequences, the second procedure seems to be easier to implement than the first one. Fourth, error rates during training sessions through criterion were higher in constant time delay than simultaneous prompting procedure. Sixth, when error rates were found to be high, wait training is advised with constant time delay. It can be time consuming to implement wait training. Besides, positive outcomes may not result every time. Therefore, in this study, it was thought that wait training was necessary for Ceren. However, because it was a comparison study and the procedures were delivered by sibling tutors rather than teachers, and given some of the internal threats of validity such as maturation and history, wait training was not implemented.

When all these points are taken into consideration, although constant time delay and simultaneous prompting delivered by sibling tutors were found to be effective on teaching receptively identifying animals to sibling tutees with mild and moderate disabilities, given the six reasons discussed above, simultaneous prompting might be more easily recommended to teachers, parents, tutors, and other related service personnel.

On the other hand, both in this study and in the previous study conducted by Schuster et al. (1992) the differences in efficiency were minimal. Therefore, the following conclusions should be taken into consideration: (a) both procedures are easy to implement and are low cost, (b) both procedures can be delivered in individual and group teaching ar-

rangements, (c) since error rates during instruction in these procedures are lower than traditional teaching methods, the possibility of exhibiting inappropriate behaviors and experiencing frustration are rare, and (d) a positive interaction between the trainee and trainer is observed during instruction. Therefore, practitioners might utilize both procedures.

There are several limitations of the study. Baseline performance level of sibling tutees on untrained teaching sets (Recep) and full probe performance levels of sibling tutees on some of the untrained teaching sets (Ceren) are relatively high. It can be thought that delivering reinforcement during probe sessions may have caused an increase in untrained teaching sets. Reinforcement during probe sessions may not have been delivered during probe sessions in order to eliminate this problem. On the other hand, we choose to reinforce correct responses during probe sessions in order to let the effectiveness of the instructional procedures emerge.

Based upon the findings of this study, conducting similar studies in different settings with different trainers on different behaviors is recommended. It also might be important for other response prompting procedures to be investigated with sibling tutors in order for them to have a range of strategies for instruction with their brother or sister with disabilities.

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Received: 29 May 2001
Initial Acceptance: 20 July 2001
Final Acceptance: 1 November 2001