Simultaneous Prompting: An Instructional Strategy for Skill Acquisition

Rebecca E. Waugh, Paul A. Alberto, and Laura D. Fredrick
Georgia State University

Abstract: Errorless learning is an instructional approach designed to eliminate and/or reduce the number of errors students produce in traditional trial-and-error approaches (Mueller, Palkovic, & Maynard, 2007). Various response prompting strategies are employed to produce errorless learning. Simultaneous prompting is an errorless learning strategy that has a growing body of literature to support its use spanning two decades. This paper provides a comprehensive review of the literature including (a) skills targeted for instruction, (b) populations targeted for instruction, (c) strengths and weaknesses of simultaneous prompting, and (d) future areas of research.

Errorless learning is an instructional approach designed to reduce the number of errors students make in traditional trial-and-error approaches (Mueller, Palkovic, & Maynard, 2007). During errorless learning procedures stimulus control is transferred from the controlling prompt to the discriminative stimulus. This transfer is achieved through the use of response prompting strategies. Response prompting strategies consist of additional information which results in the correct response being emitted (Wolery, Ault, & Doyle, 1992). The underlying purpose of errorless learning is the transfer of stimulus control from a response prompt to the natural stimulus. Wolery and Gast (1984) identified four common response prompting strategies that commonly are employed to transfer stimulus control: (a) most-to-least prompts, (b) least-to-most prompts, (c) graduated guidance, and (d) time delay. Most-to-least prompts consists of employing the most intrusive prompt needed to assist the student in emitting the correct response and fading the intensity of the prompt until the student is correctly responding to the discriminative stimulus independently. Least-to-most prompts provide the student with an opportunity to respond independently to the discriminative stimulus. If the student responds incorrectly a prompt is provided which gradually increases in intensity until the student responds correctly to the discriminative stimulus. “Graduated guidance is a technique combining physical guidance and fading in which the physical guidance is systematically and gradually reduced and then faded completely” (Foxx, 1982, p. 129). Graduate guidance relies heavily on the teacher’s judgment whether or not a prompt is required or the degree of prompt required. There are two forms of graduated guidance. During one form a teacher shadows a student’s movement when teaching a task to provide guidance during each step or to remove the physical prompt. During a second form of graduated guidance the teacher may provide constant contact but gradually and systematically reduce the intrusiveness and placement of the prompt (Foxx, 1981; Wolery & Gast, 1984).

Time delay is the fourth common response prompting strategy which results in near errorless learning by transferring stimulus control from a controlling prompt to the discriminative stimulus by inserting a delay between the presentation of the discriminative stimulus and the controlling prompt (Snell & Gast, 1981; Touchette, 1971). Two forms of time delay are reported in the literature, progressive time delay (PTD) and constant time delay (CTD). During PTD a systematically increased
delay is inserted between the presentation of the discriminative stimulus and the controlling prompt (Cooper, Heron, & Heward, 2007). In contrast, CTD consists of only two prompting conditions, a zero-second delay condition and a three- or five-second delay condition. During the zero-second delay condition, the stimulus and controlling prompt are delivered concurrently. During the three- or five-second delay condition the stimulus is presented with the specified delay inserted prior to the delivery of the controlling prompt to allow for independent responding. Acquisition during both PTD and CTD is measured by correct responses during the delayed trials in which the student responds to the stimulus prior to the presentation of the controlling prompt.

Purpose

The purpose of this paper is to review the research literature on simultaneous prompting, a fifth prompting strategy that results in near errorless learning. This review includes skills and individuals taught using simultaneous prompting and strengths and weaknesses of simultaneous prompting as identified in the literature.

Simultaneous Prompting

Simultaneous prompting is a response prompting strategy that results in near errorless learning. During this procedure the instructional cue and controlling prompt are presented concurrently or simultaneously with probes conducted prior to the instructional session to measure skill acquisition (Gibson & Schuster, 1992; Schuster, Griffen, & Wolery, 1992). Simultaneous prompting consists of three components (a) baseline or full probe sessions, (b) assessment or daily probe sessions, and (c) instructional sessions. During baseline/full probe sessions, data are collected on the students’ identification or completion of all stimuli within the program. Baseline/full probe sessions are presented prior to the beginning of instruction and typically following mastery of a set of stimuli prior to presentation of the next set of stimuli. Full probe sessions may serve as baseline conditions as well as maintenance conditions. Assessment/daily probe sessions which measure acquisition of the stimuli targeted for instruction, are presented prior to each instructional session. Assessment/daily probe sessions provide for independent responding opportunities for the students. Instructional sessions are conducted following assessment/daily probe sessions each day. During instructional sessions the stimulus and the controlling prompt are presented concurrently.

Method

An electronic search of ERIC was conducted with simultaneous prompting used as the keyword. Articles also were identified through the reference lists of research articles and a published review of the literature on simultaneous prompting (Morse & Schuster, 2004). Articles were included if (a) they employed simultaneous prompting in an experimental design and (b) were published in a peer review journal. A total of 35 peer reviewed articles and one review of the literature were identified. Investigations that were not included in the initial review of the literature are included in Tables 1 and 2.

Demographic Variables

Participants. A total of 35 published studies spanning eighteen years (1992–2010) and one review of the literature on simultaneous prompting are included. In an initial review of the literature Morse and Schuster (2004) identified 18 published studies which examined simultaneous prompting including 74 participants. Since the initial review of the literature an additional 17 studies have been identified with an additional 62 participants for a total of 35 published studies and 136 participants.

Simultaneous prompting has been employed predominately with students in elementary school (Akmanoglu & Batu, 2004; Batu, 2008; Birkan, 2005; Griffen, Schuster, & Morse, 1998; Kurt & Tekin-Iftar, 2008; Parrott, Schuster, Collins, & Gassaway, 2000; Schuster & Griffen, 1993; Schuster, Griffen, & Wolery, 1992; Singleton, Schuster, & Ault, 1995; Tekin & Kircaali-Iftar, 2002; Tekin-Iftar, 2008; Tekin-Iftar, Kurt, & Acar, 2008; Waugh, Fredrick, & Alberto, 2009) but also has been implemented
### TABLE 1
Summary of Demographic and Procedural Variables

<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants (Target Participants)</th>
<th>Setting: Pupil: Teacher Ratio</th>
<th>Dependent Variable</th>
<th>Independent Variable (Controlling Prompt)</th>
<th>Error Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akmanoglu-Uludag &amp; Batu (2005)</td>
<td>2 with Autism; 5.5 years old</td>
<td>Classroom for children with Autism in a university unit for children with development delays (1:1)</td>
<td>Preschool: Expressive identification of relatives</td>
<td>Modeling prompt paired with verbal prompt</td>
<td>Instruction = 10.4%</td>
</tr>
<tr>
<td>Colozzi, Ward, &amp; Crotty (2008)</td>
<td>4 with pervasive developmental disorder and developmental disabilities; 3–4 years old; Para delivered instruction</td>
<td>Public preschool Classroom (1:1 and 4:1)</td>
<td>(1) acquisition and training trials of target pretend play expressive vocabulary skills (2) pretend play motor skill (3) instructive feedback - expressive vocabulary skills</td>
<td>Full physical prompt to perform play action paired with a verbal model of language</td>
<td>Instruction = (1:1)</td>
</tr>
<tr>
<td>Reichow &amp; Wolery (2009)</td>
<td>1 with speech language impairment, 1 English Language Learner, 1 with typical development, 1 at-risk for school failure; 4–5 years old</td>
<td>Classroom (1:1)</td>
<td>14 transportation words and 11 line drawings (2 words per condition; 3 conditions = Everyday probes, Every fourth day probes and control)</td>
<td>Verbal model of correct response</td>
<td>Instruction = Everyday probes = 0–3.5% Every 4th day probes = 0–4.3% Probes = First 8 days = 50% First 2 every 4th day = 28.1%</td>
</tr>
<tr>
<td>Akmanoglu &amp; Batu (2004)</td>
<td>3 with Autism; 6–17 years old</td>
<td>Classroom at university school (1:1)</td>
<td>Receptive identification of numerals 1–9</td>
<td>Modeling plus verbal prompt</td>
<td>Instruction = 34–64%</td>
</tr>
<tr>
<td>Batu (2008)</td>
<td>4 with Developmental Delays (IQ 41–50); 6-9 years old; Caregiver-delivered instruction</td>
<td>Home-based instruction</td>
<td>(1) Caregiver implementation (2) Acquisition of home-living skills (e.g., wearing socks, making bed, etc.)</td>
<td>Verbal direction paired with modeling</td>
<td>Instruction = 34–64%</td>
</tr>
<tr>
<td>Birkan (2005)</td>
<td>1 MID, 2 MoID; 6–13 years old</td>
<td>Classroom at research university (1:1)</td>
<td>3 discrete tasks (sight words, receptive identification of digits, telling time)</td>
<td>Verbal Model of correct response</td>
<td>Instruction = 0%</td>
</tr>
<tr>
<td>Kurt &amp; Tekin-Iftar (2008)</td>
<td>4 with Autism; 6–8 years old</td>
<td>School - Classroom, cafeteria, free-play area, and hall</td>
<td>Turning on CD player and taking a digital picture</td>
<td>CTD vs Simultaneous Prompting (Intermittent probes)</td>
<td>Instruction = Not reported</td>
</tr>
</tbody>
</table>

Not Reported
<table>
<thead>
<tr>
<th>Authors</th>
<th>Participants (Target Participants)</th>
<th>Setting Pupil: Teacher Ratio</th>
<th>Dependent Variable</th>
<th>Independent Variable (Controlling Prompt)</th>
<th>Error Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tekin-Iftar (2008)</td>
<td>3 with Autism, 1 with MoID; 7-12 years old; Parent-delivered instruction</td>
<td>Community settings (grocery store, pastry shop, and dry cleaning store)</td>
<td>11 - 15 step task analysis for purchasing</td>
<td>Model with verbal description</td>
<td>Instruction = 0% Probes = 14–19%</td>
</tr>
<tr>
<td>Tekin-Iftar, Kurt, &amp; Acar (2008)</td>
<td>2 with mental retardation; 7-8 years old</td>
<td>University Unit (1:1)</td>
<td>Tool identification with instructive feedback; intermittent probe Conditions</td>
<td>Verbal Model of correct response</td>
<td>Instruction = 0.3% Probes = 7.5%</td>
</tr>
<tr>
<td>Waugh, Fredrick, &amp; Alberto (2009)</td>
<td>3 students with MoID; 9–11 years old</td>
<td>Self-contained classroom in public school (1:1)</td>
<td>Correct reading of sight-words, letter-sound correspondences, and blending skills</td>
<td>Verbal model of correct response</td>
<td>Instruction = not reported Probes = not reported</td>
</tr>
<tr>
<td>Alberto, Waugh, &amp; Fredrick (2010)</td>
<td>5 with MoID (IQ 40–46); 12-15 years old</td>
<td>Self-contained classroom in public school (2:1 and 3:1)</td>
<td>Verbal reading and motoric demonstration of comprehension of individual sight words and connected text</td>
<td>Verbal Model of correct response</td>
<td>Not reported</td>
</tr>
<tr>
<td>Gursel, Tekin-Iftar, &amp; Bozkurt (2006)</td>
<td>3 with MID, 2 with MoID; 11-14 years old</td>
<td>Classroom (2:1); heterogeneous dyadic grouping</td>
<td>Discrete skills - identification of provinces, rivers, and border countries on Turkish map and expressive identification of math symbols</td>
<td>Verbal prompt paired with a model</td>
<td>Instruction = 2.14% Probes = 6.57%</td>
</tr>
<tr>
<td>Rao &amp; Kane (2009)</td>
<td>2 with Educable Mental Impairment</td>
<td>Self-contained classroom (1:1)</td>
<td>12-step task analysis for subtraction with decimals</td>
<td>Verbal prompt paired with a model</td>
<td>Not reported</td>
</tr>
<tr>
<td>Rao &amp; Mallow (2009)</td>
<td>2 with cognitive impairments (IQ = 49 &amp; 62)</td>
<td>Classroom (1:1)</td>
<td>Recall of multiplication Facts</td>
<td>Verbal of correct response</td>
<td>Instruction = 8.6%–17.6% Probes = 15.2%–26.4%</td>
</tr>
<tr>
<td>Riesen et al. (2003)</td>
<td>1 with autism, 2 with multiple disabilities (IQ = 50-55), 1 with MID (IQ = 58-70); 2 paraprofessionals</td>
<td>Special education and general education classrooms (large group)</td>
<td>Different discrete tasks - (1) expressively read words from general education vocabulary lists (2) Verbally define key vocabulary words</td>
<td>CTD vs Simultaneous Prompting</td>
<td>Not reported</td>
</tr>
<tr>
<td>Tekin-Iftar (2003)</td>
<td>4 typical peers, 4 with developmental disabilities; 10-13 years old</td>
<td>Counselor’s Office in a public school (tutor dyads)</td>
<td>Acquisition of community signs with instructive feedback</td>
<td>Verbal Model of correct response</td>
<td>Instruction = 1.1% Probes = 2.21%</td>
</tr>
<tr>
<td>Tekin-Iftar, Acar, &amp; Kurt (2003)</td>
<td>3 with MID; 13–14 years old</td>
<td>Classroom in a public school (1:1)</td>
<td>Expressive identification of first aid materials and instructive feedback</td>
<td>Verbal Model of correct response</td>
<td>Instruction = 0% Probes = 29%</td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Results</td>
<td>Maintenance</td>
<td>Generalization</td>
<td>Social Validity</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------</td>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Akmanoglu-Uludag &amp; Batu (2005)</td>
<td>Multiple Probe</td>
<td>All students acquired targeted skills</td>
<td>Preschool 1, 2, and 4 weeks following mastery criterion</td>
<td>Across materials, settings, and trainers</td>
<td>Parent Questionnaire</td>
</tr>
<tr>
<td>Colozzi et al. (2008)</td>
<td>Multiple Probe</td>
<td>Simultaneous prompting effective - met criterion. No significant differences in probe errors for verbal and motor responses between 1:1 and small group</td>
<td>Does not specify when collected</td>
<td>Across people, setting, and materials</td>
<td>Questionnaire – Parents, Preschool Teachers and Paraprofessionals</td>
</tr>
<tr>
<td>Reichow &amp; Wolery (2009)</td>
<td>Adapted Alternating Treatments</td>
<td>3 of 4 participants acquired target stimuli under both simultaneous prompting conditions; 1 student acquired target stimuli in the every 4th day condition only</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Akmanoglu &amp; Batu (2004)</td>
<td>Multiple Probe</td>
<td>All students met Criterion</td>
<td>Elementary 1, 2, and 4 weeks following demonstration of mastery</td>
<td>Across materials</td>
<td>Parent Questionnaire</td>
</tr>
<tr>
<td>Batu (2008)</td>
<td>Multiple Probe</td>
<td>All students met Criterion</td>
<td>1 and 3 weeks following demonstration of mastery</td>
<td>Across trainers</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Birkan (2005)</td>
<td>Multiple Probe</td>
<td>All students met Criterion</td>
<td>7, 18, and 25 days after criterion</td>
<td>Across setting and materials</td>
<td>Not reported</td>
</tr>
<tr>
<td>Kurt &amp; Tekin-Iftar (2008)</td>
<td>Adapted Alternating Treatments</td>
<td>Both equally effective with mixed efficiency data</td>
<td>1, 2, and 4 weeks following demonstration of mastery</td>
<td>Not reported</td>
<td>16 instructors and professors completed Questionnaire</td>
</tr>
<tr>
<td>Tekin-Iftar (2008)</td>
<td>Multiple Probe</td>
<td>All students met criterion</td>
<td>2 and 5 weeks following demonstration of mastery</td>
<td>Across settings</td>
<td>Mother and Student Questionnaire</td>
</tr>
<tr>
<td>Tekin-Iftar, Kurt, &amp; Acar (2007)</td>
<td>Multiple Probe</td>
<td>All students met criterion</td>
<td>1, 2, and 4 weeks following demonstration of mastery</td>
<td>Multiple exemplars</td>
<td>Not reported</td>
</tr>
<tr>
<td>Authors</td>
<td>Design</td>
<td>Results</td>
<td>Maintenance</td>
<td>Generalization</td>
<td>Social Validity</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Waugh et al. (2009)</td>
<td>Changing Criterion</td>
<td>All 3 students met criterion through Blending Set 2, one student met criterion through Blending Set 5 and one student met criterion through Blending Set 3</td>
<td>Preschool Measured during the study due to summer break; not measured followed mastery of all phases of instruction</td>
<td>Across materials</td>
<td>Teacher Interview</td>
</tr>
<tr>
<td>Alberto et al (2010)</td>
<td>Changing Criterion embedded in a Multiple Baseline across groups</td>
<td>All students met criterion</td>
<td>Middle School Not measured</td>
<td>Across materials</td>
<td>Teacher Questionnaire</td>
</tr>
<tr>
<td>Gursel et al. (2006)</td>
<td>Multiple Probe</td>
<td>All students met criterion</td>
<td></td>
<td>Across people and materials</td>
<td>Not reported</td>
</tr>
<tr>
<td>Rao &amp; Kane (2009)</td>
<td>Multiple Probe</td>
<td>Both students met criterion</td>
<td></td>
<td>Across settings, materials, and professionals</td>
<td>Not reported</td>
</tr>
<tr>
<td>Rao &amp; Mallow (2009)</td>
<td>Multiple Probe</td>
<td>Both students met criterion</td>
<td></td>
<td>Across format, setting, and personnel</td>
<td>Not reported</td>
</tr>
<tr>
<td>Riesen et al. (2003)</td>
<td>Adapted Alternating Treatments</td>
<td>3 students reached criterion under both conditions, 1 student reached criterion under simultaneous prompting condition only</td>
<td></td>
<td>Not reported</td>
<td>Not reported</td>
</tr>
<tr>
<td>Tekin-Htar (2003)</td>
<td>Multiple Probe</td>
<td>All met criterion</td>
<td></td>
<td>Across people</td>
<td>Not reported</td>
</tr>
<tr>
<td>Tekin-Htar, Acar, &amp; Kurt (2003)</td>
<td>Multiple Probe</td>
<td>All met criterion</td>
<td></td>
<td>1, 2, and 4 weeks following demonstration of mastery</td>
<td>Not reported</td>
</tr>
</tbody>
</table>
with students in preschool (Akmanoglu-Uludag & Batu, 2005; Colozzi, Ward, & Crotty, 2008; Dogan & Tekin-Iftar, 2002; Gibson & Schuster, 1992; MacFarland-Smith, Schuster, & Stevens, 1993; Reichow & Wolery, 2009; Sewell, Collins, Hemmeter, & Schuster, 1998), middle school (Alberto, Waugh, & Fredrick, 2010; Fickel, Schuster, & Collins, 1998; Gursel, Tekin-Iftar, & Bozkurt, 2006; Rao & Kane, 2009; Rao & Mallow, 2009; Riesen, McDonnell, Johnson, Polychronis, & Jameson, 2003; Tekin-Iftar, 2003; Tekin-Iftar, Acar, & Kurt, 2003), and high school (Fetko, Schuster, Harley, & Collins, 1999; Johnson, Schuster, & Bell, 1996; Parker & Schuster, 2002; Singleton, Schuster, Morse, & Collins, 1999), and with adults (Maciag, Schuster, Collins, & Cooper, 2000; Palmer, Collins, & Schuster, 1999). The procedure has been employed in 19 studies with a total of 51 participants with moderate intellectual disabilities (MoID) (Alberto et al., 2010; Batu, 2008; Birkan, 2005; Dogan & Tekin-Iftar, 2002; Fickel et al., 1998; Griffen et al., 1998; Gursel et al., 2006; Maciag et al., 2000; Parker & Schuster, 2002; Parrott et al., 2000; Rao & Mallow, 2009; Riesen et al., 2003; Schuster & Griffen, 1993; Schuster et al., 1992; Singleton et al., 1995; Singleton et al., 1999; Tekin & Kircaali-Iftar, 2002; Tekin-Iftar, 2008; Waugh et al., 2009). The procedure also has been employed in 13 studies with a total of 23 participants with mild intellectual disabilities (MID) (Birkan, 2005; Dogan & Tekin-Iftar, 2002; Fickel et al., 1998; Griffen et al., 1998; Gursel et al., 2006; Johnson et al., 1996; Palmer et al., 1999; Parker & Schuster, 2002; Rao & Kane, 2009; Rao & Mallow, 2009; Riesen et al., 2003; Tekin & Kircaali-Iftar, 2002; Tekin-Iftar, 2003; Tekin-Iftar et al., 2003), 7 studies with a total of 18 participants with autism (Akmanoglu & Batu, 2004; Akmanoglu-Uludag & Batu, 2005; Colozzi et al., 2008; Kurt & Tekin-Iftar, 2008; Parrott et al., 2000; Riesen et al., 2003; Tekin-Iftar, 2008), 5 studies with a total of 10 participants with typical development (Fickel et al., 1998; Gibson & Schuster, 1992; Parker & Schuster, 2002; Reichow & Wolery, 2009; Tekin-Iftar et al., 2003), 4 studies with a total of 11 participants with severe intellectual disabilities (SID) (Colozzi et al., 2008; Fetko et al., 1999; Maciag et al., 2000; Parrott et al., 2000), 4 studies with 12 participants with developmental delays (Gibson & Schuster, 1992; MacFarland-Smith et al., 1992; Sewell et al., 1998; Wolery et al., 1993), one study with a total of three participants with learning disabilities (Johnson et al., 1996), one study with a participant with spina bifida (Gibson & Schuster, 1992), one study with a participant classified as a slow learner (Tekin-Iftar, 2003), and one study which included a student with a speech-language impairment, a student who was classified as an English Language Learner, and a student identified as at-risk for school failure (Reichow & Wolery, 2009).

In the same way that simultaneous prompting has been employed with a variety of participants, a variety of individuals have implemented the procedure. While this procedure predominately has been implemented by classroom teachers (Griffen et al., 1998; Gursel et al., 2008; Waugh et al., 2009), it also has been implemented by paraprofessionals (Colozzi et al., 2008; Riesen et al., 2003), parents (Tekin-Iftar, 2008), caregivers (Batu, 2008), sibling tutors (Tekin & Kircaali-Iftar, 2002), and peer tutors (Tekin-Iftar, 2003). Simultaneous prompting is executed with a high level of procedural fidelity, ranging from 84–100% across all implementers.

**Instructional Grouping**

The majority of studies which have employed simultaneous prompting have used individual instructional formats (Akmanoglu & Batu, 2004; Akmanoglu-Uludag & Batu, 2005; Batu, 2008; Birkan, 2005; Dogan & Tekin-Iftar, 2002; Fetko et al., 1999; Gibson & Schuster, 1992; Griffen et al., 1998; Riesen et al., 2003; Schuster et al., 1992; Singleton et al., 1999; Tekin & Kircaali-Iftar, 2002; Tekin-Iftar, 2008; Waugh et al., 2009). Six studies have implemented the instructional strategy in a group format, ranging from a 2:1 format to an 11:1 format. Singleton et al. (1995) were the first to examine simultaneous prompting in a group format using dyads. The researchers found that simultaneous prompting could be implemented effectively in dyads to teach basic discrete identification of community signs to students with MoID. Maciag et al. (2000) further examined the use of simultaneous prompting in teaching a chained vo-
cational task in a dyadic group format to adults with SID. Gursel et al. (2006) also examined a heterogeneous dyadic group format in teaching discrete skills to students with developmental disabilities. Fickel et al. (1998) and Parker and Schuster (2002) further expanded the literature on simultaneous prompting in a group format by teaching a heterogeneous group of students discrete skills. Students were taught different tasks using different stimuli in a group format of 4:1 (Fickel et al., 1998) and 5:1 (Parker & Schuster, 2002). Johnson et al. (1996) conducted instructional sessions in the largest group format of 11:1 in teaching high school students with mild disabilities. Across all studies, simultaneous prompting implemented in both individual and group formats has been effective in teaching targeted skills.

Only one study directly compared the effects of simultaneous prompting in individual and group formats (Colozzi et al., 2008). Colozzi and colleagues compared the effectiveness of simultaneous prompting in individual format (1:1) and a group format (4:1) in teaching four students with autism pretend play vocabulary and motor skills. While group instruction required more instructional sessions and resulted in more instructional errors there were no significant differences in probe errors across the two instructional formats. Although group instruction required more instructional sessions to mastery, the implementation of group instruction may allow for the acquisition of additional skills through the use of nontargeted instructional feedback and observational learning.

Observational Learning and Instructive Feedback

Observational learning consists of learning through observing others engaging in an activity or being taught a specific activity. In order for observational learning to occur students must demonstrate imitative behaviors (Wolery et al., 1992). Some students with moderate to severe intellectual disabilities who demonstrate imitative behaviors can acquire nontargeted skills through observational learning. Several studies which employed simultaneous prompting in a group format have examined the acquisition of nontargeted information through observational learning (Fickel et al., 1998; Gursel et al., 2006; Parker & Schuster, 2002; Singleton et al., 1999). Fickel et al. found that students acquired 66% to 100% of their peer’s target stimuli through observational learning. Similarly, Gursel et al. found students acquiring 33% to 100% of their peer’s target stimuli through observational learning. Parker and Schuster and Singleton et al. measured observational learning of target stimuli as well as instructive feedback.

Instructive feedback consists of additional information that provides the student with supplementary details about the target stimulus (Tekin-Iftar et al., 2008). Instructive feedback has been used widely in the teaching of target skills using simultaneous prompting (Colozzi et al., 2008; Griffen et al., 1998; Gursel et al., 2006; Parker & Schuster, 2002; Singleton et al., 1999; Tekin-Iftar, 2003; Tekin-Iftar et al., 2003; Tekin-Iftar et al., 2008). While observational learning requires a group format, instructive feedback can be implemented and measured in both individual and group formats. Wolery, Holcombe, Werts, and Cipolloni (1993) provided instructive feedback to teach classification of food and drink items while teaching receptive identification of rebus symbols of specific food and drink items to preschool students with developmental disabilities. Students were provided with information concerning the classification of when (e.g., We eat cereal for breakfast) and how (e.g., Juice is a drink). Two of the five students correctly classified all the target stimuli and the remaining three students correctly classified some of the target stimuli. Gursel et al. (2006) taught a heterogeneous group of middle school students with MID and MoID a variety of discrete skills ranging from map skills to mathematical symbol identification. Instructive feedback included additional geographical information. Students acquired 33 to 100% of the instructive feedback. Parker and Schuster taught a variety of discrete skills to two high school students with typical development and two students with MID/MoID. Three of four of the student acquired some of their targeted instructive feedback (range 25–83% accuracy) and some of their group members targeted instructive feedback (range 9–38% accuracy). Singleton et al. reported similar findings with elementary-aged students.
with MoID acquiring some of their peer’s target stimuli (47–54%) and instructive feedback (61–81%) through observational learning.

Targeted Skills

Simultaneous prompting has been used to teach a variety of discrete and chained skills. Skills taught using simultaneous prompting include literacy skills (Birkan, 2005; Gibson & Schuster, 1992; Griffen et al., 1998; Johnson et al., 1996; Parker & Schuster, 2002; Reichow & Wolery, 2009; Riesen et al., 2003; Schuster et al., 1992; Singleton et al., 1995; Singleton et al., 1999; Tekin-Iftar, 2003; Waugh et al., 2009), math skills (Akmanoglu & Batu, 2004; Birkan, 2005; Fickel et al., 1998; Gursel et al., 2006; Rao & Kane, 2009; Rao & Mallow, 2009), communication skills (Akmanoglu-Uludag & Batu, 2005; Dogan & Tekin-Iftar, 2002; Fickel et al., 1998; Tekin & Kircaali-Iftar, 2002; Tekin-Iftar et al., 2003; Tekin-Iftar, 2008; Wolery et al., 1993), daily living skills (Batu, 2008; Fetto et al., 1999; Parrott et al., 2000; Schuster & Griffen, 1993; Sewell et al., 1998; Tekin-Iftar, 2008), leisure skills (Colozzi et al., 2008; Kurt & Tekin-Iftar, 2008), and vocational skills (Maciag et al., 2000).

Literacy skills. The most common skill taught employing simultaneous prompting is literacy instruction. Of the 35 studies conducted employing simultaneous prompting, 16 studies examined some component of literacy instruction with the majority of those studies focused on sight-word instruction. The words targeted for instruction include grocery words (Parker & Schuster, 2002; Schuster et al., 1992; Singleton et al., 1999), environmental words (Griffen et al., 1998), academic vocabulary words (Johnson et al., 1996; Riesen et al., 2003), occupational words (Parker & Schuster, 2002), community words and/or signs (Singleton et al., 1995; Tekin-Iftar, 2003), thematic words (Reichow & Wolery, 2009), and controlled vocabulary (Alberto et al., 2010; Birkan, 2005; Gibson & Schuster, 1992; Waugh et al., 2009). Simultaneous prompting was employed with a total of 50 participants ranging from typically developing students (Reichow & Wolery, 2009) to students with MoID (e.g., Waugh et al.) and was effective in teaching sight words to 49 of 50 participants. While most studies taught sight words in isolation, two studies expanded upon the individual approach to sight-word instruction to include reading of connected (Alberto et al., 2010) and expanding to phonics instruction (Waugh et al.). Alberto et al. systematically taught five students with MoID to read individual sight words composed of various parts of speech. Students also were taught to read the individual sight words in various forms of connected text and demonstrate comprehension of what was read. All five students read the sight words in both individual and connected text formats and were able to demonstrate comprehension. Waugh et al. also expanded on the use of simultaneous prompting to teach sight words to students with MoID by first teaching three elementary students with MoID to read targeted sight words and then teaching corresponding phonics skills. The students were taught to read four sight words using simultaneous prompting. Once students reached mastery on the four sight words, they were taught the corresponding letter-sound correspondences for the graphemes in each word. Students were then taught the skill of blending to read the previously taught sight words. The students successfully acquired the sight words and various numbers of the blending words. The students were able to read some but not all generalization words.

Math skills. Of the 35 studies which implemented simultaneous prompting, 6 of the studies addressed math skills. Of these six studies, five taught discrete skills, such as number identification (Akmanoglu & Batu, 2005; Birkan, 2005), math symbol identification (Gursel et al., 2006), multiplication facts identification (Rao & Mallow, 2009), addition facts identification (Fickel et al., 1998), and telling time (Birkan, 2005). Only one study examined the use of simultaneous prompting to teach the chained math skill of subtraction with decimals (Rao & Kane, 2009). Using simultaneous prompting Rao and Kane taught the chained academic skills of subtraction to two students (reported IQ scores 47–50). Students mastered subtraction with regrouping in 25 or fewer sessions and maintained and generalized the math skills. Simultaneous prompting was employed with a total of 11 participants and was effective in teaching math skills to all of the participants.
Communication skills. Simultaneous prompting has been used to teach communication skills in 7 of the 35 published studies. Communication skills taught include expressive naming of relatives for preschool students with autism (Akmnaoglu-Uludag & Batu, 2004), receptive identification of occupation picture cards for two preschool students with MoID and one preschool student with MID (Dogan & Tekin-Iftar, 1998), manual sign production of six communication symbols for three middle school students with MID/MoID and one student without disabilities (Fickel et al., 1998), receptive identification of animals for three elementary students with MID/MoID (Tekin & Kircaali-Iftar, 2002), expressive identification of first aid materials for three middle school students with MID (Tekin-Iftar et al., 2003), and expressive identification of tools for two elementary students with intellectual disabilities (Tekin-Iftar et al., 2008). The one receptive skill taught was identification of rebus symbols by five preschool students with developmental disabilities (Wolery et al., 1993). Across these seven studies simultaneous prompting was effective in teaching 21 of 23 participants with the remaining two participants not reaching mastery criteria but demonstrating an increase in performance over baseline.

Daily living skills. Of the 35 studies examining simultaneous prompting, 6 studies examined the acquisition of daily skills (Batu, 2008; Fetko et al., 1999; Parrott et al., 2000; Schuster & Griffen, 1993; Sewell et al., 1998; Tekin-Iftar, 2008). Simultaneous prompting was employed to teach home living skills, such as setting the table, preparing sandwiches, hanging clothes, folding clothes, etc (Batu, 2008), making juice (Schuster & Griffen, 1993) dressing skills (Sewell et al., 1998), opening a key lock (Fetko et al., 1999), hand washing skills (Parrott et al., 2000), and purchasing skills (Tekin-Iftar, 2008). This strategy was successful in teaching 20 of the 23 participants.

The use of simultaneous prompting to teach daily living skills was implemented predominately by classroom teachers. Tekin-Iftar (2008) was the first to examine the effectiveness of implementation of the procedure in a natural setting by a parent. Four students with developmental delays were taught purchasing skills in the natural setting (i.e., grocery store, pastry shop, and dry cleaning store). The students acquired the targeted purchasing skills and were able to generalize those skills to purchasing of items in different locations. The parents effectively delivered simultaneous prompting at an average of 91% accuracy. Batu (2008) further examined the implementation of caregiver-delivered simultaneous prompting to teach home skills (e.g., setting the table, preparing food, hanging clothes, etc) to four elementary students with developmental delays. All four students acquired the targeted stimuli and maintained the skills over time. Students were able to generalize the skills across individuals in the naturalistic setting. This study provided initial support for the implementation of simultaneous prompting with caregivers of students with disabilities. Across all students and caregivers, reliability data were reported at a range of 87%–100% accuracy. These studies also support the ease with which simultaneous prompting can be implemented reliably.

Leisure skills. Colozzi et al. (2008) and Kurt and Tekin-Iftar (2008) examined the effects of simultaneous prompting in teaching leisure/play skills to students with autism. Colozzi et al. analyzed the effects of simultaneous prompting in teaching pretend play skills to preschool students with autism in both individual and group instructional formats. Students were taught vocabulary and motor skills to represent the pretend play activity. All students acquired the targeted skills and maintained the skills at 100% accuracy, and individual instruction was more efficient, requiring fewer instructional sessions than group instruction. However, group instruction allowed for the acquisition of observational learning responses. Kurt and Tekin-Iftar compared the response prompting strategies of CTD and simultaneous prompting in teaching four students with autism to engage in two leisure skills of turning on a compact disc player and taking a digital picture. Both procedures were effective in teaching the targeted leisure skills to students with autism. Efficiency data produced mixed results as in previous studies with two students requiring the leisure skills in fewer sessions with CTD and two students requiring fewer sessions with simultaneous prompting.
Vocational task. To date one study has examined the effectiveness of simultaneous prompting in teaching a vocational task. Ten adults with MoID and SID were taught to assemble boxes at a sheltered work site in groups of two (Maciag et al., 2000). Simultaneous prompting was effective for teaching 4 of the 5 dyads. The remaining dyad was unable to complete the task to criterion due to time constraints. The employees acquired the targeted skill within a maximum of twenty sessions and maintained the skill fifteen weeks after instruction at a range of 73–93% accuracy.

Comparison of Instructional Strategies

In order to determine the effectiveness and efficiency of simultaneous prompting, researchers have compared simultaneous prompting to other response prompting strategies. Simultaneous prompting has been compared to CTD (Kurt & Tekin-Iftar, 2008; Riesen et al., 2003; Schuster et al., 1992; Tekin & Kircaali-Iftar, 2002) and antecedent-prompt and test procedure (Singleton et al., 1999). Simultaneous prompting is considered an adaptation of these two differing response prompting procedures (Schuster et al., 1992). In CTD, simultaneous prompting is comparable to the zero-second delay interval (Schuster et al., 1992). However, simultaneous prompting does not transition to increased delayed intervals as in CTD.

During the antecedent-prompt and test procedure the teacher presents the stimulus and controlling prompt together and then provides an opportunity for the student to respond independently to the stimulus during probe or test trials (Wolery, Ault, & Doyle, 1992). In the antecedent-prompt and test procedure trials in which the stimulus and controlling prompt are presented together always occur prior to probe trials (Wolery et al.). In contrast, during simultaneous prompting probes are conducted prior to instructional sessions.

Constant time delay. Schuster et al. (1992) first examined the effectiveness of simultaneous prompting by comparing the procedure to CTD in teaching four elementary students with MoID to read grocery words. While both procedures were effective in teaching sight words to students with MOID, simultaneous prompting required fewer instructional sessions and less instructional time and resulted in fewer errors. It should be noted that the reduction in instructional time with simultaneous prompting was minimal for three of the four students ranging from 30-seconds to 3-minutes and substantial for one student (11-minutes). Maintenance data for the procedure was mixed with two students producing better maintenance with words taught with CTD and two students producing better maintenance with words taught with simultaneous prompting. This study provided initial support for the use of simultaneous prompting in teaching students with MoID.

Riesen et al. (2003) further compared the effectiveness and efficiency of CTD and simultaneous prompting in teaching two junior high school students to read academic words and two junior high school students to define academic vocabulary words within an embedded-instruction format. Three students reached criterion under both conditions while one student reached criterion only in the simultaneous prompting condition. This study further validated the use of simultaneous prompting as an effective instructional strategy for teaching literacy skills to students with disabilities.

Tekin and Kircaali-Iftar (2003) examined the effects of simultaneous prompting and CTD in teaching students with MID and MoID to receptively identify animals. Three students with MID/MoID were taught by sibling tutors to identify animals receptively. Both procedures were implemented with a high level of fidelity by sibling tutors. Both procedures were effective in teaching receptive identification of animals with no difference in maintenance data across the two procedures. Efficiency data were inconclusive with CTD more efficient in the number of sessions and number of trials to criterion and simultaneous prompting more efficient in the number of errors and total training time to criterion.

Kurt and Tekin-Iftar (2008) compared the effects of simultaneous prompting and CTD in teaching the leisure skills of turning on a compact disc player and taking a digital picture to four boys with autism. Both procedures were equally effective in the acquisition and maintenance of the targeted skills. Efficiency
data were inconclusive with CTD more efficient for two students and simultaneous prompting more efficient for two students. Across the four studies that have compared simultaneous prompting to CTD, the data have showed minimal differences between the two strategies with both strategies demonstrating effectiveness in teaching discrete skills and demonstrating mixed results in efficiency with simultaneous prompting more efficient for some students and CTD more efficient for some students.

Antecedent-prompt and test procedure. Singleton et al. (1999) compared the effectiveness of simultaneous prompting and the antecedent-prompt and test procedure in teaching four students with MoID to read grocery words. Both procedures were effective. However, efficiency data supported the antecedent-prompt and test procedure over simultaneous prompting. The antecedent-prompt and test procedure required fewer sessions, less probe time, and resulted in fewer probe errors to criterion. Despite the data supporting the antecedent-prompt and test procedure, maintenance data supported simultaneous prompting with students maintaining a higher percentage of words taught in the simultaneous prompting condition. These data indicate an important difference between simultaneous prompting and the antecedent-prompt and test procedure. During the antecedent-prompt and test procedure probes are conducted following instruction thereby indirectly measuring transfer of skills to short-term memory. However, simultaneous prompting conducts probes prior to instruction each day measuring transfer of skills to long-term memory.

Strengths and Weaknesses of Simultaneous Prompting

Simultaneous prompting may provide certain advantages over other response prompting strategies for various reasons. First, simultaneous prompting does not require changes in teacher behavior as in CTD (Schuster et al., 1992), system of least prompts, most prompts, and graduated guidance. Each instructional session is completed in the same sequence until mastery is reached, decreasing the likelihood that teachers will emit procedural errors. Second, simultaneous prompting does not require differential reinforcement because only one correct response is reinforced (Schuster et al.). Third, unlike CTD in which students must exhibit a wait response, simultaneous prompting eliminates the need for this response (Schuster et al.). Simultaneous prompting also reduces the need to keep direct data during instructional sessions because transfer of stimulus control is measured during probes. Avoiding the need to keep data during instructional sessions may be preferred by teachers when conducting group instruction because it eliminates the problems associated with keeping track of multiple students’ responses and maintaining student attention and focus.

Across 35 peer-reviewed studies, simultaneous prompting has an effectiveness rate of 93%, with 126 out of 136 participants reaching criterion during instruction with simultaneous prompting. Ten participants across the 35 studies did not reach criterion. Rationale for not reaching criterion is often noted as time constraints associated with the end of the school year. Although the number of participants who did not reach criterion is minimal and all students demonstrated an increase in performance over baseline, the literature does reveal some problems associated with simultaneous prompting. The goal of errorless learning procedures is to ensure that students do not have opportunities to make errors or practice incorrect responses. While instructional sessions attempt to control the production of errors by providing a controlling prompt concurrently with the discriminative stimulus, errors can often be emitted during probe sessions when students have an opportunity to independently respond to the discriminative stimulus. As such, error rates vary greatly between daily probes (4–54% of trials) and instructional sessions (0–5% of trials) (Morse & Schuster, 2004). A second obstacle noted concerning simultaneous prompting is the need to conduct probe sessions and thereby impact efficiency (Schuster et al., 1992). Alternate response prompting strategies allow students to respond independently during instructional trials, however, in order for students to have an opportunity to respond independently to a stimulus during simultaneous prompting, a probe session must be conduct-
ed; thereby adding to the amount of time required to fully employ the strategy. Despite the fact that probe time is often minimal, it is in addition to instructional time.

Future Research Areas

There are currently four main areas for future research on simultaneous prompting. The first is to expand the procedure to examine its effectiveness with individuals with profound intellectual disabilities (Morse & Schuster, 2004). To date, no studies have investigated the effectiveness of the procedure with individuals with profound intellectual disabilities and only a few studies have been conducted with individuals with severe intellectual disabilities. Second, researchers have recommended that future investigations examine the effects of previous learning histories on the effects of simultaneous prompting (Singleton et al., 1995). Does previous experience with errorless learning strategies impact acquisition rates?

The third and fourth recommendations are designed to examine methods for reducing the number of errors students emit during probe sessions in order to increase the degree of errorless learning associated with simultaneous prompting. The third recommendation is to provide error correction during daily/assessment probes (Birkan, 2005; Colozzi et al., 2008; Dogan & Tekin-Iftar, 2002; Fickel et al., 1998; Gibson & Schuster, 1992; Griffen et al., 1998; Johnson et al., 1996; Maciag et al., 2000; Parker & Schuster, 2002; Tekin-Iftar et al., 2008; Wolery et al., 1993). Intermittent probes are probes conducted prior to every second or third session of instruction instead of prior to each session. By conducting probes prior to every second or third session of instruction students are allowed fewer opportunities to respond independently to the stimulus and possibly make fewer errors. To date five studies have provided error correction during daily/assessment probes (Alberto, Waugh, & Fredrick, 2010; Johnson et al., 1996; Parker & Schuster, 2002; Tekin-Iftar, 2003; Waugh et al., 2009) and one study has directly compared the effects of traditional simultaneous prompting and simultaneous prompting with error correction during daily/assessment probes (Johnson et al., 1996). Johnson et al. conducted a direct comparison of simultaneous prompting with error correction during daily probes and simultaneous prompting without error correction during daily/assessment probes in teaching science vocabulary words to five high school students with learning disabilities and mild intellectual disabilities. Both conditions were effective for teaching science vocabulary. Compared to sessions in which no error correction was provided fewer sessions to criterion were required and fewer errors were emitted when error correction was provided during daily/assessment probes. Social validity indicated that students preferred when they were provided with error correction during daily/assessment probes. Four other studies have included error correction during daily/assessment probes but have not directly examined the impact of error correction. While simultaneous prompting with error correction may be more efficient in the acquisition of targeted stimuli, this procedural modification has been examined only with a limited number of participants and in a limited disability area. Further research should be conducted with individuals with various disabilities to determine if daily/assessment probes with error correction are more efficient than without error correction.

The fourth recommendation for future research is to provide intermittent probes versus daily/assessment probes (Birkan, 2005; Dogan & Tekin-Iftar, 2002; Fickel et al., 1998; Gibson & Schuster, 1992; Griffen et al., 1998; Johnson et al., 1996; Maciag et al., 2000; Parker & Schuster, 2002; Tekin-Iftar et al., 2008; Wolery et al., 1993). Intermittent probes are probes conducted prior to every second or third session of instruction instead of prior to each session. By conducting probes prior to every second or third session of instruction students are allowed fewer opportunities to respond independently to the stimulus and possibly make fewer errors. To date two studies have employed intermittent probes (Reichow & Wolery, 2009; Tekin-Iftar et al., 2008). Tekin-Iftar et al. employed intermittent probes to examine the effects of simultaneous prompting in teaching object identification to two students with intellectual disabilities (level of functioning not reported). Researchers conducted probes prior to every third instructional session. Tekin-Iftar et al. report that employing intermittent probes did not reduce the number of errors emitted during probe sessions, although a direct comparison was not made. Without a direct comparison, it is unclear if these students would have produced lower error rates with intermittent versus daily
probes. Reichow and Wolery recently conducted a direct comparison of daily versus intermittent probes during simultaneous prompting. The researchers taught four preschool students to read vehicle transportation words (i.e., car, bus, truck, etc). The students included one student with speech language impairment, one student who was an English Language Learner, one typically developing student, and one student identified as at-risk for school failure. Reichow and Wolery provided no error correction during probe sessions. All four students reached mastery during intermittent probe conditions with three of the four students reaching mastery during the daily probe conditions. Efficiency data were mixed with the one student who did not reach mastery in the daily probe condition, one student who reached mastery in fewer sessions during intermittent probes, one student who required the same number of sessions across both conditions and one student who required fewer sessions during daily probe conditions. While the researchers did not report direct percentages of error rates across probe and instructional sessions, they did provide initial data to support intermittent probes. During the first eight sessions during daily probes 50% of student trials resulted in errors versus the first two sessions of the intermittent probe condition which resulted in errors in 28.1% of student trials. However, due to the limited number of participants and the lack of details concerning characteristics of the participants (i.e., IQ scores, etc), further research should be conducted to determine if intermittent probes produce more efficient student learning when employing simultaneous prompting.

Simultaneous prompting is an errorless learning strategy with a research base to support its use to teach a variety of skills across various groups of ability levels. Despite the research base to support its usage, continued research is needed to further examine alternatives to increase its efficiency and examine its usage with students with profound intellectual disabilities.

References


Tekin-Iftar, E. (2003). Effectiveness of peer delivered simultaneous prompting on teaching community signs to students with developmental dis-


Received: 27 July 2010
Initial Acceptance: 25 September 2010
Final Acceptance: 16 December 2010