

## Comparison of Two Instructional Strategies for Students with Autism to Read Sight Words

Nur AKÇİN\*

### Suggested Citation:

Akcin, N. (2013). Comparison of two instructional strategies for students with autism to read sight words. *Egitim Arastirmalari-Eurasian Journal of Educational Research*, 51, 85-106.

### Abstract

*Problem Statement:* Literacy skills are extremely important for all individuals, especially children with autism, because these skills provide a channel for educational assessment and learning as well as enhance vocational opportunities, promote self-expression, and facilitate independent living. Some individuals with autism cannot acquire academic literacy skills, though they can acquire the functional literacy skills that are essential for them to live, work and participate in social life. Word reading is the first step of functional literacy instruction. Previous studies in literature have compared the effectiveness of constant time-delay and stimulus fading procedures within sight word reading instruction. These studies included participants with mild and moderate mental retardation. However, it is surprising that there are so few similar studies conducted among individuals with autism. In addition, existing studies have revealed that teachers lack the specific information and skills necessary to teach literacy skills to individuals with autism. This study will contribute to literature comparing the effectiveness and efficiency of constant time-delay and stimulus fading strategies in teaching students with autism to read sight words.

*Purpose of Study:* The purpose of this study was to compare the effectiveness and efficiency of constant time-delay and stimulus fading strategies in assisting three students with autism to read sight words.

*Methods:* Participants were three students with autism, ranging in age from 12 to 14. A five-word set was determined for each teaching strategy, and both sets were taught to the participants. The teachers and mothers of the participants were interviewed before selecting the target words. An

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\* Dr., Marmara University, Atatürk Faculty of Education, Special Education Department, e-mail: nakcin@marmara.edu.tr

adapted alternating-treatments design was used to compare the effectiveness and efficiency of constant time-delay and stimulus fading strategies for students with autism to read sight words. Inter-observer and procedural reliability data were collected.

*Findings and Results:* Target words were acquired by students during the intervention sessions. All three participants were able to generalize reading these target words through the materials of different writing styles, font sizes and letter styles (upper- and lower-cases). Permanent effects of the instructional procedures were observed in maintenance sessions.

*Conclusions and Recommendations:* The results indicated that both strategies were effective; however, the constant time-delay strategy was more efficient in terms of the number of trials required to achieve performance criterion.

*Keywords:* Autism, sight word reading, constant time-delay, stimulus fading, single-subject design

Literacy skills are extremely important for all individuals, particularly for children with autism, because these skills provide a channel for educational assessment and learning, and also enhance vocational opportunities, promote self-expression, and facilitate independent living (Bureau of Instructional Support and Community Services, 2004; Light & Kent-Walsh, 2003). Nonetheless, individuals with autism experience serious difficulties in reading and writing due to problems related to attention, motivation, word decoding, and phonemic awareness (Hannah, 2001; Vacca, 2007). Individuals with autism therefore require literacy instruction to progress from emergent literacy to academic literacy. During this instruction, individuals with autism need to go through stages of development that are carefully matched with systematic, explicit, and multiple instructional strategies (Mirenda, 2003; Monroe, 2009; Rivera, Koorland, & Fueyo, 2002; Whalon, Otaiba, & Delano, 2009).

Literacy skills are discussed under two themes: functional literacy and academic literacy (Monroe, 2009; Ysselduke, Algozzine, & Thurlow, 1992). Functional literacy refers to reading the words necessary to perform daily routines in various environments by sight without decoding. A functional literacy program includes the following: (a) comprehending words needed to manage activities at home (e.g., food preparation, medication directions), within the community (e.g., understanding grocery vocabulary, restaurant menus), at work (e.g. following job schedule), and at school (e.g., recognizing classroom numbers); (b) responding safely when encountering warning words (e.g., "do not enter"); (c) making the right choices among the printed options (e.g., music or TV programs); (d) accessing new opportunities through increased reading skills (e.g., taking up hobbies that involve some reading; and (e) participating more attentively in general education lessons. Academic literacy refers to the ability to understand and manage academic materials. Academic literacy also includes word analysis, comprehension, and fluency skills to

derive information from adult reading materials in the general community (Bigge, Stump, Spagna, & Silberman, 1999; Browder, 2001, Browder & Snell, 2000; Monreo, 2009). While some individuals with autism cannot acquire academic literacy skills, they can acquire functional literacy skills (Alberto, Frederick, Hughes, McIntosh, & Cihak, 2007).

Word reading is the first step of teaching functional literacy (Laz, 2009; Whalon et al., 2009; Williams, 2001). It is significant in terms of forming a basis for reading comprehension and includes the ability to identify words through decoding or by sight. Decoding is an ability to identify words using knowledge of sound-symbol correspondence (Davis & Williamson, 2010). Sight word reading refers to the identification of words as distinct graphic configurations without any attempt to analyze the composition of the word in relation to the sound that it represents (Bigge et al., 1999; Davis & Williamson, 2010; Rivera et al., 2002; Williams, 2001). The presumed advantages of reading by sight are that when the phonetic principles involved in reading are not yet within the child's grasp, he or she is able to use sight words immediately. Sight words give beginner readers early success and help children to acquire decoding skills (William, 2001). The instruction of sight word reading is important in terms of forming a basis for teaching letter-sound relationships to the child via known words (Kaderavak & Rabidoux, 2004).

The acquisition of sight words involves recognizing words through discrimination training, which is a challenging task (Browder, Wakeman, Spooner, Ahlgrim-Dezell, & Algozzine, 2006; Fosset & Mirenda, 2006; William, 2001). There are several well-supported instructional strategies for teaching sight words (McDonnell & Copeland, 2011), two of which are "constant time-delay" and "stimulus fading" procedures (Snell & Brown, 2000).

Constant time-delay procedure is an approach that involves error-minimizing learning for students with disabilities (Browder & Snell, 2000). It begins by presenting the learner with several 0- second time delay trials in which the target stimulus (e.g., a printed word) and a controlling prompt (e.g., a spoken word and/or a pictorial clue) are paired. Over successive teaching opportunities, the teacher adds a latency of a few seconds between the target stimulus and the controlling prompt, thus giving the learner an opportunity to respond without assistance (Browder & Snell, 2000; Gast et al., 1990; Jones Ault et al., 1988). There have been studies that conducted this instructional strategy. The results of these studies established the efficacy of sight word reading instruction for most students with significant cognitive disabilities. For example, Browder, Hines, McCarthy and Fees (1984) taught sight words to the retarded adults. Jones Ault, Gast, and Wolery (1988) used the same procedure to read functional community-sign words. Gast, Wolery, Morris, Munson Doyle, and Meyer (1990) trained a small group of students with moderate disabilities to read environmental sight words. Schloss, Alper, Young, Arnold-Reid, Aylward, and Dudenhoefte (1995) used reaction activities to train individuals with mental retardation within a community setting. All of these studies revealed that the constant time-delay procedure was an effective teaching method.

Stimulus fading is a procedure in which the stimulus prompts are gradually reduced in size or intensity. In teaching sight words, the picture cue is gradually faded over instructional sessions until only the word itself remains. The stimulus fading strategies include placing a known stimulus (a picture) upon other unknown

stimulus and slowly fading the intensity, definition or clarity of the known stimulus until it becomes invisible (Snell & Brown, 2000; Tekin-İftar & Kırcaali-İftar, 2004). Dorry and Zeaman (1975) reported that children with moderate disabilities were able to learn simple words relatively easily by using this method, and McGee, Krantz, and McClannahan (1986) used the same method to enable children with autism to read toy labels. These studies all concluded that the stimulus fading strategies were effective to use with children with developmental disabilities.

In related literature, there are a few studies comparing the effectiveness and efficacy of constant time-delay and stimulus fading procedures within sight word reading instruction of children with mental retardation (Browder & Ping Xin, 1998; Lalli & Browder, 1993). On the other hand, there have been studies that focus on the effectiveness of either constant time-delay or stimulus fading procedures within sight word reading instruction to children with autism. For instance, McGee et al. (1986) taught two children with autism to match printed word-representing toys to spoken words by using stimulus fading and prompting only. Similarly, Hetzroni and Shalem (2005) used stimulus-superimposition and fading to train children with autism to match food logos to printed words and printed words to actual food items. On the other hand, Ledford, Gast, Luscre, and Ayres (2008) applied direct instruction using constant time delay and observational learning to teach six children with autism to read words on environmental signs. However, it seems that there have been no studies done to compare the effectiveness and efficacy of the constant time-delay and stimulus fading procedures.

On the other hand, existing literature seems to provide limited guidance regarding the comparison of constant time-delay and stimulus fading strategies for individuals with autism to read sight words. Therefore, the purpose of the present study was to compare the effectiveness and efficiency of constant time-delay and stimulus fading strategies in teaching students with autism to read sight words. This study is crucial in terms of providing an insight into literacy acquisition among children with autism and revealing the effectiveness and efficacy of the constant time-delay and stimulus fading procedures in supporting literacy related with development of children with autism. The following research questions were addressed:

1. Which instructional procedure is more effective in teaching word reading to children with autism?
2. Which instructional procedure is more efficient regarding:
  - the number of training sessions required
  - the number of training trials
  - the percentage of errors
  - total training timein order to achieve the performance criterion?
3. What do the teachers and mothers of the students think about the students' learning reading words?

## Method

### *Participants*

Participants of the study consisted of three students with autism, two boys and one girl, ranging in age from 12 to 14. These children had been receiving education at a training center for children with autism in Istanbul. Prerequisite skills for the participants were as follows: (a) speaking with comprehensible pronunciation at least with one word; (b) matching pictures; (c) pointing to the picture asked among two; (d) naming the picture shown; (e) remaining attentive to an activity for at least 10–15 min; (f) waiting when verbally instructed; (g) successfully following simple verbal instructions; and (h) having no prior skills to read words. Before beginning the study, the subjects' parents were informed about the study and written permission was obtained for each child's participation. Names of participants were replaced with pseudonyms in the article. The participants' chronological age, results of the tests administered, and intensity of training are presented in Table 1.

**Table 1.**

*The Participants' Chronological Age, Test Results and Intensity of Training*

<i>Participants</i>	<i>Chronological Age</i>	<i>Peabody Picture-Vocabulary Test</i>	<i>Gilliam Autistic Disorder Rating Scale-2</i>	<i>Autism Behavior Control List</i>	<i>Group training in autism training center per week</i>	<i>1:1 training in rehabilitation center per week</i>
<b>Can</b>	14;7	5	85	82	5 days	2 hour
<b>Metem</b>	13;8	4	90	87	5 days	2 hour
<b>Seda</b>	12;8	5	100	98	3 days	2 hour

Can was almost at the same level with his normally developing peers in self-care skills and gross motor skills. He could express himself by using two word clauses, including an object/subject and a verb. He possessed concepts of color, shape, position, and size. However, he was limited in fine motor skills and social skills.

Metem almost at the same level with his normally developing peers in self-care skills, gross motor skills, and receptive language. He could express himself using single words. He had the concepts of color, shape, contrast and quantity. He was limited in fine motor skills, pencil holding skill and social skills.

Seda was almost at the same level with his normally developing peers in self-care skills, fine and gross motor skills. She could express herself using single words. She rarely used phrases including noun-noun or noun-verb. She had concepts of color, shape, and position. She was limited in social skills.

#### *Trainers*

The author planned the research, prepared the materials, wrote procedural instructions, and video recorded the training sessions for efficiency and reliability. The implementation of the study was conducted by a teacher attending a graduate study program at the Department of Special Education, Faculty of Education at Marmara University. The teacher had previous experience at the Tohum Autism Foundation Special Training School (an extension team of the Princeton Child Development Institute). The teacher conducted all sessions with the participants.

#### *Setting*

The study was conducted in a classroom at the Education Center for Children with Autism. The classroom was approximately 9 square meters and contained two tables and three chairs. A handy-cam video camera was used to record the sessions. All sessions were conducted before (11-12 p.m) and after lunch (1-2 p.m) on Monday, Wednesday and Fridays. Each session lasted approximately 10 minutes. All sessions were conducted individually.

#### *Materials*

##### *Determining Target Words*

While selecting target words, it was taken into consideration that the words were functional and commonly encountered by children. We also benefited from a study by Bakır (2007), "Developments of the Turkish Quick Automatic Denotation Tests", when compiling the words used in the study. Bakır had identified the most commonly used words of children aged from 5 to 10.

The following points were taken into consideration to ensure that the words were of the same difficulty level: (a) words formed of 4-6 letters; (b) words formed of vowel-consonant-vowel-consonant or consonant-vowel-consonant-vowel letter combinations; (c) words dissimilar to each other in terms of phoneme and grapheme; (d) words with 2 or 3 syllables; (e) words compatible with the developmental level of the children; and (f) words that were not abstract. A series of 10 words were chosen for use in instruction with two distinct independent variables. Two teaching sets including 5 words each were used for all children in both strategies; five in the instruction with constant time-delay, and the other 5 with stimulus fading method. The words were randomly assigned to the teaching sets. The words are presented in Table 2.

**Table 2***Target Words*

<i>Instructional Procedure</i>	<i>Target Words (Turkish/English)</i>				
Constant time-delay	köpek/dog	ağaç/tree	kalem/pencil	aslan/lion	bulut/cloud
Stimulus fading	balık/fish	çiçek/ flower	çanta/bag	masa/table	kedi/cat

*Teaching Materials*

The cards were 15 × 20 cm in size. The words on the cards were written in black on a white background using bold lowercase 16-point Comic Sans font. Picture cards were the same size as the word cards. Picture cards had images of 10×10 cm that represented the associated word. CorelDRAW Graphic Suite professional graphic design software was used to achieve the picture fading. An example of these materials is shown in Figure 1. They were as follows:

- *1<sup>st</sup>set (F1)*: On the first card, there was a distinct picture of the target vocabulary with the associated word printed on it.
- *2<sup>nd</sup>set (F2)*: The second card included the same target picture-word combination gradually faded with the help of square blank divisions, but the word was clearly printed on it.
- *3<sup>rd</sup>set (F3)*: The third picture had more blank squares, which slightly gave the impression of the target item, but the associated word still remained distinct on the faded picture.
- *4<sup>th</sup> set(F4)*: On the fourth card, the picture was removed, but the word remained as distinct as it was printed on the previous cards.



Figure 1. Materials of stimulus fading strategy

*Generalization Materials:* The font size and font used in the generalization sessions were changed for both instructional strategies. The word cards used in the generalization sessions were prepared by using 12-point Calibri font.

*Procedure*

*Reinforcers:* Interviews were conducted with mothers and teachers of participating students to identify reinforcements. The reinforcers used for each participant and the instructional procedures are shown in Table 3.

**Table 3**  
*Reinforcers and Instructional Procedure*

<i>Participants</i>	<i>Reinforcements</i>	<i>Instructional Procedure</i>
<b>Can</b>	bonbon, crisps	Constant time-delay
	Jelly bean, pretzel	Stimulus fading
<b>Metem</b>	Crisps, bueno, "Well done",	Constant time-delay Stimulus fading
	<b>Seda</b>	Chocolate, crisps candy, jelly bean

*Probe Sessions*

The study phases consisted of full probe, daily probe, training, maintenance and generalization sessions:

*Full probe sessions.* For each student, at least three probe sessions were conducted until baseline data were obtained. In each full probe session, ten trials were conducted in order to check each target word. Full probe sessions were conducted in the following order: (1) word cards and recording materials were placed on the material table in the experimental setting; (2) the trainer randomly selected one of the word cards without showing the student; (3) an attentional cue (i.e. "Are you ready?") was provided; (4) task direction (i.e. "Read") was provided; (5) 4 seconds waiting interval; (6) verbal praises were provided for correct responses (i.e., "well done, bravo"), whereas incorrect responses were ignored; and (7) the next trial was conducted after 4 seconds. At the end of the full probe conditions, participants were given a tangible reinforce to reward their attention and cooperation during the sessions.

*Daily probe sessions.* Daily probe sessions were conducted prior to each training session in order to collect the data. Each student was asked a series of 10 target words in random order. Daily probe sessions were conducted with three participants until they achieved 100% for at least three consecutive days. Participants were rewarded verbally for each correct response during daily probe sessions, while all

incorrect responses were ignored. Participants' attention and cooperation were reinforced at the end of each session.

*Training Sessions.* Constant time delay and stimulus fading procedures were randomly assigned to the word set and conducted in the same order with each student. In each training session, each of the target words was asked twice. Since there were five target words in each procedure set, a total of ten trials were conducted during the sessions. The training was repeated until 100% was obtained during at least three consecutive intermittent sessions. Correct responses (before and after prompting) resulted in verbal and social reinforcement, whereas incorrect responses resulted in error correction.

*Constant time-delay sessions:* Visual cue and modeling word reading were used as prompts during sessions. The trials used two kinds of response intervals: 0-second delay and 5-second delay. The initial instructional session used a 0-second delay interval, and in the subsequent sessions, the duration between the task direction and the prompt was increased to 5 seconds. The inter-trial interval was 2 seconds. Unprompted and prompted correct responses resulted in reinforcement, whereas unprompted incorrect responses, prompted incorrect responses and no-response cases resulted in error correction and repetition of the controlling prompts.

Training sessions were conducted as follows for the 0-second delay interval: (1) five target word cards were placed on the material table; (2) the trainer held up one of the word cards at the eye level of the student; (3) an attentional cue phrase was delivered to the student (e.g., "Metē, look at me"); (4) while the trainer was holding up the word card at eye level, task direction was delivered (i.e., "Read"); (5) the trainer immediately delivered the controlling prompt by holding up the picture card with the other hand and modeled the reading of the word; (6) a correct response by student was reinforced verbally and socially (i.e., "Well done, you read correctly), whereas incorrect responses were ignored (0-second delay interval); and (7) the subsequent instructional sessions were conducted using 5-second delay intervals between task directions and controlling prompts. In these trials, while the trainer was holding up the word card at eye level, the task direction was delivered (i.e., "Read") and the trainer waited 5 seconds for the student's response. If the student read correctly before the controlling prompt was delivered, the student's correct response was verbally praised (i.e., "well done, great job, etc.) and reinforced with the participant's preferred item (chocolate, chips, etc.). If the student read incorrectly, the trainer warned the student to wait for the prompts and a new trial was started after 2 seconds. If the student read correctly after the controlling prompt was delivered, his/her correct response was only verbally praised (i.e., "well done, great job, etc.). If the student read the word incorrectly even after the prompts were delivered, the mistake was corrected. If the student did not provide any response, a new trial was started.

*Stimulus fading sessions:* Stimulus fading was conducted in four stages, as previously explained in the teaching material section. Teaching materials in which the faded stimulus was used in a successive manner were used for each stage. The instruction was conducted in the same way in all the stages. Training sessions were conducted as follows: (1) five target word cards of the first set of materials were placed on the material table; (2) the trainer held up one of the word cards at the eye level of the student; (3) an attentional cue was delivered to the student (e.g., "Metē,

look at me); (4) while the trainer was holding the word card at eye level, task direction was delivered (i.e., "Read"); (5) the trainer waited 4 seconds for the participant's response; (6) a correct response was reinforced verbally and socially (i.e., "Well done, you read correctly). If the student read the word incorrectly, the error was corrected (i.e., "No, it is....."). If the student did not provide a response, a new trial was started; and (7) when the student scored 100% correctly on three subsequent sessions with the same level of materials, the trial progressed to the next level of material.

*Maintenance and generalization:* Maintenance data was collected 1, 2 and 3 weeks after completing the intervention sessions. Maintenance and generalization sessions were conducted in the same way as probe sessions, but the reinforcers were faded. Three generalization sessions were conducted immediately after the intervention sessions. Generalization data were collected across the material's writing style, font size and letter style (upper-case/lower-case).

#### *Experimental Design*

An adapted alternating-treatments design was used to compare the effectiveness and efficiency of two different procedures in teaching students with autism to read sight words. In adapted alternating-treatments, the effects of two or more variables on two or more dependent variables with non-reversible behavior are compared. The dependent variable was the percentage of correct responses of the target words, and the independent variables were constant time-delay and stimulus fading. There are some points to be taken into consideration when using an adapted alternating-treatments design (Alberto & Troutman, 1995; Cooper, Heron, & Heward, 1987; Gay, Mills, & Airasian, 2006; Kennedy, 2005; Richards, Taylor, Ramasamy, & Richards, 1999; Riley-Tillman & Burns, 2009; Tawney & Gast, 1984; Tekin-Iftar & Kircaali-Iftar, 2004). The first is the necessity of dependent and independent variables that are independent of each other and that are also similar in terms of function and difficulty levels. As described previously, difficulty level was taken into consideration when choosing the words to teach. Second, which strategy to be used for the target words was determined by using an objective assignment method. The numbers of sessions conducted with procedures were equal. Rapid cycling of the procedures was possible, with both instruction methods conducted at different times within a single day. Third, all other variables except for the independent variables should be equal. With the aim of meeting this condition, similar reinforcers and similar reinforcement methods were used during the training. Finally, there should be a one-hour break between the applications of independent variables in order to control for transition effect. Experimental control was achieved by comparing both methods via the number of attended sessions, the number of trials, the total time of instruction and the difference in terms of error percentage until meeting the criterion of the performances of samples.

#### *Reliability*

Inter-observer and procedural reliability data were collected during the study. Reliability data comprised random video records of selected sessions, which were examined independently by the trainer and the observer. Reliability data were collected for at least 20% of all experimental sessions. Inter-observer reliability was calculated by the number of agreements, divided by the number of agreements, plus disagreements and multiplied by 100 (Tawney & Gast, 1984; Tekin-Iftar & Kircaali-Iftar, 2004). The inter-observer reliability was between 97 and 100% for constant time-

delay sessions and between 98 and 100% for stimulus fading during the probe sessions. Reliability was between 90 and 100% for the constant time-delay sessions and between 91 and 100% for stimulus fading during the instruction sessions. In maintenance and generalization sessions, there was 98% agreement for constant time-delay sessions and 100% for stimulus fading sessions.

Procedural reliability data were collected to assess the implementation of the teaching plan. Data were calculated via the number of trainer behaviors observed divided by the number of behaviors planned and multiplied by 100 (Tekin-Iftar & Kırcaali-Iftar, 2004). The following steps were used to ensure procedural reliability: (1) the trainer had materials ready; (2) secured attention; (3) presented the word card; (4) gave task direction; (5) delivered the controlling prompt; (6) waited for the response interval; (7) gave appropriate feedback according to the students' responses; and (8) waited for the inter-trial interval. Analysis of the recordings showed that procedural reliability was 100%.

#### *Social Validity*

Social validity data were collected to determine the efficiency of both instruction methods in sight word reading and the importance of the results for teachers. Social validity data were collected via semi-structured interviews with the teachers of each of the three participants.

## Results

#### *Effectiveness*

The results indicate that both procedures were equally effective in teaching students to read words. All participants met the criterion. Figures 2, 3, and 4 show the percentages of correct reading responses during the baseline, intervention, and maintenance probe sessions for Can, Mete and Seda. As seen in these figures, although all participants met the criterion, the total number of training sessions differs.

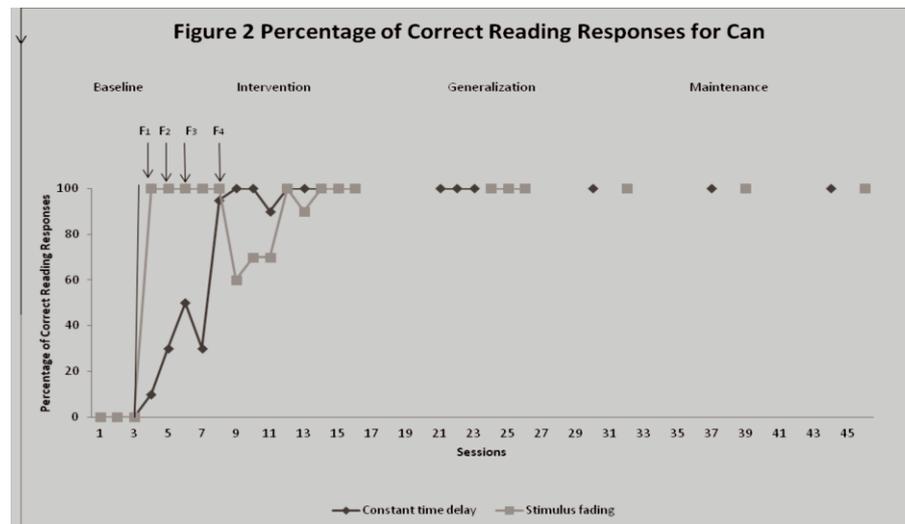


Figure 2. Percentage of correct responses of Can

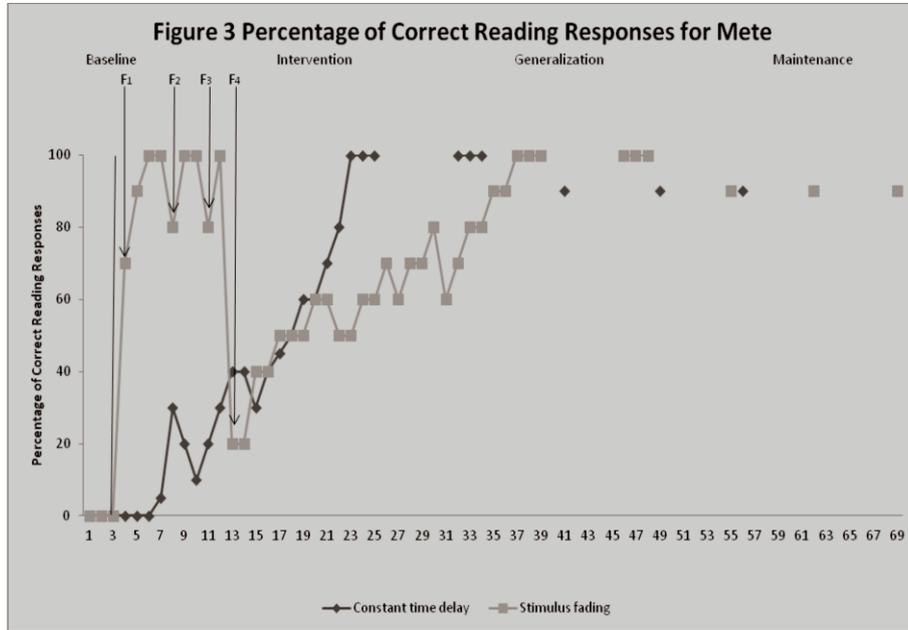


Figure 3. Percentage of correct responses of Mete

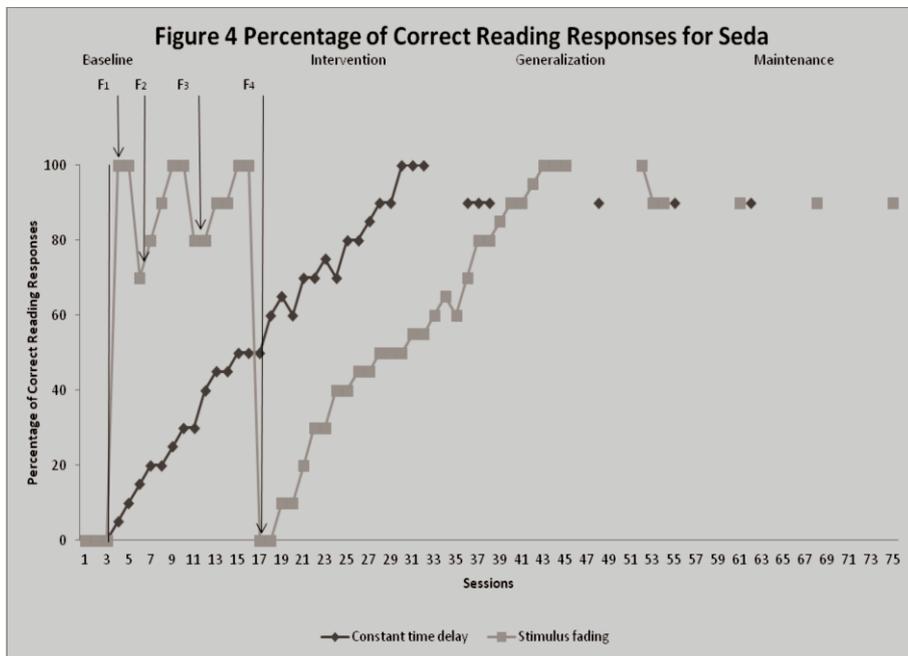


Figure 4. Percentage of correct responses of Seda

Can. During the baseline, Can read 0% of his target words correctly. During the intervention phase, Can achieved a mastery criterion of 100% after 14 constant time-delay sessions. Can's accuracy rate was 73.1% (range=10-100%) during the constant time-delay sessions. On the other hand, Can achieved the mastery criterion of 100% immediately when the Fading 1 (F1), Fading 2 (F2) and Fading 3 (F3) materials were presented at the stimulus fading sessions. However, when the Fading 4 (F4) material was presented, accuracy rate decreased to 60%. Can's accuracy rate reached 100% again with the Fading 4 material at the sixteenth stimulus fading session. Can's accuracy rate reached 91.5 on average (range=60-100) at the stimulus fading session. Can read 100% correctly across materials during the generalization sessions. Can maintained 100 % of the behavior taught during the maintenance sessions.

Mete. During baseline, Mete read 0% of his target words. During the intervention phase, Mete read 0% of his target words correctly during the first three sessions, and then he achieved a mastery criterion of 100% after 25 constant time-delay sessions. Mete's accuracy rate was 42.3% (range=5-100%) during the constant time-delay sessions. On the other hand, Mete achieved a mastery criterion of 100% immediately when the Fading 1 (F1), Fading 2 (F2), Fading 3 (F3) materials were presented during the stimulus fading sessions. However, when the Fading 4 (F4) material was presented, accuracy rate decreased to 20%. Mete's accuracy rate reached 100% again with the Fading 4 material at the thirty-ninth stimulus fading session. Mete's accuracy rate was 63.7% on average (range 20-100) during the stimulus fading session. Mete read 100% correctly across materials during the generalization sessions. Mete maintained the behavior taught 90 % during maintenance sessions.

Seda. During baseline, Seda read 0% of her target words. During the intervention phase, Seda achieved a mastery criterion of 100% after 32 constant time-delay sessions. Seda's accuracy rate was 58.2% (range=5-100%) at the constant time-delay sessions. On the other hand, Seda achieved a mastery criterion of 100% when the Fading 1 (F1) material was presented at the first two stimulus fading sessions. When the Fading 2 (F2) material was presented, her accuracy rate decreased to 70%. Seda's accuracy rate reached 100% again with the Fading 2 material at the sixth and seventh stimulus fading sessions. When the Fading 3 (F3) material was presented, her accuracy rate decreased to 80%. Seda's accuracy rate reached 100% again with the Fading 3 material at the end of the twelfth and thirteenth stimulus fading sessions. When the Fading 4 (F4) material was presented, her accuracy rate dramatically decreased to 0%. Seda's accuracy rate reached 100% again with the Fading 4 material at the forty-ninth stimulus fading session. Seda's accuracy rate averaged 66.3% (range 0-100) during the stimulus fading session. Seda read 90% correctly across materials during the generalization sessions. Seda maintained 90% of the behavior taught during the maintenance sessions.

#### *Efficiency*

Results showing the efficiency of instruction for the two training conditions are presented in Table 4. For each participant, the table shows the number of training sessions to achieve the acquisition criterion, the number of training trials, number of training errors and the training time to achieve the criterion. Table 4 presents the efficiency results.

**Table 4***Efficiency Data*

<i>Student</i>	<i>Training condition</i>	<i>Training sessions to criterion</i>	<i>Training trials to criterion</i>	<i>Training errors to criterion</i>	<i>Training time to criterion (minutes)</i>
<b>Can</b>	Constant time-delay	14	28	0	58
	Stimulus fading	16	32	11	51
<b>Mete</b>	Constant time-delay	25	50	0	72
	Stimulus fading	39	78	37	91
<b>Seda</b>	Constant time-delay	32	64	3	90
	Stimulus fading	45	90	24	140

The constant time-delay strategy seemed to be more efficient than the stimulus fading strategy for all three participants. The constant time-delay procedure seemed to be more efficient than the stimulus fading procedure in terms of the number of training trails, training errors and training time to achieve the targeted criterion.

When the number of training sessions required to achieve the criteria for the participants to read sight words was investigated, it was seen that all three participants needed fewer training sessions in constant time-delay compared with the stimulus fading teaching strategy. The most significant difference between the two methods was the number of training errors the students made before achieving the completion criterion. During the constant time-delay sessions, the number of training errors to achieve the criterion was 0 for Can and Mete and 3 for Seda. Training errors to reach the criterion of the participants ranged between 11 and 37 in the sessions with stimulus fading. When these two strategies were compared in terms of training errors, it was observed that constant time-delay resulted in significantly fewer incorrect responses. When the participants were compared in terms of training errors, it was observed that Can took less time for constant time-delay procedure than stimulus fading. However, the training times of Mete and Seda were significantly shorter with the constant time-delay method.

### *Social Validation*

Social validity findings indicated by the teachers were as follows: (a) the participants were more willing to engage in reading studies; (b) when the students realized they were able to read the words, they were motivated to practice more; and (c) skills such as turn taking, waiting and making an eye contact without warning improved.

### **Discussion**

This study was designed to compare the effectiveness and efficiency of constant time-delay and stimulus fading strategies in teaching students with autism to read sight words. The findings indicated that both strategies were effective in assisting students to acquire target words during the intervention sessions. All three participants were able to generalize reading these target words through materials of different writing styles, font sizes and letter styles (upper-case/lower-case). Permanent effects of the instructional procedures were observed in the maintenance sessions. However, constant time-delay was more efficient in terms of trials to meet the criterion. These results were consistent with the results of the studies that examined the effectiveness of constant time-delay strategies in teaching students with autism to read sight words (Alberto et al., 2007; Browder et al., 1984; Cuvo & Klatt, 1992; Gast et al., 1990; Jones Ault et al., 1988; Schloss et al., 1995).

Two instructional strategies were used to teach sight words in this study. One of them was constant time delay. All of the participants progressed steady during the intervention phase which constant time-delay implemented. There are several evident advantages of the constant time-delay strategy over the fading strategy (Browder & Xin, 1998; Browder et al., 2006; Gast et al., 1990). The constant time-delay strategy is teacher-friendly. It would be the simplest teaching approach to plan and implement for three reasons. First, preparing teaching material for this strategy is easier than for the stimulus fading strategy, which requires numerous materials per word, a time consuming process for teachers. Second, once the materials are prepared, they can be used for many students. Third, the constant time-delay strategy is easy to implement. The trainer knows what he/she must do, according to the students' response. This is very important for teachers with limited experience in using such instructional strategies. On the part of the learner, the constant time-delay strategy can be defined as student-friendly, resulting in few errors and therefore a high density of student reinforcement.

The second instructional strategy adopted in the present study was the stimulus fading strategy, which consists of a fading procedure. The fading procedure used in this study consisted of four steps incorporating pictorial cues that were eliminated in stages. For all of the three participants, Fading 1 through Fading 3 presented smooth transitions that enabled close to errorless transitions. Can thought that the task was easy to learn across all the fading stages, whereas Mete and Seda found all the fading stages relatively difficult. According to Seda, all fading stages become increasingly

difficult. When the participants reached the Fading 4 stage, all the pictorial clues were removed and only the target stimulus remained. Thus the last fading stage was the most difficult one, and all of the participants needed several attempts before they successfully completed this stage. The fading 4 stage took all of the participants longer to reach the goal, but all three participants could learn to read target words through stimulus fading strategy overall. Perhaps more steps would have made the task easier. These results support previous research that also found fading to be a suitable tool to teach sight words for teaching children with autism (McGee, Krantz & McClannahan, 1986; Hetzroni & Shalem, 2005).

Can's performance can be said to be better for each strategy than other two participants. Comparatively, Can has advantages on both the level of affecting from autism and language skills. Yet information about the intellectual level of the participants could not be obtained, and it can be said that the intellectual level could be influential for differentiation of participants' performances.

Constant time delay instruction needs 1:1 practice with the student. On the other hand, stimulus fading procedure's allowance for student's independent practice without a teacher's assistance can be advantageous. Both instructional methods are effective for visual word reading instruction, and they have their own advantages and disadvantages over each other.

The present study includes some limitations that may affect the results. First, the trainer and the observer were visitors to this school, so their unfamiliarity with this school context and the participants' level of acceptance of new instructors might be associated with the extended time taken to start the intervention sessions. Another limitation was the functional use of the target words. Once they were learned, they might be used to perform daily activities in the generalization sessions. Even with the limitations noted, the experimental design of the study allows the effect of the independent variables to be observed.

This study is the first to compare the effectiveness and efficiency of constant time-delay and prompt-fading strategies for enabling students with autism to read sight words. It is essential to design replication studies to compare both strategies in teaching different word-groups. The results of this study are also limited by the fact that only three participants who met the prerequisite skills were selected; thus, more studies are needed to be conducted with a large population. Studies are needed with a large number of students with autism and across populations (e.g., students with intellectual disabilities, students with learning disabilities).

The results of the present study lead to a number of suggestions for future research. First, future research might be directed at investigating the effects of similar implementation with different word-groups. Second, further research might examine whether additional fading stages enhance errorless transitions of target words. Third, it might be useful to examine the effects of the constant time-delay strategy within a small group format, again among children with autism. Finally, these strategies could be repeated and compared when applied within the community and in a general education context.

Learning sight words is an important skill to improve the literacy domain. However, it is not enough to develop literacy skills. Both constant time delay and stimulus fading are effective instructional strategies to teach sight word reading to children with autism, but the constant time delay strategy appears to be slightly more efficient. Besides sight word reading, alphabetic knowledge and word analysis skills are important skills for the acquisition of reading. Fluency, vocabulary and reading comprehension are three components of a literacy development program.

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## Ötizmli Öğrencilere Görsel Sözcükleri Okumayı Öğretmede İki Öğretimsel Stratejinin Karşılaştırılması

### Atıf:

- Akçin, N. (2013). Comparison of two instructional strategies for students with autism to read sight words. *Eğitim Araştırmaları-Eurasian Journal of Educational Research*, 51, 85-106.

### (Özet)

#### *Problem Durumu*

Okur-yazarlık becerileri tüm bireyler için olduğu gibi otizmli çocuklar için de, eğitsel değerlendirme ve öğrenme için bir kanal sağlaması, iş olanaklarını çeşitlendirmesi, kendini ifade etmeye teşvik ettiği ve bağımsız yaşamı kolaylaştırdığı için çok önemlidir. Otizmli bireylerin bazıları akademik okur-yazarlık becerilerini kazanamayabilirken, işlevsel okur-yazarlık becerileri onların yaşayabilmeleri, çalışabilmeleri ve topluma katılabilmelerini sağlamak için gereklidir. Sözcük okuma, işlevsel okur-yazarlık öğretimin ilk basamağını oluşturur. Görsel sözcük okuma henüz fonetik prensiplerin kavranmadığı dönemde çocuğa başarılı okuma yaşantıları sağlaması bakımından önem taşımaktadır. Görsel sözcük okuma, çocukların ilk sözcüklerini kolayca öğrenmelerini ve böylece okumaya karşı olumlu tutum kazanmaları bakımından önemlidir. Görsel sözcük okunmanın öğretilmesi, çocuğa bilinen sözcüklerden yola çıkarak harfleri tanıtmak ve harf-ses ilişkisini öğretmek için bir zemin oluşturması bakımından önemlidir.

Literatür incelendiğinde görsel sözcük okuma öğretiminde sabit bekleme süreli öğretim ile ipucunun silikleştirilmesiyle öğretim stratejilerinin etkililiğinin karşılaştırıldığı araştırmaların genellikle hafif ve orta zihin engelli katılımcılara uygulandığı ancak otizmli bireyler ile benzer çalışmaların oldukça az olması dikkati çekmektedir. Bunun yanı sıra, araştırmalar öğretmenlerinin otizmli bireylere okur-yazarlık becerilerini kazandırmak için gerekli etkili spesifik bilgi ve becerilerden yoksun olduğunu ortaya koymaktadır.

#### *Araştırmanın Amacı*

*Bu araştırmanın amacı, otizmli öğrencilere görsel sözcükleri okumayı öğretmede iki öğretimsel stratejinin karşılaştırılmasıdır.*

*Araştırmanın Yöntemi*

Araştırmanın katılımcıları İstanbul'da bir otistik çocuklar eğitim merkezinde eğitim görmekte olan, yaşları 12-14 arasında değişen, iki erkek ve bir kız olmak üzere üç otizmli öğrencidir. Katılımcılarda aranan ön koşul özellikler şunlardır; (a) en az tek sözcükle ve anlaşılır bir telaffuzla konuşabilen, (b) resim-resim eşleyebilen (c) gösterilen iki resimden ismi söylenen parmağı ile işaret ederek gösterebilen, (d) bir resim gösterilip onun ne olduğu sorulduğunda resmi isimlendirebilen, (e) bir etkinliğe dikkatini en az 10-15 dakika yöneltebilen, (f) beklemesi söylendiğinde bekleyebilen, (g) basit sözel yönergeleri takip edebilen, (h) sözcük okuma becerisine sahip olmayan.

Her iki öğretim stratejisinde öğretmek üzere beş sözcük belirlenmiş ve her üç öğrenciye bunlar öğretilmiştir. Hedef sözcüklerin belirlenmesinde, katılımcıların öğretmen ve anneleri ile görüşülerek çocukların ilgi alanlarına yönelik ve işlevsel sözcükler olmasının yanı sıra sözcüklerin eşit zorluk düzeyinde olmasına dikkat edilmiştir. Katılımcılar için etkili pekiştiricileri belirlemek amacıyla her katılımcının annesiyle ve öğretmeniyle görüşmeler yapılmıştır. Pe kiştiricilere do ygunluğu önlemek amacıyla her bağımsız değişken için farklı pekiştiriciler belirlenmiştir. Araştırma, toplu ve günlük yoklama oturumları, öğretim, kalıcılık ve genelleme oturumlarından oluşmaktadır. Otizmli öğrencilere görsel sözcükleri okumayı öğretmede sabit bekleme süreli öğretim ile ip ucunun silikleştirilmesiyle öğretimin etkililik ve verimliliğini karşılaştırmak için uyarlamalı dönüşümlü sa ğaltımlar modeli kullanılmıştır. Bu araştırmanın deneysel kontrolü, deneklerin yoklama oturumlarında göstermiş oldukları performansın sabit bekleme süreli öğretim ya da hedef uyarana ipucu eklenmesine dayalı öğretim oturumlarından biriyle yapılan öğretimde ölçüt karşılanıncaya kadar gerçekleşen oturum sayısı, ölçüt karşılanıncaya kadar gerçekleşen deneme sayısı, ölçüt karşılanıncaya kadar gerçekleşen toplam öğretim süresi ve ölçüt karşılanıncaya kadar gerçekleşen hata yüzdesi açısından farklılık olması ile sağlanmıştır.

Bu çalışmada, otizmli öğrencilere görsel sözcük okuma öğretiminde sabit bekleme süreli öğretim ve ipucunun silikleşmesi stratejilerinin etkililik ve verimliliğini karşılaştırmak için uyarlamalı dönüşümlü sa ğaltımlar modeli kullanılmıştır. Dönüşümlü sa ğaltımlar modeli, iki ya da daha fazla değişkenin, iki ya da daha fazla geriye dönüşü olmayan bağımlı değişken üzerindeki etkilerinin karşılaştırıldığı araştırmalardır. Bu araştırmanın deneysel kontrolü, deneklerin yoklama oturumlarında göstermiş oldukları performansın sabit bekleme süreli öğretim ya da hedef uyarana ipucu eklenmesine dayalı öğretim oturumlarından biriyle yapılan öğretimde ölçüt karşılanıncaya kadar gerçekleşen oturum sayısı, ölçüt karşılanıncaya kadar gerçekleşen deneme sayısı, ölçüt karşılanıncaya kadar gerçekleşen toplam öğretim süresi ve ölçüt karşılanıncaya kadar gerçekleşen hata yüzdesi açısından farklılık olması ile sağlanmıştır.

Gözlemciler arası güvenilirlik verileri toplanmıştır. Buna göre, güvenilirlik katsayıları sabit bekleme süreli öğretimin yoklama oturumları için 97-100%, öğretim oturumları için 91-100, kalıcılık ve genelleme oturumları için 98% olarak, ipucunun silikleştirilmesiyle öğretimin yoklama oturumları için 98-100%, öğretim oturumları

için 90-100%, kalıcılık ve genelleme oturumları 100% olarak hesaplanmıştır. Öğretim planının uygulanmasını değerlendirmek için uygulama güvenilirlik verisi toplanmış ve uygulama güvenilirliği 100% olarak hesaplanmıştır. Araştırmanın sosyal geçerlik verisi, öğretim uygulaması yapılan her üç deneğin öğretmeniyle yarı-yapılandırılmış görüşmeler yoluyla toplanmıştır.

#### *Araştırmanın Bulguları*

Araştırma bulguları, sabit bekleme süreli öğretim ve ip ucunun silikleşmesiyle öğretimin katılımcıların görsel sözcükleri okumayı öğrenmesinde eşit derecede etkili olduğunu göstermiştir. Katılımcıların tümü belirlenen ölçütlere ulaşmıştır. Sabit bekleme süreli öğretim, her üç öğrenci için de, ip ucunun silikleştirilmesiyle öğretimden ölçüt karşılanıncaya kadar geçen deneme sayısı, hata sayısı ve öğretim süresi bakımından daha verimli olduğu görülmektedir. Katılımcıların öğretim oturumlarında hedeflenen görsel sözcükleri okuma ölçütlerine erişebilmek için gereksinim duyduğu öğretim oturumu sayısı incelendiğinde ipucunu silikleştirmeye öğretime göre sabit bekleme süreli öğretimin daha avantajlı olduğu görülmektedir. Her iki öğretim stratejisi arasında verimlilik bakımından en belirgin farkın ölçüte ulaşıncaya kadar gerçekleşen öğretim oturumlarındaki hata sayısında olduğu dikkati çekmektedir.

Katılımcıların üçü de, bu hedef sözcükleri farklı yazı stili, punto ve büyük-küçük harfte okumaya genelledebilmiştir. Öğretimsel yöntemlerin kalıcı etkisi kalıcılık oturumlarında gözlenmiştir.

Araştırmadan elde edilen sosyal geçerlilik verileri şöyle özetlenebilir; katılımcıların öğretmenleri (a) katılımcıların okuma çalışmalarına daha istekli olduklarını, (b) öğrencilerin sözcük okumayı öğrenebildiklerini görmelerinin kendilerinin de bu tür çalışmalar yapmaya motive ettiğini, (c) bu çalışmalar sonrasında öğrencilerin sıra alma, bekleme ve kendiliğinden göz kontağı kurma becerilerinde artış olduğunu ifade etmişlerdir.

#### *Araştırmanın Sonuçları ve Önerileri*

Araştırma sonuçları her iki öğretimsel stratejinin de etkili olduğunu ancak sabit bekleme süreli öğretimin hedeflenen ölçütlere ulaşmada daha verimli olduğuna işaret etmektedir.

Bu araştırma, otizmlili çocuklara görsel sözcük öğretmede sabit bekleme süreli öğretim ve ipucunun silikleştirilmesiyle öğretim stratejilerinin etkililik ve verimliliğinin karşılaştırıldığı ilk araştırmadır. Her iki stratejinin farklı sözcük gruplarını öğretmede karşılaştırmak için replikasyon çalışmaları yapılabilir. Bu araştırma sonunda gelecek araştırmalara yönelik öneriler sunulmuştur. Bunlardan ilki, benzer uygulamalar farklı sözcük grupları için yapılabilir. İkincisi, gelecekteki araştırmalarda, sabit bekleme süreli öğretim stratejisi, otizmlili çocuklara görsel sözcük okumayı grup formatında öğretimin etkililiği incelenebilir. Üçüncü olarak da, gelecekteki araştırmalar, bu stratejilerin toplum ortamında ve genel eğitim bağlamında uygulanması incelenebilir.

*Anahtar Sözcükler:* Otizm, görsel sözcük okuma, sabit bekleme süreli öğretim, ip ucunun silikleştirilmesiyle öğretim, tek denek desen