Education and Training in Autism and Developmental Disabilities

Editor: Stanley H. Zucker
Arizona State University
Mary Lou Fulton Teachers College

Editorial Assistant: Stephanie McBride-Schreiner
Arizona State University
Mary Lou Fulton Teachers College

Consulting Editors
Martin Agran, David Cihak, John McDonnell, Keith Storey
Kevin Ayres, Ginevra Courtade, Hedda Meadan-Kaplansky, William Therrien
Devender Banda, Samuel A. DiGangi, Pam Mims, Matt Tincani
Juliet Hart Barnett, Teresa Doughty, Wendy Oakes, Jason Travers
Laura Bassette, Kimberly W. Fisher, Jenny Root, Toni Van Laarhoven
Kyle D. Bennett, Youjia Hua, Karrie Shogren, Elizabeth West
Emily Bouck, Bree Jimenez, Tom E.C. Smith, John Wheeler
Amanda Boutot, Russ Lang, Scott Sparks, Mark Wolery
Michael P. Brady, Justin Leaf, Fred Spooner, Leah Wood
Stacy Carter, Rose A. Mason, Robert Stodden, Dalun Zhang

Education and Training in Autism and Developmental Disabilities is sent to all members of the Division on Autism and Developmental Disabilities of The Council for Exceptional Children. All Division members must first be members of The Council for Exceptional Children. Division membership dues are $30.00 for regular members and $15.00 for full time students. Membership is on a yearly basis. All inquiries concerning membership, subscription, advertising, etc. should be sent to the Division on Autism and Developmental Disabilities, 2900 Crystal Drive, Suite 100, Arlington, VA 22202-3556. Advertising rates are available upon request.

Manuscripts should be typed, double spaced, and sent (three copies) to the Editor: Stanley H. Zucker, Mary Lou Fulton Teachers College, Box 871811, Arizona State University, Tempe, AZ 85287-1811. Each manuscript should have a cover sheet that gives the names, affiliations, and complete addresses of all authors.

Editing policies are based on the Publication Manual, the American Psychological Association, 2009 revision. Additional information is provided on the inside back cover. Any signed article is the personal expression of the author; likewise, any advertisement is the responsibility of the advertiser. Neither necessarily carries Division endorsement unless specifically set forth by adopted resolution.

Education and Training in Autism and Developmental Disabilities is abstracted and indexed in Psychological Abstracts, PsycINFO, e-psyche, Abstracts for Social Workers, International Journal of Rehabilitation Research, Current Contents/Social and Behavioral Sciences, Excerpta Medica, ISI Social Sciences Citation Index, Adolescent Mental Health Abstracts, Educational Administration Abstracts, Educational Research Abstracts, Language and Language Behavior Abstracts. Additionally, it is annotated and indexed by the ERIC Clearinghouse on Handicapped and Gifted Children for publication in the monthly print index Current Index to Journals in Education and the quarterly index, Exceptional Child Education Resources. Access is also available in EBSCO, ProQuest, and JSTOR.


Division on Autism and Developmental Disabilities
The Council for Exceptional Children

Board of Directors

Officers
PAST PRESIDENT Jordan Shurr
PRESIDENT Michael Wehmeyer
PRESIDENT-ELECT Ginevra Courtade
VICE PRESIDENT Robert Pennington
SECRETARY Angi Stone-MacDonald
TREASURER Gardner Umbarger

Members
Elizabeth Harkins
Kimberly Maich
Nikki Murdick
Gary Trump (Student Representative)

Members

Executive Director
Teresa Doughy
Publications Chair
Michael Wehmeyer
Communications Chair
Emily C. Bouck
Conference Coordinator
Cindy Perras

The purposes of this organization shall be to advance the education and welfare of persons with autism and developmental disabilities, research in the education of persons with autism and developmental disabilities, competency of educators in this field, public understanding of autism and developmental disabilities, and legislation needed to help accomplish these goals. The Division shall encourage and promote professional growth, research, and the dissemination and utilization of research findings.

EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES (ISSN 2154-1647) (USPS 0016-8500) is published quarterly, by The Council for Exceptional Children, Division on Autism and Developmental Disabilities, 2900 Crystal Drive, Suite 100, Arlington, Virginia 22202-3556. Members’ dues to The Council for Exceptional Children Division on Developmental Disabilities include $8.00 for subscription to EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES. Subscription to EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES is available for institutions—U.S. $100.00 per year; Canada, PUAS, and all other countries $104.00; Institutions—U.S. $249.00 per year; Canada, PUAS, and all other countries $254.00; single copy price is $40.00. U.S. Periodicals postage is paid at Arlington, Virginia 22204 and additional mailing offices.

POSTMASTERS: Send address changes to EDUCATION AND TRAINING IN AUTISM AND DEVELOPMENTAL DISABILITIES, 2900 Crystal Drive, Suite 100, Arlington, Virginia 22202-3556.
Education and Training in Autism and Developmental Disabilities

VOLUME 54    NUMBER 3    SEPTEMBER 2019

Effects of Constant Time Delay on Route Planning Using Google Maps for Young Adults with Intellectual and Developmental Disabilities 215
CHENGAN YUAN, KINGA BALINT-LANGEL, and YOUJIA HUA

Do Illustrations Promote Reading Comprehension in Adults with Intellectual or Developmental Disabilities? 225
MEREDITH SALETTA, ERICA KALDENBERG, KIARA RIVERA, and AUDREY WOOD

Impact of Video Modeling Combined with Skillstreaming Teaching Procedures on the Social Interaction Skills of Middle School-Aged Children with ASD 237
ONUR EMRE KOCAOZ, MARY E. LITTLE, and JENNIFER GALLUP

Effectiveness of Video Modeling Presented by Tablet PC on Teaching Job Interview Skills to Individuals with Developmental Disabilities 249
TURGUT BAHCALI and ARZU OZEN

Effects of a Self-Monitoring Strategy to Increase Classroom Task Completion for High School Students with Moderate Intellectual Disability 263
YI-FAN LI, HSINYI CHEN, DALUN ZHANG, and CARLY B. GILSON

Comparing No-No Prompt to Flexible Prompt Fading to Teach Expressive Labels to Individuals Diagnosed with Autism Spectrum Disorder 274
JUSTIN B. LEAF, JOSEPH H. CIHON, JULIA L. FERGUSON, RONALD LEAF, and JOHN MCEACHIN

Promoting Social Play Based on Ecological Assessment and Social Play Selection Conditions of a Child with Autism Spectrum Disorder in an Inclusive Early Childhood Classroom 288
AYA FUJWARA and SHIGEKI SONOYAMA

Examining Use of School Personnel in CBT Interventions for Anxiety in Students with ASD 301
LISA A. SIMPSON, CARA S. MAFFINI, and RACHEL K. SCHUCK

Manuscripts Accepted for Future Publication in Education and Training in Autism and Developmental Disabilities 214

The Division on Autism and Developmental Disabilities retains literary property rights on copyrighted articles. Up to 100 copies of the articles in this journal may be reproduced for nonprofit distribution without permission from the publisher. All other forms of reproduction require permission from the publisher.
Manuscripts Accepted for Future Publication in Education and Training in Autism and Developmental Disabilities

December 2019

Comparison of concrete and app-based manipulatives to teach subtraction skills to elementary students with autism. Laura Bassette, Emily Bouck, Jordan Shurr, Jiyoung Park, and McKenzie Cremeans, Dept. of Special Education, Ball State University, Teachers College, Room 705, Muncie, IN 47306.


Systematic review of functional communication training in early care and education settings. Li Luo, Nicholas A. Gage, and Debra A. Prykanowski, University of Florida, College of Education, 1403 Norman Hall, PO Box 117050, Gainesville, FL 32611.

Online module plus ecoaching: The effects on special education teachers’ comprehension instruction for students with significant intellectual disability. Aftynne E. Cheek, Marcia L. Rock, and Bree A. Jimenez, Appalachian State University, Dept. of Reading Education and Special Education, 326E Reich College of Education, Boone, NC 28608.

Video self-modeling and functional behavior assessment to modify aggressive behaviors in students with autism spectrum disorder and intellectual disabilities. Kate M. Sadler, 1025 Tupelo Court, Charlottesville, VA 22903.

Inclusive inquiry-based social studies instruction for students with significant intellectual disability. Joanna Ryan, J. Matt Jameson, Olivia Fudge Coleman, Carrie Eichelberger, Jessica A. Bowman, Lyndsey Aiono Conrad, Susan S. Johnston, and John McDonnell, University of Utah, Dept. of Special Education, 1721 Campus Center, SAEC 2280, Salt Lake City, UT 84112.


Push hard and fast: Teaching college students with intellectual disability to perform hands-only cardiopulmonary resuscitation. Kelly B. Kearney, Michael P. Brady, Charles Dukes, and Angelica Downey, Academy for Community Inclusion, Exceptional Student Education, College of Education, 777 Glades Road, Boca Raton, FL 33431-0091.

Address is supplied for author in boldface type.
Effects of Constant Time Delay on Route Planning Using Google Maps for Young Adults with Intellectual and Developmental Disabilities

Chengan Yuan  
Arizona State University

Kinga Balint-Langel  
University of Minnesota Duluth

Youjia Hua  
University of Virginia

Abstract: Individuals with intellectual and developmental disabilities (IDD) often lack the skills to navigate in the communities. Given the availability of the mobile devices and their potential use as assistive technologies for learners with IDD, we investigated the effects of constant time delay (CTD) on acquisition of the steps required to plan routes using Google Maps mobile app for young adults with IDD. Using a multiple probe across participants design, we taught three young adults with IDD enrolled in a postsecondary education program to plan routes using Google Maps on the mobile devices. Results showed that two participants learned all steps to use Google Maps. They were also successful in reaching the destinations independently following the routes they had planned. The other participant required additional sessions and instructional modifications to master the steps and needed adult assistance during her navigation probes.

Self-determination refers to independence and control over one’s life. Skills that contribute to self-determination include choice and decision-making, goal setting and attainment, problem solving, self-awareness, self-advocacy, self-regulation, and self-efficacy (Wood, Karvon, Test, Browder, & Algozzine, 2004). More specifically, self-determined individuals are actively involved in making choices and decisions for themselves, taking responsibility for their actions, setting and evaluating progress towards own goals, understanding their strengths and needs, and advocating for themselves in various everyday situations. One set of skills that can contribute to self-determination is navigation skills. Such skills include setting up routes, following directions, and reaching the destination (Richards, Brady, & Taylor, 2014). However, many individuals with intellectual and developmental disabilities (IDD) often have difficulties with navigation skills. Without these skills, their potential to reach self-determination is limited because they must rely on others in order to walk from one point to another (LaGrow, Wiener, & LaDuke, 1990). It restricts their opportunities to participate in their community, employment, and education.

Previous research on navigation skills for individuals with IDD focused on teaching students to reach a destination following researcher-programmed routes. For example, Mechling and Seid (2011) taught three young women with moderate intellectual disabilities to reach destinations while following the directions from a personal digital assistant (PDA). The researchers first determined landmarks known to the participants as well as destinations they would like to visit. Then they planned the routes by connecting these landmarks. Pictures of landmarks were taken and programmed in the PDA as picture prompts. The PDA also provided auditory prompts of spoken directions and video prompts showing the movements to the next landmark. Prior to the start of the study, researchers taught participants how to operate the PDA and access...
the prompts. During the study, the participants were asked to reach one of the programmed destinations following the audio and video prompts from the PDA. The results showed that all participants were able to reach the destination using different levels of prompts embedded in the PDA and did not require additional assistance from other adults.

In another study, Kelley, Test, and Cooke (2013) used an iPod to teach navigation skills. They programmed picture prompts of landmarks to enable independent navigation of four young adults with IDD in a postsecondary education setting. Kelley et al. taught the participants to use an iPod to access the picture prompts using a training script prior to intervention. During the iPod intervention phase, the participants were asked to walk to a destination with the iPod. Similar to Mechling and Seid (2011), participants used the prompts when necessary. Their results showed that all participants were able to reach the destinations using picture prompts of landmarks without assistance from other adults. Kelley et al. reported that participants were also able to navigate the trained routes without the presence of researchers. Three out of four participants were able to independently navigate untrained routes with the iPod picture prompts.

Results from the series of studies showed that individuals with IDD were capable of reaching researcher-programmed destinations following the prompts embedded in the mobile devices. However, the participants in the studies still needed other people to program prompts and plan routes. In order to improve self-determination and independence, interventions for young adults with IDD should focus on route planning in addition to following the routes planned by others.

One route planning tool that may be appropriate for learners with IDD to use is the mobile navigation software such as Google Maps app (Google, 2017). The Google Maps is a popular navigation mobile app that provides real-time location-based auditory and visual directions to a destination. The app highlights the route and displays where the user is on the route and the location to which the user should be navigating. Its auditory directions instruct the user to the direction of travel, whether and where to take a turn, as well as the direction of that turn. Using Google Maps may reduce the need for prior planning and customization of prompts, and can allow young adults to plan routes. Therefore, they may rely on in-app directions to travel to the destinations, eliminating the need of another adult for navigation assistance.

While many young adults with IDD carry mobile devices, the use of navigation function may be challenging for learners with IDD. Setting up a route on Google Maps requires the users to complete a series of discrete steps in a chained task. One intervention that can teach chained tasks is constant time delay (CTD). Dogoe and Banda’s review (2009) found that CTD is one of the effective instructional delivery strategies to teach chained tasks such as food preparation, shopping, and other vocational skills. Richter, Mustian, and Test (2012) further noted CTD can be effective in teaching students community participation skills such as banking, mailing, and street crossing. CTD is a prompt fading procedure that transfers stimulus control of a target response from prompts to the target stimulus (e.g., an instruction). During the CTD, instructors initially deliver the target stimulus and the prompts simultaneously (i.e., 0 s time delay). The 0 s time delay constitutes errorless teaching to ensure student success. Following 0 s delay, a predetermined interval (e.g., 5 s) is then inserted between the target stimulus and the prompt to allow for student independent response within that interval. Instructors deliver reinforcers (e.g., praises, tangibles) upon student correct response. Consequently, only the target stimulus is necessary for the student to respond correctly.

Using the CTD intervention, researchers have successfully taught students with IDD the steps required to use the mobile apps. For example, Douglas and Uphold (2014) as well as Uphold, Douglas, and Loseke (2016) taught secondary students and young adults with IDD chained tasks on mobile devices. In both studies, researchers used CTD to promote independent performance of creating picture schedules. The intervention started with 0 s time delay, during which instructors provided immediate prompts for participants to complete each step. After students were successful with 0 s time delay, the instructors
moved to 3 s time delay trials. They allowed the students to complete steps in sequence independently and only provided prompts if participants did not respond within 3 s or initiated an incorrect response. In both studies, all participants successfully learned steps required to create picture schedules using the mobile device independently.

Giving the availability of the mobile devices and their potential use as assistive technologies for learners with IDD, we investigated the effects of CTD on acquisition of the steps required to plan routes using Google Maps mobile app for young adults with IDD. In addition, we probed if they can follow the directions on Google Maps and navigate in their community. Therefore, the current study addressed the following questions:

1) Will young adults with IDD acquire the steps to use Google Maps application in order find directions to destinations?
2) Can students reach destinations using the routes they have set up on Google Maps?

Method

Participants and Settings

Three young adults with IDD, Jessica, Frank, and Blake, between 18 and 20 years old and enrolled in a postsecondary education program in a Midwest university, participated in the study. Each participant was attending a two-year on-campus postsecondary education program. Students enrolled in the program lived in the dormitory and attended college activities and courses, as well as participated in different internship opportunities at different campus locations. The participants for the study were first recommended by their program coordinator because of their difficulties with navigation on campus.

Jessica was a 20-year-old female with a mild intellectual disability (IQ 58, WAIS-IV; Wechsler, 2008). Frank was an 18-year-old male with a mild intellectual disability (IQ 70, WAIS-IV) and a diagnosis of Fetal Alcohol Syndrome, and Blake was an 18-year-old male with a mild intellectual disability (IQ 68, WAIS-IV) and a diagnosis of autism spectrum disorder. All three participants read at approximately second grade level according to Curriculum-Based Measurement in Reading (CBM-R; Hasbrouck, Ihnot, & Rogers, 1999). At the time of this study, they lived in the dormitory on campus approximately 0.7 mi (equivalent to a 15-min walk) from the building where they attended most of their classes. They were able to walk on the sidewalk and cross streets safely. Their program coordinator reported all three participants owned a mobile device and had the fine motor skills to use their devices (e.g., touching the screen, pressing the button, unlocking the device, etc.). They used their devices for communication and other leisure activities, but had never for navigation.

Two instructors with at least three years of experience working with individuals with IDD conducted the study and implemented the intervention in a private office on campus. The office included a main desk and a number of chairs. Each session lasted for approximately 45 mins. The initial screening and post-intervention pedestrian navigation probes occurred on the campus. The campus was located in the urban area with lecture halls, stores, banks, student housings, restaurants, and office buildings all connected with walkways and sidewalks. The sidewalks were marked and separated from the roadways, and the intersections had crossings at every corner. In addition, each traffic light had a pedestrian signal and a call button for crossing. All vehicles were required to yield to crossing pedestrians by the state law.

Materials

Cue card with mnemonic device. Prior to the start of the study, we task-analyzed the steps required to use the Google Maps in order to find routes to destinations. We created a 5 × 7 cue card that had the acronym “TRAVEL” serving as a mnemonic device for the six steps to plan routes (see Table 1).

Mobile devices. Both Frank and Blake owned an iPhone and Jessica had an Android phone. We made sure that the Google Maps app was installed on their devices before the start of the study. We used an iPad for the duration of the study because it had a bigger screen as compared with participants’ personal devices, and still shared similar operational features to iPhone and Android phones.
**Location notecards.** In order for students to enter the location accurately in the Google Maps app, we prepared location notecards before the study. We printed the name of the location without addresses on each location notecard (e.g., “Wells Fargo”, “Subway”, etc.). The destinations included lecture halls, shops, cafes, restaurants, etc. For each participant, we only selected the locations that the participants never visited before. We prepared approximately 30 location notecards during the study.

**Screening**

We conducted a screening before the study to assess our participants’ navigation skills in the community. We first asked how they would go to an unknown place. Jessica and Frank reported that they would rely on other adults, such as peers and family, while Blake stated that he would use a map and look for street signs to locate the destinations. The participants were then given a notecard with a name of a location that was within 5 min walking distance. During this step, the participants had access to the Google Maps app on their phones. Jessica and Frank reported that they did not know how to reach the destination. For Blake, we followed him as he walked around the campus for 10 mins. None of the participants used their mobile phones or requested a paper map. Therefore, all participants were eligible for this study.

**Dependent Variables**

The primary dependent variable was the number of steps that participants independently completed to find the route on Google Maps. Every step that a participant completed independently was marked as correct. If the participant did not complete a step within 5 s or completed a step incorrectly (e.g., press the wrong button, select wrong location), we terminated the task and marked that step and all subsequent steps as errors since the TRAVEL steps should be performed in sequence in order to obtain routes (i.e., single-opportunity probes; Alexander, Smith, Mataras, Shepley, & Ayres, 2015).

We probed pedestrian navigation following the routes the participants had set up on their phones once during the post-instruction phase. Each probe lasted up to 15 mins. The locations were within 10 mins walking distance. If a participant reached the destination without strictly following the initial route loaded on the Google Maps, it would also be considered successful navigation as long as the navigation was completed independently without assistance from another adult within the specified time. Participants would have achieved the desirable goal of navigation to the destination independently regardless how they used the Google Maps or the route (Kelley et al., 2013). We also collected anecdotal data on the type of assistance when provided during the probe.

---

**TABLE 1**

**TRAVEL Steps and the Corresponding Definitions to Establish Routes on Google Maps**

<table>
<thead>
<tr>
<th><strong>TRAVEL Steps</strong></th>
<th><strong>Definitions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 – Tap the app</td>
<td>The student locates and presses the Google Maps app.</td>
</tr>
<tr>
<td>Step 2 – Reach search bar</td>
<td>The student locates and presses the search bar in the Google Maps.</td>
</tr>
<tr>
<td>Step 3 – Address</td>
<td>The student types the destination name in the search bar.</td>
</tr>
<tr>
<td>Step 4 – Validate address</td>
<td>The student confirms the address in one of the two ways: 1. Selects the destination in the current city; 2. If there are two locations sharing the same name in the current city, asks for full address. The student then clicks on the correct option in the dropdown list on Google Maps.</td>
</tr>
<tr>
<td>Step 5 – Elect walking icon</td>
<td>The student presses the blue walking (走路) icon.</td>
</tr>
<tr>
<td>Step 6 – Load and route</td>
<td>The student clicks on the blue navigation (导航) icon to route.</td>
</tr>
</tbody>
</table>
**Design and Procedure**

We used the multiple probe across participants design to investigate the effects of CTD on independent route planning on Google Maps. The multiple probe design is a variation of the multiple baseline design. Using this design, the functional relation is demonstrated with the staggered application of the intervention to participants at different times (Kazdin, 2011). A clear demonstration of effects occurs when the participants’ target performance changes only when the intervention is implemented and not earlier. In addition, the multiple probe design would reduce the aversiveness of repeated testing of untaught task such as completing a chained task on the Google Maps.

**Baseline.** Each baseline session included one opportunity to plan a route on the Google Maps. We first provided participants with a location notecard and an unlocked iPad, and then pointed to the Google Maps app on the iPad and asked the participants to use the Google Maps app to find the directions to the specified locations (e.g., “show me the way to get there using Google Maps.”) and recorded the number of steps the participants completed. If they did not perform a step within 5 s or completed the step incorrectly, we ended the session and said “thank you for the effort and we are done for the day!” We marked that step and all subsequent steps as errors. We did not provide instruction, prompts, or feedback during baseline. If participants asked any questions, we redirected them back to the task and told them to do their best. For Jessica and Blake, each session lasted approximately 30 s while Frank took on average 1 min.

**CTD Instruction.** We delivered the instruction twice a week and each session focused on two steps of the strategy. At the beginning of each session, we presented the iPad and a location notecard and informed the participants that they needed to find the direction to the location using Google Maps similar to the baseline.

The CTD began with a 0 s delay where we provided a prompt simultaneously with the target stimulus for that step (i.e., either the instruction or completion of previous step). For example, we first pointed to the letter “T” on the cue card and read the step. We then modeled the step followed by an instruction for the participant to perform the step. We repeated the 0 s delay three times and then initiated the 5 s delay trial for the step.

During the 5 s delay trial, after we presented the task, we waited 5 s for the participants to complete the target step. If the participants performed the step independently within 5 s, we delivered praise (e.g., “Good job tapping the app!”). We repeated the 0 s delay procedure for the step if the participants did not perform the step within 5 s or performed the step incorrectly.

Once the participants performed the target step independently for five consecutive trials with 5 s delay, we considered the participants mastered that step and taught the subsequent step following the same CTD procedures. In order to provide more opportunities for the students to practice the steps following the sequence, we asked the participant to perform the mastered preceding steps while learning the new step. For example, during teaching of the second step (i.e., “reach search bar”), the participants had to complete the first step (i.e., tap the Google Maps app) before the 0 s delay for the second step could begin. In case of an error on a mastered step before teaching the target step, we terminated the trial and the asked the participant to perform the incorrect step again. We did not deliver error correction when the students performed a previously mastered steps incorrectly. If error persisted, we retaught that step following the CTD procedures.

When the participants performed all six steps independently for five consecutive trials, we concluded the instruction. The number of sessions it took to achieve student mastery varied slightly among the participants. Jessica took four sessions, while Frank and Blake took three sessions.

**Post-instruction.** Post-instruction phase started immediately after participants mastered all the steps. The procedures for the post-instruction sessions were the same as the baseline sessions. After presenting an unlocked iPad and a location notecard to the participants, we asked the participants to set up the route to the given location. We did not provide any instruction, prompts, or feedback (e.g., praise and error correction).
Generalization and pedestrian navigation probes. Generalization probes were conducted during post-instruction sessions after participants independently completed all TRAVEL steps using the iPad. This was to assess if treatment effects were generalized to participants’ own phones beyond the instruction device. While Frank and Blake had iPhones, Jessica had an Android phone. During the generalization probes, we provided the participants with a location notecard and asked them to find the way to the destination using their phones.

In addition, we also conduct a pedestrian navigation probe to assess whether the participants could reach a destination using Google Maps. Each pedestrian navigation probe immediately followed the last generalization probe. After the participants completed the TRAVEL steps on Google Maps using their phones, we asked them to go to the location (e.g., “now let’s go there.”). We followed the participants within a few feet behind while they walked to destination. If a participant stopped longer than 10 s or asked us for help, we provided an indirect verbal prompt (e.g., “do you take a turn here?”). However, we did not stop participants if they walked to a direction different from their route loaded on the Google Maps. When the participants navigated to the location with or without assistance within 15 mins, we provided a feedback (e.g., “You found it!”). However, if the participants did not find the location within 15 mins, we would terminate the probe with a verbal statement (e.g., “It is time to go back.”).

Procedural integrity and interobserver agreement. A second observer was responsible for collecting procedural integrity and participant performance data. At the start of a session, we gave him a procedural integrity (PI) checklist and a copy of the data recording sheet. He stayed approximately 3 ft away from the participants in order to be able to observe and record data independently and remained nonintrusive.

We developed a PI checklist for baseline, post-instruction, and probes, and another PI checklist for instruction and booster sessions. The second observer collected PI data for a minimum of 33.3% of baseline sessions and at least 80% of both instruction and post-instruction sessions (including probes) for each participant. Procedural integrity was 100% for all participants across all phases.

Interobserver agreement (IOA) checks were conducted during at least 66.7% of the sessions during each phase, and we calculated the IOA on the number of steps completed using step-by-step agreement. The data collected by us on each step was compared with data collected by the second observer. Mean IOA was 100% for both Blake and Frank and 97.2% for Jessica (range, 66.7%–100%).

Results

Figure 1 represents participants’ completion of TRAVEL steps during baseline and post-instruction sessions. Baseline data for all participants was stable with zero trend. Both Jessica and Blake completed one step and Frank completed an average of 3.33 steps (range, 3–4 steps). After the CTD intervention, Frank and Blake independently completed all six TRAVEL steps across all post-instruction sessions. Both Frank and Blake successfully completed the six steps when we asked them to use the Google Maps on their own cellphones.

After CTD intervention, Jessica’s performance was variable with a slight decreasing trend. She struggled with steps 4–6. As a result, we provided additional feedback in the sixth session as well as verbal instruction, cue card and feedback during the seventh session during her post-instruction phase. Feedback included praise on each independently performed step and error correction on the missed or incorrectly performed steps while verbal instruction was to prompt her to use the mnemonic device (e.g., “try to say each step and do each step”). However, Jessica did not reach mastery criteria after additional components. We decided to include additional sessions that systematically targeted the three steps that she missed. We taught the three steps following the same CTD procedures as the instructional phase with one exception that we asked Jessica to continue using the cue card while completing the steps regardless of the time delay. We concluded the condition after Jessica reached the mastery criterion (i.e., independently complete all steps within 5 s delay for five consecutive times).

During Jessica’s second post-instruction
phase, she used the cue card that reminded her of the steps and did not receive any prompt or feedback from the instructor. Jessica completed all TRAVEL steps independently during her second post-instruction phase. She also completed all six steps independently using her Android phone with the cue card during the generalization probes.

In order to assess if the participants could follow the directions from the Google Map app on their phones, we conducted pedestrian navigation probes. During the pedestrian navigation probes, we asked them to go to the destination after they had set up the routes using Google Maps on their phones. Both Frank and Blake independently navi-
gated to the given location within 15 mins, while Jessica needed a total of two verbal prompts in order to reach the destination (e.g., “do you take a turn here?”).

**Discussion**

We evaluated the effects of CTD on acquisition of the steps required to plan routes using Google Maps mobile app for young adults with IDD. We also assessed the functional use of the skills by asking the participants to reach the destination using the routes they planned on Google Maps. We found all of the participants learned to set up routes on Google Maps using both iPad and their personal phones. During the pedestrian probes, two participants successfully walked to the novel locations using routes they planned on the Google Maps app on their phones. One participant required verbal prompts to complete her navigation.

Given the availability of the mobile devices and their potential use as assistive technologies for learners with IDD, this finding is particularly relevant in that young adults with IDD can learn to use different apps to remediate a variety of skill deficits related to education, employment, and living. For example, finance apps can help plan and track budgets and daily spending, health and fitness apps monitor health conditions and may assist with promoting regular exercise and meal-planning, and productivity apps could improve the organizational skills such as time management. These skills will improve self-determination and result in higher quality of life for individuals with IDD.

In addition, our results provided additional evidence that CTD can be used as an effective intervention to teach functional life skills for learners with IDD. Previously, educators have implemented the CTD for chained tasks across a variety of functional life skills, including safety, leisure, banking, vocational, domestic, and self-help skills (Dogoe & Banda, 2009; Test, 2012). Our study expanded the application of CTD intervention to the use of mobile technologies that could lead to independent navigation.

When used to teach a sequence of steps in a chained task, CTD can be implemented in both forward chaining and total-task presentation procedures. In our study, we taught the TRAVEL steps using a forward chaining procedure. The participant must learn one step at a time and reach mastery before learning a subsequent step. By contrast, both Douglas and Uphold (2014) and Uphold et al. (2016) used the CTD in a total-task presentation procedure. In both studies, the researchers had the students complete all the steps in a chain using 0 s delay first. During each subsequent 3 s time delay sessions, the students had the opportunity to complete all the steps in a chain independently. Although empirical data suggest both types of chaining procedures are effective on skill acquisition for students with IDD (e.g., Horner & Keilitz, 1975; Thompson, Braam, & Fuqua, 1982), the two procedures may have a different impact with regard to its effectiveness and efficiency. In light of our findings, it is possible that some students may need additional practice embedded in the forward chaining procedures in order to acquire the skills. For other students, additional practice may become unnecessary and lower the efficiency of the intervention. Educators must be responsive to the learning needs of the students with IDD and select the most optimal intervention for the students.

It is worth noting that all participants managed to generalize the newly acquired skills even though we did not systematically program for it. It is possible that generalization occurred because students were very familiar with the technologies and had plenty of opportunities to use them outside of the study. However, we cannot assume that generalization will occur automatically. Researchers have used several generalization strategies in conjunction with CTD including multiple exemplar training across stimuli and settings, training loosely, and teaching students in natural settings (Dogoe & Banda, 2009; Schuster et al., 1998). Educators should assess and program for generalization when teaching life skills, so that students can utilize the skills in a functional and generalized manner.

**Limitations**

Our study has several limitations. First, there was only one replication of instructional effects in our study. Initially, Jessica did not respond to the intervention the same way as
the other two participants. We modified the intervention similar to those that reported in the previous studies according to Schuster et al. (1998). They argued that modifications were necessary because of the diverse learning needs of students with disabilities. Students with IDD represent a heterogeneous population and may require differentiated intervention (Richards et al., 2014). Jessica’s difficulties in retention of previously learned steps is one of the defining characteristics of individuals with IDD. In order to be responsive to her needs, we provided her with a cue card to help her recall the six steps (Lubin & Polloway, 2016).

Another issue related to the diverse learning needs of students with IDD is the intervention design. We designed the intervention using “TRAVEL” as a mnemonic device to facilitate information recall. We chose this component because students in the study all had sufficient reading skills and a meaningful mnemonic facilitates information retention and recall (Roediger, 1980). However, the steps and the mnemonic may not be effective for students with IDD who do not have sufficient reading skills. We recommend that educators and researchers design interventions according to the learning needs of the students.

Furthermore, we did not assess or program for navigation skill retention over an extended period of time after the intervention ended. Richards et al. (2014) noted that individuals with IDD often have difficulties with skill retention over time of varying degrees. For example, Mechling and Seid (2011) found that their participants retained the acquired routes for 35 to 60 days after instruction. On the other hand, in the study by Kelley et al. (2013), the participants maintained their navigation skills for up to 232 days. Regardless of the varying levels of retention, educators should always systematically program for skill retention to achieve long lasting behavioral changes (Rush & Kazdin, 1981). Strategies that can promote skill retention include training under different settings, creating more opportunities for students to apply the skills, and prompting them to frequently use these skills in real life (Brown & Odom, 1994).

The last limitation of the study is related to how we conducted the navigation probes. Although navigation probes occurred in the natural environment, they were significantly different from the condition in which the skill will be utilized. As a result, student performance may not represent true functional use of the skills in real life situations (Kazdin, 2011). In order to assess functional use of these skills, researchers can enlist help from other people in the environment and create opportunities for the students to use the skills. For example, if a student shares his or her location with an advisor, the advisor can call and ask the student to go meet with him or her at a certain place while monitoring the navigation progress remotely. The student’s peer can also walk with the student to the destination. In these cases, a student’s true functional use of the skills under real life scenarios can be assessed.

**Practical Implications**

This study demonstrated that young adults with IDD can learn to use a navigation software on a personal mobile device and some students can even use that software to walk within their community without further instruction from adults. Having the skills to navigate one’s community may ultimately result in greater self-determination and independence of young adults with IDD. Postsecondary educational programming for this population should include navigation skills.

The study also demonstrated the potential effects of using mobile devices as assistive technologies on functional life skills of young adults with IDD. In order to capitalize on the benefits, educators must teach them how to take advantage of the technology using research-based interventions. Educators should also consider modifying the interventions according to their students’ learning needs.

**References**


Dogoe, M., & Banda, D. R. (2009). Review of recent research using constant time delay to teach chained tasks to persons with developmental disabili-


Received: 21 June 2018
Initial Acceptance: 14 August 2018
Final Acceptance: 18 September 2018
Do Illustrations Promote Reading Comprehension in Adults with Intellectual or Developmental Disabilities?

Meredith Saletta and Erica Kaldenberg
University of Iowa

Kiara Rivera
Midwestern University

Audrey Wood
University of Iowa

Abstract: As individuals with intellectual or developmental disabilities (IDD) mature, it is important to train them not only in functional/vocational skills, but also to continue to develop their literacy skills. There is little conclusive information regarding what facilitates reading comprehension in this population. Some previous research indicates that the use of illustrations and/or symbols promotes reading comprehension in this population, but this is not a consistent finding. We explored how adding illustrations to “Easy Read” stories would impact reading comprehension in postsecondary students with IDD. We added colored photographs, black-and-white line drawings, or images/patterns without content in three separate studies, each addressing a related question. In all three cases, adding illustrations did not improve reading comprehension. Furthermore, since adults with typical development do not usually read books with illustrations, this factor lacks content validity. We need to reevaluate the inclusion of pictures in reading materials for adolescents or adults with IDD.

Literacy is an extremely important element in enabling adolescents and adults of all backgrounds to participate in modern society (Nota, Ferrari, Soresi, & Wehmeyer, 2007). This is true for adolescents and adults with intellectual or developmental disabilities (IDD) as well as individuals with typical development. However, despite this importance, literacy instruction has traditionally not been a curricular focus for individuals with IDD (van Kraayenoord, Moni, Jobling, & Ziebarth, 2002; Young, Moni, Jobling, & van Kraayenoord, 2004). Rather, reading instruction for individuals with IDD has been typically limited to functional literacy skills and content including sets of sight words required for safety and independence (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006; Karvonen, Wakeman, Browder, Rogers, & Flowers, 2011; Roberts, Leko, & Wilkerson, 2013). For example, educators may use words printed on flashcards rather than facilitating students’ interaction with grade-level text (Roberts et al., 2013). This is true in spite of federal mandates put in place over the past decades, such as the No Child Left Behind Act of 2002 and the Individuals with Disabilities Education Improvement Act of 2004. Also, many teacher preparation programs do not offer training in research instruction for students with IDD (Copeland, Keefe, Calhoon, Tanner, & Park, 2011). Recently, there has been a proposal to directly integrate both functional and academic subject matter into instruction for students with IDD (e.g., Collins, Hager, & Galloway, 2011), but there has been inadequate research regarding this approach (Roberts & Leko, 2013). Moreover, there is a disconnect between this type of learning and the comprehensive, evidence-based methods usually employed with chil-
The definition of IDD encompasses such populations as individuals with Down syndrome, autism spectrum disorder, traumatic brain injury, and other disabilities that affect cognition. The Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) specifies that there are three criteria for diagnosing IDD: deficits in intellectual functioning, social functioning, and practical matters such as independence. There has been a 17% increase in the prevalence of IDD in the last decade. Better health care, earlier and higher-quality intervention, and improved nutrition and exercise contribute to this growing adult population (Anderson et al., 2013). Today, IDD has a worldwide prevalence of between 1% and 3% of the population (Maulik, Mascarenhas, Mathers, Dua, & Saxena, 2011). To meet the needs of this growing population, more research is needed to further understand how to positively influence the factors associated with quality of life (Sheppard-Jones, Thompson, Prout, & Kleinert, 2005).

Literacy Demands in the Community

Literacy is a strong predictor for many quality-of-life outcomes. For example, greater literacy skills are associated with higher self-confidence and are positively correlated with employability and the ability to live independently (Young et al., 2004). In 2006, the United Nations Convention on the Rights of Persons with Disabilities articulated that individuals with disabilities often have difficulty accessing services and making informed choices due to often excessive text demands. Informational pamphlets or webpages provide community members with information (e.g., suggestions and recommendations) in text-heavy formats assuming the audience can read. Reading is also required to sign a lease, negotiate a contract, apply for a job, and communicate electronically. However, not all adults can read, thus limiting access to services, supports, and resources available (National Assessment of Adult Literacy, 2006). This skill deficit is particularly troublesome for individuals with IDD, who often lack the natural supports available to other non-readers (i.e., close friend, a trusted adult) due to small social networks (Buntinx & Schalock, 2010).

One concept that has been shown to significantly impact a person’s quality of life is self-determination (Nota, Soresi, Ferrari, & Wehmeyer, 2011). Self-determination is defined as the degree to which a person feels that they can change things in life (Wehmeyer & Little, 2009). Consequently, over the years there has been an increased focus on the importance of, and advocacy for, self-determination in individuals with IDD. Wehmeyer (1996) stated that choice-making, decision-making, and problem-solving are important skills in the self-determination equation. Other research also highlights that academic proficiency can have a dramatic impact as well on self-determination, with literacy being the most important factor (Nota et al., 2007).

In the U.S., federal legislation mandates that public school districts must appropriately support students with IDD. For example, even students who participate in special education are required to be included in state-wide and district-wide educational assessments. Students with significant cognitive disabilities may need to demonstrate their knowledge and/or skills by means of alternate assessments (Kleinert, Browder, & Towles-Reeves, 2009). We have seen an increasing effort to provide intensive academic instruction in elementary and middle school, yet reviews of special education programming reveal explicit academic instruction is lacking from many high school special education programs (Fleury et al., 2014). Given the importance of literacy, targeted reading instruction should continue to be a core component of all educational programs throughout high school (Browder, Spooner, Wakeman, Trela, & Baker, 2006; Downing, 2005) and adulthood (Van, Nakken, Nicolay, & Van Houten, 2007). However, even with intensive reading instruction, there will always be adults still requiring additional supplemental reading supports.

There are additional factors to consider regarding classroom-based instruction for students with disabilities. Ruppar (2015) discovered that literacy activities of adolescents with severe disabilities were often separated from...
the natural setting and the natural materials in which the literacy skill would typically be used. McKenzie (2009) found that in self-contained classes, the most common literacy activities were discussing daily news, reading aloud, following activity schedules, and participating in morning circle activities. According to Ruppar (2017), teachers’ beliefs about instructional outcomes are important components of instructional decisions; a student’s poor short-term outcomes may reinforce his or her teacher’s low expectations. Teachers may fail to have high enough expectations that students with significant disabilities are able to achieve conventional literacy skills (Kliwer, Biklen, & Kasa-Hendrickson, 2006; Roberts et al., 2013). Teachers may also base their decisions about access to literacy instruction on perceived stereotypes of student features (Ruppar, Alcock, & Gonsier-Gerdin, 2017; Ruppar, Dymon, & Gaffney, 2001). Finally, social context, familiarity, and modeling within supportive and integrated settings may improve these students’ motivation and performance (Kleinert et al., 2009).

Demands and Guidelines for Text Augmentation

One way to provide supplemental text support is to provide the reader with text augmentations. Text augmentations are additions made to a text passage in order to increase readability and reading comprehension (Hudson, Browder, & Wakeman, 2013). Further clarity regarding text supports is even more important today as inclusive educational and career opportunities for adults with IDD continue to rise. Disability rights advocates in combination with federal legislation (i.e., the Higher Education Opportunity Act of 2008) have led to the establishment of over 260 postsecondary education programs for students with IDD on college campuses (Think College, 2018). Of these programs, many utilize the traditional college curriculum available to all matriculated students (Grigal, Hart, & Weir, 2012). Still today, the majority of college course instructors require students to read and comprehend course content independently. Yet as inclusive college educational opportunities continue to expand, there will be a continued demand to better understand how best (effectively and efficiently) to support students with IDD in environments that are notorious for underutilizing evidence-based instructional strategies and practices (Plotner & Marshall, 2015).

After recognizing the need for community resources and public departments to provide accommodations for individuals with limited reading ability, the United Nations released a list of recommended reading accommodations for service providers to use to increase the overall readability of written materials (Article 9 of the United Nations Convention on the Rights of Persons with Disabilities). These recommendations are referred to as Easy Read guidelines. Recommendations for Easy Read materials include: simple text structure (i.e., simple sentences compared to complex, compound, or passive sentences; Spadoreca, 2005), use of large font, use of short paragraphs which separate important points (Hurtado, Jones, & Burniston, 2014), and inclusion of pictorial symbols (Challoner, 1999). Easy Read materials commonly include photographs and/or black-and-white drawings which illustrate single concepts or complex ideas expressed by a whole sentence of paragraph (Turnpenny et al., 2018).

Efficacy of Supplemental Illustrations, Line Drawings, and Symbols

There has been some research regarding the roles of supplemental text supports such as illustrations, lines drawings, and symbols in facilitating reading comprehension in older individuals with IDD. Hibbing and Rankin-Eriksen (2003) consider the maxim, “A picture is worth a thousand words” as it applies to individuals who have poor reading skills, in that these readers can explain and understand how pictures can promote their comprehension. The addition of illustrations to text can enhance an individual’s reading comprehension (Hibbing & Rankin-Eriksen, 2003). Illustrations have also been found to be crucial in facilitating non-literal understanding of text, such as making inferences, as they reduce the demands on working memory during processing (Pike, Barnes, & Barron, 2010) and promote distinctiveness in encoding (Peeck, 1993). Rusted and Coltheart (1979) found that individuals who experience reading difficulties move from text to illustrations.
and back to the text in order to understand what is being read. Other classic research has shown that illustration enhancement has been found to have a more positive effect for individuals who struggle with reading than for those who can read proficiently (Levie & Lentz, 1982). These authors state that illustrations can have a number of effects on the reader such as increasing interest, affecting attitude, provoking emotional responses, and even facilitating reading comprehension. They also reviewed studies concerning experimental comparisons of the effects of illustrations and non-illustrated text on learning, and concluded that illustrations promote learning of information in written texts when the illustrations depict what is in the text. Learning information was better in illustrated text than text alone in 98% of all comparisons, and in 85% of these differentiations, the difference was statistically significant. Other researchers indicate that colored or black-and-white photographs are easier for individuals with IDD to recognize or understand in comparison to line drawings or symbols which demand a greater amount of processing. In addition, it is recommended that all photographs are presented together with explanations in order to confirm that the intended message is communicated (Sutherland & Isherwood, 2016).

On the other hand, line drawings may be more effective than photographs in communicating documents relevant to adult living such as brochures in a doctor’s office. Houts, Doak, Doak, and Lescalzo (2006) argue that “the advantage of simple drawings over more complex pictures may be due to their minimizing distracting details (p. 180).” When using picture accommodations, it is essential that the educator pays attention to literal, factual recall, versus bridging inferences to derive meaning, in models of comprehension. This concept has been studied in children. Pike, Barnes, and Barron (2010) examined different pictures, one of which represented information which would help to make the correct inference, while the other represented competing or conflicting information. Results from the study indicate the first had a facilitative effect, while the second had an interfering effect.

Symbols have also been systematically added within text structures to aid in overall reading comprehension. Jones, Long, and Finlay (2007) found that adults with mild or borderline learning disabilities comprehended passages written with symbols more successfully than they comprehended passages written without symbols, suggesting that symbols carry meaning and represent words or parts of words. In contrast, Sallery and Winberg (2018) found that adults with IDD read more accurately when there was a single line of text and a single illustration on each page as opposed to a symbol accompanying each word on each page. Similarly, Poncelas and Murphy (2007) found the addition of symbols did not promote understanding in adults with IDD. These researchers indicated that symbols need to be taught and learned, especially if their meanings are not iconic or immediately apparent, in order to have a beneficial impact.

While some results have indicated that supplemental text supports are beneficial, researchers also conclude that supplemental text supports hinderer reading comprehension and create short-term confusion for readers (Strydom & Hall, 2001). Other findings suggest that pictures reduce the attention being paid to the information presented and interfere with retention of the information (Peeck, 1993). Many of the citations that support the use of pictures to facilitate reading comprehension include samples of children without IDD. In contrast, many of the studies that contradict this finding and demonstrate that pictures/symbols do not support comprehension include samples of readers with IDD. Therefore, one may argue that the samples of participants, rather than the supports created in the studies, are the cause of the variability in findings.

Research Questions

The contradictory findings within this literature base indicate a need for further evaluation of the impact supplemental text illustrations, line drawings, or symbols has on reading comprehension. Previous research (Saletta & Winberg, 2018) focused on the supplemental support symbols provide readers. Therefore, as a next step, we wanted to focus on the influence illustrations have on reading.
comprehension for adults with IDD. We asked the following three questions. Each question was systematically studied independently at three different points in time.

1. Are there significant differences in comprehension when participants are given three colored photographs, black-and-white line drawings, or unrelated abstract images to view before reading a passage?

2. Are there significant differences in comprehension when participants are given five colored photographs, black-and-white line drawings, or unrelated abstract images to view before reading a passage?

3. Are there significant differences in comprehension when participants read passages with colored photographs or black-and-white line drawings inserted meaningfully in text compared to text with unrelated abstract images integrated?

The outcome variable which we measured was the number of comprehension questions answered correctly after reading a given passage.

**Method**

**Participants**

Participants were all enrolled in a postsecondary educational program designed for adults with disabilities in a small city in the Midwest. All students were between 18 and 25 years old. Demographic data including independent reading levels are presented in Table 1. In Studies 1 and 2, the same set of 50 students with IDD participated; in Study 3, a different set of 45 students with IDD participated. A total of four participants across the three studies were removed from the analyses because they accidentally failed to answer any questions on a particular page. The three studies were conducted over the course of three academic semesters.

**Materials**

For each study, participants were randomly assigned to one of three conditions (i.e., colored photographs, black-and-white line drawings, control images). Each student was presented with a packet containing a story and

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Number of Participants</th>
<th>Age Range</th>
<th>Broad Reading (Woodcock Johnson)</th>
<th>Broad Writing (Woodcock Johnson)</th>
<th>Full Scale IQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild intellectual disability (not secondary to any other known etiology)</td>
<td>20</td>
<td>18–24</td>
<td>&lt;40–116</td>
<td>&lt;40–110</td>
<td>40–100</td>
</tr>
<tr>
<td>ADD/ADHD</td>
<td>5</td>
<td>20–21</td>
<td>65–81</td>
<td>68–87</td>
<td>67–94</td>
</tr>
<tr>
<td>Pervasive developmental disorder-not otherwise specified</td>
<td>5</td>
<td>20–21</td>
<td>&lt;40–91</td>
<td>&lt;40–95</td>
<td>65–81</td>
</tr>
<tr>
<td>Cerebral palsy</td>
<td>4</td>
<td>19–21</td>
<td>&lt;40–75</td>
<td>46–81</td>
<td>55–81</td>
</tr>
<tr>
<td>DiGeorge syndrome</td>
<td>3</td>
<td>19–23</td>
<td>&lt;40–105</td>
<td>60–98</td>
<td>51–88</td>
</tr>
<tr>
<td>Down syndrome</td>
<td>3</td>
<td>19–23</td>
<td>&lt;40–46</td>
<td>&lt;40–81</td>
<td>51–63</td>
</tr>
<tr>
<td>Specific learning disability</td>
<td>3</td>
<td>21–22</td>
<td>&lt;40–50</td>
<td>52–54</td>
<td>58–78</td>
</tr>
<tr>
<td>Seizure disorder</td>
<td>3</td>
<td>19–23</td>
<td>51–87</td>
<td>84–89</td>
<td>64–83</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>2</td>
<td>19–24</td>
<td>46–72</td>
<td>78–83</td>
<td>68–75</td>
</tr>
<tr>
<td>Sotos syndrome</td>
<td>1</td>
<td>21</td>
<td>73</td>
<td>83</td>
<td>68</td>
</tr>
<tr>
<td>Noonan syndrome</td>
<td>1</td>
<td>19</td>
<td>53</td>
<td>64</td>
<td>69</td>
</tr>
<tr>
<td>Smith-Magenis syndrome</td>
<td>1</td>
<td>19</td>
<td>76</td>
<td>84</td>
<td>82</td>
</tr>
<tr>
<td>Mosaic ring 18 chromosome abnormality</td>
<td>1</td>
<td>21</td>
<td>59</td>
<td>&lt;40</td>
<td>55</td>
</tr>
<tr>
<td>Severe/profound hearing loss</td>
<td>1</td>
<td>21</td>
<td>50</td>
<td>54</td>
<td>78</td>
</tr>
<tr>
<td>Fetal alcohol syndrome</td>
<td>1</td>
<td>20</td>
<td>70</td>
<td>53</td>
<td>54</td>
</tr>
</tbody>
</table>
a set of condition images accompanying the story. Both the colored photographs and the black-and-white line drawings illustrated the content of the story; the control images were pictures of abstract designs (i.e., swirling lines) not aligned with the study at all. All stories were taken from the early Grade 3 materials from the “Easy Curriculum-Based Measurements” (CBM) of the University of Oregon (2018). Grade 3 was selected based on the Woodcock Johnson broad reading scores, which were associated with a grade equivalence of grade 3.5. In Study 1 and 3, each image set was made up of three images. In Study 2, each image set contained five images. Figure 1 shows an example of one colored photograph, the corresponding line drawing, and one control image.

Members of the research team created the treatment condition photos by recreating selected scenes with carefully chosen props and actors. When creating the pictures, we ensured that essential story components were illustrated. The aspects in the story that the comprehension questions asked about were the essential story elements. Higher-order inferencing questions were not depicted in the images. For each study, colored photographs which illustrated the main people and events of each story were taken and printed in color on 8.5 × 11 paper. These photographs were then converted to black-and-white line drawings using Photoshop software and were printed on 8.5 × 11 paper. Finally, colored nonsense images, such as colorful swirls and patterns, were downloaded from the Internet and printed in color on 8.5 × 11 paper.

Procedures and Session Structure

Each study took place on one day during each of the three semesters. Each data collection day was 30 minutes, and two members of the research team proctored each session. During each day of administrating the reading assessment, a member of the research team read a set of scripted directions aloud to the students.

Study 1. In Study 1, participants were divided into three groups (photographs, line drawings, or control images). The readers were instructed to first look at each of three pictures for 60 seconds and then read the story silently. The image sets were stapled separately from the reading passage/comprehension question packet. After reading the story, they answered 18 multiple-choice comprehension questions by marking their choices on the answer sheet accompanying the story. (Although the CBM is typically accompanied by 20 comprehension questions, the research team determined that two of the 20 questions had ambiguous answers and so the team decided to omit those two questions.) Students were able to look back at the pictures and the story while answering the questions.

Study 2. In Study 2, participants were divided into two groups (photographs or control images). The readers were instructed to look first at each of five pictures for 60 seconds and then read the story silently. The image sets were stapled separately from the reading passage/comprehension question packet. After reading the story, they answered 18 multiple-choice comprehension questions. Students were able to look back at the pictures and the story while answering the questions. The unique feature of Study 2 is that there were five pictures (rather than three pictures as in Study 1 and Study 3) in each condition.

Study 3. In Study 3, participants were divided into three groups (photographs, line drawings, or control images). The readers...
were instructed to look at each of three pictures which were integrated within the text while reading the story silently. After reading the story, they answered 18 multiple-choice comprehension questions. The unique feature of Study 3 is that the images were distributed throughout the passage, directly above the corresponding text (rather than clustered before the story as in Study 1 and Study 2). Therefore, each student in Study 3 was given only one packet (story with pictures and questions), not two (image set, story/question set).

Research Design
For each study independently, we used a randomly-assigned group design with one control group and one (or two) treatment group(s). A research assistant scored all multiple choice assessments. We analyzed data using a one-way analysis of variance (ANOVA) to determine whether the groups differed based on reading level, and a separate ANOVA to determine whether the groups differed based on the number of comprehension questions correctly answered. Our methods have high social validity because reading comprehension is a highly relevant construct to adults with IDD and so may have a palpable impact on activities of daily living. The alpha level was set to .05. In all three studies, a priori tests indicated that there were no differences between the groups’ reading levels. Also, Leven’s Test for Homogeneity of Variances indicated that the hypothesis of homogeneous variances should not be rejected, $F(2, 142) = 1.50, p = .23$.

Results
For Study 1, the groups did not differ based on reading level (Woodcock Johnson Passage Comprehension), $F(2, 42) = 1.95, p = .15$. A one-way ANOVA revealed that there was no effect of condition, $F(2, 47) = .36, p = .70$. For Study 2, the groups did not differ based on reading level (Woodcock Johnson Passage Comprehension), $F(1, 39), 1.73, p = .20$. A one-way ANOVA indicated that there was no effect of condition, $F(1, 48) = .07, p = .80$. For Study 3, the groups did not differ based on reading level (Woodcock Johnson Passage Comprehension), $F(2, 38) = .60, p = .55$. A one-way ANOVA revealed that there was no effect of condition, $F(2, 42) = 1.27, p = .29$. Table 2 summarizes these results. Although the passages were difficult for many students, as a whole their performance was above chance given that there were three different options available in the multiple-choice answers.

Results of a linear regression analysis indicated that reading comprehension on the Woodcock Johnson examination predicted performance in our CBM comprehension task, $F(1, 125) = 11.18, R^2 = .08, p = .001$, in that students with higher reading skills also performed better on our comprehension measures. Figure 2 summarizes these results.

Discussion
There is a dearth of research examining supports for individuals with IDD. Moreover, the research studies that have been conducted have focused on functional skills, adaptive behavior, independent living, and career readiness. As inclusive opportunities continue to expand, there is an increasing demand to better understand how to accommodate and enhance academic proficiency, which directly impacts the quality of life for people with IDD. Even as the efficacy of instructional interventions and programming is determined, societal demands for

<table>
<thead>
<tr>
<th>Study</th>
<th>Colored Photographs</th>
<th>Black-and-white Line Drawings</th>
<th>Control Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.79 (3.03); Range: 6–18</td>
<td>10.56 (4.44); Range: 3–16</td>
<td>10.83 (2.95); Range: 4–16</td>
</tr>
<tr>
<td>2</td>
<td>10.60 (2.97); Range: 5–16</td>
<td>N/A</td>
<td>10.84 (3.61); Range: 5–16</td>
</tr>
<tr>
<td>3</td>
<td>9.54 (3.84); Range: 3–16</td>
<td>11.39 (3.05); Range: 3–15</td>
<td>11.35 (3.73); Range: 5–16</td>
</tr>
</tbody>
</table>

Table 2
Summary of Results; Comprehension Questions Answered Correctly Out of 18: Mean (Standard Deviation).
academic proficiency heighten the need for clarity in which text supports to use and how to use them. Previous literature has indicated that the addition of illustrations to text is an important factor in making text content more accessible to individuals with reading difficulties (Levie & Lentz, 1982). The utility of this augmentation has been called into question by contradictory research findings. To better understand the differing effects supplemental illustrations may have, we asked whether (a) colored photographs or black-and-white line drawings would facilitate reading comprehension; (b) a greater number of illustrations would be more beneficial than a smaller number of illustrations; and, (c) integrating the illustrations throughout the text of the story would be more beneficial than viewing all of the illustrations before reading the story. All three studies were conducted at a postsecondary program for adults with IDD. Due to the variation of these three research aims, each question was studied separately over the course of three semesters, adjusting study procedures accordingly.

Data from each of the three studies yielded non-significant results. In each case, statistics indicated that there were no differences between the conditions (photographs, line drawings, and control images). These results suggest that various types of illustrations do not necessarily facilitate reading comprehension in adults with IDD. These findings further support the positions of Pike and colleagues (2010) and Hibbing et al., (2003) giving us evidence that illustrations might not be beneficial and/or appropriate for adolescents and adults with IDD. We therefore need to rethink the call for including pictures for older individuals with IDD, and to reevaluate our approach to adding modifications and accommodations for these readers.

There are some issues regarding the materials which we used in the study. First, the Easy CBM passages which we used in our materials were written at a third-grade level. Of the 18 comprehension questions, an average of 9–11 were answered correctly. This finding indicates that participants were responding at a level above chance. However, future work should test a variety of grade levels to find the optimal grade level which avoids both floor and ceiling effects. Additionally, Readance and Moore (1981) found that more simplistic line drawings are more likely to facilitate comprehension. In the future, researchers should incorporate these simplistic types of line drawings to complement the more complex line drawings used in the current study.

Results of our linear regression indicate a positive correlation between the CBM and the Woodcock Johnson IV. This indicates that the CBM is an appropriate tool for this popula-
tion, and previous research confirms this finding (Hosp, Hensley, Huddle, & Ford, 2014). Although our regression results indicate that our measures are valid, the overall reading comprehension scores of the participants (Study 1: $M = \text{number of comprehension questions answered correctly out of } 18 = 10.50, SD = 3.54$; Study 2: $M = 11.21, SD = 3.56$; Study 3: $M = 10.84, SD = 3.53$) indicate that we need to institute more appropriate accommodations and modifications.

**Clinical Applications**

Reading skills are essential for adult employment, community participation and leisure (as reading can be an important form of recreation). However, data indicate that although only a small percentage of adults with IDD can read with basic proficiency (SRI International, 2002), these individuals can significantly improve reading skills through direct instruction. Therefore, reading instruction must proceed beyond the K-12 setting despite a significant lack of community resources and/or systems to do so. In addition to explicit academic reading instruction, society must understand how we can assist non-readers in accessing text material.

While noting the importance of explicit reading instruction, we think it is important to highlight that our results may be a byproduct of the lack of such instruction. We as researchers assumed study participants would inherently know how and why illustrations may be useful to a reader. We thought that students would independently rely on the images for support. Furthermore, this study may show that pictures do not help young adults with IDD comprehend text that is difficult. Therefore, explicit instruction using instructional strategies such as “think aloud” may be needed to ascertain the efficacy of images as supplemental text support for this type of difficult text.

**Future Directions**

The results of this study raise several important questions for future works. First, adding pictures to text lacks social validity because adults with typical development do not usually read books containing pictures. But if pictures are used, it is likely that students with IDD need to be taught how to explore and/or gain the most information from looking at pictures. Otherwise, pictures may just be a distraction from reading the text. For example, instructing readers to stop and think about what is happening in a picture (before they read the story) may be a valuable first step in this line of instruction.

Future research should also examine the correlation between reading level and comprehension. Our results indicate that, for reading passages at a third grade reading level, students with IDD provided correct answers at a rate above chance. But in order to increase the quality of life for these readers – for example, when reading health information presented at a doctor’s office – it is important for them to understand material which is written at a higher level. To address this issue, future studies should examine the utility of assistive technology (AT), such as text readers, which may facilitate comprehension. Just like reading skills, the introduction of AT needs to be supplemented by teaching individuals with IDD how to use the pictures or technology.

Another important issue regarding adults with IDD is that there is a dearth of published reading materials which are appropriate for these individuals to select. In most cases, if the topic of the book is appropriate for adolescents and adults, the reading level of the book is too high at the word- and sentence-level and therefore inaccessible. In contrast, if the reading level is accessible, it is likely that the topic is immature and not relevant for older individuals. This factor is important if these individuals are to choose to read as a leisure activity, or to improve their reading skills by practicing reading appropriate materials. One solution to this obstacle is for educators and researchers to create **leveled books** – texts which are appropriate both in terms of topic and reading level (e.g., Saletta & Winberg, 2018). Additionally, there is an increasing number of easy-to-read materials on topics of interest to adolescents and young adults that are written at a second- or third-grade reading level. These include Tar Heel Readers, Story Shares, and Start-to-Finish books. However, more research is necessary to determine the utility of these types of leveled books. Our current study can serve as a jumping-off point to exploring whether the addition of illustrations...
or symbols to leveled texts promotes reading comprehension.

Reading materials must be accessible in order to promote self-advocacy, especially in vulnerable populations. Future works can focus on this issue specifically, and can inform the development of reading materials with or without illustrations. In summary, although counterintuitive, our results indicate that manipulating aspects of written text may be more important than focusing on supplementing the text with photographs or drawings.

References


Received: 11 July 2018
Initial Acceptance: 29 August 2018
Final Acceptance: 1 November 2018
Impact of Video Modeling Combined with Skillstreaming Teaching Procedures on the Social Interaction Skills of Middle School-Aged Children with ASD

Onur Emre Kocaoz
Aksaray University

Mary E. Little
University of Central Florida

Jennifer Gallup
Idaho State University

Abstract: This study investigated an intervention package that combined Skillstreaming procedures with video modeling for the development of social skills for middle school students identified with autism spectrum disorder (ASD). A multiple probe design across participants was employed to assess the effectiveness of the video modeling intervention package on beginning social skills, initiating, maintaining, and ending, and (i.e., initiate greetings and sustaining a conversation). Participants included three middle school-aged students diagnosed with ASD, enrolled in a self-contained classroom, at an urban middle school. The results indicated improved social skills performance for all participants following the implementation of the video modeling intervention package. Furthermore, during the maintenance phase, the social skills performance of each student was maintained. This article presents the results and recommendations for future studies.

Individuals identified under the ASD’s broad spectrum classification share common impairment characteristics; although, the severity of these challenges varies across each individual with ASD (APA, 2013; Crosland & Dunlap, 2012). As defined by the Diagnostic and Statistical Manual of Mental Health (DSM 5), impairments in social communication and social interaction skills are the most common deficits for individuals with ASD which may potentially impact the individual’s school, work, and personal life (APA, 2013; Bellini, Peters, Benner, & Hopf, 2007).

Individuals with ASD experience impaired social communication throughout life; social communication remains a pervasive problem (Bauminger, 2002; Weiss & Harris, 2001; White, Keonig, & Scahill, 2007). Challenges with initiating social interactions and making friends impact opportunities to build meaningful social relationships and may result in isolation within their peer communities (Atwood, 2000; Bellini, Peters, Benner, & Hopf, 2007; authors, 2016; Myles & Simpson, 2002).

Most individuals with ASD have some difficulty in social functioning which may have direct and indirect effects on the quality of an individual’s life (White et al., 2007). In particular, individuals with ASD struggle with social greetings and initiating conversations (Simson, Langone, & Ayres, 2004). Researchers found individuals with ASD are less likely to engage in pro-social behavior commensurate with their peers (Bellini, Akullian, & Hopf, 2007; Carter et al., 2013). The findings are consistent with both clinical and educational definitions of ASD. Remediation of social skills deficits is important as improved social functioning yields to improved academics and behavioral outcomes (Bellini, Peters, Benner, & Hopf, 2007; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012; Rao, Beidel, & Murray, 2008).

Specific interventions that are designed to teach social skills may assist students with ASD to improve their social competence and ultimately academic and peer interactions (Atwood, 2000; Carter et al., 2013; Church, Al-
isanski, & Amanullah, 2000; Weiss & Harris, 2001). Although a number of effective strategies have been used to teach and improve social interaction skills, individuals with ASD continue to have difficulty with more complex social interactions, such as initiating conversations following a greeting (APA, 2013; Kago-hara et al., 2013; Simpson et al., 2004). An inability to sustain conversation within relationships increases an individual with ASD’s likelihood of social rejection and isolation (Bellini, 2004; Bellini, Peters, Benner, & Hopf, 2007).

**Video Modeling**

Video modeling is a strategy that holds the potential to teach students with ASD the necessary skills to respond appropriately to teachers and peers (Bellini & Akullian, 2007; Delano, 2007; Ogilvie, 2011). Although video modeling interventions are becoming popular for teaching social skills to individuals with ASD, research extending to social interaction and communication for adolescents is limited (Delano, 2007; Ogilvie & Dieker, 2010; Reichow & Volkmar, 2010; Sani-Bozkurt & Ozen, 2015). At the time of the present study, insufficient research had been conducted to fully investigate the impact of a video modeling intervention package on the development of social skills for middle school students with ASD. This research could provide insight into an instructional package using technology and specific procedures for teaching social skills that are necessary for social skill development specific to individuals with ASD.

**Social Skills Intervention Packages and Skillstreaming**

Intervention packages were used as a single intervention to teach different skill areas, including social skills, for individuals with ASD. Skillstreaming is an internationally-known technique, developed in 1973 by Arnold P. Goldstein, as a social skill training approach to teach and develop the social skills of children and youth with or without disabilities (Goldstein & McGinnis, 1997). The curriculum teaches social skills using explicit, systematic, and structured instruction and is organized to target different age groups (e.g., kindergarten, elementary, and middle school). The general steps of Skillstreaming curriculum include: (a) introduction to the target social skill behavior; (b) model the skill; (c) practice/role model; (d) provide feedback; and (e) assign homework with related skills (Goldstein & McGinnis, 1997).

The present study examined the effects of video modeling combined with Skillstreaming teaching procedures on the acquisition of two beginning social skills (greeting and initiation of a conversation) by three middle school students with ASD in a self-contained classroom in a mid-sized public school district in central Florida. This research sought to extend the current evidence base for video modeling (Ogilvie & Dieker, 2010) by implementing a video modeling intervention package with adolescent students with ASD in a self-contained classroom setting.

**Method**

**Research Design and Questions**

A single-subject, multiple probe design across participants (Gast & Ledford, 2010; Horner & Baer, 1978) was used to evaluate the impact of video modeling on the acquisition of social skills by three middle school students with ASD in a self-contained classroom.

The variability in the percentages of correct social skills components for each participant are reported through graphs. The researchers obtained permission from the Institutional Review Board (IRB) from both the University of Central Florida and the school district.

Two research questions for this study were: 1) To what extent does the implementation of video modeling combined with Skillstreaming teaching procedures impact social skill acquisition of middle school students with ASD in a self-contained classroom setting as measured by percentage of correct social skills components performed? and 2) Were the goals, procedures, and outcomes rated as desirable by teachers and students with ASD regarding the acquisition of targeted social skills?

**Participants**

Three middle school students participated in this study. The participants’ eligibility was de-
termined based on the following criteria: (a) identified on an Individual Education Program (IEP) as having ASD as the primary disability category according to the criteria of federal and state law; (b) possessed limited verbal communication skills that included the ability to hold simple conversations; (c) needed to improve social skills as noted in the student’s IEPs and confirmed by the student’s teacher/paraprofessional; and d) received special education services in a self-contained classroom setting in a public school.

**Participant Data**

The current special education teacher and one paraprofessional were asked to complete a portion of the *Skillstreaming* checklist related to the targeted social skills to determine which students might be appropriate for the intervention package. Participants were included in the study if the checklist evaluation for greeting/initiating conversation shows that the student does not or rarely offer an appropriate greeting and initiate conversation each day in the morning without prompting from adults. Once students were identified, parent permissions were received. Each of the following descriptions accurately reflects the three participants within this study, although a pseudonym has been assigned to each to maintain confidentiality.

Michael was a 14 year old, Hispanic male student in the eighth grade. He was identified with ASD based upon the results of the Gilliam Autism Rating Scales (GARS) evaluation. He has also a language impairment as an additional exceptionality. Based on evaluation, Michael’s cognitive ability is below average range. He has difficulty with executive functioning.

Charlie is a 14 year old, Caucasian male student, in the eighth grade. He was identified as having ASD based upon the results of the Gilliam Autism Rating Scales (GARS) evaluation. He has also a language impairment as an additional exceptionality. Based on evaluation, Michael’s cognitive ability is below average range. He has difficulty with executive functioning.

Nancy is a 13 year old female student from a Hispanic background in the seventh grade. She has a diagnosis of ASD according to results on the Gilliam Autism Rating Scales-2 (GARS-2) evaluation. She also has been diagnosed with language impairments, as well as Attention Deficit Hyperactivity Disorder (ADHD).

**Setting**

All video demonstration sessions and data collection took place in a self-contained special education classroom within a public, middle school in central Florida. A total of 1,154 students were enrolled in this middle school for students in grades 6–8. The self-contained classroom consisted of six male and four female middle school-aged students with ASD. A special education teacher and three paraprofessionals served the ten students with ASD in this self-contained classroom.

**Materials**

**Video model.** The video model was created prior to delivering the intervention using the procedures described by the NPDC in 2014. The researcher created the script for the video model that consisted of the identified, correct social skills components for the greeting/initiating conversation based on *Skillstreaming*. Each component for the social skill sequence of morning greeting/initiating a conversation with the teacher was performed in a video model by a typically developing student of similar age. One middle school student and one adult performed the script outlined by the researcher and created four videos. Both actors were familiar with the participants. The conversation topics that were used by actors in video models included topics such as movies, sports, and class schedule. The iPad was used for recording and viewing the video models for all participants. The researcher ensured all necessary components of the greeting/initiating a conversation scripts were included and performed with fidelity prior to implementation of the video model.

**Visual cards.** Visual cards of two different sizes (16 × 9 and 3 × 5) were created for student use during discussions of the social skills components by using screenshots of the video model. Both visual cards included all components of the social skills. Each card was
laminated, hole-punched, and secured in sequential order on a metal ring. These cards were used as a visual support prompt during the intervention phases. Validation of visual cards was completed by classroom teacher and an expert who is a special education professor.

Data recording form. Data were collected using an event-recording sheet. Participants' performance was measured using a data collection form which was created by the researcher. Components for the social skills measured were based on multiple resources including Skillstreaming curricula (Goldstein & McGinnis, 1997) and published literature (Kiburz, Miller, & Morrow, 1984; Litras, Moore, & Anderson, 2010; Ogilvie & Dieker, 2010). Validation of the data collection form was conducted by an expert panel review.

Procedure

Baseline phase. During baseline, data were collected daily while each student participated in his/her natural social environment. The researcher concurrently collected baseline data for a minimum of five and maximum of ten social skill probes for each participant. For each probe, the percentage of correct components of the social skill sequence was calculated. The intervention was assigned when a participant’s performance data was stable as indicated by the baseline for each participant. The criteria for stability were determined by the researcher to be no change of more than 20% of correct skills components across a period of five days. The baseline data collection continued for all three participants until they were identified as stable as evidenced by visual graph. Once a participant’s data were stable, the baseline data collection discontinued. Data were then collected following the multiple probe design prior to intervention.

Intervention phase. The intervention was delivered daily to each student individually in a one-on-one setting at a table located in the back of the self-contained classroom. The environment was controlled so there was no contamination across participants. Instruction was delivered by the classroom teacher during the last class period of each day. Students attended seven class periods within their self-contained unit. The researcher prepared the scripted instruction plan which was validated by a content area expert and classroom teacher.

Delivery of the intervention began with the video model demonstrating the desired greeting and teacher initiated conversation. Then, after viewing the video, the components to complete an appropriate greeting were reviewed using the visual cards and discussed with the student during the intervention stage. Finally, the students role-played the social skills sequence with the teacher in another classroom.

Data were collected for correct components in greeting/initiating a conversation each morning following intervention the previous afternoon. The performance of participants was measured by the researcher and a research assistant, who attended and completed inter-observer data collection with the data collection form for 25% each phase. Each participant received the intervention until 80% mastery was reached over three sessions or they had received a maximum of six intervention sessions. The next participant received the intervention after the researcher ensured there was evidence of change in level and slope within three cumulative days for the first participant. This process was repeated for the other two participants.

Maintenance phase. Once the first participant received six days intervention, the maintenance phase began. The number of maintenance data varied across participants.

Inter-Rater Agreement

The researcher scored all components of the defined social skills. In addition, a second research assistant observed a minimum 33% of the observation sessions in each phase for the targeted behaviors. In preparation for data collection, a video example was watched by both the researcher and the second observer to ensure that the correct skill performance was measured by each observer during a training session. The results from each observer were compared and discussed to resolve any discrepancies with data collection. Total agreement reliability was calculated by dividing the number of agreements by the number of disagreements and number of agreements then multiple by 100. Total agreement be-
tween the two observers was 100% at the end of the training session.

The procedures of instruction and role play were followed with 100% accuracy for all three participants. The fidelity percentage calculated during the prompt presentation phase was observed at 90% for Michael and Charlie, and 80% for Nancy. Data were collected to ensure procedural implementation during the morning routine.

Inter-Observer Agreement

Using the data collection form, two trained observers collected observational data four times for each student’s performance of the social skills during the baseline phase, which is 40 percent of the total baseline observations. The inter-observer also observed each student’s performance of the social skill two times during each student’s intervention phase, or 33 percent of the total intervention observations across students (Gast, 2010).

Inter-observer agreement (IOA) were reported across all participants and phases. The percentage IOA agreement for each phase are reported in Table 1.

Data Analysis Procedures

Visual analysis is the most applied data analysis process in single subject research (Gast & Spriggs, 2010). In this data analysis strategy, the impact of the video model intervention package on a dependent variable is represented in the visual form. For this study, the dependent variable measures (percentage of correct social skills components) were demonstrated as a graph for each session across participants and phases (e.g., baseline, intervention, maintenance). Three common concepts (mean, trend, and variability) were analyzed to evaluate each student’s acquisition of beginning social skills when the social skills intervention package was implemented.

Results

Research Question One

The first research question addressed in this study was: to what extent does the implementation of video modeling, combined with Skillstreaming teaching procedures, impact social skill acquisition of students with ASD in a self-contained classroom setting as measured by percentage of correct social skills components performed?

Figure 1 depicts each participant’s correct social skill performance as shown after implementation of the video modeling intervention package. The percentage of correct social skills components for each session was calculated by dividing the number of correct components by the total number of components within a session, then multiplying 100. All three participants showed increases in total number of social skill components after receiving instruction with the video modeling intervention package. During the maintenance phase, two participants performed over the mastery level and one participant’s maintenance percentage was 75%. Please note: each participant has been given a pseudonym to ensure confidentiality.

The Percentage of Non-Overlap Data

The percentage of non-overlapping data (PND) is one of most commonly used forms of

<table>
<thead>
<tr>
<th>Participant</th>
<th>Michael</th>
<th>Charlie</th>
<th>Nancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline IOA</td>
<td>95% (90%-100%)</td>
<td>95% (90%-100%)</td>
<td>85% (80%-90%)</td>
</tr>
<tr>
<td>Intervention IOA</td>
<td>90% (85%-95%)</td>
<td>95% (85%-95%)</td>
<td>85% (80%-90%)</td>
</tr>
<tr>
<td>Maintenance IOA</td>
<td>95% (90%-95%)</td>
<td>90% (90%-100%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Mean and Range of Interobserver Agreement (IOA) Across Phases and Participants

Video Modeling Combined with Skillstreaming / 241
assessing the effect size in single subject design (Gast, 2010). With this study, PND was calculated with data across baseline and intervention phases. A PND value of less than 50% reflects unreliable treatment, a PND score between 50% and 70% can be considered as questionable effectiveness, a PND score ranging between 70% and 90% reflects fairly effective, and if the PND score is higher than 90%, the independent variable would be considered highly effective (Gast, 2010). As illustrated in Table 2, the results for PND calcula-
The visual analysis of baseline measures for Michael revealed a mean score of 3% of targeted behaviors during ten observations, with behavioral components ranging from 0% to 30%. The data pattern was almost perfectly stable, with no variability during ten baseline sessions. Following the introduction of the video modeling intervention package, Michael demonstrated a dramatic and substantial increase in mean level of performance from 3% during baseline to a mean level of 93% during intervention for the percentage of beginning social skills components correctly performed. The first three days of visual inspection of the data for Michael indicated an accelerating trend. This was followed by one session of a decreasing trend on the percentage value with low variability. The final data points exhibited a stable trend over two days, where Michael demonstrated 100% of the necessary components. Through visual analysis, Michael scored the same value of 100% three times and a value of 90% twice. Overall, visual analysis of intervention phase shows stability over time with the mean level of 93%. Data were collected during five maintenance sessions for Michael. The results show a stable pattern in scores at the mean value 90% with zero accelerating or decelerating. While the first two maintenance probes were collected only two days after the intervention package was implemented, the last three maintenance probes were collected two weeks after Michael completed the intervention package. The visual inspection of results during the maintenance phase shows a predictable pattern of stability in scores for this participant.

Charlie

A similar result was reported for participant two, Charlie. A total of 10 baseline data points were taken for participant two and the last baseline probe was collected one day before intervention initiated during the 13th session. Baseline data showed a low level of variability with a mean score of 3% and displayed a stable pattern of scores. As illustrated in Figure 3, visual analysis of data collected during implementation of the intervention package showed there was an immediate, increasing trend when compared to the last baseline probe score. Following the intervention package, the mean of correct social skills completed during six intervention sessions was computed at 96%. The visual graph of intervention phase showed stability, with a relatively flat line over time. Following the intervention phase Charlie performed 100% of the total correct social skill components for each of three days. The maintenance pattern of scores was stable at 100% across all three maintenance probes.

Nancy

During the baseline phase, the visual display of data was initially variable, but stabilized following the fourth session. The baseline mean was 7% and the last seven baseline observations yielded scores of 0%. Her performance during the intervention phase increased to 70% and visually illustrated an upward trend for the first two intervention sessions; however, the stability pattern of data was not seen during the intervention phase. A
90% performance score was reported on the second session and the mean for the intervention phase was 78.3%. The baseline mean for Nancy’s social skill performance was 7% and increased to a mean of 78% during intervention. Stability was recorded in the last two sessions. While watching the video models, Nancy became somewhat distracted and was reminded by the teacher to watch and focus on the video for four of the six sessions which was not consistent with the other two participants. Data for a total of two maintenance sessions were collected for Nancy. The mean level for the maintenance phase was 75%.

Research Question Two

Social Validity

Wolf (1978) highlighted three dimensions of social validity: (a) goal, (b) procedures, and (c) outcomes. These areas were addressed for the measurement of the social validity of this investigation. The second research question for this study was: were the goals, procedures, and outcomes rated as desirable by teachers and students with ASD regarding the acquisition of targeted social skills?

To address this research question, a teacher survey modified from a previous study (Lane et. al., 2009) was administered to the participants’ teacher. The survey consisted of 15 questions to rate the level of agreement and satisfaction with the video modeling intervention package (see Table 3). In addition, two open-ended questions were asked of the teacher. The results of the survey indicated 14 items were rated as “strongly agree” and one item was rated as “agree”. The teacher stated, “It is a very successful intervention that kept the students engaged and met their needs”. She also suggested this intervention for use with a variety of children. Therefore, strong agreements are expressed by the teacher for the goal, procedures, and outcomes of video modeling intervention package.

In addition to the survey the teacher expressed her views in regard to the intervention package; the teacher was asked to describe what she would change if she planned to implement this intervention with similar students. She stated, “I do not have any suggestions for change. This is a very appropriate, well planned, and easy to implement.”

For this study, three areas of social validity measurement were examined using students’ responses to a questionnaire and two open-ended questions. All three students evaluated the video modeling intervention package after the intervention was completed. The results of student participants’ reflections about the video modeling intervention package are reported, along with a rating mean score, in Table 6. All student participants reported that the video modeling package intervention assisted their learning social skills of greeting the teacher followed by starting a conversation. All three participants expressed that they enjoyed their involvement in this study. An open-ended question was asked to determine which part of intervention package the participants identified as the most useful in learning the social skills. All three students reported that viewing the video was the most useful part of intervention package. They believed this package could also help other students in learning these skills. Two participants noted that the actors represented the social skills perfectly: one student rated the video modeling as “its ok”. All three participants expressed their belief that learning beginning social skills is useful for them to create a friendly classroom environment. None of participants’ scores were negative about this study. Overall, responses from the student participants demonstrated positive results for the goals, procedures, and outcomes of video modeling intervention package.

Discussion

The results demonstrated an improvement in the social skill performance of three students with ASD. The results of this study are consistent with previously published studies in which a positive impact on social skill development when an intervention package is delivered to students with ASD (e.g., Charlop-Christy, Le, & Freeman, 2000; Nikopoulos & Keenan, 2004; Sansosti, & Powell-Smith, 2008). The current study’s results also confirm previous studies and reviews suggesting the
use of a familiar character (peer model of same age range) in the video model with students with ASD will improve the results of the intervention (Bellini & Akullian, 2007; Delano, 2007; McCoy & Hermansen, 2007).

The current study shares some similarities with the study by Ogilvie and Dieker (2008) in which five critical social skills of three middle school-aged students across subject design were researched. The intervention package used in their study consisted of a peer-mediated teaching strategy and video modeling. Similarities of the two studies include: (a) target behavior; (b) participants’ grades and age range; (c) use of an intervention package instead of teaching the target behavior with a single intervention; (d) research conducted in a public school; and (e) implementation of the intervention by special education teacher.

Despite the similarities between the Ogilvie and Dieker (2010) study, several differences exist. First, although both studies’ findings showed an improvement on social skills performance of students, the results of their study showed an improvement level for three students across five critical social skills with peer/adults in general education classrooms; the current results indicated three students with ASD demonstrated immediate improvements in acquisition of two identified social skills using an intervention package within a self-contained classroom setting. Second, this video modeling intervention package differed by adding an additional component to the

### TABLE 3

Teacher Questionnaire

<table>
<thead>
<tr>
<th>Questionnaire Statements</th>
<th>Strongly Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This is an acceptable intervention package for the child’s development age.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Most teachers would find this intervention package appropriate for social skills as well as the two identified.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. This intervention package should prove effective in changing the child’s social skills.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I would suggest the use of this intervention package to other teachers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. The child’s developmental age is severe enough to warrant the use of this intervention package.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Most teachers would find this intervention package suitable for the beginning social skills identified.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I would be willing to use this intervention package in the classroom setting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. This intervention package would not result in negative side-effects for the child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. This intervention package would be appropriate for a variety of children.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. This intervention package is consistent with those I have used in classroom settings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. The intervention package is a fair way to handle the child’s social skills difficulties.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. This intervention package is reasonable for the beginning social skills identified.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I like the procedures used in this intervention package.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. This intervention package is a good way to meet the specified purpose.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. Overall, this intervention package would be beneficial for the middle school aged child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
intervention package (discussion/reviewing technique with visual cards prior to performance of the targeted social skills). Third, although role play of social skills was a part of the intervention package for both studies, role play was done with peers in Ogilvie and Dieker’s (2010) investigation. For this study, the role play occurred between teacher and student in another classroom. Finally, the research design of the studies differs. Although both studies used single subject design, their study employed multiple baseline across subjects.

The current findings provide support to previous studies in which the effectiveness of video modeling on social skills for students between the ages of 9 to 15 was reported (Nikopoulos & Keenan, 2003; Ogilvie & Dieker, 2010). For this investigation, the students received the intervention package during one school day, then used a visual prompt (card) the following day to complete the social skills related to greetings and conversations at the beginning of the next school day. The researcher noted, since the target behavior of this study was two beginning social skills (two skills were: greeting the teacher and initiating a conversation) that should be observed in the first 10 minutes of class time during greetings, the intervention needed to be implemented with the students the day before. The results of the current study showed positive results. Therefore, this current study contributes to the existing literature by modifying the procedural steps.

Limitations

The results of this investigation indicated that all three participants demonstrated and improvements of the targeted social skills as observed within their classrooms. However, several limitations existed. For this study, three participants with ASD were chosen which limits the external validity of the investigation (Kazdin, 1982). Furthermore, due to the variations in behaviors of individuals with ASD, it cannot be guaranteed that the findings of this investigation could be replicated with individuals across the ASD spectrum. For example, Nancy has identified with ASD and ADHD. During the intervention implementation process Nancy responded differently when compared first two participants of this study. In addition, this study was restricted to the collection of data on greeting teacher/starting a conversation with teacher during the first ten minutes morning greeting routine. Given the initial results, however, replication studies should be completed.

Recommendation for Future Studies

The use of video model intervention packages for social skills instruction needs to continue to be researched for students ASD. This investigation was designed to examine video modeling combined within an intervention package in which Skillstreaming procedures were followed. Although video modeling has been demonstrated as an EBP in many research studies, the published research articles utilizing the Skillstreaming curriculum as part of an instructional package to develop social skills of students with ASD is limited. Therefore, in agreement with Horner et al. (2005), replication of this study is also needed across subjects, by additional researchers and settings.

A focus of future research could include the development of social skills with peers or other adults in inclusive settings using similar instructional packages. Thus, future researchers could change the target behavior to greeting and/or initiating the conversation with a peer instead of the teacher if students are provided opportunities to interact with their typical peers within either general education or self-contained classroom settings, the research focus would be of interest to the field.

Future research may also make some modifications to the intervention components. For this investigation, the participants received the intervention during the last period of class and data collection occurred the next day, after the intervention session. Future research may consider implementation of the intervention with a shorter latency period between intervention and data collection. Future research may also investigate the same intervention package either without or with a fading of the prompt components of the intervention procedures. It would be important to determine if more streamlined procedures could be found to yield similar results.

Additional research could involve modifications to the design of this study by adding
more intervention and maintenance sessions to determine the number of sessions required for mastery of social skills across all participants. In this research, if the intervention could have been implemented for a longer period of time, Nancy possibly could have performed more components of the social skills accurately. Future research studies with other students with ADHD are warranted. This might include students with ADHD as well as ASD.

Conclusion

Social interactions with peers and adults are important for improving social competency with individuals with ASD. However, individuals with ASD often face difficulties when learning social skills. Therefore, teachers, caregivers, and parents may apply various instructional strategies to teach new skills or improve the performance of social skills of students with ASD. Teaching new skills to students with ASD can be effective when multiple means of teaching are provided (e.g., role model, visual cue cards, video modeling, etc.). The findings of this research demonstrated that three middle school-aged students with ASD responded positively to the video modeling intervention package in learning to perform the target behaviors and were able to maintain the acquisition of the skills learned. Therefore, the results of this study support the use of employing a video modeling intervention package to teach social skills for students with ASD.

References


Video Modeling Combined with Skillstreaming / 247


Received: 26 April 2018
Initial Acceptance: 21 June 2018
Final Acceptance: 26 September 2018
Effectiveness of Video Modeling Presented by Tablet PC on Teaching Job Interview Skills to Individuals with Developmental Disabilities

Turgut Bahcalı
Eskisehir OsmanGazi University

Arzu Ozen
Anadolu University

Abstract: This study’s aim was to investigate the effectiveness of video modeling presented with tablet PC on teaching job interview skills to individuals who have developmental disabilities. Participants of the study were two men and a woman whose ages were 21–24 and whose diagnosis was developmental disability. The research was carried out with multiple probe design across subjects which is one of the single subject research models. Dependent variable of the research was the level of the participants’ performing the behaviors that they have displayed during job interview with the employer and their level of verbalizing the behaviors which they have displayed for an effective job interview. Independent variable of the research was teaching process with video modeling presented via tablet PC, which the participants used by themselves. The findings of the research revealed that the individuals, who have developmental disabilities, acquired the skill of having job interview and verbalized the behaviors which they should display both before and during an effective job interview. Findings also revealed that, the individuals generalized the information to different environment, to different person and to different situation. Participants could also display the information they learned after the study finished.

Increase in the use of technology provides accessibility to the basic support needed by individuals with developmental disabilities (DD) in recent years. Technology based interventions provide assistance to individuals with DD to make things easier for them in order to complete their responsibilities that are very difficult for them without technological support. This helps them to present their real potential (Hasselbring & Glaser, 2000) and provides an important equality in accessing the opportunities which typically developing individuals have during their daily lives (Jeffs, Morrison, Messenheimer, Rizza, & Banister, 2003; Stoddlen, Conway, & Chang, 2003).

Laptop, desk-top, palm, pocket, tablet PC and iPod computers are the most frequently used technological equipment in education of individuals with DD (Ennis-Cole, 2012). Variety in assistive technology emerged new research ideas for evaluating the effectiveness of those assistive technologies in the education and treatment of individuals with DD (Gentry, Lau, Molinelli, Fallen, & Kriener, 2012). On the other hand, usage of computers especially with applied behavior analysis implementations in the education of individuals with DD became a promising choice. Since the beginning of 1980s, computers are being used in the special education environments with educational purposes (Bernard-Opitz, Ross, & Tuttas, 1990). Laptop and desktop left their places to more mobile equipments such as smart phones and tablet PC (Sansosti, Doolan, Remaklus, Krupko, & Sansosti, 2014). Many functional skills are being taught via tablet PC nowadays to children with autism spectrum disorders (ASD) and intellectual disabilities (ID) which are considered to be subgroups of individuals with DD (Goldsmith & LeBlanc, 2004; Murdock, Ganz, & Crittendon, 2013). Using tablet PC put forth a series of advantages when compared with traditional teaching materials in the educational environments. These advantages are: (a) tablet PCs provide a wide, colorful and shiny screen in
order to attract the attentions of both individuals with and without DD; (b) being able to use it with only one hand and even one finger provides an easy way of use; (c) being able to turn the tablet PC on by only one finger touch on a button provides an effective usage of the teaching time; and (d) it provides an opportunity to individuals with DD to explore and remember prompts independent from an adult (Mechling, 2007). Although tablet PCs are being used in educational and clinical environments extensively, research studies for providing evidence to show the effectiveness and make the use of tablet PC more extensive in educational settings, are not sufficient yet (Ozen, 2015).

In special education settings, using technology with individuals with DD can be the most frequently seen in teaching job and vocational skills. High school dropouts and people with disabilities were reported to be the least employed groups according to the 2014 U.S. Bureau of Labor Statistics (BLS) reports (Walker, Vasquez, & Wienke, 2016). For this reason, researchers and implementers are looking for ways of preparing individuals with DD as qualified people for the vocational world since 1980s (Walker & Bartholomew, 2012). During these years, using mobile technologies for teaching job and vocational skills to individuals with DD seemed to be an effective method (Smith, 2013). Literature put forth studies in which job and vocational skills were taught to individuals with DD with the following example skills; clerical (Mechling & Ortega-Hurndon, 2007), cleaning skills (Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009), entertainment (Allen, Wallace, Greene, Bowen, & Burke, 2010a; Allen, Burke, Howard, Wallace, & Bowen, 2012), food-preparation skills (Johnson, Blood, Freeman, & Simmons, 2013), and making photocopies (Bennett, Ramasamy, & Honsberger, 2013).

One of the major titles which individuals with DD need to learn regarding job and vocational skills is making appropriate job interviews with the employers (Olson, Platt, & Dieker, 2008). According to Jang, Wang and Lin (2014), providing information and support related with the job being applied to by individuals with DD affects their acceptance process to that job. The prerequisite behaviors that should be present before applying a job can be listed as follows: being able to (a) find a job interview example that would be a guide for him on the Internet, (b) describe the appropriate and inappropriate behaviors that would be presented during a job interview, (c) make a job interview in a simulation or natural environment as a preparation, and (d) plan his transportation to the interview place and back to his home and apply the job (Wandry, Wehmeyer, & Glor-Scheib, 2013). Besides, another important skill group for a successful job interview is social skills. Social skills can have a profound impact on an individual’s interview performance. On the other hand, social skills and self-advocacy behaviors which were expected to be performed in successful interviews seem to be the most struggling issues for individuals with ID (Crites & Dunn, 2004). These skills can be listed as going to work on time, paying attention to his appearance and grooming (i.e. taking a shower, combing hair, cleaning quotes, tooth brushing, wearing clean and appropriate clothes etc.), and presenting appropriate communication skills (i.e. greeting, making eye contact with the person who is making the interview, smiling, listening, shaking hands etc.).

At the same time, a limited number of studies could be found that were conducted for teaching a job interview skills in the literature. For example, Strickland, Coles and Southern (2013) examined the effectiveness of teaching job interviewing skills via an educational program provided on the internet to individuals with high functioning ASD and Asperger syndrome. In that study, determining career interests, finding a job, getting a job, keeping the job, and other job topics such as leaving a job skills were the targeted skills to be taught. Besides, teaching greeting, verbal expression of appreciation at the end of the interview, making eye contact, body positioning according to the person making the interview, using appropriate facial expressions, and hand shaking behaviors were also targeted to be taught to the subjects. 22 male participants who were 16–19 years with ASD or Asperger syndrome took place in the study. At the end of the study, participants in the experimental group who completed the education program on the internet had a significant increase in their verbal context skills when compared with the...
control group. In another study, Morgan, Leatzow, Clark and Siller (2014) taught making a job-interview skills to 27 male and one female individuals who were 18–36 years with ASD in a group setting. Greeting others, having an appropriate appearance, social interaction and communication skills were targeted to be increased in the study. The group intervention provided to the experiment group included video-feedback, role-play, discussion, peer-review, and game scenarios. At the end of the study, experiment group increased their job-interviewing skills and had more social gain when compared with the control group.

In a very recent study Walker et al. (2016) examined the effects of role playing and coaching on acquisition and generalization of job-interviewing skills of individuals with ID. Study was conducted by using multiple baseline across participants model which is one of the single-subject designs. Five individuals with ID who were 18–22 years participated in the study. Skills included making eye-contact, using appropriate posture, and hand gestures, not using disturbing language such as “umm”, using appropriate voice while talking, and giving answers related with the context. The results of the study revealed that training and coaching implementations in simulation and real environments were found to be effective in acquisition of job-interviewing skills to individuals with ID.

While teaching job and vocational skills to individuals with DD, tablet PC are also being used besides other technological equipments nowadays. Technologies such as tablet PCs are designed to provide individualized usability depending on the differences and disabilities of a person (Boyd, Barnett, & More, 2015). Besides, Jones and Bucholz (2014) reported that widespread the use of tablet PC during work provides less dependence to other staff at work and so increases the potential of taking a job and his working training. Moving with this purpose, the following questions were addressed in the present study: (a) is video modeling presented via visual and audial technologies using tablet PC effective on teaching to make a job interview to individuals with DD? (b) is video modeling presented via visual and audial technologies using tablet PC effective on the acquisition of expressing the behaviors that should be presented before and during a job interview verbally? and (c) can individuals with DD generalize the acquired job interviewing skills across different conditions, settings, and people?

Method

Participants

Participants of the study were three adults who were a male diagnosed with ASD and ID, a male and a female, each diagnosed with ID and physical disability. Participants were attending a Social Living Center in the city where they were living. They did not receive any instruction regarding the targeted skills. Participants’ ages ranged between 21 and 24 years. They all had their diagnosis from governmental hospitals. Participants could accomplish daily living skills independently and they all could read and write basically. They could also respond to two- or three-step directions correctly and express themselves basically. Participants could follow the rules in the community and interact with their peers appropriately.

Settings

Implementation sessions of the study were conducted in the studio of the Social Living Center. Generalization sessions were conducted in the room of the director of a college where individuals with hearing impairment were attending in a governmental university.

Dependent Variable

Dependent variable of the study was the level of making an effective job interview by presenting the required behaviors with an employer and also the level of expressing verbalizing the required behaviors before and during a job interview. Targeted behaviors which were also the dependent behaviors of the study can be seen in Table 1, Table 2, and Table 3.

Independent Variable

Independent variable of the study was the teaching procedure provided via video mod-
Teaching Procedure via Video Modeling Consisted of Visual and Audio Recordings.

Materials

During the study, a table, four chairs for the participants, for recording the sessions; a video camera, a tripod, data collection forms, the video file, a computer for transferring the video recordings, and a portable hard disk for securing the video recordings, a pencil, an eraser, a Samsung tablet PC (SM-T532Tab 4) were used during the study.

Preparation of the Scenarios and Video Images for the Target Skills

A scenario regarding the job interview skills to be taught to the participants was prepared. Information from different resources about making job interviews skills were reviewed (i.e., Morgan et al., 2014; Strickland et al, 2013). It was important for the behaviors to be short, clear and understandably the individuals with DD. Besides, all skills to be presented during a job interview should be placed into the scenario was another point to be mentioned. Five professionals’ opinions were asked regarding the appropriateness of the skills. Depending on the feedback from the professionals and the last version of the scenario was formed. According to those regulations, the video images would have 21 verbal and nine physical behaviors to be presented by the interviewee.

Vocalization of the behaviors that should be presented before and during job interviews and presentation of the target stimuli were realized by a student of the Government Conservatoire who took elocution classes and made book chapters’ vocalizations. Besides, the visual pictures of the targeted verbal behaviors which can be seen in the Tables 2 and 3 were also added to the videoclips. The visual

### TABLE 1
Behaviors That Should Be Presented During a Job Interview

1. Knocks the door before entering the room.
2. Enters the room saying “hello”.
3. Closes the door.
4. Shakes hands with the employer.
5. When the employer says “welcome”, he says “thank you”.
6. Sits somewhere he can talk to the employer face to face.
7. Makes eye-contact with the employer.
8. Introduces himself to the employer (e.g. Tells his name, age, school graduated, whether or not he has a job experience, if he had, tells the name of the job worked, the length of time worked for that job, etc.).
9. Asks permission to ask questions related with the job.
10. Asks which days he would work.
11. Asks the working hours of the job.
12. Tells that he wants to work for his job.
13. Asks when and how he would learn if he was accepted to the job.
14. Thanks for the given information.
15. Stands up and shakes the employer’s hand.
16. Says “Good day,” and goes out of the room.
17. Closes the door.

### TABLE 2
Behaviors Regarding the Verbal Information That Should Be Presented Before a Job Interview

1. We must learn the address of the work before going to a job interview.
2. We must take a shower before going to a job interview.
3. We must choose appropriate and clean clothes before going to a job interview.
4. We must brush our teeth before going to a job interview.
5. We must comb our hair before going to a job interview.
6. We must go to a job interview 10 minutes before the interview.
7. We must be smiling during the job interview.
8. We must speak with appropriate voice tone during the job interview.
9. We must make eye contact with the employer during the job interview.
picture was shown on the screen while the behavior was defined verbally in the videoclip.

Research Design

The study was carried out with multiple probe design across subjects which is one of the single subject design models. This model examines the effectiveness of the independent variable on a dependent variable with at least three participants. In this study, the effectiveness of making job interviews by providing video models via visual and audial technologies through tablet PC was examined by replicating the study with three participants.

Experimental Process

**Baseline and daily probe sessions.** Baseline sessions were realized for determining the performance level of the participants regarding the targeted skill before starting video model teaching via tablet PC. Setting and materials of the study were prepared. At the beginning of the baseline sessions, the participant was told about the skill to be studied (“Now we are going to make a job interview with you.”). Afterwards, the attention of the participant was secured and the target stimuli was presented (“Make the job interview.”). After the target stimuli was presented, correct steps were recorded with (+) and incorrect responses were recorded with (−) on the data recording form. The participant was provided with neither prompts nor reinforcers during these sessions.

Baseline data of the verbal behaviors which should be presented before and during the job interview were also collected similarly. Participants were told that they would work on making a job interview and were asked if they were ready for working. Afterwards, target stimuli was presented as (“Tell me which behaviors should we do before/during a job interview”). Responses of the participants were recorded on the data collection forms. After collecting three consecutive constant points during the baseline sessions, teaching via tablet PC sessions were started. During the study, daily probe sessions were conducted in order to determine the performance level of the participants regarding making a job interview and define the verbal information. Daily probe sessions were conducted similar to the baseline sessions.

**Intervention sessions.** Intervention sessions were conducted in three sections in the same day. In the first section of the video, the behaviors that should be realized before a job interview were presented as a verbal information. In the second section, the job interview was realized and in the third section, the behaviors that should be realized during a job interview were presented as a verbal information. Intervention sessions were conducted in the days in which the participants were attending the Social Living Center for two days for two of the participants, and for three days a week for one participant. Each intervention session was planned to conduct two trials.

In the first and third section of the study the following process was realized: The setting and materials were prepared at the beginning. Before starting to work, the participant was greeted (“Hello, how are you?”), and then given information (“Now we are going to watch a video which is telling the things that should be done before making a job interview. Afterwards, I will ask questions about the things that you watched”). Then attention of the participant was secured and asked (“Are you ready to work?”) by providing the attentional question. When the participant answered (“Yes, or I’m ready.”) s/he was reinforced orally (“Yes, okay, nice, etc.”). Afterwards, the participant was provided with the target stimuli (“Turn on the tablet PC and watch the first video”). Within five seconds, the participant was to initiate and turn the tablet PC on. If the participant did not turn the tablet PC on or did not watch the video, the direction was repeated. After the participant watched the video, s/he was reinforced (“Well done, very good, you watched carefully.”) and another direction was provided (“Watch the video again”) to watch the video for the second time. After the participant watched the video again, the tablet PC was taken from the participants. Then the participant was told, (“You watched the video, now I’m going to ask the things you watched. Tell me what you know.”). The target stimuli was provided with the name of the participant (“... tell me which behaviors should we present before a job interview?”). If the participant responded within the response inter-
val (5 sec.) the response was recorded on the data collection form. Correct responses were reinforced verbally. If the participant did not respond within 5 seconds, the trial was completed.

In the second section of the intervention sessions the following process was followed: Firstly, the setting and materials were prepared in the training environment. Before starting to work, the participant was greeted (“Hello, how are you?”) and was provided with information (“Now we are going to watch a video showing a job interview. Afterwards, depending on the video, you will make a job interview”). Then the participant’s attention was secured and was provided with the target stimuli (“Turn on the tablet PC and watch the second video). After providing the target stimuli, the participant was to initiate or turn the tablet PC on within 5 seconds. If the participant did not turn the computer on or did not watch the video, s/he was provided the same direction again. Then the participant was waited to turn the computer on and watch the video. After the participant watched the video for the first time, s/he was provided with reinforcer (“Well done, you watched the video very nicely.”) and another direction for watching the video for the second time (“Watch the video again.”). After the participant watched the video for the second time, the tablet PC was taken from him/her. Then s/he was asked to display the skills s/he watched on the video. The participant was told what s/he would do next (“We watched the video, now you are going to make a job interview similar to the one you watched.”). Then s/he was provided with the target stimuli with his/her name (“... make a job interview.”). The first researcher played the employer role and the participant role-played the job interview with him. When the participant completed the skill steps or s/he did not respond within the response interval (5 sec.) the trial was ended. When all the sessions were completed and the participant participated appropriately in the study, s/he was allowed to take photos/videos using the tablet PC for 5 minutes, to check the photos or videos s/he has taken or listen to music as an activity reinforcer.

Generalization sessions. Generalization sessions were conducted with pre and post-test sessions and they were realized similar to the baseline sessions. For the generalization of making job interview skills, a setting which is not familiar to the participants and a woman director of a governmental school was chosen. Neither a prompt nor a reinforcer was provided to the participants during the generalization sessions. They were thanked at the end of the sessions for their participation.

Generalization data of the verbal behaviors that should be presented before and during a job interview were collected in two ways. Participants’ mothers were asked if the participants realized the behaviors (e.g. taking a shower, wearing appropriate and clean clothes, brushing tooth, combing hair) they should perform before they go to the job interview. Mothers were asked to observe their children and check if they would realize the behaviors to be conducted before going to the job interview. After making the job interview, both mothers and participants were asked which preparations were realized before the job interview. The behaviors that should be presented during the job interview (e.g. smiling, using appropriate tone of voice, making eye contact) were recorded by the researchers by watching the recorded video during generalization sessions.

Maintenance sessions. Maintenance sessions were planned to be conducted 1, 3, and 5 weeks after the criterion was met in the intervention sessions and they were conducted similar to the baseline sessions. Since the participants did not come for the maintenance sessions on the pre-determined dates, maintenance data of the first and third participants were collected in different dates.

Data Collection

Effectiveness, social validity and reliability data were collected during the study. Effectiveness and social validity data were collected by the first researcher. Reliability data were collected by two different participants.

Social validity data collection. In this study, questions were addressed to the individuals with DD who are the direct consumers and to the teachers in the studios at the school who are the indirect consumers. After the study was completed, one to one interviews were conducted with the participants of the study and their teachers. For the social validity, nine
“yes-no” questions and three open-ended questions, with a total of 12 questions were asked to the teachers. Participants were asked six “yes-no” questions and one open-ended question, with a total of seven questions.

Reliability data collection. Treatment reliability data were collected from the baseline, daily probe, intervention, maintenance and generalization data, and inter-observer reliability data were collected in the study. Besides, inter-raters reliability data were collected from the social reliability data. At least 30% of all the sessions were used for the reliability data collection of the study. Session which were used for reliability were selected randomly.

Results

Results regarding the verbal behaviors that should be presented before and during the job interview

Mehmet’s baseline, intervention, full probe, and maintenance data can be seen on Figure 1. Mean percentage level of Mehmet regarding the behaviors that should be presented before a job interview during the baseline phase was 5%. Mehmet’s second behavior was the verbal behaviors that should be presented during a job interview. His mean percentage level of performance was 0% in this behavior. Mehmet acquired the behaviors that should be presented before a job interview at the end of two sessions, and the behaviors that should be presented during an interview in three sessions with a 100% performance during intervention sessions. In Figure 1 it can be seen that Mehmet performed with 100% accuracy for both skills in the first, second and third full probe sessions. Mehmet also performed with 100% accuracy for both skills in the maintenance sessions which were conducted one, three and eight weeks after the intervention sessions were completed.

Damla’s baseline, intervention, full probe and maintenance data can also be seen in Figure 1. Damla’s mean baseline performance level for making a job interview skill was 19%. It can be seen that Damla has met the criterion by presenting 100% correct performance for making a job interview skill in seven intervention sessions. Damla’s performance during the first full probe session which was conducted before the intervention sessions was 28%. At the end of eight intervention sessions, Mehmet met the criterion and reached a 100% performance level. His performance level during the first, second and third full probe sessions were 100%. Mehmet presented a performance of 100% in the maintenance sessions which were conducted one, three and eight weeks after the intervention sessions were completed.

Hakan’s baseline, intervention, full probe and maintenance data can also be seen in Figure 1. Hakan’s mean performance level of both verbal skills that should be presented before and during a job interview were 0%. He acquired the skills in three intervention sessions with a performance level of 100% accuracy for each skill. Hakan presented a performance level of 0% for both skills during the first and second full probe sessions. His performance level during the third full probe session was 100%. His performance regarding the maintenance sessions which were conducted one, three, and five weeks after the completion of the intervention sessions were 100% for both target skills.

Results regarding teaching a job interview. Mehmet’s baseline, intervention, full probe and maintenance data can be seen in Figure 2. Mehmet’s baseline data of making a job interview skill was 28%. At the end of eight intervention sessions, Mehmet met the criterion and reached a 100% performance level. His performance level during the first, second and third full probe sessions were 100%. Mehmet presented a performance of 100% in the maintenance sessions which were conducted one, three and eight weeks after the intervention sessions were completed.

Damla’s baseline, intervention, full probe and maintenance data can also be seen in Figure 2. Damla’s mean performance level of baseline for making a job interview skill was 19%. It can be seen that Damla has met the criterion by presenting 100% correct performance for making a job interview skill in seven intervention sessions. Damla’s performance during the first full probe session which was conducted before the intervention sessions was 20%. After the intervention session was conducted, in the second full probe session, the performance level of Damla was 92%, and in the third full probe session it was 100% correct responses. It can also be seen that Damla had a performance of 100% accuracy
Figure 1. Mehmet, Damla, and Hakan’s correct responses to behaviors before and during a job interview. B = baseline; I = intervention; FP = full probe; M = maintenance; G = generalization; BBJI = behaviors to be done before the job interview; BDJI = behaviors to be done during the job interview.
Figure 2. Mehmet, Damla, and Hakan's correct percentage of response to the job interview skills. B = baseline; I = intervention; FP = full probe; M = maintenance; G = generalization.
during the maintenance sessions which were conducted two, four, and six weeks after the intervention sessions were completed.

Hakan’s baseline, intervention, full probe and maintenance results were presented in Figure 2. Hakan’s performance level regarding making a job interview skill in the baseline phase was 24%. It can be seen that he acquired the skill by performing 100% accuracy at the end of eight intervention sessions. Mean performance level of Hakan in the first and second full probe sessions which were conducted before intervention was 27%. After the intervention sessions, mean performance level of Hakan during the third full probe session was 99% whereas his performance level of the targeted skill during the maintenance sessions which were conducted one, three and five weeks after the intervention sessions were completed was 100%.

Generalization Data

Generalization pre and post-test results regarding the behaviors that should be presented before and during the job interview and making a job interview skill data are shown in Figure 1 and 2. Mehmet’s generalization pre-test result was 0% and post-test result was 100% correct responses revealing the behaviors that should be presented before a job interview. Behaviors that should be shown during a job interview results of Mehmet for the pre-test generalization was 33% accuracy and for the post-test generalization was 100% accuracy. Moreover, Mehmet’s generalization pre-test score for making a job interview skill was 23% and his post-test score for that skill was 100%.

Damla’s generalization pre-test result was 0% and post-test result was 100% correct responses revealing the behaviors that should be presented before a job interview. Behaviors that should be shown during a job interview results of Damla for the pre-test generalization was 33% accuracy and for the post-test generalization was 100% accuracy. Damla’s generalization pre-test score for making a job interview skill was 20% and her post-test score for that skill was 100%.

Hakan’s generalization pre-test result was 0% and post-test result was 100% correct responses revealing the behaviors that should be presented before a job interview. Behaviors that should be shown during a job interview results of Hakan for the pre-test generalization was 33% accuracy and for the post-test generalization was 100% accuracy. Moreover, Hakan’s generalization pre-test score for making a job interview skill was 20% and his post-test score for that skill was 100%.

Social Validity Results

Social validity data collected from the participants. Participants mentioned that (a) they were happy about participating in the study aiming to teach job interview skills; (b) the target skill was important; (c) they would use the acquired skills in the future when they apply for a job; (d) they were glad for watching the skill from the video and using the tablet PC during the study; and (e) if this study would be repeated they would be willing to participate in it by marking the “YES” choices in the social validity form. Last but not the least, the participants were asked if there were any part of the study that they did not like. All participants answered as “NO” to this question.

Social validity data collected from the teachers. Questions on the Social Validity Form were read to the teachers by the researcher and their answers were recorded on the form. Social Validity Form was conducted to the two teachers who were working in the Center.

Teachers reported that (a) making a job interview was an important skill for their students’ lives; (b) their students would use the skill before applying for a job; (c) they would create opportunities for their students to use the target skill; (d) learning to make a job interview would increase the chance to be placed in a job; (e) teaching to make a job interview via video modeling was an effective strategy; (f) they considered to use this study during their vocational lives and in their daily teaching programmes; (g) when the needed conditions are met, they would teach to use tablet PC to their students at school; and (h) the method used in the present study provided convenience for the teachers. Besides, teachers also mentioned that tablet PCs provided visual support, attracted attention of the students for the skill to be taught, helped for concentration, the study provided self-confi-
dence for the students and also provided opportunity for making exercises. The teachers were also asked, “Is there any part of the study that you did not like?” and “If yes, could you please explain?”. Participant teachers reported that there were no parts of the study that they disliked.

Discussion

Results of the study revealed that video modeling presented via visual and audial technologies using tablet PCs was effective on teaching to make a job-interview, teaching to verbalize the behaviors to be conducted before and during the job interview skills to individuals with DD. The results also showed that participants of the study could generalize the acquired skills to a different setting, condition, and person, and also maintain the skills after the intervention sessions were completed. This result was consistent with the results of the previous studies examining the effectiveness of video modeling on teaching different job skills to individuals with DD (Allen, Wallece, Renes, Bowen, & Burke, 2010b; Collins, 2012; Goh & Bambara, 2013; Kellemes & Morningstar, 2012; Mechling & Ortega-Hurndon, 2007; Van Laarhoven, Laarhoven-Myers, & Zurita, 2007; Van Laarhoven et al., 2009). Besides the present study’s results showed consistency with the results of the limited number of studies which provided video feedback and used more than one teaching strategies for teaching to make job interview (Morgan et al., 2014; Strickland et al., 2013).

Results of the present study showed that all of the participants of the study maintained the acquired skills which were taught through video modeling presented via visual and audial technologies using tablet PCs. Besides, the results also showed that participants of the study could generalize the acquired skills to a different setting, condition, and person. These results showed similarity with the previously conducted studies’ results (Goh & Bambara, 2013; Mechling & Ortega-Hurndon, 2007; Van Laarhoven et al., 2007). When the generalization results of the previously conducted studies were examined, it can be seen that setting generalization (Mechling & Ortega-Hurndon, 2007), skill generalization (Huntington, 2012; Van Laarhoven et al., 2007), and generalization to a natural condition (Goh & Bambara, 2013) were studied. The different part of generalization phase of the present study from the others was using the three variables in the same study; generalizing the target skill into a different setting (an unfamiliar setting to the participants), condition (changing some sentences of the employer) and with a person (an unfamiliar person to the participants) were used together. It is hoped that this strong part of the study will contribute to the literature.

There are some important points to be discussed in the study. First of all, all participants’ baseline data regarding making a job interview skill was 28%, 19% and 24% respectively. The reason for that was the participants did not need to have instruction for conducting some of the steps in the job interview skill analysis. Participants presented these skills in their daily lives in natural environments frequently. These skills were mostly, closing the door of the room, sitting in an appropriate place, turning her face to the employer, looking at the employer, when the employer says “welcome” replying by saying “thank you”, telling her name, surname and age. Another point to be mentioned was that during the intervention sessions of teaching to make a job interview, some of the steps took longer time to meet the criterion for the participants. Both the first and second participants learned the skill step “to ask when they could learn if they were accepted to the job or not” later than the other steps of the target behavior. Other than these, there were also different skill steps that the participants acquired later than the others. When the participants were evaluated depending on the acquisition level of verbally presenting the behaviors that should be realized before and during a job interview skills, there was not a significant difference in the data. The participants acquired many of the skill steps with 100% accuracy in a few intervention sessions. Third participant’s decrease in the data regarding the behaviors that should be presented before the job interview after the first full probe session was another point to be discussed. The first full probe data was 50% whereas the second was 0%. It was thought that the weekend holiday after starting the study might be the reason for that.
During the post-test session of the generalization participants’ mothers were asked about their children’s behaviors that should be presented before a job interview. Mothers were given information as “Your son will make a job interview, so could you please observe his preparations stealthily.” Afterwards, mothers were asked about the preparations that her son did before the job interview and her answers were recorded on the data collection form. Mothers were asked questions like “did he take a shower, brush his tooth, etc.” Regarding the behaviors to be presented before making a job interview. The same questions were asked to the participants and their answers were found to be similar to their mothers’ answers.

Another point that might be discussed was related with the behaviors that should be presented before a job interview. Before going to the job interview, the data regarding the “we should learn the address of the job behavior” was not collected during the pre and post-test sessions of generalization. Since the researcher picked up the participants from the Center where they were attending by his car to the generalization setting, the participants were asked to tell this behavior verbally but implementation of this step was not realized during the study. Therefore, evaluation of this step was not included in the data.

Participants asked many questions about the time they would start to use the tablet PCs during the baseline and full probe sessions to the researchers. This might show the importance of using tablet PC during education. Thus, tablet PC increase the motivation of students for the study and it can be used as reinforcer before and after the target behavior (Haksız, 2014). Although there are research studies which used technological instruments such as video ipod (Collins, 2012; Johnson, Blood, Freeman, & Simmons, 2013; Kellemes & Morningstar, 2012; Van Laarhoven et al., 2009), pocket computers (Van Laarhoven et al., 2007), desk-top computers (Mechling & Ortega-Hurndon, 2007), DVD player (Mechling & Gustafson, 2009), and iPhone (Bereznak, Ayres, Mechling, & Alexander, 2012) for teaching job skills to adult individuals with DD, teaching to make a job interview via video modeling on the tablet PC has not been reached in the literature yet. In the present study, teaching to make a job interview was realized via a tablet PC, besides, visual and audial prompts were used together regarding the behaviors that should be presented before and during job interview. These were the original parts of the present study and they are hoped to provide contribution to the literature. Moreover, there are limited number of studies related with making job interviews directly with the employer. The present study was planned to meet this need in the literature. Besides, acquisition of these skills was hoped to effect the acceptance to a job procedure of individuals with DD positively. Moving with these basic reasons, following suggestions can be addressed for the future studies.

Recommendations

In the future studies, preparing CV, applying for a job through Internet, and filling in a form skills can be targeted. Using different types of video modeling, efficiency studies can be conducted. Effectiveness of parents, siblings and peers using video models provided via tablet PC can be examined. Future researchers can conduct the same study with different levels of ASD and ID. Besides, life after school, preparation for a job, job placement and continuing the job skills can be studied by the researchers.

References


Bennett, K. D., Ramasamy, R., & Honsberger, T.


Received: 11 July 2018
Initial Acceptance: 29 August 2018
Final Acceptance: 17 November 2018
Effects of a Self-Monitoring Strategy to Increase Classroom Task Completion for High School Students with Moderate Intellectual Disability

Yi-Fan Li
Texas A&M University

Hsinyi Chen
National Taiwan Normal University

Dalun Zhang and Carly B. Gilson
Texas A&M University

Abstract: The current study was conducted in Taiwan to examine the effectiveness of using a self-monitoring strategy to increase the percentage of completion of classroom tasks for three high school seniors with moderate intellectual disability. We used a multiple-probe-across-subjects single-case design to evaluate the use of a self-monitoring tool to increase task completion. The unique feature for this study is that learning characteristics of participants were considered while designing the self-monitoring strategy. The primary result of the study is that the self-monitoring strategy was effective. Participants used the self-monitoring tool more often when guided by visual prompts and rhymes, and their differential decision-making and reasoning behaviors increased their motivation for learning. We share implications for research and suggestions for teachers when applying the self-monitoring strategy.

One of the major issues concerning individuals with intellectual disability (ID), who wish to have a smooth transition from school to community, is their lack of self-determination. During the transition process, self-determination is one of the indicators that predict transition outcomes (Chiou & Li, 2009). In Taiwan, the importance of self-determination has been emphasized in new special education curriculum guidelines (Ministry of Education in Taiwan, 2015), which embraced the notion that teaching students to lead a self-directed life is the responsibility of educators. However, special education teachers face challenges in providing self-determination instruction. Cheng and Lin (2008) indicated that while special educators considered self-determination important, the majority of them did not provide instruction on this important topic. The current study aimed at providing a practical strategy for special education teachers to help their students improve self-determination.

Numerous scholars have already demonstrated that self-monitoring, self-regulation, and self-determination are learned in sequence (Gilberts, Agran, Hughes, & Wehmeyer, 2001; Wehmeyer, Agran, & Hughes, 1998; Wehmeyer, Kelchner, & Richards, 1996). For students with ID, they can learn self-determination through self-monitoring, which is easier to learn and generalizable to other contexts (Gilberts et al., 2001; Wehmeyer, Yeager, Bolding, Agran, & Hughes, 2003). Self-monitoring is a practical strategy that can assess individual progress in learning and provide continuous feedback for students, parents, and teachers. Moxley (1997) and Lee, Palmer, and Wehmeyer (2009) also reported additional benefits of using self-monitoring strategies, such as strengthening organization, confidence, and introductory academic skills.

Self-monitoring has been successfully used by students with moderate to severe disability for increasing on-task behaviors. For example, Copeland, Hughes, Argan, Wehmeyer and Fowler (2002) taught four students with ID to complete in-class assignments with self-monitor-
ing strategies. The students needed to set a goal for themselves and do self-recording while completing the assignment. Results of the study showed that students with ID increased assignment completion by applying the self-monitoring strategies. Hughes et al. (2002) employed self-monitoring strategies with four students with ID. Each student had a different goal, such as building social skills or improving academic performance. The study showed that the self-monitoring strategies could be applied to different goals. Wehmeyer et al. (2003) used self-regulation strategies with students with ID and incorporated visual supports into the process of self-monitoring. The results showed that these students’ academic performance improved. Agran et al. (2005) taught six students with ID to use self-monitoring strategies to help them follow instructions in a regular classroom. Students were taught to observe their own behaviors and record their performance. This research demonstrated that students with ID were capable of studying in the regular classroom by using the self-monitoring strategies. Agran, Cavin, Wehmeyer, and Palmer (2010) employed the Self-Determined Learning Model of Instruction to help three students with ID get involved in a regular classroom. In this model, students with ID had the autonomy to choose those strategies that fitted into the model; it was found that self-monitoring was effective in helping students stay on-task in a regular classroom. Amato-Zech, Hoff, and Doepke (2006) and Boswell, Knight, and Spriggs (2013) taught students with ID to self-monitor their attention by using the MotivAider. In these studies, students self-monitored their on-task behaviors without external reinforcement, which indicated that self-monitoring strategies were useful to help students complete tasks. However, Ganz and Sigafoos (2005) used self-monitoring strategies to teach students with moderate to severe intellectual disability to complete tasks and found that these students needed numerous prompts while learning self-monitoring strategies, thereby highlighting the need to investigate the effects of self-monitoring on individuals with ID.

Even though the above-mentioned research found that self-monitoring strategies are effective for students with ID, these studies did not take learning characteristics into consideration. Restorff and Aber (2013) suggested that teachers should consider the importance of learning characteristics of students with ID when applying specific strategies to curriculum, such as providing age-appropriate materials and instruction, allowing students to evaluate their own performance, teaching functional skills, and providing appropriately tailored content. Other scholars suggested teaching practices such as reading written directions aloud, which helps individuals with ID remember the steps of the tasks and learn how to perform the correct actions for completing a task (Gilberts et al., 2001; Lee et al., 2009; Wehmeyer et al., 1998). Without this information, it can be difficult to understand the process of learning self-monitoring for students with ID. To address this gap, this current research incorporated learning characteristics of students with ID into strategy design; for instance, participants evaluated their own performance and maintained attention by using a self-monitoring strategy. We allowed participants to choose a goal from the appropriate options; we also provided age-appropriate and functional tasks, which were essential job skills for students with ID. Studies demonstrated that the functional skills were highly applicable to real-life situations and to the learning of self-determination (Kontu & Pirttimaa, 2010; Shurr & Bouck, 2013).

In this study, we developed a self-monitoring teaching strategy which comprised of two stages (self-observation and self-recording) and five steps (choosing a task, deciding actions, modeling, practice with feedback, and practice without feedback). We used the strategy to investigate the effects of self-monitoring to increase classroom task completion among high school students with ID. For high school students, self-monitoring is a crucial skill during the process of transition from school to adulthood. Specifically, we addressed the following research question: What are the effects of the self-monitoring strategy on classroom task completion for participants during the intervention, maintenance, and generalization phases?
Method

Participants and Setting

Participants included three high school seniors who were classified as having a moderate intellectual disability. These students attended a school located in an urban community in northern Taiwan which only admits students with moderate to severe cognitive impairment. Students in the school are in a self-contained classroom with one main classroom teacher and one teacher assistant. Inclusion criteria for participants included: (a) a diagnosis of a moderate intellectual disability, (b) hearing and vision within normal range and (c) no significant motor dysfunction and the ability to complete job skills. According to the inclusion criteria, we asked classroom teachers to select three students that met the criteria.

Chi. Chi was an 18-year-old male student, and classified as having a moderate intellectual disability. He communicated verbally and was able to engage in meaningful communication, but he needed additional cues or explanations while receiving directions. Although his reading was at a low first grade level, he could tell a short story by reading pictures. His writing skills were at an emergent level. Usually, he completed writing assignment by tracing texts. Chi loved to do job skills and writing tasks. One of his IEP goals was to use a strategy to maintain his attention and complete a task since he was easily distracted and failed to complete assigned tasks. In the classroom, he required multiple prompts from a teacher assistant to keep on-task and continue working. Reinforcement, such as sweets, was his favorite reinforcement.

Hung. Hung was an 18-year-old male student, and classified as having a moderate intellectual disability. He communicated verbally. When receiving directions, he was able to understand directions and completed assigned tasks. His reading was at a low second grade level and recognized basic sight words. His writing skills were at an emergent level and he completed writing assignment by copying texts. Hung had a strong motivation to learn a new task. One of his IEP goals was to use a strategy to remind himself to complete a whole task since he easily forgot to do some steps of a task and left the task uncompleted. For example, when he finished sweeping floor in a classroom, he forgot to put the tools back in the original place. In the classroom, he required multiple prompts from others to remind him to complete a whole task. Reinforcement, such as stationary, was his favorite reinforcement.

Hui. Hui was an 18-year-old female student, and classified as having a moderate intellectual disability. She communicated verbally and was capable to complete assigned tasks after receiving directions. However, she was not confident with her performance when there was no support or encouragement from her teachers. Her reading was at a low first grade level, but she could read pictures to understand contexts. Her writing skills were at an emergent level and completed writing assignment by copying texts. One of her IEP goals was to use a strategy to build her motivation to learn more and boost her confidence by completing a task independently. Reinforcement, such as stationary, was her favorite reinforcement.

The first author served as the instructor and data collector. She took courses related to teaching students with ID, consulted the senior teachers about modifying teaching materials and methods, and discussed this study with the second author before beginning the instruction. All sessions took place in the participants’ school. We used the assigned classroom at the scheduled job-skills learning class. The instruction included three sessions a week and each session took approximately 50 minutes in one-on-one format either with the printed materials or using the chalkboard in the front of the classroom.

Experimental Procedures

Design the self-monitoring teaching strategy and materials. Considering the learning characteristics of the participants, the first author developed the self-monitoring teaching strategy with specific steps and teaching methods. The first stage was self-observation, which consisted of choosing a task and deciding actions. In “choosing a task,” the instructor worked with the participants to choose a target task; subsequently, the participants identified the target task and read the written directions aloud. If the participants experienced difficulty read-
ing, they could use pictures to guide themselves to read the directions aloud. In “deciding actions,” the participants learned to perform the appropriate actions to complete the task, which required them to identify whether a target action has occurred. The second stage was self-recording, which comprised modeling, practice with feedback, and practice without feedback. In “modeling”, the instructor demonstrated the entire self-monitoring process through rhymes and visual prompts. The rhymes “read and read, do and do, see and see” reminded participants of the entire self-monitoring process. “Read and read” meant reading the written directions of each action aloud; “do and do” meant performing the action and putting the token on the completed action; “see and see” meant checking again to make sure that each action was done accurately. The instructor also used visual prompts, such as pictures, to remind participants on how to read the direction aloud if they had trouble reading the directions. After the participants learned the self-monitoring process, they continued to “practice without feedback,” in which they monitored themselves independently, and the instructor evaluated their performance.

Design target task and dependent measure. Considering the importance of the transition process for individuals with ID, learning prerequisite skills before they enter the workplace is essential. If students acquire adequate job skills, they are more likely to find a job and lead an independent life. Job skills are also age-appropriate and functional learning. Therefore, the current study taught participants to complete job skills by using the self-monitoring strategy. Six job skills were included in the choices, namely, mopping the floor, sweeping the floor, cleaning the windows, cleaning the cabinets, cleaning the toilet, and cleaning the ceiling. Every task was divided into six actions through task analysis. Each action was paired with one picture and one written direction to provide a stepwise guide to the participants for completing the task. The participants were asked to choose one job skill as the first task during the intervention phase. Next, they chose another job skill as the second task during the generalization I phase to assess whether they would generalize the self-monitoring strategy from one skill to the other. In the generalization II phase, the participants were asked to complete the writing task to assess whether they would generalize the self-monitoring strategy from job skills to writing skills.

The dependent measure was the percentage of task completion and self-monitoring behaviors performed independently by participants. For each action in the task sequence participants were asked to read the direction aloud, perform the action and put the token on the self-monitoring sheet to record the completed action. After they completed the task, they needed to check the sheet again and make sure that they had already done each action and completed the task. During each session, the instructor verbally directed the participants to complete the task that they chose from the six job tasks. Participants’ responses were scored by the instructor as independent or prompted. Only independent responses were scored. After the experiment, we administered a follow-up questionnaire to the six participating teachers to obtain their perspectives on the importance and feasibility of the self-monitoring strategy. We used a 5-point Likert scale to investigate their attitudes toward applying the self-monitoring strategy into instruction (i.e., I will instruct students to learn how to use the self-monitoring strategy for improving performance). We also had three open-ended questions to get their opinions regarding the strategy (i.e., which curriculum and context are appropriate for using the self-monitoring strategy).

We obtained interobserver agreement by using a point-by-point agreement method to assess the percentage of agreement of target behaviors. The instructor invited a senior teacher to be the observer for the purpose of interobserver agreement. Interobserver agreement was determined by observing the steps of the task analysis. Only participants’ independent responses were scored. The observation took place one session a week. Before the observer joined the session, the instructor invited her to practice the evaluation until the interobserver agreements were consistently 100%. The overall interobserver agreements for all participants were 100%.
Design materials. The following materials were designed according to the self-monitoring strategy:

Self-monitoring sheet. The self-monitoring sheet was similar to a token system with task analysis. Every task was divided into six actions using picture and written directions to help the participants monitor their action and identify and record the occurrence of target behaviors.

Evaluation of target behavior sheet. The evaluation of target behavior sheet was for recording task completion and self-monitoring behaviors performed and only independent responses were scored as the outcome of learning the self-monitoring strategy.

Modified writing worksheets. To investigate the effect of generalization, the participants’ task at the generalization II phase was to complete the modified writing worksheets. The writing task was modified based on the different levels of literacy, allowing all the participants to complete the writing task.

Orientation. Before beginning the formal research, we conducted a pilot study to test the teaching materials and methods, which were subsequently modified according to the results. We talked with the participants and discussed how they wish to work on the goals and explained why self-monitoring was used and what the benefits of learning the strategy were. Then, we obtained permissions for participation from the participants, their parents and participating teachers. The participating teachers included one job coach and five school teachers. They were interviewed after the experiment for social validity. After participants promised they would try to complete the tasks through the strategy, participants were directed to choose one job skill as their task and a preferred reinforcement as a reward when they completed tasks.

The experimental design was multiple-probe-across-subjects single-case design and controlled for internal validity including keeping the same teaching instructor, contexts and data collector, avoiding mortality threat and history threat. This design included four phases: baseline, intervention, maintenance, and two-phase generalization.

Baseline phase. During baseline, the instructor assessed independent task completion without the intervention of the self-monitoring strategy. The instructor did not prompt the students to respond or provide any instructional feedback during baseline. Once data were stable, intervention began for the first participant. During each session, we used a script to introduce the task and the instructor directed the participants to complete the task, and then the instructor used evaluation of target behavior sheet to record the occurrence of target behaviors at the same time.

Intervention phase. During intervention, the instructor used the same script to introduce the task. After the introduction of the task, the instructor began the intervention. The instructor followed two stages and five steps of the self-monitoring teaching strategy to teach participants how to self-monitor themselves and complete their tasks. And the instructor asked participants to try to complete the task independently and monitor themselves until they completed the task. In this phase, we prepared self-monitoring sheets for participants to record the occurrence of target behaviors by themselves.

Maintenance phase. After the intervention, the participants did not receive the self-monitoring instruction for one week to see whether the participants would use the strategy by themselves. The purpose of the maintenance phase was to evaluate whether participants would complete the task and monitor themselves under the condition without any instruction and feedback from the instructor. The instructor verbally directed the participants to do the task, and then evaluated their performance every session. During maintenance, participants continued using the self-monitoring sheets to record their target behaviors.

Generalization I phase. The purpose of the generalization I phase was to evaluate whether participants could generalize the self-monitoring strategy from one skill to another when instruction and feedback were not provided by the instructor. The second job skill task that the participants chose in this phase was different from the task in the intervention and maintenance phases. Before session began, instructor verbally introduced the second task. The instructor verbally directed participants to complete the task, and then evaluate their performance every session.
Generalization II phase. To evaluate if participants could generalize the self-monitoring strategy from job skills to different skills, the instructor asked participants to complete the writing task by using the self-monitoring strategy. Before the session began, instructor verbally introduced the writing task. When the session began, the instructor prepared modified writing worksheets for participants and verbally direct participants to do the task without providing any instruction and feedback.

Results

Chi. Figure 1 shows the percentage of task completion and self-monitoring behaviors performed independently across participants.
In baseline, Chi had no response, which means he did not know how to complete tasks through the self-mentoring strategy. Once in intervention, Chi showed an immediate increase in trend, with responses ranging from 26.7% to 100% ($M = 79.26\%$). After intervention phase, maintenance data were collected for one week. Chi continued to complete the task with the self-monitoring strategy. The responses ranged from 86.7% to 100% ($M = 93.33\%$). In Generalization phases, the responses in generalization I phase ranged from 66.7 to 100% ($M = 84.44\%$); in generalization II phase, the responses ranged from 46.7 to 100% ($M = 77.78\%$).

Hung. In baseline, Hung had no response. After the introduction of the intervention, Hung showed an immediate increase in trend, with responses ranging from 53.3% to 93.3% ($M = 82.96\%$). After intervention phase, maintenance data were collected for a week. Hung maintained task completion with the self-monitoring strategy. The responses ranged from 86.7% to 100% ($M = 95.56\%$). In Generalization phases, the responses in generalization I phase ranged from 80 to 93.3% ($M = 87.78\%$); in generalization II phase, the responses ranged from 66.7 to 100% ($M = 87\%$).

Hui. In baseline, Hui did not know how to complete tasks through the self-mentoring strategy so she did not have any response. In intervention, Hui showed an immediate increase in trend, with responses ranging from 73.3% to 100% ($M = 88.15\%$). After intervention phase, maintenance data were collected for one week. Hui continued to complete the task with the self-monitoring strategy. The responses ranged from 93.3% to 100% ($M = 97.78\%$). In Generalization phases, the responses in generalization I phase ranged from 80 to 100% ($M = 92\%$); in generalization II phase, the responses ranged from 93.3 to 100% ($M = 98.89\%$).

Follow-up questionnaire. We invited the six school teachers to fill out the follow-up questionnaire. Some of them were senior teachers and classroom teachers. Only one teacher’s duty was like a job coach, who provided instruction on job sites. The results suggested that the participating teachers liked the teaching skills and general procedure of the self-monitoring strategy. They also agreed that the self-monitoring strategy could be applied to diverse contexts, such as on job sites and at home. The self-monitoring strategy also guided students to complete various tasks. If a task required sequential actions with pictures and written directions, the self-monitoring strategy guided them to complete the tasks step by step. The follow-up questionnaire results were provided in Tables 1 and 2.

Discussion

The purpose of the study was to investigate the effects of using a self-monitoring strategy to increase the completion of classroom tasks. The results were consistent with those of previous research that showed the act of self-monitoring increased completion of tasks (e.g. Agran et al., 2005; Agran et al., 2010; Boswell et al., 2013; Wehmeyer et al., 2003) and the self-monitoring strategy was effective for individuals with ID to increase their completion of tasks. However, Ganz and Sigafoos (2005) reported that individuals with severe ID still required numerous prompts from others when they completed tasks using self-monitoring strategies, which is different from that of this current study. We found that developing the teaching self-monitoring strategy and conducting a pilot study before introducing the intervention helped the researcher modify teaching practices, such as incorporating visual prompts and rhymes into the strategy. Therefore, once in intervention, the participants understood how to use the self-monitoring strategy to complete tasks without assistance from others. Actually, self-monitoring does not need much time to practice after students have learned to use the system (Ganz & Sigafoos, 2005; Hughes et al., 2002). All the participants’ performances at the maintenance phase were higher than that at the intervention phase because the self-monitoring strategy functioned as a cue or a reminder for them to change a behavior and take a correct action (Agran et al., 2005; Selznick & Savage, 2000). This study also showed that the self-monitoring strategy was effective across different types of tasks through generalization. Studies also showed that self-monitoring can be applied to various skills and consequently enhanced the performances in generalization. (Agran et al., 2005; Agran et al., 2010).
Browder and Cooper-Duffy (2003) believed that such effectiveness demonstrated in generalization can confirm that students have successfully learned the skills. The current results revealed that the participants did complete different tasks through self-monitoring.

The first step of the self-monitoring teaching strategy required participants to choose their preferred task before introducing the intervention, which increased their learning motivation. As Lee et al. (2009) reported that students needed to continue focusing on the goals they set for themselves. Choosing a preferred task has a positive impact on the self-determination performance of individuals with disabilities. Lee et al. (2006) suggested that before starting instruction, teachers may need to teach students how to set a goal by guiding them to choose a goal from some possible options and state the goal statement prior to working on it. In the current study, the researcher simply asked the participants which task they wanted to complete and then observed their decision-making process. For example, Chi was tall and therefore chose to clean the ceiling; Hui chose to clean the window, because she had not cleaned a window for a long time. Selznick and Savage (2000) reported that the decision-making and reasoning process may vary across individuals. The process of choosing a task should be empha-

### TABLE 1
Social Validity Results of Open-Ended Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answers</th>
</tr>
</thead>
</table>
| 1. What are the benefits of learning the self-monitoring strategy for students? | “When students’ tasks are interrupted and the on-task behaviors stop, students can come back to complete their tasks by using the self-monitoring sheet.” (Teacher A)  
“The strategy enables students to understand the steps of the tasks” (Teacher C)  
“The self-monitoring strategy can train students to control the completion of their tasks.” (Teacher D) |
| 2. Which curriculum and context are appropriate for using the self-monitoring strategy? | “Employment specialists can teach students to use the self-monitoring strategy to monitor their performance at the workplace.” (Teacher F)  
“Students can also learn the self-monitoring strategy at home. If students practice the self-monitoring strategy in different contexts, they can generalize the strategy to workplaces.” (Teacher A)  
“In addition to developing job skills, tasks that illustrate sequences with pictures and written directions are appropriate to teach students by using the self-monitoring strategy.” (Teacher D)  
“The self-monitoring strategy is also appropriate for static tasks such as solving math questions.” (Teacher B) |
| 3. Do you have other suggestions (for example, suggestions for overcoming difficulties in teaching the self-monitoring strategy)? | “A self-monitoring instrument can record the time, including the start and end times of a task. By recording the time, students can monitor their completion performance and speed.” (Teacher E) |

### TABLE 2
Social Validity Results of Quantitative Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I will instruct students to learn how to use the self-monitoring strategy for improving performance.</td>
<td>4.83</td>
</tr>
<tr>
<td>2. I believe the self-monitoring strategy is effective.</td>
<td>4.67</td>
</tr>
<tr>
<td>3. I am willing to incorporate the self-monitoring strategy into my teaching plan.</td>
<td>4.67</td>
</tr>
<tr>
<td>4. I believe students can perform better after learning the self-monitoring strategy.</td>
<td>4.17</td>
</tr>
<tr>
<td>5. I believe students can be more confident after learning the self-monitoring strategy.</td>
<td>4.33</td>
</tr>
<tr>
<td>6. I believe students can be more focused in class after learning the self-monitoring strategy.</td>
<td>4.17</td>
</tr>
</tbody>
</table>
sized because the mental process for choosing a specific task could influence participants’ learning motivation. Schunk and Zimmerman (2008) described that motivation was very critical to lead the performance of self-monitoring; teachers should observe the process of choosing a preferred task to understand the specific reasoning. Other steps of the self-monitoring teaching strategy — deciding actions, modeling, practicing with feedback, and practicing without feedback — also influenced the task completion process. The step of deciding actions helped the participants learn to determine which response was expected and appropriate for completing the task. The instructor’s modeling also guided the participants to follow the entire process of self-monitoring. The modeling showed participants how to monitor themselves through the visual prompts and rhymes. When the participants practiced the strategy independently without feedback from the instructor, visual prompts and rhymes reminded them of appropriate actions for completing the tasks. As Lee et al. (2006) described, visual prompts, such as pictures or photos, are useful when learning new skills.

The current study took learning characteristics into consideration. From observation, although all the participants were diagnosed with moderate ID, they had different learning characteristics and levels of motivation, which influenced the learning process. Hui’s performance was the highest among all participants; she had active motivation and attitude toward learning, expected to learn the self-monitoring strategy, and liked the task she chose before beginning the formal research. Lee et al. (2009) suggested that self-monitoring is a useful skill to guide students to understand their goals. Once they focus on their goals, their confidence can be strengthened. Thomas (1996) also stated that students with intellectual disability need more successful experiences as encouragements to build up confidence. By learning the self-monitoring strategy, Hui gained confidence and completed tasks faster than she did previously. Hung also had a strong motivation and attitude toward learning. He completed tasks actively with a smile. However, he did not understand how to review the completion of his tasks and, therefore, made a few mistakes, such as ignoring important actions and forgetting to place the token for recording. After Hung learned the self-monitoring strategy, his percentage of incorrect responses decreased. Chi was distracted easily by interruption; therefore, he required additional time to focus on completing the tasks. Although he took more time, he still could complete the tasks by using the self-monitoring strategy. The preferred reinforcement of the participants might also affected their responses. Chi required reinforcement as a motivation to complete his tasks. However, Hui and Hung could complete the tasks without any tangible reinforcement. Hughes et al. (2002) reported that self-monitoring alone can help participants improve the target behaviors so the external reinforcement might not be needed in the process of implementing self-monitoring strategy. In the current study, the self-monitoring sheet provided the participants a sense of achievement and motivated them to work on the tasks. The results serve as a reminder for teachers that the self-monitoring strategy leads to heightened awareness of on-task behaviors and subsequent improvement without tangible reinforcements.

In conclusion, the self-monitoring strategy is a student-directed learning strategy to help them monitor their learning process. The ultimate goal is to help students assume more ownership of their learning. When teachers design similar strategies, they should consider functional purposes and the learning characteristics of individuals with intellectual disability. Self-monitoring enhances students’ motivation by transferring the ownership of data collection from teachers to students and, thus, permits students to evaluate their own performance, which leads to the possibility of self-determination.

Limitations

There are several limitations to this current study that warrant serious attention. First, although the effects of the strategy were investigated across three participants with individual differences, the results should not be overly overgeneralized. Second, the first author consulted school teachers when developing the strategy. However, it was possible that, although participating teachers generally...
valued the teaching strategy and the process of self-monitoring, their positive perspectives might come from supporting the researcher’s time and efforts in the preparation of the materials. Therefore, caution is warranted when interpreting the social validation. Third, self-monitoring is a student-directed learning strategy; the researcher did not collect data on the participants’ perceptions regarding their use of the strategy. Fourth, in the current study, procedural fidelity data were not collected, only interobserver agreement data were collected. Because both measures followed the same sequence in the task, the researcher thought that presenting interobserver agreement was sufficient. However, the lack of the procedural fidelity does represent a limitation of the study.

**Future Directions**

Future research may replicate this study with individuals with severe disabilities. Such replications would evaluate the effectiveness of the self-monitoring strategy for individuals with severe disabilities. More studies about other changes or modifications are needed when teaching individuals with severe disabilities self-monitoring. Second, future research should also emphasize the perceptions from participants themselves because self-monitoring is a student-directed learning strategy. Third, social validation data from caregivers and employers are also important because the application of this strategy in different settings can be considered. Social validation from a diverse population can help teachers design more applicable strategies in a real situation. Finally, to encourage teachers to teach self-monitoring or incorporate the self-monitoring strategy into their instructions, we suggest that school teachers form learning communities in which they can discuss how to design materials and cooperate with each other to teach self-monitoring; such an approach can also motivate school teachers to realize the importance of applying self-monitoring strategies.

**References**


Training in Mental Retardation and Developmental Disabilities, 37, 262–72.

Received: 26 April 2018
Initial Acceptance: 21 June 2018
Final Acceptance: 19 August 2018
Comparing No-No Prompt to Flexible Prompt Fading to Teach Expressive Labels to Individuals Diagnosed with Autism Spectrum Disorder

Justin B. Leaf and Joseph H. Cihon
Autism Partnership Foundation and Endicott College

Julia L. Ferguson, Ronald Leaf, and John McEachin
Autism Partnership Foundation

Abstract: This study compared no-no prompt to flexible prompt fading to teach four children diagnosed with autism spectrum disorder expressive labels. Using an adapted alternating treatment design, we evaluated the effectiveness of both systems to teach each participant to expressively label 10 pictures of athletes. The researchers evaluated the effectiveness, preference, and responding during teaching trials and probe trials for each participant across the two teaching conditions. Results indicated that both prompting procedures were effective, that no-no prompt was more preferred than flexible prompt fading for the majority of participants, and that flexible prompt fading resulted in a higher percentage of correct responding during teaching trials. The results are discussed as it applies to clinical implications and areas for future research.

Prompting has been defined as antecedent manipulations that increase the likelihood of the desired response on a given teaching opportunity or trial (Green, 2001; Grow & Le Blanc, 2013; MacDuff, Krantz, & McClannahan, 2001; Wolery, Ault, & Doyle, 1992). Prompting has been further classified into response prompting that operate directly on a response and stimulus prompts that operate directly on the stimuli associated with the task (see Cooper, Heron, & Heward, 2007 for a detailed description). For the purposes of this paper, “prompting” will be used to describe a general class of antecedent events to increase the likelihood of the desired response. Prompting can include gesturing to the correct stimulus (e.g., pointing to the picture of a book in an array of pictures after stating, “Where is the book?”; Kodak & Paden, 2015), stating the desired response (e.g., stating “book” after asking “What is this?” while holding up a book; Haq & Kodak, 2015), stating part of the desired response (e.g., stating “buh” after asking “What is this?” while holding up a book; Williams, Donley, & Keller, 2000), placing the correct stimulus closer to the learner (e.g., Leaf et al., 2016b), and providing multiple alternatives (e.g., stating “Is this a book, apple, or car?” after holding up a picture of a book; Leaf et al., 2016c).

Researchers have developed and evaluated a variety of prompting systems including least-to-most (LTM; e.g., Libby, Weiss, Bancroft, & Ahearn, 2008), most-to-least (MTL; e.g., Leaf et al., 2014a), constant time delay (CTD; see Walker, 2008, for a review), progressive time delay (e.g., Loughrey, Betz, Majdalany, & Nicholson, 2014), and simultaneous (e.g., Leaf, Sheldon, & Sherman, 2010). Prompting systems help guide interventionists when to provide prompts, fade prompts, and decide which prompts to provide. Two additional prompting systems which have been empirically evaluated are no-no prompt (e.g., Leaf et al., 2010) and flexible prompt fading (Soluaga, Leaf, Taubman, McEachin, & Leaf, 2008).

No-no prompt is a teaching procedure with which an interventionist first provides an opportunity for the learner to engage in a response without prompting. If the learner responds correctly, the interventionist provides reinforcement. If the learner responds incorrectly, the interventionist provides corrective feedback (e.g., saying “No that is not it”) followed by a remedial trial. In the remedial trial,
the interventionist provides the same instruction, does not provide a prompt, and provides consequences the same way as in the original trial. If the learner fails the first remedial trial, the interventionist implements a final remedial trial that includes a controlling prompt (i.e., a prompt ensuring the learner responds correctly 100% of the time) immediately following the instruction.

No-no prompt has been clinically implemented for several years (Leaf et al., 2010) but was not empirically evaluated until 2010. Specifically, Leaf and colleagues (2010) compared no-no prompt to simultaneous prompting in a one-to-one discrete trial teaching format to teach four individuals diagnosed with autism spectrum disorder (ASD) to receptively identify stimuli in a two-choice discrimination. The participants in this study were taught a variety of skills including math facts, answering why questions, and object labels. Participants were taught six to eight skills with no-no prompt and six to eight skills with simultaneous prompting. The results of a parallel treatment design showed that all four participants learned all the targets taught with no-no prompt. Only one participant learned two out of eight targets with the simultaneous prompting procedure. Thus, the results demonstrated that no-no prompt was more effective than simultaneous prompting.

In a follow-up study Leaf and colleagues (2011) evaluated no-no prompt to teach five children, four diagnosed with ASD and one typically developing child, to expressively label pictures of emotions (i.e., excited, bored, surprised, and confused). In this study, the authors implemented no-no prompt in a group discrete trial instructional format. Within the study, participants were directly taught one or two emotions and two emotions were evaluated through observational learning. The results of the study showed that all participants learned the emotions directly taught in an average of five sessions. Additionally, the results demonstrated that the participants also learned the emotions not directly taught, but acquired through observing other participants. Thus, the results of this study indicate that no-no prompt is an effective prompting system for teaching receptive labels and for teaching expressive labels.

Fentress and Lerman (2012) conducted a third study comparing no-no prompt to most-to-least prompting for four children diagnosed with ASD. In this study, the authors taught the participants receptive labels, motor imitation, expressive labels, and matching tasks. The results indicated that participants learned all the skills taught in both conditions; however, the participants learned the skills more efficiently (i.e., number of teaching sessions) in the no-no prompt condition. Thus, the results across three studies have demonstrated that no-no prompt can be an effective prompting system for individuals diagnosed with ASD.

A second prompting system which has been implemented clinically for numerous years, but only recently has been empirically evaluated, is flexible prompt fading. Unlike no-no prompt and other prompting systems (e.g., most-to-least, least-to-most, and constant time delay), which clinicians have to follow strict protocols, flexible prompt fading allows interventionists to use in-the-moment assessment to make clinical judgments about when to prompt, when to fade prompts, and what prompt to provide. Although interventionists implementing flexible prompt fading do not follow to a strict protocol, these decisions are not arbitrary in that there are several guidelines that help guide the interventionist as to when to prompt, when to fade prompts, and what types of prompts to provide. These guidelines include, but are not limited to, keeping the learner responding correctly on 80% of trials or more, relying on past performance (e.g., data), evaluating the learner’s attending behavior (e.g., scanning the materials, sitting in chair, responding to instructions) evaluating the learner’s interfering behavior, and evaluating the novelty of the targets. Additional guidelines for flexible prompt fading have been described by Leaf and McEachin (1999) and in other commentaries (Leaf, Cihon, Leaf, McEachin, & Taubman, 2016a; Leaf et al. 2016d).

Flexible prompt fading was implemented as the primary prompting system during the Lovaas UCLA Young Autism Project (Leaf & McEachin, 2016), but the prompting system was not specifically evaluated during that time. It was not until 2008 when Soluaga and colleagues conducted the first empirical study which compared flexible prompt fading
to constant time delay to teach five children diagnosed with ASD receptive labels. In this study, the interventionist was constrained to only using five different prompt types (i.e., physical, pointing, modeling, positioning prompts, and field reduction prompts) as part of flexible prompt fading. Both flexible prompt fading and the constant time delay procedure were used during discrete trial teaching and implemented in a one-to-one instructional format. The results of a parallel treatment design showed that both prompting procedures were effective and overall FPF was slightly more efficient (i.e., trials, sessions, and time) across participants.

Since Soluaga, Leaf, Taubman, McEachin, & Leaf (2008) there have been two other studies which have compared flexible prompt fading to other prompting systems or error correction procedures for children diagnosed with ASD. Leaf, Leaf, Taubman, McEachin, and Delmolino (2014b) compared flexible prompt fading to an error correction procedure to teach four participants to expressively label pictures of Muppet characters. The results of this study demonstrated that both procedures were effective, and resulted in high levels of maintenance, but flexible prompt fading was the more efficient procedure (number of teaching sessions). In another study, Leaf and colleagues (2016c) compared flexible prompt fading to most-to-least prompting to teach three children diagnosed with ASD how to expressively label movie characters, cartoon characters, and locations. The results of this study indicated that both prompting systems were effective to teach the participants new skills, but flexible prompt fading was more efficient in terms of sessions to mastery. Overall, the research conducted on flexible prompt fading has demonstrated that it is an effective and efficient prompting system for individuals diagnosed with ASD.

To date, the literature has demonstrated that both no-no prompt and flexible prompt fading are effective prompting systems in the context of discrete trial teaching. However, there are no studies comparing no-no prompt to flexible prompt fading for individuals with or without ASD. It is important that researchers compare different prompting systems for individuals diagnosed with ASD help identify the conditions under which different prompting systems are more effective, efficient, and preferred by the learner. Therefore, the purpose of this study was to compare no-no prompt to flexible prompt fading to teach expressive labels to four children diagnosed with ASD.

Method

Participants, Setting, and Researcher

Paige was a 5-year-old girl with an independent diagnosis of ASD. Paige had a Wechsler Preschool and Primary Scale of Intelligence-Third Edition (WPPSI-III; Wechsler, 2002) FSIQ score of 126, a Vineland-II Adaptive Behavior Scales Survey Interview Form (VABS-II; Sparrow, Cicchetti, & Balla, 2005) adaptive behavior score of 80, an Expressive One-Word Picture Vocabulary Test (EOWPVT; Martin & Brownell, 2010) standard score of 145, and a Peabody Picture Vocabulary Test-4th Edition (PPVT-4; Dunn & Dunn, 2007) standard score of 109, and an EOWPVT standard score of 97. Logan was a 7-year-old boy independently diagnosed with ASD. Logan had a WPPSI-III FSIQ score of 64, a VABS-II standard score of 55, a EWOPVT standard score of 86, and a PPVT standard score of 77. Bart was an 8-year-old boy independently diagnosed with ASD. Bart had an EOWPVT standard score of 118, and a PPVT standard score of 106.

All sessions were conducted in a room (approximately $4.5 \times 5.3$ m) located within a private clinic in southern California that provides intervention based on the principles of behavior analysis for individuals diagnosed with ASD. The room included a child-sized table and chairs, adult-sized desks and chairs, video camera, treasure chest (described below), and other furniture (e.g., desks, bookcases, and a couch). The research was conducted by two researchers both who had a Masters Degree in Behavior Analysis and both who were Board Certified Behavior Analysts. Both researchers had over five years of experience implementing behavior intervention for individuals diagnosed with ASD.
Stimuli

The researchers selected pictures of athletes to target throughout the intervention. Each participant was taught to expressively label pictures of athletes (e.g., Aaron Rodgers, Todd Gurley, LeBron James). The researchers selected the target stimuli through interviews with each of the participant’s parents and/or clinical supervisor (i.e., the person in charge of the participant’s clinic and school program curriculum). It was determined through these interviews that knowledge of popular athletes was important as the participants’ peers were interested in sports. Two sets of 10 pictures of athletes (i.e., a total of 20 pictures) were selected for inclusion in the study. Each set was divided and randomly assigned to each teaching condition. As such, Set 1 consisted of five pictures assigned to the no-no prompt condition (i.e., NNP-1) and five pictures assigned to the flexible prompt fading condition (i.e., FPF-1). Set 2 consisted of five pictures assigned to the no-no prompt condition (i.e., NNP-2) and five pictures assigned to the flexible prompt fading condition (i.e., FPF-2). To ensure the participants had no prior history with the athletes’ names prior to inclusion in the study, baseline sessions were conducted. During these sessions, each target within the set (i.e., 10 athletes) was presented twice (i.e., 20 total trials per set). Three probes occurred for Set 1 and six probes occurred for Set 2. During the first intervention session across both sets and conditions, the athlete pictures were introduced in pairs.

Dependent Variable and Data Collection

The primary dependent variable was correct responses to the target stimuli as measured during daily probe trials (described later). A correct response was defined as engaging in a vocal response that corresponded with the presented stimulus within 5 s of its presentation (e.g., saying “Yadier Molina” in the presence of the picture of Yadier Molina). An incorrect response was defined as engaging in a vocal response that did not correspond with the presented stimulus within 5 s of its presentation (e.g., saying “Buster Posey” in the presence of the picture of Yadier Molina). Finally, a no response was defined as not engaging in any vocal response within 5 s of the presented stimulus. For the purposes of this study a target was considered mastered when a participant engaged in 100% correct responses on all trials across three consecutive daily probe sessions.

Another dependent variable that was assessed was participant responding during teaching trials across the two conditions. During teaching trials, correct, incorrect, and no response were defined as stated above during daily probe trials. However, two additional responses were measured during teaching trials. A prompted correct response was defined as engaging in a vocal response that corresponded with the presented stimulus within 5 s of its presentation following a prompt (e.g., saying “Yadier Molina” in the presence of the picture of Yadier Molina after the interventionist said, “Is this Yadier Molina or Buster Posey?”). A prompted incorrect response was defined as engaging in a vocal response that did not correspond with the presented stimulus within 5 s of its presentation following a prompt (e.g., saying “Buster Posey” in the presence of the picture of Yadier Molina after the interventionist said “Is this Yadier Molina or Buster Posey?”).

Paired Stimulus Preference Assessment

Prior to intervention, a single paired stimulus preference assessment (Fisher et al., 1992) was implemented to identify two colors that were least- or non-preferred. A total of five colors (i.e., green, brown, blue, orange, purple) were evaluated using the paired stimulus preference assessment. During, the paired stimulus preference assessment the researcher held up two papers displaying a different color (one in each hand) and asked the participant to select her or his favorite. This continued until all colors were paired with each other. The two colors selected on one or fewer trials (i.e., least, or non-preferred) were randomly assigned to each condition. Although not experimentally evaluated, anecdotally the participants could match the color mat that corresponded to the two teaching conditions.

Baseline Sessions

During these sessions, each target with a set (i.e., 10 athletes) was presented twice (i.e., 20
A trial consisted of the researcher holding up the picture of the athlete in view of the participant. Next, the researcher provided an instruction (e.g., “What is his name?,” “who is this?”) and provided 5 s for the participant to respond. The researcher provided neutral feedback (e.g., “Thanks” or “Okay”) regardless of the participant’s response. No prompts, primes, programmed reinforcement, or corrective feedback were provided. Three probes occurred for Set 1 and six probes occurred for Set 2.

Daily Probe Sessions

Daily probe sessions occurred prior to each teaching session. The targets were randomized and only targets that were currently receiving intervention were included during daily probe sessions. Depending on participant responding, daily probe session could include from one to four targets. Each target received a total of two probe trials. Thus, the number of probe trials during a daily probe session ranged from two to eight. Following a daily probe session, the participant was provided with a 1 min break before the researcher implemented the first intervention condition. This was followed by another 1 min break and then the researcher implementing the second intervention condition. With the exception of the first intervention session, daily probes were conducted prior to each intervention session (i.e., the first data point during intervention represents one day of intervention).

Teaching Procedures

No-no prompt. The no-no prompt condition began with the researcher placing a colored sheet of paper in front of the participant that indicated the condition. In the no-no prompt condition, the participant had two trials to respond correctly prior to an echoic prompt on the third trial. Trial order of the targets was randomized and predetermined prior to each teaching session. The researcher began each session by holding up a picture of the predetermined target within eyesight of the participant and providing an instruction (e.g., “Who is it?”). If the participant responded correctly, the researcher provided praise and two tickets, and moved on to the next planned target. If the participant responded incorrectly, the researcher provided corrective feedback (e.g., “No”) followed by a remedial trial. During the first remedial trial, the same picture was held up and the same instruction was provided. If the participant responded correctly the researcher provided praise, one ticket, and moved on to the next target. If the participant responded incorrectly on this remedial trial, the researcher provided corrective feedback (i.e., “No”) followed by a second remedial trial. On the second remedial trial the researcher held up the same picture, provided the same instruction, and immediately provided an echoic prompt. If the participant responded correctly, the researcher provided praise and one ticket. If the participant responded incorrectly on the second remedial trial, the researcher provided corrective feedback (i.e., “No”) and move onto the next predetermined target. There was a total of 20 teaching trials in the no-no prompt condition. It should be noted that all remedial trials were counted as a teaching trial. Therefore, if there were remedial trials within the session the number of planned trials was reduced so that the total of planned trials plus remedial trials would equal 20.

Flexible prompt fading. The flexible prompt fading condition started with the researcher placing a colored sheet of paper in front of the participant that indicated the condition. Trial order of the targets was randomized and predetermined prior to each teaching session. Similar to the no-no prompting condition, there was a total of 20 teaching trials in the flexible prompt fading condition. The researcher would then implement a teaching trial by holding up a picture of the predetermined target and providing an instruction (e.g., “Who is this?”). If the participant responded correctly without a prompt, the researcher provided praise, two tickets, and moved on to the next trial with the next target. If the participant responded correctly with a prompt, the researcher provided praise, one ticket, and moved on to the next trial with the next target. If the participant responded incorrectly with or without a prompt, the researcher provided corrective feedback (e.g., “Nope, that’s not it”) and moved on to the next trial with the next target. Flexible
prompt fading was used on all trials in which a prompt was provided. That is, the researcher used clinical judgment to determine when and when not to prompt, how to fade prompts, and what types of prompts to provide (Lerman, Valentino, & LeBlanc, 2016).

Although clinical judgement was used with respect to prompting, several guidelines were provided. First, the researcher was instructed to attempt to occasion correct participant responding (i.e., prompted or unprompted) on at least 80% of teaching trials per session. Second, the researcher was instructed to provide a prompt if s/he judged that the participant was unlikely to respond correctly and not to provide a prompt if s/he judged that the participant was likely to respond correctly. There were several variables that the researcher responded to when assessing the likelihood of a correct or incorrect response including, but not limited to, (a) recent performance; (b) past performance, (c) attending, (d) motivation, (e) novelty of the target, (f) non-verbal behavior (e.g., smiling), and (g) the presence or absence of interfering behaviors. If a prompt was provided, the researcher could select from any and all prompts (e.g., full or partial echoic, multiple alternatives, etc.). The researcher was instructed to transfer stimulus control from the prompt to the instruction alone (e.g., “What’s his name?”) as quickly as possible.

**Token Economy**

Participants earned two tickets for correct independent responding and one ticket for correct prompted responses across both teaching conditions. Participants earned tickets across both teaching conditions and could cash-in tickets after both teaching conditions were completed. The participant could earn a total of 80 tickets per session (i.e., 40 tickets per teaching condition). If a participant reached mastery on all targets for a given teaching condition, the researchers provided 40 tickets for that condition. If a participant had only one target remaining in any given teaching condition the researcher provided the participant with 20 tickets. If the participant earned 72 or more tickets, s/he could select a toy from a treasure chest to take home. The treasure chest contained several toys (e.g., princess stickers, silly putty, sticky hands, plastic bracelets) selected based on participant preferences identified through observation and interviews with the staff, supervisors, and caregivers. If the participant earned 60 to 71 tickets, s/he could select a toy from the treasure chest to play with for 5 min. If the participant earned 40 to 59 tickets the participant could select a toy from the treasure chest to play with for 1 min. If the participant earned under 40 tickets they received no reinforcement.

**Experimental Design**

An adapted alternating treatment design replicated across participants and sets was used to compare no-no prompt to flexible prompt fading. Within an adapted alternating treatment design a baseline condition is not needed, however we implemented three baseline sessions for Set 1 and six baseline sessions for Set 2 to further demonstrate that correct responding was low prior to intervention across sessions. Within the design, two targets were initially introduced for no-no prompt and two targets were initially introduced for flexible prompt fading. Once a participant reached the mastery criteria (i.e., 100% correct responding on daily probe trials across three consecutive sessions) on a single target, the researchers then introduced a new target. This continued until all five targets for no-no prompt and all five targets for flexible prompt fading were introduced and had reached the mastery criterion.

**Interobserver Agreement**

The researcher scored participant responding during every baseline, daily probe, no-no prompt, and flexible prompt fading teaching session. A second observer independently recorded participant responses during 48.4% (range, 25 to 87.5% across participants) of baseline sessions, 42.2% (range, 25.5% to 68.4% across participants) of daily probe sessions, 47.5% (range, 27.9 to 73.6% across participants) of no-no prompt sessions, and 49.2% (range, 30 to 73.6% across participants) of flexible prompt fading sessions. Interobserver reliability was scored in-vivo and through videotaped sessions. Interobserver agreement was calculated by totaling the number of agreements (i.e., trials in which
both observers scored the same response) divided by the number of agreements plus disagreements (i.e., trials in which the two observers scored a different participant response) and converting this ratio to a percentage. Percentage agreement across all participant responses was 100% for baseline, 99.7% (range, 87.5 to 100% across sessions) for daily probes, 100% for no-no prompt sessions, and 100% for flexible prompt fading sessions across all participants and sets.

Treatment Fidelity

Treatment fidelity was collected for correct researcher behavior during baseline, daily probe, no-no prompt, and flexible prompt sessions. Correct researcher behavior during probe trials in baseline and daily probe sessions was defined as: (1) the researcher holding up the picture within the participant’s view; (2) the researcher delivering an instruction (e.g., “Who is this?”); (3) the researcher providing 5 s for the participant to respond; and (4) the researcher providing neutral praise (e.g., “Thanks,” “Alright”) regardless of accuracy.

During no-no prompt sessions, correct researcher behaviors were defined as: (1) the researcher holding up the picture within the participant’s view; (2) the researcher delivering an instruction (e.g., “Who’s this?”); (3) the researcher providing 5 s for the participant to respond; (4) the researcher providing an echoic prompt only on the second remedial trial; (5) the researcher providing praise for correct responses; (6) the researcher providing the correct amount of tickets for a correct response; and (7) the researcher providing corrective feedback (e.g., “No, that is not it”) and no tokens if the participant responded incorrectly.

During flexible prompt fading trials, correct researcher behaviors were defined as: (1) the researcher holding up the picture within the participant’s view; (2) the researcher delivering an instruction for the participant to name the athlete; (3) the researcher providing approximately 5 s for the participant to respond; (4) the researcher providing praise for correct responses; (5) the researcher providing corrective feedback (i.e., “No, that is not it”) and no tokens if the participant responded incorrectly; (7) the researcher ensuring that the participant responded correctly (prompted or unprompted) in at least 80% of the teaching trials.

To measure treatment fidelity, an independent observer recorded correct researcher behaviors 36.3% (range, 25 to 50% across participants) during baseline sessions, 39% (range, 25.6 to 52.6% across participants) during daily probe sessions, 36% (range, 28.5 to 52.6% across participants) during no-no prompt sessions, and 33.8% (range, 29.9 to 52.6% across participants) during flexible prompt fading sessions. Treatment fidelity was 100% for baseline sessions and daily probe sessions, 99.8% (range, 95 to 100%, across sessions) for no-no prompt sessions, and 99.8 (range, 95 to 100%, across sessions) for flexible prompt fading sessions.

Social Validity

Participant preference for the two teaching conditions was assessed using a concurrent chains arrangement (Hanley, 2010). Within this arrangement each teaching condition was assigned a color determined from a paired stimulus preference assessment (described previously). On every third session, the participant was presented with a choice of which color s/he wanted to occur first. Whichever condition the participant selected was assumed to be the most preferred.

Results

Skill Acquisition

The primary dependent variable was mastery of the targets within the two teaching conditions as determined through correct responses during daily probe sessions. These results are displayed in Figure 1 and Figure 2. While Paige mastered all targets across both teaching conditions, her results were idiosyncratic across sets. For Set 1, Paige mastered all targets across both teaching conditions, her results were idiosyncratic across sets. For Set 1, Paige mastered all targets across both teaching conditions, her results were idiosyncratic across sets. For Set 2, Paige mastered targets in the flexible prompt fading condition faster. For Set 2, Paige mastered targets in the no-no prompt condition faster. Ryan mastered all targets across both teaching conditions. The results for Ryan showed no differences between the no-no prompt and flexible prompt fading conditions. That is, Ryan mastered targets in both teaching conditions.
across both sets of stimuli within the same number of sessions. Logan mastered all targets across both teaching conditions, but his results were idiosyncratic across sets. Logan mastered targets in Set 1 across both teaching conditions in the same number of sessions. However, Logan mastered targets in Set 2 faster in the flexible prompt fading condition. Bart also mastered all targets across both teaching conditions. Across both sets of stimuli, Bart mastered targets faster in the no-no prompt condition.

**Responding During Teaching**

Tables 1 and 2 detail participant responding on teaching trials during no-no prompt and flexible prompt fading, respectively. Within the no-no prompt condition, the percent of...
correct independent responding across all participants was 69.7% (range, 56% to 83.9%). Overall correct responding during no-no prompt (i.e., independent and prompted correct responding), across all participants was 79.4% (range, 69.3% to 89.4%). The overall percent of incorrect responding (i.e., independent and prompted incorrect responding) across all participants for no-no prompt was 20.6% (range, 10.6% to 30.7%). Within the flexible prompt fading condition, the percent of correct of independent responding across all participants was 83% (range, 75.4% to 92%). Overall correct responding during flexible prompt fading (i.e., independent and prompted correct responding), across all participants was 96% (range, 94.3% to 98.7%). The overall percent of incorrect responding (i.e., independent and prompted incorrect responding) for flexible prompt fading was...
fading across all participants was 4% (range, 1.3% to 5.7%).

Teaching Procedure Preference

Figure 3 depicts participant preference for each teaching condition. Paige selected no-no prompt and flexible prompt fading condition on an equivalent number of opportunities during Set 1 teaching and selected flexible prompt fading more during Set 2 teaching. Logan selected no-no prompt and flexible prompt fading an equivalent number of times during Set 1 teaching and no-no prompt one more time than flexible prompt fading during Set 2 teaching. Bart selected no-no prompt more frequently than flexible prompt fading during Set 1 teaching and flexible prompt fading more frequently than no-no prompt during Set 2 teaching. Overall, no-no prompt was selected more often than

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant Responding During Teaching Trials for No-no prompt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Set</th>
<th>% Correct</th>
<th>% Incorrect</th>
<th>% Prompted Correct</th>
<th>% Prompted Incorrect</th>
<th>% Overall Correct</th>
<th>% Overall Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paige</td>
<td>1</td>
<td>76.8%</td>
<td>15.9%</td>
<td>7.3%</td>
<td>0%</td>
<td>84.1%</td>
<td>15.9%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>80%</td>
<td>13.6%</td>
<td>6.4%</td>
<td>0%</td>
<td>86.4%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>78.4%</td>
<td>14.7%</td>
<td>6.9%</td>
<td>0%</td>
<td>85.3%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Ryan</td>
<td>1</td>
<td>81.8%</td>
<td>11.8%</td>
<td>6.4%</td>
<td>0%</td>
<td>88.2%</td>
<td>11.8%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>85.8%</td>
<td>9.4%</td>
<td>4.8%</td>
<td>0%</td>
<td>90.6%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>83.9%</td>
<td>10.6%</td>
<td>5.5%</td>
<td>0%</td>
<td>89.4%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Logan</td>
<td>1</td>
<td>58.7%</td>
<td>28.7%</td>
<td>12.1%</td>
<td>0.5%</td>
<td>70.8%</td>
<td>29.2%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>53.6%</td>
<td>31.8%</td>
<td>14.6%</td>
<td>0%</td>
<td>68.2%</td>
<td>31.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>56%</td>
<td>30.4%</td>
<td>13.3%</td>
<td>0.3%</td>
<td>69.3%</td>
<td>30.7%</td>
</tr>
<tr>
<td>Bart</td>
<td>1</td>
<td>68.6%</td>
<td>21.7%</td>
<td>9.7%</td>
<td>0%</td>
<td>78.3%</td>
<td>21.7%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>73.6%</td>
<td>16.3%</td>
<td>10.1%</td>
<td>0%</td>
<td>83.7%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>71.4%</td>
<td>18.6%</td>
<td>10%</td>
<td>0%</td>
<td>81.4%</td>
<td>18.6%</td>
</tr>
<tr>
<td>All Participants Total</td>
<td></td>
<td>69.7%</td>
<td>20.5%</td>
<td>9.7%</td>
<td>0.1%</td>
<td>79.4%</td>
<td>20.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant Responding During Teaching Trials for Flexible Prompt Fading</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Set</th>
<th>% Correct</th>
<th>% Incorrect</th>
<th>% Prompted Correct</th>
<th>% Prompted Incorrect</th>
<th>% Overall Correct</th>
<th>% Overall Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paige</td>
<td>1–2</td>
<td>82%</td>
<td>1.2%</td>
<td>15.8%</td>
<td>1%</td>
<td>97.8%</td>
<td>2.2%</td>
</tr>
<tr>
<td></td>
<td>3–4</td>
<td>88.6%</td>
<td>1.7%</td>
<td>8.6%</td>
<td>1.1%</td>
<td>97.2%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>85.3%</td>
<td>1.4%</td>
<td>12.3%</td>
<td>1%</td>
<td>97.6%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Ryan</td>
<td>1–2</td>
<td>90.5%</td>
<td>1.7%</td>
<td>7.8%</td>
<td>0%</td>
<td>98.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td></td>
<td>3–4</td>
<td>93.5%</td>
<td>0.7%</td>
<td>5.8%</td>
<td>0%</td>
<td>98.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>92%</td>
<td>1.3%</td>
<td>6.7%</td>
<td>0%</td>
<td>98.7%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Logan</td>
<td>1–2</td>
<td>73.9%</td>
<td>4.5%</td>
<td>20.3%</td>
<td>1.3%</td>
<td>94.2%</td>
<td>5.8%</td>
</tr>
<tr>
<td></td>
<td>3–4</td>
<td>76.7%</td>
<td>5%</td>
<td>17.8%</td>
<td>0.5%</td>
<td>94.5%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75.4%</td>
<td>4.8%</td>
<td>18.9%</td>
<td>0.9%</td>
<td>94.3%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Bart</td>
<td>1–2</td>
<td>81.9%</td>
<td>4.5%</td>
<td>12.1%</td>
<td>1.5%</td>
<td>94%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>3–4</td>
<td>89.6%</td>
<td>2.6%</td>
<td>7.3%</td>
<td>0.5%</td>
<td>96.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>85.7%</td>
<td>3.6%</td>
<td>9.7%</td>
<td>1%</td>
<td>95.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>All Participants Total</td>
<td></td>
<td>83%</td>
<td>3.1%</td>
<td>13%</td>
<td>0.9%</td>
<td>96%</td>
<td>4%</td>
</tr>
</tbody>
</table>
flexible prompt fading for three participants and one participant was indifferent.

**Discussion**

The purpose of this study was to compare no-no prompt to flexible prompt fading to teach four children diagnosed with ASD to expressively label pictures of athletes. Overall there was very little difference between the methods of prompting in terms of learners acquiring the skill. One participant (Ryan) mastered all 10 targets in exactly the same number of sessions across the two prompting procedures. Two participants, learned the 10 targets taught by NNP in fewer sessions than the 10 targets taught by FPF, Paige requiring one less session to learn her NNP targets and Bart requiring four fewer sessions to learn his NNP targets. Logan learned the 10 targets taught by FPF in three fewer sessions than the 10 targets taught by NNP. While both teaching conditions were effective, participant preference indicated that the majority of participants preferred no-no prompt. Finally, in terms of responding during teaching, flexible prompt fading resulted in a higher rate of correct responding during acquisition than no-no prompt, but this did not translate into fewer sessions to mastery. These results have

![Figure 3. Preference for two teaching conditions.](image-url)
important implications for clinical practice and future research.

First, although no-no prompt and flexible prompt fading have some empirical evaluations within the literature, the number of studies is far less than that of other prompting systems (e.g., most-to-least, least-to-most, progressive time delay). The results of this study are similar to previous research which have shown no-no prompt and flexible prompt fading are effective prompting systems. Given that numerous studies have now shown that both prompting systems are effective, and that studies have shown that both no-no prompt and flexible prompt fading can be more effective than other prompting systems, interventionists may wish to implement these prompting systems as part of clinical practice.

Second, since the results indicated limited differences between the two prompting procedures with respect to effectiveness, interventionists should consider variables other than effectiveness when selecting a prompting procedure. For instance, no-no prompt may be easier to implement and require less training. Therefore, no-no prompt may be more preferred for newer interventionists or when there is a limited amount of training time available. If, however, more training time is available or if the goal of training is to develop clinical judgement, flexible prompt fading may be more preferred. Interventionists could also take participant preference into account. This study evaluated preference using a concurrent chains arrangement; however, preference can be assessed in many other ways (e.g., affect). Regardless of how preference is assessed, if two prompting procedures are equally effective, participant preference could play a vital role in interventionist selection of one over the other.

Third, there were differences in participant responding during teaching and probes. Specifically, participants responded correctly on more teaching trials with flexible prompt fading. However, these results were not reflected during probe trials. It is likely that in most clinical settings teaching trials will be used to determine mastery opposed to non-reinforced probes, in which cases flexible prompt fading may be preferred. However, future researchers should attempt to evaluate variables contributing to the differences in responding during teaching trials and whether these differences are important. Identifying these variables could help inform the selection of mastery criteria across a wide variety of skills and learners.

Finally, the results of this study are similar to previous studies which have found the results to be idiosyncratic between prompting systems (e.g., Leaf et al., 2010). Therefore, the particular conditions under which a particular prompting system will be more or less effective remains unknown. Nonetheless, this, and other comparison studies, can help contribute to identifying some of the conditions under which various prompting procedures may be more or less effective and preferred. The use of an alternating treatment design (or, in this case, an adapted alternating treatment design), permit researchers to identify the conditions under which an intervention (or, in this case, a prompting system) is not or is less effective. If interventionists have similar conditions under which they are operating (e.g., learners with a similar profile, similar targets, similar instructional arrangement), this information can help inform them as to which prompting system to select and avoid. Future researchers should continue to conduct similar studies to continue to identify these conditions, which may help lead to the creation of assessment tools to guide interventionists to assess the conditions under which learning is occurring to select a prompting system.

This study is not without its limitations which may affect the clinical implications stated above. First, maintenance of labels taught within this study was not assessed. Therefore, it is unknown as to which prompting system may have resulted longer maintenance. Future researchers should include measures of maintenance when comparing different prompting systems. Second, the design of the study was atypical as new targets introduced after the mastery of a target as opposed to teaching all targets within a set then introducing a new set (e.g., Leaf et al., 2018). It is possible that introducing targets in this way may have yielded different results. Future researchers may wish to compare this method of introducing targets to other established approaches. Third, the participants in this study had fairly sophisticated behavioral repertoires and minimal interfering behavior.
It is possible that similar results may not be obtained with participants who displayed more problem behavior or had less developed behavioral repertoires (e.g., cognitive impairments). Fourth, it is difficult to operationally define what constitutes flexible prompt fading as it is left up to the researchers’ judgement. Therefore, there is no measurement system that could accurately portray if the provision of prompts and fading of prompts was done accurately. Thus, future researchers should look at ways to evaluate clinical judgment as it relates to prompting. Finally, we only compared the prompting systems for teaching expressive labels so it is not clear what the results would be for other commonly taught skills (e.g., matching, receptive labels, instruction following).

Despite these limitations, the results indicate that no-no prompt and flexible prompt fading were effective prompting systems to teach individuals diagnosed with ASD to expressively label athletes. Furthermore, the results showed idiosyncratic effects across participants and sets. Since, the effects were idiosyncratic it may be hard to know what prompting system an interventionist should implement. As such the interventionist might have to use clinical judgment which is a decision-making model derived from the medical field that “combines scientific theory, personal experience, patient perspectives and other insights” (Redelmeier, Ferris, Tu, Hux, & Schull, 2001, p. 358). From a behavior analytic perspective, clinical judgement can be described as a behavioral repertoire that consists of, at least in part, analyzing several variables (e.g., current responding, past history, function, health) and responding to the outcomes of these analyses in the best interest of the client. This study helps contribute to the emerging literature on the use of clinical judgement within applied behavior analysis (e.g., Cihon et al., 2018; Leaf et al., 2018).

References


Based Communication Assessment and Intervention, 7, 124–133.


Received: 25 July 2018
Initial Acceptance: 20 September 2018
Final Acceptance: 17 October 2018
Promoting Social Play Based on Ecological Assessment and Social Play Selection Conditions of a Child with Autism Spectrum Disorder in an Inclusive Early Childhood Classroom

Aya Fujiwara
University of Tsukuba

Shigeki Sonoyama
The University of Shimane

Abstract: Children with autism spectrum disorder (ASD) experience difficulties with social play. They have some limitations in learning play skills and playing with peers. This study examines the effects of intervention, in an inclusive classroom, based on ecological assessment and conditions of social play selection on the engagement in social play of a child with ASD. The conditions of selection in social play were investigated based on this ecological assessment. The results indicated that the target play selected according to these conditions could be incorporated into the classroom program, and that the participant increased his time engaged in social play and interactions with his peers.

Children with autism spectrum disorder (ASD) experience difficulties with social interaction, including social play (Hughes, 2010; Pierce-Jordan & Lifter, 2005; Wolfberg, DeWitt, Young, & Nguyen, 2015); they have some limitations in learning play skills and playing with peers (Holmes & Willoughby, 2005; Terpstra, Higgins, & Pierce, 2002). Therefore, without explicit support, they are likely to remain isolated and thus are deprived of the type of consistent interactive play experiences that encourage developmental growth and the acquisition of meaningful peer relationships (Bass & Mulick, 2007; Prendeville, Prelock, & Unwin, 2005; Wolfberg, Bottema-Beutel, & Dewitt, 2012; Yang, Wolfberg, Wu, & Hwu, 2003). Lack of interventions to increase engagement during play may cause them to miss critical classroom learning opportunities in early childhood (Nelson, Paul, Johnston, & Kidder, 2017). However, young children with ASD may have more opportunities to engage in a variety of play contexts with their peers if play skills are taught directly and systematically during daily classroom activities in natural environments (Jung & Sainato, 2013).

Several studies have been implemented to teach social play with peers to children with ASD in inclusive classrooms. These include teaching pretend play by time delay (Liber, Frea, & Symon, 2008), teaching games by video modeling (Jung & Sainato, 2015), teaching games by priming (Gengoux, 2015), and intervention in play in learning centers by peer mediation (Nelson & Nelson, 2007). Strategies for instruction in play skills have been studied, but the rationale for the selection of play skills taught in classrooms has not been clarified. Jung and Sainato (2013) proposed that acquisition and generalization of play skills may be affected by which play skills are taught, and that the careful selection of play activities may further encourage more spontaneous play among children with autism and their peers. Target social play taught in inclusive classrooms have been selected based on the preferences of children with ASD (Ganz & Flores, 2008; Liber et al., 2008), those which are common in classrooms (Licciardello, Harckik, & Luiselli, 2008; Nelson & Nelson, 2007), and the preferences of peers (Gengoux, 2015; Jung & Sainato, 2015). However, selection of target play in inclusive classrooms may be affected by classroom routines, classroom programs, number of peers and teachers, peers’ age, and the physical characteristics of the environment. Sonoyama (1996) suggested setting factors relating to inclusive education such as for children with disabilities, programs, children
without disabilities, teachers, and the physical aspects of the environment. These factors may affect the selection of target play in inclusive classrooms. Nelson et al. (2017) proposed that the time and structures involved in play interventions may be prohibitive in inclusive classrooms unless they can be incorporated into existing classroom routines. Assessment of routines and the classroom environment might therefore be needed to select target play.

Focusing on ecological assessment to assess routines and environment. Ecological assessment involves assessing and analyzing not only the responses of the learner, but also the various ecologies (Heron & Heward, 1988). An ecological assessment investigates physiological conditions, the physical aspects of the environment, interaction with other individuals, practitioner-client interaction, the home environment, and history of past reinforcements (Heward, 1987) through observations and interviews. Fujiwara and Sonoyama (2015, 2018a, 2018b) reported the effects of selection of and intervention in social play based on ecological assessments of children with ASD in inclusive classrooms. The results indicated that ecological assessment requires assessment items: (a) the preferences, social play level and cognitive level of play of the participant; (b) the preferences, social play level and cognitive level of play of his or her peers; (c) the human aspects and physical aspects of the play environment; and (d) the teacher’s rules governing play. The results suggested that the target play was selected based on conditions such as the play levels of children with ASD, the play levels of their peers, the play area, and whether or not an assistant was present.

The purpose of this study was to evaluate the effectiveness of selection of social play and interventions based on ecological assessments and the conditions of selection on a child with ASD at a kindergarten. The following research questions were addressed in this inquiry: (a) Can a child with ASD acquire social play skills in the classroom? (b) Did a child with ASD show an increase in the time they engaged in social play? and (c) Were there any changes in the interactions between a child with ASD and his or her peers?

Method

Participant

Ichiro was a 6-year-old Chinese male diagnosed with ASD and intellectual disability. He attended a regular education kindergarten three days per week. On the other days he attended a child development support center and university-based clinic. According to the 2001 Kyoto Scale of Psychological Development (Ikuzawa, Matsushita, & Nakase, 2002), his total developmental age was 1 year and 11 months (DQ38), his physical-motion age was 3 years 1 month, cognitive-adaptation age was 2 years 3 months, and verbal-social age was 10 months. On the Japanese version of the Vineland Adaptive Behavior Scales, Second Edition (Vineland; Sparrow et al., 2014), he obtained a global adaptive composite score of 35, a communication score of 36, a daily living score of 31, a socialization score of 32 and a gross and fine motor skills score of 45. He showed significant delays in all developmental areas. He could imitate one-step motor responses and short utterances and used picture cards to get play materials or snacks. He was able to classify balls or blocks as to shape and color. During classroom activities, he needed frequent support to attend to his tasks. When a song or music began, he often covered his ears. During the free play time he played alone, lifting up and pouring sand, and did not interact with the other children.

Peers

His peers were children in the class between 5 and 6 years old, comprising typically developing children and children with disabilities. Any peer wishing to participate in target play during intervention 1 and maintenance sessions was permitted; therefore, his peers varied in number between 1 and 22 according to the session. If his peers did not spontaneously participate in target play, the teacher and assistants invited children nearby to play. In intervention 2, his peers were all the children in his class.

 Interventionists

Intervention 1 was provided by the assistant and first author (the researcher). The assis-
tant had a license and experience as a kindergarten teacher. The researcher, who was a graduate student, had a license and two years’ experience as a kindergarten teacher. Intervention 2 was provided by the classroom teacher and the assistant. The classroom teacher had licenses as a kindergarten teacher and an elementary school teacher.

Setting

The study was conducted at a public kindergarten classroom located in a local city in Japan. The classroom enrolled children with and without disabilities between 5 and 6 years of age and held activities within the regular education program. The class had 22 typically developing children, a child with developmental delay and two children with ASD. The class had one classroom teacher and one assistant.

All sessions occurred during free play time in a classroom (26 feet × 16 feet). In free play time, children could play as they wanted with the materials available in the classroom (e.g., oil-based modeling clay, children’s books, drawing and board games).

Materials

In intervention 1 and maintenance, the “Imitation Game” used chairs. “Fortune Puzzle” comprised a 6 - 8 piece wooden peg puzzle, an opaque plastic box to put the pieces in and a table and chairs (see Figure 1, for setting up target play in intervention 1). On the back of each piece was written a phrase, such as “very good luck” or “bad luck”. In intervention 2, “Musical Chairs” used chairs, CDs of children’s songs and a CD player. “Fruit Basket” used one fewer chair than the number of participants, and fruit (apple, bananas and melon) shaped cards made of paper to hang around their necks.

Measurements

All sessions were videotaped by the researcher using a wearable camera. The sessions were then played back on a laptop computer to note dependent measures. Dependent measures were (a) percentage of correct performance in target play skills, (b) time of social play engagement, and (c) number of interactions. The percentage of correct performances in target play skills was measured in the intervention and maintenance sessions. Correct was recorded if Ichiro spontaneously completed each step of the target play. Incorrect was recorded if Ichiro required a verbal, pointing, or physical prompt from the Interventionists (see Table 1, for task analyses). The percentage of correct performances of target play skills was the total number of correct performances divided by the total number of correct plus incorrect performances, multiplied by 100. Intervention 1 was calculated for each block, and intervention 2 was calculated for each session. The length of time...
of social play engagement was measured in 60-second intervals through all sessions. An engagement was recorded if Ichiro continuously demonstrated social play skills. No engagement was recorded if Ichiro played alone, wandered around with no specific purpose or watched the activities of others but did not join an activity. Time of social play engagement was the total number of intervals recorded as engagement for each session. Interaction was defined as communication about play, play behaviors, other communication, other behaviors, and physical contact (see Table 2, for definition of interactions). The number of interactions initiated by Ichiro with his peers and the number of interactions initiated by his peers with Ichiro were recorded. The number of interactions was the total number of interactions initiated by Ichiro and the total number of interactions initiated by his peers for each session.

**Experimental Design**

The study consisted of six phases: baseline, intervention 1, probe 1, maintenance, probe 2, and intervention 2. Baseline data were collected on social play engagement and interaction 1–2 times per week. Ecological assessment and selection of social play were conducted parallel to

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Analyses of Target Play Skills</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 1</th>
<th>Fortune Puzzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imitation Game</td>
<td>1. Pick a piece out of the box</td>
</tr>
<tr>
<td>1. Hold each other’s hands</td>
<td>2. Put the piece where it fits</td>
</tr>
<tr>
<td>2. Replicate a pose</td>
<td>3. Hand the playmate the box</td>
</tr>
<tr>
<td>3. Make any pose</td>
<td>4. Wait</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 2</th>
<th>Musical Chairs</th>
<th>London Bridge is Falling Down</th>
<th>Fruit Basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hold each other’s hands</td>
<td>1. Stand up</td>
<td>1. Sit on a chair</td>
<td></td>
</tr>
<tr>
<td>2. Replicate a pose</td>
<td>2. Move in a circle</td>
<td>2. Stand up when one’s own fruit is called</td>
<td></td>
</tr>
<tr>
<td>3. Make any pose</td>
<td>3. Hold hands</td>
<td>3. Find a chair</td>
<td></td>
</tr>
<tr>
<td>4. Wait</td>
<td>4. Lower arms and catch a child</td>
<td>4. Call out fruit name</td>
<td></td>
</tr>
<tr>
<td>5. Find a chair</td>
<td></td>
<td>5. Find a chair</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of Interactions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication about Play</td>
<td>Speech or gesture directed at playmates during social play (i.e., “Good!”, “Here!”)</td>
</tr>
<tr>
<td>Play Behaviors</td>
<td>Behaviors with playmates to start playing or to continue (i.e., extending children’s hand to peers to hold hands)</td>
</tr>
<tr>
<td>Other Communication</td>
<td>Speech or gestures directed at peers (e.g., “Can I borrow it?”, “You’re spilling it!”) Not followed by shared play</td>
</tr>
<tr>
<td>Other Behaviors</td>
<td>Behaviors of handing over or returning something. Not followed by shared play</td>
</tr>
</tbody>
</table>
baseline. After a stable baseline had been recorded for social play engagement and interaction, intervention 1 was conducted 1–2 times per week. Selection of social play by the teacher and the assistant was conducted parallel to probe 2. Following probe 2, intervention 2 was conducted once per week.

Procedure

Ecological assessment. Ecological assessment was conducted to investigate four items (Fujiwara & Sonoyama, 2015, 2018a, 2018b) by observations and interviews (see Table 3, for results of ecological assessment). During free play time, Ichiro would sit in an isolated corner of the room and engage in self-stimulatory activities such as lifting up and pouring colored sand in a box and tearing clay. The characteristics of play in which he could participate were to use his body or to obtain physical sensations. Other children engaged in drawing or clay play while chatting to each other: there was a difference between his play and those of his peers. The length of play time varied from day to day. During free play time, his assistant kept an eye on him or provided him support with drawing and clay play. The teacher wanted Ichiro to engage in play other than with colored sand.

Conditions of selection and selection of social play. Conditions of selection in social play were checked based on the ecological assessment (see Figure 2, for checklist). The conditions of selection in social play were as follows: the play was (a) appropriate to Ichiro’s development; (b) incorporated his preferences or the characteristics of play in which he could participate; (c) could be set up in his classroom; (d) was enjoyable for his peers; (e) he could participate in it with one-to-one support; (f) was an activity matched the teacher’s needs; (g) was included in the classroom education plan if possible; (h) consisted of skills already possessed by Ichiro; (i) was easy to set up; and (j) could be implemented with two or more. The researcher created the Imitation Game and Fortune Puzzle specially for Ichiro based on these conditions. In the Imitation Game, players sat in a circle and held each

### Table 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Observation</th>
<th>Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ichiro’s play</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement of Play</td>
<td>Colored sand, clay, scribbling</td>
<td>Colored sand, clay, scribbling</td>
</tr>
<tr>
<td>Social Play Stage</td>
<td>Solitary play</td>
<td></td>
</tr>
<tr>
<td>Cognitive Level of Play</td>
<td>Sensorimotor play</td>
<td></td>
</tr>
<tr>
<td><strong>Peers’ play</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement of Play</td>
<td>Clay, children’s books, drawing, building blocks</td>
<td>Clay, children’s books, drawing</td>
</tr>
<tr>
<td>Social Play Stage</td>
<td>Associative play, Cooperative play</td>
<td></td>
</tr>
<tr>
<td>Cognitive Level of Play</td>
<td>Constructive play</td>
<td></td>
</tr>
<tr>
<td><strong>Play environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play area</td>
<td>Classroom</td>
<td></td>
</tr>
<tr>
<td>Peers</td>
<td>Classmates</td>
<td></td>
</tr>
<tr>
<td>Assistant</td>
<td>One-to-one assistant</td>
<td></td>
</tr>
<tr>
<td><strong>Rules governing the play</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Needs</td>
<td>—</td>
<td>Engage in play other than with colored sand</td>
</tr>
<tr>
<td>Plan</td>
<td>—</td>
<td>Relay, ball-toss game</td>
</tr>
<tr>
<td>Frequency and Length of Play Time</td>
<td>—</td>
<td>30 min of free play time in the classroom on most days (varies)</td>
</tr>
<tr>
<td>Style of support</td>
<td>By an assistant</td>
<td>By an assistant</td>
</tr>
</tbody>
</table>
other’s hands and the assistant chose a leader from among the players. The leader adopted a pose (e.g., standing with both hands, angled upwards, on his head while saying “rabbit”) after all players said “Transform!” and other players replicated the same pose. The next player then became the leader. The leader was allowed to pose in any way they wanted. Players tickled each other when the leader took on a “ghost pose.” In Fortune Puzzle, a wooden peg puzzle board and an opaque plastic box to hold the pieces were placed between Ichiro and his playmate. One child picked up a piece from the box and put it in its place on the board. The child then handed the other child the box. This process was repeated until the box was empty.

Baseline. During baseline sessions, Ichiro’s play was observed in his classroom free play settings for four days. The teacher and assistant were asked to support him in the usual way during free play in his classroom. The researcher did not provide any prompts.

Intervention 1. In intervention 1, the researcher or the assistant led Ichiro to the Imitation Game and Fortune Puzzle during free play time. If he demonstrated the skills needed for the game, he was given physical and verbal reinforcement. If he could not, prompts (i.e., a physical prompt, a partial physical prompt, or gestural prompt) were provided. During the first intervention session, the researcher provided Ichiro constant reinforcements and prompts. From the second session, this task was taken over by the assistant. When Ichiro left the play area or started another game, the session was ended. One to five blocks were implemented per intervention session, with one block consisting of an average of 11.5 trials in the Imitation Game and 3.5 trials in Fortune Puzzle. Intervention sessions continued until he was able to participate in the target play while receiving prompts from the assistant.

Probe 1. Similarly to the baseline sessions, the teacher and assistants were asked to support the participant in the usual way during free play in the classroom.

Maintenance. The assistant led Ichiro to the “Imitation Game” and “Fortune Puzzle” and provided him reinforcements and prompts. The researcher did not provide any prompts.
Probe 2. Similarly to the baseline sessions, Ichiro’s play was observed in his classroom free play settings for two days. The teacher and assistant were asked to support him in the usual way during free play in the classroom.

Conditions of selection and selection of a game by the teacher and the assistant. The teacher and assistant checked the conditions of selection in social play based on Ichiro’s actual play (see Figure 2). These conditions for selection in social play were as follows. The play should be (a) appropriate to Ichiro’s development, (b) incorporated his preferences or the characteristics of play in which he could participate, (c) could be set up in his classroom, (d) was enjoyable for his peers, (e) he could participate in it with one-to-one support, (f) was an activity matched the teacher’s needs, (g) was included in the classroom education plan if possible, (h) consisted of skills already possessed by Ichiro, (i) was easy to set up, and (j) could be implemented in a group. The teacher and assistant selected Musical Chairs, London Bridge is Falling Down, and Fruit Basket based on those conditions. In Musical Chairs, players sat on the chairs that arranged in a circle in the middle of the room. When the teacher started music, players moved around the chairs; meanwhile, one chair was removed. When she stopped the music, each had to each find a chair and sit on it. The player who didn’t get a chair was out. Another chair was removed and the music started again. The process was repeated until two players but only one chair was left. The winner was the person who sat on the last chair when the music stopped. In London Bridge is Falling Down, players formed a circle and held each other’s hands. The teacher raised her arms to play the role of the bridge and stood outside the ring of players. Players moved in a circle while singing. When the song came to an end, the teacher put down her arms and caught one of players. The caught player stood across from the teacher and held her hands to play the role of the bridge. The process was repeated until one player was left, who was declared the winner. In Fruit Basket, players sat in chairs facing each other in a circle and the teacher chose one as leader. The teacher went around the circle and gave each player a fruit card. The leader stood in the middle and called out one or two fruits. Those who had that fruit card had to stand up and go to another chair as soon as they could. The leader tried to find an empty chair so someone else would be “a leader” and not him. Alternatively, Fruit Basket was called out and everyone had to find a new chair.

Intervention 2. In intervention 2, the teacher began Musical Chairs, London Bridge is Falling Down, or Fruit Basket during free play time. All the children in the class participated in these games. The assistant provided Ichiro with reinforcements and prompts. One or two games were implemented per intervention session. The researcher did not provide prompts to Ichiro.

Inter-Observer Agreement

Inter-observer agreement data were collected and analyzed to ensure the believability of the coded data. The researcher and second observer viewed on average 30 % of the videotaped sessions throughout all conditions. The second observer was taught the definitions of dependent measures in advance. Inter-observer reliability was assessed using an exact agreement formula in which the total number of agreements was divided by the total number of agreements plus disagreements and multiplied by 100. The IOA for targeted play skills was 92% in intervention 1 and 91% in intervention 2. The IOA for social play engagement was 98% in intervention 1 and 93% in intervention 2. And the researcher and second observer discussed until numbers and contents of interactions agreed.

Social Validity

After intervention 1 and intervention 2, the teacher and assistants were asked to provide information to assess the social validity of the interventions. They completed a survey consisting of items such as the acceptability of the game and the procedure. After intervention 2, they were asked to provide information to assess the social validity of the play selections. They completed a survey consisting of items such as the acceptability of the conditions of selection. Each survey used a 6-point rating scale, in which 1 = strongly disagree, 2 = dis-
agree, 3 = slightly disagree, 4 = somewhat agree, 5 = agree, and 6 = strongly agree.

Results

Target Play Skills

The percentages of correct performances in target play skills are shown in Figure 3. Ichiro was able to participate while receiving prompts by the assistant after 7 blocks in Imitation Game and after 17 blocks in Fortune Puzzle. The percentages of correct performances in Imitation Game were unstable in intervention 1 and stable at between 71–100% in Maintenance. Fortune Puzzle were marked between 38–71% in intervention 1 and marked between 60 to 88% in Maintenance. Figure 4 shows the percentages of correct performances in target play skills in intervention 1 and Maintenance.
In Musical Chairs, Ichiro needed prompting to stand up when the music started (Step 1) and to find a chair (Step 3). In London Bridge is Falling Down, he received prompts to hold hands (Step 1) and walk hand in hand (Step 2), but he almost spontaneously completed each step. In Fruit Basket, he participated while receiving prompts for each step. As a result, the percentage of correct performances remained low.

**Social Play Engagement**

Time of social play engagement is displayed in Figure 5. Baseline engaged time was lower because Ichiro engaged in solitary play such as lifting up and pouring colored sand in a box. In intervention 1, he participated in the target play and engaged time increased. Probe 1 engaged time was lower, as was seen in baseline. Engaged time was increased when the Imitation Game and Fortune Puzzle were adopted in maintenance. Ichiro played with colored sand in a box during probe 2. He participated in the target play (Musical Chairs, London Bridge is Falling Down, and Fruit Basket) and time spent engaged increased during intervention 2.

**Interaction**

The number of interactions is shown in Figure 5. Ichiro’s interaction and peers’ interaction increased in number during intervention 1. Ichiro did not initiate interaction with peers during baseline. In intervention 1, Ichiro increased his play behaviors: he extended his hands to peers to hold hands when he participated in the Imitation Game. Ichiro’s interactions showed a slight increase in number during maintenance. Peers demonstrated other communication such as saying “You’re spilling it!” or gathering up sand when Ichiro spilled it out of the box during baseline. In intervention 1, peers increased play behaviors and communication about play: his peers praised Ichiro as “Good!” or spontaneously provided Ichiro with prompts. The number of peers’ interactions was greater during maintenance than baseline.
Ichiro did not initiate any interactions with his peers during probe 2 or intervention 2. In intervention 2, peers increased play behaviors and communication about play: peers praised Ichiro as “Great!” or peers spoke to an empty chair. In intervention 2, peers increased their play behaviors and communication about play: his peers praised Ichiro as “Great!” or called “Here!” to tell him where to sit.

Social Validity

The social validity of the interventions is displayed in Table 4. The teacher and assistant responded positively to the social validity assessment questions in intervention 1 and 2. They indicated that the intervention goal was meaningful for Ichiro, and clearly enjoyed participating in the target play. However, the teacher alone disagreed about whether this type of support for play could be applied to different forms of play in intervention 2. The assistant slightly disagreed that Ichiro was able to participate easily in the target play.

The teacher and assistant responded positively to the social validity assessment questions in the selection of play. The teacher only somewhat agreed that choosing play according to the conditions would be useful for the education plan. The assistant somewhat agreed that this type of condition for selection of play was acceptable.

Discussion

The purpose of this study was to determine the effectiveness of selection of social play and intervention based on ecological assessment for a child with ASD in an inclusive classroom. To determine if selection and intervention did in fact affect the social play of the participant during free play time, the skills of the participants, the time of social play engagement, and the number of interactions were measured. Our results indicated that the child with ASD participated in the target play and increased his time of social play engagement. The participant increased interaction with his peers in intervention and during the maintenance probes more than the baseline.
Target games in interventions 1 and 2 were selected based on the conditions of social play selection. Target games that were selected according to these conditions could be incorporated into the classroom program. Ichiro participated in most target play and showed increased length of social play engagement and number of interactions. The teacher and assistant indicated that his peers enjoyed the target play. In addition to the conditions used by previous researchers (Ganz & Flores, 2008; Gengoux, 2015; Jung & Sainato, 2015; Liber at al., 2008; Licciardello at al., 2008; Nelson & Nelson, 2007), these results suggest that the target social play should be selected based on the following conditions: a difference in play developmentally between the child with ASD and his or her peers, play area, whether there was an assistant, the teacher’s need and plan for play, frequency and length of free play time, and style of support.

However, the number of interactions was few in intervention 2. This was due to the target games requiring individual competition and did not necessarily include interaction with each other. Moreover, Ichiro required numerous prompts to participate in Fruit Basket, because Fruit Basket included many steps that were difficult for him to perform. This result indicated that it was hard for the teacher and assistant to know, based on the above conditions, whether the play would be appropriate for Ichiro’s development and his existing skills. Regarding this point, procedures would be necessary to show teachers examples of appropriate games for a participant’s development or to be checked by teachers whether the selected play matches the participant’s skills. Furthermore, ecological assessment was needed to decide the conditions of selection in intervention 1. Our results suggested that it was necessary to evaluate factors in an inclusive classroom by ecological assessment: these factors are (a) the preferences, social play level and cognitive level of play of the participant; (b) the preferences, social play level and cognitive level of play of his or her peers; (c) the human aspects and physical aspects of the play environment; (d) the teacher’s rules governing play. These factors closely agreed with the setting factors relating to inclusive education such as children with disabilities, programs, children without disabilities, teachers, and physical aspects of environment (Sonoyama, 1996). The selection and Intervention of social play in an inclusive classroom should be based on ecological assessment (Heron & Heward, 1988), that is, assessment and analysis not only the responses of the learner, but also of the various ecologies.

This study had several limitations related to the participant, social play skills, and time constraints. Because only one child participated in this study and the teacher and assistant who experienced intervention 1 conducted intervention 2, it is possible that this affected the results. Further, because of limited opportunities for Intervention sessions in classroom programs and the need to prevent children getting tired of target play, no baseline probe for target play skills was conducted. Our study could therefore not clearly demonstrate that target play skills were acquired due to interventions. Finally, because intervention 2 was conducted near the end of the academic year, the number of intervention sessions was limited and there was insufficient time to conduct a maintenance probe.

Conclusion

This study contributes to the education of young children with ASD and typically developing children. First, teachers and practitioners may be able to refer to the conditions of social play selection when they select what game to conduct in classroom programs. Second, because the procedures of this study do not require skills training of children with ASD or their specific peers, the procedure is applicable to the teaching of social play to children with ASD in a naturalistic environment.

References

Fujiwara, A., & Sonoyama, S. (2018). Promoting social play in a child with autism spectrum disor-


Received: 7 June 2018
Initial Acceptance: 25 July 2018
Final Acceptance: 21 September 2018
Teaching Authentic Cooking Skills to Adults With Intellectual and Developmental Disabilities:

Active Engagement

Janice Goldschmidt

A unique instructional tool for direct support professionals and program directors. With this book, you can address two critical issues: healthy eating habits and teaching real-life skills that will develop greater independence and self-determination.

Everyone, regardless of ability, should be able to make choices about their food and to learn to prepare food – or to actively participate in preparing food.

Based on evidence-based instructional practices and sound nutritional principles, Active Engagement will enable you to help your clients achieve greater independence, better health, and a higher level of self-confidence.

2018, Product# 4167 • List Price: $39.95 • Member Price: $33.95  aaidd.org
Examining Use of School Personnel in CBT Interventions for Anxiety in Students with ASD

Lisa A. Simpson and Cara S. Maffini
San Jose State University

Rachel K. Schuck
Stanford University

Abstract: Anxiety disorders are highly comorbid with autism spectrum disorders (ASD) and can negatively impact student functioning, particularly relationships with peers and teachers. Though cognitive-behavior therapy (CBT) is increasingly used to address anxiety in school-aged youth with ASD, few studies have included school personnel in CBT treatment programs. This review examined the extant literature on CBT interventions that include school personnel in the treatment of anxiety among children and adolescents with ASD. Eight studies were identified and data were examined regarding the ways in which school personnel were incorporated in the treatment process and the efficacy of the results. Recommendations, including interventions that hold particular promise for use in schools, are discussed as well as ways in which school personnel may collaborate to meet the needs of students with ASD and anxiety.

Research indicates that anxiety disorders are highly comorbid in children and youth with autism spectrum disorders (ASD), with prevalence estimates ranging from 11% to 84% (de Bruin, Ferdinand, Meester, de Nijs, & Verheij, 2006; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000; Lecavalier, 2006; Leyfer et al., 2006; Muris, Steermanan, Merckelbach, Holdrinet, & Meesters, 1998; Vasa et al., 2013; White, Oswald, Ollendick, & Scahill, 2009), with some suggesting these figures may be an underestimate of the prevalence because of the significant overlap in symptoms between ASD and specific anxiety disorders (e.g., social phobia, obsessive compulsive disorder [OCD]; White, Oswald, et al., 2009). Anxiety disorders are often greater in individuals with ASD who have higher intellectual functioning (Sukhodolsky et al., 2008; Weisbrot, Gadow, DeVincent, & Pomeroy, 2005) and have been shown to increase in prevalence with age (Vasa et al., 2013).

As students with ASD are increasingly included in general education classrooms, consideration must be given to the ways in which anxiety impacts students with ASD in the school environment. For example, the significant social deficits inherent in ASD often make it difficult for these students to connect with peers and engage in on-going relationships (Bellini, 2004; Cotugno, 2009), which may in turn exacerbate anxiety and lead students with ASD to withdraw from social situations altogether (Cotugno, 2009; Humphrey & Symes, 2010; Stichter et al., 2010). Though not all students with ASD and anxiety will go to this extreme, most will find peer interactions to be especially challenging. Students with ASD often fail to understand the reciprocal nature of social communication, may lack understanding of nonverbal cues such as facial expression and body posture, and frequently persist in pursuing preferred interests regardless of peers’ conversation topics (APA, 2013). As a result, many students with typical development (TD) avoid social encounters with students with ASD, leaving them feeling lonely, confused, and misunderstood (Bauminger & Kasari, 2000). With continued failed social encounters, it is not surprising that students with ASD report high levels of anxiety and ultimately anxiety, avoidance, and rejection create the cycle by which students with
ASD can become isolated from peers altogether.

Anxiety levels in students with ASD may also be impacted by an inability to regulate emotions and a lack of flexibility (Ashburner, Ziviani, & Rodger, 2010; Scarpa & Reyes, 2011) impacting classroom performance. For example, when asked to make multiple transitions between activities, students with ASD may react with an outburst of anger and frustration and experience increased anxiety over having to set aside an assignment to complete later. Anxiety can also manifest as perfectionism and excessive worry, which may keep students with ASD from starting and finishing assignments and participating in class discussion. Other routine school activities such as weekly spelling tests and group projects may be particularly anxiety-inducing for students with ASD who have a high propensity for perfectionism (Ashburner et al., 2010). In fact, research has shown that individuals with ASD and anxiety display more severe symptoms than those with ASD alone (Sukhodolsky et al., 2008), and these students may demonstrate poor attendance and low academic performance despite having high cognitive functioning (Ashburner et al., 2010). Thus, ASD and anxiety may be a significant barrier to academic and social progress, making it critical to identify interventions to reduce anxiety in this unique group.

Children and youth with ASD spend a significant amount of time in school, with school professionals responsible for meeting their needs and ensuring they make adequate progress under IDEA (2004). Students with ASD report more anxiety symptoms than their typical peers and teachers report more behavioral concerns, including aggression, related to anxiety in this group (Ambler, Eidels, & Gregory, 2015) yet few strategies exist for managing anxiety in students with ASD in the school setting. Given the potential for negative outcomes resulting from anxiety and ASD, it is imperative that school personnel understand how to address anxiety in these students.

**CBT for treatment of Anxiety in ASD**

One promising intervention to address anxiety in ASD is cognitive behavior therapy (CBT). CBT is a psychological intervention that helps students develop techniques and strategies to engage in metacognition to modify their thoughts and behaviors and typically includes the use of gradual exposure techniques (Beck, 2011). CBT has been used quite successfully with individuals in the general population, and an increasing body of evidence has shown that CBT can be used effectively to reduce anxiety in individuals with ASD (Chalfant, Rapee, & Carroll, 2007; Ehrenreich-May et al., 2014; Fujii et al., 2013; McNally-Keehn, Lincoln, Brown, & Chavira, 2013; Reaven, Blakeley-Smith, Calhane-Seliburne, & Hepburn, 2012; Reaven, Blakeley-Smith, Leuthe, Moody, & Hepburn, 2012; Reaven et al., 2009; Sofronoff, Attwood, & Hinton, 2005; Storch et al., 2013; Storch et al., 2015; Sung et al., 2011; Sze & Wood, 2007, 2008; van Steensel & Bögels, 2015; White, Ollendick, Scabill, Oswald, & Albano, 2009; White et al., 2013; Wood, Drahota, Sze, Har, et al., 2009; Wood, Drahota, Sze, Van Dyke, et al., 2009; Wood et al., 2015). However, a major limitation of this research has been that many of the CBT studies have taken place in clinical settings (with clinical staff) and there is limited exploration of the use of CBT in school settings to reduce anxiety in students with ASD. Because research has shown that children and youth with ASD have difficulty generalizing skills from one setting to the next (Bellini, Peters, Benner, & Hopf, 2007), it is important to examine how CBT can be used in school settings to ensure students with ASD achieve maximum benefit from their school program and improve long-term outcomes.

**Purpose**

The purpose of this review was threefold: (a) to examine the existing literature on the use of cognitive behavior therapy (CBT) in school settings with school personnel to address anxiety in students with ASD, (b) to describe the ways in which school personnel were incorporated in these CBT interventions, and (c) to evaluate the results of the interventions on reducing anxiety symptoms in school-aged participants with ASD.
Method

Search Strategy

A search was conducted of the ERIC, PsychINFO, Academic Search Complete, Education Research Complete, and PubMed databases using multiple combinations of the terms: *autism, anxiety, and CBT* for the years 2005 to 2016 inclusive, covering the time period in which CBT came to be seen as a viable treatment option for individuals with ASD. This search of the databases resulted in 404 articles, 38 of which were deemed suitable for full text review using the inclusion/exclusion criteria below. In the full-text review eight studies were identified that included school personnel in the treatment process. (See Figure 1 for diagram of selection process.)

Inclusion Criteria

This review sought to identify studies that incorporated school practitioners in a CBT intervention to treat anxiety in school-aged children with ASD. The following criteria were used for inclusion: (a) an empirical study employing CBT published in a peer-reviewed journal between 2005 and 2016, (b) participants with ASD, including previous DSM-IV categories of Asperger’s disorder and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS; APA, 2000) ranging in age from 5–18 (i.e., the ages in which children typically are enrolled in school) with evidence of anxiety, (c) anxiety as an outcome measure in the study, and (d) treatment in a school setting and/or school personnel included in the treatment process. Severity of ASD symptoms was not a criterion for inclusion or exclusion in the review.
Results

Data were extracted from the eight studies pertaining to study design, participant characteristics, CBT programs used, anxiety measures, use of school personnel, and study outcomes. See Table 1 for detailed information about studies included in the review.

Study Design

The eight studies included in this review employed three research designs. Specifically, five studies employed random control trials (RCTs; Fujii et al., 2013; Luxford, Hadwin, & Kovshoff, 2016; Storch et al., 2013; Wood, Drahota, Sze, Har, et al., 2009; Wood, Ehrenreich-May et al., 2015), one study used a two-group pre-post design (Ehrenreich-May et al., 2014), and two were case studies (Sze & Wood, 2007, 2008).

Participant Characteristics

A total of 187 participants were included in the reviewed studies. ASD diagnoses included autism, Asperger’s disorder, and PDD-NOS. All participants exhibited anxiety symptoms and behaviors, while those with official diagnoses fell in the categories of generalized anxiety disorder, separation anxiety disorder, social phobia, and OCD. Participants ranged in age from seven to 15 years old. Most participants were male (78%; n = 145). All participants held IQ scores ≥70.

Cognitive Behavior Therapy Programs

Cognitive Behavior Therapy (CBT) programs were used in all eight studies, a requirement of this review. CBT is a short-term goal-oriented counseling intervention that focuses on changing people’s thoughts and behaviors to affect how they feel (Beck, 2011). The interventions in this review were characterized by structured weekly sessions lasting 60–90 minutes incorporating strategies to teach recognition of anxiety symptoms as well as cognitive restructuring approaches to manage anxiety, and the use of gradual exposure techniques to change behaviors to anxiety-provoking stimuli. Homework, an integral piece to CBT that helps to reinforce skills and strategies learned in therapy sessions (Beck, 2011; Garland, Brookman-Frazee, & Chavira, 2010), was often included requiring participants to work on skills outside of the treatment setting. The CBT programs included in this review were all manualized and included Behavioral Interventions for Anxiety in Children with Autism (BIACA; Wood, Drahota, Sze, Har, et al., 2009), Building Confidence (Wood & McLeod, 2008), and Exploring Feelings (Atwood, 2004).

Anxiety Measures

As the focus of this review was to identify studies aimed at reducing anxiety in students with ASD, anxiety was an important outcome measure. Anxiety measures included anxiety scales (and a semi-structured interview protocol) specific to children such as the Pediatric Anxiety Rating Scale (PARS [RUPP, 2002]; Ehrenreich-May et al., 2014; Storch et al., 2013; Wood et al., 2015) and the Anxiety Disorders Interview Schedule (ADIS [Silverman & Albano, 1996]; Ehrenreich-May et al., 2014; Fujii et al., 2013; Storch et al., 2013; Sze & Wood, 2007, 2008; Wood, Drahota, Sze, Har, et al., 2009; Wood et al., 2015); along with measures to assess overall functioning such as Clinical Global Impression Scale (CGIS [Guy & Bonato, 1970]; Ehrenreich-May et al., 2014; Wood, Drahota, Sze, Har, et al., 2009; Wood et al., 2015). Other anxiety measures included the Social Anxiety Scale (Lyneham, Street, Abbott, & Rapee, 2008), Spence Anxiety Scale (Spence, 1998), and Social Worries Questionnaire (Spence, 1995) all used in Luxford et al. (2016) and the Multidimensional Anxiety Scale for Children (MASC; March, 1998) used in two studies by Wood and colleagues (Wood, Drahota, Sze, Har, et al., 2009; Wood et al., 2015).

Use of School Personnel

Identifying ways in which the use of school personnel supported the reduction of anxiety symptoms in children and youth with ASD is important as these students are particularly prone to experiencing poor school outcomes due to anxiety related issues (Bellini, 2006). This review identified three key ways in which...
<table>
<thead>
<tr>
<th>Study</th>
<th>N (Tx n) Age in Years</th>
<th>Study Design</th>
<th>Intervention</th>
<th>School Involvement</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ehrenreich-May et al. (2014)</td>
<td>20 (20) 11–14 16 sessions</td>
<td>Two Group Pre-Post Design</td>
<td>BIACA</td>
<td>Social skills training with school personnel. Implement peer buddies.</td>
<td>3 of 17 completers (18%) no longer primary anxiety disorder post-treatment, 4 of 17 (24%) no longer primary anxiety disorder at 1-month follow-up; 76% considered treatment responders post treatment, 72% responders at 1-month follow-up.</td>
</tr>
<tr>
<td>Fujii et al. (2013)</td>
<td>12 (7) 7–11 32 sessions</td>
<td>RCT</td>
<td>Building Confidence</td>
<td>Teacher-therapist conferences, daily home-school communication; playground observations; peer buddies at school.</td>
<td>5 of 7 (71%) no longer primary anxiety disorder post-treatment versus 0 in TAU. No follow-up measures.</td>
</tr>
<tr>
<td>Luxford, Hadwin &amp; Kovshoff (2016)</td>
<td>35 (18) (11–15) 32 sessions</td>
<td>RCT</td>
<td>Exploring Feelings</td>
<td>Intervention delivered at school by the researcher. Teacher aide from each school assisted at each session and reminded students to use strategies when experiencing anxiety at school.</td>
<td>No measure of principal anxiety disorder. Treatment group showed greater reduction in anxiety symptoms, school anxiety and social worry than WL group, though no designation of treatment responders. Results maintained at 6-week follow-up.</td>
</tr>
<tr>
<td>Storch et al. (2013)</td>
<td>45 (24) (11–15) 6 sessions</td>
<td>RCT</td>
<td>BIACA</td>
<td>Meeting with school official.</td>
<td>9 of 24 (38%) no longer primary anxiety diagnosis post treatment versus 1 of 21 (5%) TAU; 6 of 9 (67%) no longer primary anxiety diagnosis at 3-month follow-up. 75% considered treatment responders post treatment versus 14% TAU; 73% responders at 3-month follow-up.</td>
</tr>
<tr>
<td>Sze &amp; Wood (2007)</td>
<td>1 (1) 7–11 16 sessions</td>
<td>Case Study</td>
<td>Building Confidence</td>
<td>Teacher nominated peers for social group at lunch and recess.</td>
<td>No anxiety disorders post treatment. No follow up data.</td>
</tr>
</tbody>
</table>

(Continued on next page)
<table>
<thead>
<tr>
<th>Study</th>
<th>N (Tx n)</th>
<th>Age in Years</th>
<th>Study Design</th>
<th>Intervention</th>
<th>School Involvement</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood, Drahota, Sze, Har, et al. (2009)</td>
<td>40 (17)</td>
<td>7–11</td>
<td>RCT</td>
<td>Building Confidence</td>
<td>Buddies at school; skills practiced at school; school provide social coaching; school-home notes.</td>
<td>9 of 14 (64%) no anxiety disorders post treatment versus 2 of 22 (9%) WL; 8 of 10 (80%) no anxiety disorder at 3-month follow-up; 93% considered treatment responders versus 9% WL; 90% responders at 3-month follow-up.</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 sessions unknown</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood et al. (2015)</td>
<td>33 (19)</td>
<td>11–15</td>
<td>RCT</td>
<td>BIACA</td>
<td>Consultation with school personnel.</td>
<td>6 of 19 (32%) no principle anxiety diagnosis post treatment versus 5 of 14 (21%) WL; 8 of 13 (62%) no principle anxiety diagnosis at 1-month follow-up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
school personnel were incorporated in CBT interventions.

**Monitoring and implementing strategies.** Though none of the studies had teachers directly deliver CBT, teachers were included in the treatment process in several ways. Teachers monitored progress on anxiety-related behaviors and sent home daily progress reports to parents (Fujii et al., 2013; Sze & Wood, 2008) with students earning rewards at home for meeting target behaviors at school (Fujii et al., 2013). This type of teacher-parent communication was important to students with ASD generalizing their learned behavior across settings and likely facilitated improved outcomes for students. Teachers were also informed of specific strategies that students were taught to use in therapy sessions and encouraged students’ use of those strategies in the classroom, such as asking and answering at least one question in class (Fujii et al., 2013) and excusing oneself from class before beginning to cry in front of peers (Sze & Wood, 2008). As teachers participated in the use of the strategies, they could provide specific feedback to therapists enabling therapists to modify or adjust elements in the student’s treatment program as needed. Therapists also met with teachers and teacher aides at school to demonstrate intervention techniques they could use with students, such as providing social coaching to students on how to enter and maintain conversations with peers (Wood, Drahota, Sze, Har, et al., 2009). One group held CBT sessions at the school site with teacher aides participating in therapy sessions then monitoring students’ use of strategies learned in therapy throughout the school day and providing specific reminders to students during times of high anxiety (Luxford et al., 2016). This unique approach allowed students to quickly generalize skills to the natural environment (school) where anxiety was taking place.

**Facilitating peer relationships.** Another key element in the studies included in this review was the use of peer-buddies as part of the treatment plan to reduce anxiety in students with ASD. An increased focus on developing social skills was important to reducing anxiety related to peer interactions and teachers were often asked to develop a peer buddy system for the student with ASD (Ehrenreich-May et al., 2014; Fujii et al., 2013), with some studies providing specific training to teachers related to supporting interactions between the child with ASD and the peer (Fujii et al., 2013). Teachers were asked to nominate empathetic peers who might show kindness and pro-social behavior toward the child with autism, then the peers were trained to initiate interaction and include the child at lunch and recess (Sze & Wood, 2007). In some cases, several peers were nominated and teachers set up a schedule with a different peer serving as a buddy each day of the week (Sze & Wood, 2007). Peer mentoring programs were also established at school where the child with ASD was provided with opportunities to be both a mentee and a mentor (Sze & Wood, 2008; Wood, Drahota, Sze, Har, et al., 2009). Acting as a mentor to younger students offered the student with ASD an opportunity to reflect on the needs and desires of other children and increase perspective taking skills (Sze & Wood, 2008). Peer buddy and mentoring programs provide the impetus for students with ASD to engage with other children at recess breaking the cycle of social isolation.

**Priming and social coaching.** School personnel were also used in the reviewed studies to employ priming or social coaching techniques immediately before students entered the anxiety-provoking situation (Fujii et al., 2013; Storch et al., 2013; Wood, Drahota, Sze, Har, et al., 2009). This technique was designed to reduce the length of time between when the student with ASD was introduced to a skill and when he/she would use the skill. Therapists conducted playground observations of the student with ASD then taught the teacher to use social coaching (priming) techniques with the student immediately before the recess session (Fujii et al., 2013) and before entering conversations with peers (Storch et al. 2013; Wood, Drahota, Sze, Har, et al., 2009). In addition, participants practiced skills with therapists first then applied skills learned in therapy to the school setting. For example, one participant learned to tolerate losing games in the clinic with therapists, keeping his anxiety in check; then the participant employed those skills at school during recess with the help of school staff. Once he learned to tolerate losing and began to engage more appropriately with peers at recess, the parti-
pant experienced both a reduction in social anxiety and social isolation (Fujii et al., 2013).

**Study Outcomes**

The eight studies included in this review employed three manualized CBT programs, BIACA (Wood, Drahota, Sze, Har, et al., 2009), Building Confidence (Wood & McLeod, 2008), and Exploring Feelings (Attwood, 2004). Overall results of these studies indicated 81% of participants were considered treatment responders (range = 75%–93%) in the four studies reporting on response to treatment. All four used the CGI-I (Guy, 1976) to designate treatment response. Three studies using the BIACA program demonstrated rates of treatment response (scores of 1 or 2 on the CGI-I) from 75–79% at post treatment (Ehrenreich-May et al., 2014; Storch et al., 2013; Wood et al., 2015), while one study using Building Confidence resulted in 93% of treatment participants considered to be responders to the intervention using a broader range of scores to designate treatment response ([ratings of 1, 2, or 3 on the CGI-I] Wood, Drahota, Sze, Har, et al., 2009).

In addition, 41% (n = 84) of participants across seven studies remitted their principle anxiety diagnosis post treatment using the Anxiety Disorders Interview Schedule (Silverman & Albano, 1996). Specifically, in the three studies employing BIACA as the intervention (one group design and two RCTs), 18% (Ehrenreich-May et al., 2014), 32% (Wood et al., 2015), and 38% (Storch et al., 2013) of treatment participants no longer met criteria for their primary anxiety diagnosis at post treatment, while in the two RCTs using Building Confidence 64% (Wood, Drahota, Sze, Har, et al., 2009) and 71% (Fujii et al., 2013) of treatment participants no longer met criteria for their primary anxiety diagnosis at post treatment. In addition, two case studies each had one participant who demonstrated remission of all anxiety disorders post treatment using the Building Confidence program (Sze & Wood, 2007, 2008). Data suggests that the percentage of participants remitting their principle anxiety disorder post treatment was higher using Building Confidence (Wood & McLeod, 2008) than BIACA (Wood, Drahota, Sze, Har, et al., 2009) though the current authors caution that the overall number of studies was small and needs further investigation.

The final study using Exploring Feelings (Attwood, 2004) did not include a pre-post diagnosis of anxiety disorders nor a generalized measure of treatment response, though the treatment group showed greater reductions in anxiety symptoms, school anxiety, and social worries than the waitlist group using the School Anxiety Scale (Lyneham et al., 2008), the Spence Anxiety Scale (Spence, 1998), and the Social Worries Questionnaire (Spence, 1995).

**Certainty of evidence.** This review suggests that the use of CBT that includes school personnel to treat anxiety in students with ASD was mixed. Across seven studies the response to treatment was overwhelmingly positive in reducing anxiety symptoms in participants with ASD using measures of global functioning. This suggests that participants did benefit from the treatment, an important outcome for improving overall success. The number of participants who remitted all anxiety disorders post treatment however, was inconsistent across these same seven studies. Though all studies using a pre-post measure of principle anxiety disorder showed more participants remitting anxiety disorders in treatment groups over TAU or WL groups, there was significant variability (range = 18% to 71%) across both RCT and group designs. Two case study participants also remitted their principle anxiety disorder post-treatment, but caution is warranted when comparing case studies to RCTs or group designs.

**Discussion**

This review identified and examined studies in which school personnel were included in CBT interventions to treat anxiety in school-aged children with ASD. While the number of studies was small (n = 8), many elements of the eight studies were similar and the overall outcomes positive, with an average of 81% of participants across seven studies considered treatment responders. Including teachers and other school personnel in the treatment process served to assist participants to generalize skills across settings and allowed for a more consistent set of behaviors and expectations across the day. When provided training from
clinical personnel, teachers and teacher aides were able to redirect students to use previously learned strategies during times of high anxiety. Teachers could also monitor progress on goals and objectives provided by the therapist and communicate that progress to both parents and therapists, with all parties collaborating to assist students to achieve maximum success.

The studies included in this review, however, lacked specific detail regarding how school personnel were included in the CBT interventions and at what level of intensity, with some studies providing considerably more information than others. Future studies should provide specific information regarding the ways in which school personnel were included in CBT interventions to reduce anxiety in students with ASD in order that parameters and guidelines can be developed. For example, is it better to have school psychologists deliver interventions once or twice a month or train paraeducators to deliver intervention components every day? Understanding dosage and intensity of intervention is important when using school personnel with varying levels of training.

The three highly manualized CBT programs used in the eight studies (BIACA, Building Confidence, Exploring Feelings) may be of interest and benefit to school personnel (e.g., school psychologists, school counselors, special education teachers) working together with clinical professionals to meet the needs of students with ASD. School personnel may be trained to implement some elements of these modular programs at school in collaboration with clinical professionals. As students with ASD report experiencing significant anxiety in school (Ashburner et al., 2010), including a collaborative team of school professionals in treatment programs is important to improving outcomes in these students. Students with ASD are known to have difficulty generalizing skills from one setting to the next (National Research Council, 2001), and including school personnel in the treatment process could significantly reduce the time spent transferring skills.

Given the highly specialized skills held by the persons implementing CBT in these studies, it would be unwise to think that school-based practitioners could simply pick up the CBT manuals and implement these interventions without sufficient training. Training of multiple school personnel (e.g., school psychologists, school counselors, special education teachers) would be necessary to fully implement these manualized CBT programs with fidelity. That said, given the significant need in this area, spending time and money on such training may serve to improve long-term outcomes for students with ASD and anxiety. Training school personnel to implement CBT interventions has been identified as an important next step in at least two recent publications (Ehrenreich-May et al., 2014; Rotheram-Fuller & MacMullen, 2011). Professionals implementing interventions in clinical settings are able to draw on a range of staff to ensure successful implementation while also supporting participants and their parents; schools, however, are less likely to have the same level of staffing available to them. School psychologists, school counselors, and special education teachers must work collaboratively to implement CBT interventions to increase success for students with ASD.

All but one study in this review were conducted primarily in clinical settings, yet a growing number of children with ASD are entering the school system, indicating a disconnect between research and practice in the field. It is imperative that future research examine implementation of programs to manage anxiety in students with ASD in school settings by school personnel. Students with ASD have been reported to experience significant levels of anxiety in school which often results in maladaptive behaviors, potentially leading to isolation from peers and further anxiety (Ashburner et al., 2010; Storch et al., 2012). Failure to address anxiety in these students is likely to lead to increased negative outcomes.

Several CBT approaches identified in this review were effective in reducing anxiety symptoms when implemented in clinical settings, but additional research is needed on which interventions may be best suited to school settings. Schools are typically more diverse and less controlled than clinical programs and may require unique modifications to ensure student success. Understanding which programs are best suited to school settings is an important next step in the re-
search process. The Building Confidence and BIACA programs incorporated school personnel to a greater extent than the other manualized CBT programs (e.g., holding some sessions at school, consultation with teachers) with positive results, lending support to their eventual use in school settings. We recommend school personnel look at Building Confidence and BIACA as first options when investigating school-based treatment approaches for anxiety in students with ASD.

Limitations

Some limitations in this review should be noted. First, there exists the potential for bias related to article selection in this review. Only studies published in English in peer-reviewed journals were reported. Thus, studies published in languages other than English and studies that have not been published may present with different outcomes and their exclusion from the review could influence the overall picture of the effectiveness of these studies. In addition, several of the studies of CBT interventions were clustered within the same research group increasing the possibility that more than one publication reported on the same research sample. In such cases the overall number of intervention studies would be less than appears. The authors aimed to address this potential bias by carefully examining articles with overlapping researchers for indicators that more than one publication was derived from the same research sample. When this was discovered to be true only the first published article was included in the review (e.g., Drahota, Wood, Sze, & van Dyke, 2011 and Wood, Drahota, Sze, Har, et al., 2009). This review is further limited by the heterogeneity of the studies. No single anxiety measure was used across all studies; and with methodological differences, it was not possible to pool data and conduct analyses across studies.

References


Focus on Autism and Other Developmental Disorders, 29, 145–155.


Received: 21 June 2018
Initial Acceptance: 14 August 2018
Final Acceptance: 28 September 2018
Education and Training in Autism and Developmental Disabilities

Editorial Policy

*Education and Training in Autism and Developmental Disabilities* focuses on the education and welfare of persons with autism and developmental disabilities. *ETADD* invites research and expository manuscripts and critical review of the literature. Major emphasis is on identification and assessment, educational programming, characteristics, training of instructional personnel, habilitation, prevention, community understanding and provisions, and legislation.

Each manuscript is evaluated anonymously by three reviewers. Criteria for acceptance include the following: relevance, reader interest, quality, applicability, contribution to the field, and economy and smoothness of expression. The review process requires two to four months.

Viewpoints expressed are those of the authors and do not necessarily conform to positions of the editors or of the officers of the Division.

Submission of Manuscripts

1. Manuscript submission is a representation that the manuscript is the author’s own work, has not been published, and is not currently under consideration for publication elsewhere.


3. Each manuscript must have a cover sheet giving the names and affiliations of all authors and the address of the principal author.

4. Research studies, including experimental (group and single-subject methodologies), quasi-experimental, surveys, and qualitative designs should be no more than 20–30 typewritten, double-spaced pages, including references, tables, figures, and an abstract.

5. Graphs and figures should be originals or sharp, high quality photographic prints suitable, if necessary, for a 50% reduction in size.

6. Three copies of the manuscript along with a transmittal letter should be sent to the Editor: Stanley H. Zucker, Mary Lou Fulton Teachers College, Box 871811, Arizona State University, Tempe, AZ 85287-1811.

7. Upon receipt, each manuscript will be screened by the editor. Appropriate manuscripts will then be sent to consulting editors. Principal authors will receive notification of receipt of manuscript.

8. The Editor reserves the right to make minor editorial changes which do not materially affect the meaning of the text.

9. Manuscripts are the property of *ETADD* for a minimum period of six months. All articles accepted for publication are copyrighted in the name of the Division on Autism and Developmental Disabilities.

10. Please describe subjects (or any other references to persons with disabilities) with a people first orientation. Also, use the term “intellectual disability” (singular) to replace any previous term used to describe the population of students with significant limitations in intellectual functioning and adaptive behavior as manifested in the developmental period.
21st International Conference on Autism, Intellectual Disability & Developmental Disabilities

Research-Informed Practice

January 22 - 24, 2020
Sarasota, Florida

CEC’s Division on Autism and Developmental Disabilities (DADD) conference will have innovative and engaging presentations that explicitly link research to practice within the following or related topical areas:

- Academic Skills
- Assistive & Adaptive Tech
- Life Skills
- Sexuality
- Mental Health
- Post-secondary Initiatives
- Communication
- Social Skills
- Evidence-based Practices
- Self-determination
- Transition
- Assessment

For further information, please contact Cindy Perras, DADD’s Conference Co-ordinator: cindy.perras@gmail.com.