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# The Impact of Social Scripts and Visual Cues on Verbal Communication in Three Children With Autism Spectrum Disorders

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Social script and visual cue use with students with autism spectrum disorders (ASD) were examined. A multiple baseline design across activities with embedded withdrawal was used to measure student acquisition of verbal communication skills. Three children with ASD, two boys and one girl, were taught a series of scripts and were shown a “quiet” picture when they engaged in perseverative speech (e.g., repetitive phrases or words). The number of scripted statements increased during treatment, with reductions in perseverative speech for all three students. One student’s unscripted statements increased during intervention. Analysis of percentage of nonoverlapping data indicated that the intervention was highly effective for scripted statements, ineffective for unscripted statements, and produced variable results for total communicative statements.

**Keywords:** *autism; scripts; verbal communication; visual strategies; conversation; perseverative speech; unscripted speech*

Children with autism spectrum disorders (ASD) exhibit impairments in social interactions, language, and communication (Baron-Cohen, 2004). They often fail to make eye contact and infrequently respond to parents and caretakers. Unlike other children with disabilities who compensate for their lack of language and communication skills by gesturing or using nonverbal means of expression, children with ASD infrequently display spontaneous speech or engage in conversations with other children or adults (Krantz & McClannahan, 1993). Although some children with ASD spontaneously interact with peers, they may respond but fail to initiate interactions (Janzen, 2003).

Language and communication difficulties common to ASD include challenges with processing input and generating output (American Psychiatric Association [APA], 2000). Conversational speech requires the use of complex language skills. Initiation and expansion of a conversational topic, taking turns in a conversation, and maintaining that exchange are difficult for children with ASD (Janzen, 2003). One approach to improving

conversational skills in children with ASD is through the use of pretaught scripts. As described below, previously published literature has documented the efficacy of using visually based scripts with young children with ASD, particularly those of preschool or early elementary age and those who cannot read well.

Research has demonstrated that when children with autism are taught social scripts through modeling, prompting, and reinforcement, their interactions with peers and adults increase. Students with ASD benefit from the use of scripts in nonacademic and academic settings. Goldstein (2002) suggests that improving social interactions for students with ASD through the use of

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social scripts may positively affect language skills and peer interactions. Krantz and McClannahan (1998) examined the use of written scripts with three preschool students with autism who had minimal reading skills. Prior to this study, students initiated only single-word requests for toys or food. The participants were taught to follow photographic activity schedules that included the words *look* and *watch me* paired with activities. Participants learned to approach adults when those words appeared, say the phrases, and show the adult something they could do (e.g., put on a costume, play with a toy). After the written scripts were introduced, the participants used both scripted and unscripted statements and generalized new skills to different adult respondents and to new activities.

Krantz and McClannahan (1993) used a multiple baseline design across four participants with autism, ages 9 to 12 years, to introduce a script fading procedure. The participants had some functional expressive language (i.e., they responded when addressed by adults and sometimes made simple requests to teachers, parents, or other familiar adults). Prior to social script training, the participants exhibited few independent initiations with peers (i.e., using unprompted statements or questions directed at another child). Written instructions and scripts with 10 statements and questions were introduced along with a script fading procedure during which the written scripts were faded over time (i.e., the ending punctuation was removed, then part of each sentence, until the entire sentence was gone). As a result of the intervention, each of the participant's independent initiations and responses, both scripted and unscripted, increased significantly.

Charlop-Christy and Kelso (2003) also examined the use of written scripts on cue cards with 6- and 7-year-old boys with autism to improve conversational skills about topics in which they were not immediately engaged (e.g., past events, hobbies). Each cue card contained seven statements and seven questions. Each participant was taught to answer and ask questions by reading the cue cards and then responding without looking at the cards. Results indicated that the children did not acquire conversational speech during the baseline phase; however, the children reached criterion during the cue card intervention and this was maintained during testing without the use of cue cards.

Sarokoff, Taylor, and Poulson (2001) expanded on the success of using scripts with students with autism by using stimuli that had "naturally embedded textual cues." They implemented written scripts with two 8- and 9-year-old boys with autism who could read at least 50 words each. Scripts with six or seven statements about an

item were put with snacks and play props. The scripts were taught through the use of gestures (e.g., pointing to the script) and, once mastered, were faded back to front. As a result of script implementation, participants significantly increased their use of scripted and unscripted statements and results were maintained and generalized to new materials when the scripts were faded. Furthermore, the study found that the students used scripted statements even when there was no adult in the room.

Audiotaped scripts also have been used to increase social interactions in children with autism. Stevenson, Krantz, and McClannahan (2000) used audiotaped scripts to examine their impact on the conversational skills of four boys with autism between the ages of 10 to 15 years who had limited expressive language and could not read. Twenty-five nonsocial activities (e.g., puzzles, tracing) and five social activities were taught using audiotaped scripts. Although the students demonstrated few social interactions prior to training, within nine sessions, each participant had mastered the five social scripts. After the scripts were totally faded, each participant maintained the use of at least 15 unscripted statements or questions within each 10-minute session.

In addition to the literature supporting the use of scripts with individuals with ASD, research supports the use of other visual supports (Simpson, Myles, & Ganz, 2008). Research has demonstrated the efficacy of using visual schedules to improve behavior problems (Dooley, Wilczenski, & Torem, 2001), task completion (Bryan & Gast, 2000; Dettmer, Simpson, Myles, & Ganz, 2000; MacDuff, Krantz, & McClannahan, 1993; Massey & Wheeler, 2000), and play skills (Morrison, Sainato, BenChaaban, & Endo, 2002). Social Stories™ and similar scripted interventions also have been supported by research (Simpson et al., 2008). They have been shown to improve task completion (Hagiwara & Myles, 1999), sociocommunicative skills (Norris & Dattilo, 1999; Roger & Myles, 2001), behavior problems (Agosta, Graetz, Mastropieri, & Scruggs, 2004; Kuttler, Myles, & Carlson, 1998; Lorimer, Simpson, Myles, & Ganz, 2002; Scattone, Wilczynski, Edwards, & Rabian, 2002; Swaggert et al., 1995), and preparation for special events (Ivey, Heflin, & Alberto, 2004). These interventions demonstrate the efficacy of the use of visually based strategies with individuals with ASD. Thus, to some extent, they contribute to the literature promoting the use of visual scripts and point to the possibility of using visual scripts and other visual cues in tandem.

The purpose of the current research was to investigate the effectiveness of written scripts and visual cues with verbal elementary-age children with ASD. The following

questions were considered: (a) Do written and pictorial scripts increase context-appropriate conversation? (b) Do written and pictorial scripts have collateral effects on unscripted statements? and (c) Do visual reminders decrease perseverative speech? This study contributes to the literature on social and communication interventions for individuals with ASD by, in part, replicating previous research, which is necessary to document the effectiveness of single-subject research. In addition, this study provides a variation on previous research via the implementation of a visual cue to decrease repetitive speech in children with ASD who engaged in high rates of repetitive, perseverative speech that interfered with their abilities to communicate effectively with peers. Moreover, the participants in this study were older and higher functioning than those in previously published literature, although the participants in the present study had significant sociocommunicative delays, a core characteristic of the range of ASD.

## Method

### Participants

Three children participated in this study. All three had been diagnosed by a licensed medical or other clinical professional and met the criteria for *Autistic Disorder* or *Pervasive Developmental Disorder, Not Otherwise Specified* (PDD-NOS), as defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR; APA, 2000).

Henry was a 12-year-old boy currently diagnosed with PDD-NOS by a pediatric neurologist. He was initially diagnosed at age 4 years, 6 months, with speech delay. Henry's cognitive skills were average; however, he had difficulty with wh- questions and abstract concepts (e.g., idioms). Henry independently performed self-help skills, such as toileting. He had age-appropriate phonologic and semantic speech skills; however, his speech sounded stilted and monotone. Henry usually worked and played independently and rarely initiated interactions unless he needed or wanted something. In addition, Henry infrequently made spontaneous eye contact. He frequently engaged in self-talk, repeating phrases from television commercials and video games. Henry often drew pictures and could write the letters of the alphabet and read. Henry's Individualized Education Program (IEP) included the following social skill and communication objectives related to this study: "use the names of individuals in his class," "speak fluently with appropriate inflection and prosody," and "work cooperatively on an activity with a peer."

Aidan was a 7-year-old boy who was diagnosed with autism at age 2 years, 6 months, by a developmental diagnostic team, who noted that he was "high-functioning." His cognitive skills were average and he independently demonstrated self-help skills. Aidan's phonologic and semantic skills were age-appropriate; however, he infrequently initiated or engaged in conversation with peers or adults. Furthermore, Aidan engaged in self-stimulatory behaviors, including jumping, putting his fingers in his mouth, and self-talk (e.g., repeating phrases from favorite songs and books). Aidan often played independently with a variety of materials, although play sequences often were repetitive. Aidan's IEP included the following social skill and communication objectives related to this study: "use the names of individuals in his class," "initiate and sustain play with a peer using a script," and "greet every member of his class."

Moira was an 8-year-old girl who was initially diagnosed by a pediatric geneticist with Asperger syndrome at age 3. She was later diagnosed at approximately 3 years, 6 months, with PDD-NOS. Moira was a verbal child who had previously learned many appropriate phrases for a variety of play situations. For example, in the sandbox, she frequently said, "I'm making a volcano." Unfortunately, she repeated such phrases at a far higher rate than her peers, causing the annoyance of playmates, one of whom often told her, "You already said that, Moira!" Such repetitious speech was considered to be perseverative instead of communicative and was categorized during this study as perseverative speech as defined under Response Definitions. Moira's IEP included the following social skill objectives: "use appropriate greetings and salutations with all the children in her class" and "use a set of appropriate phrases with another child while playing."

### Settings and Materials

This study took place in a private school for children with ASD and cognitive impairments. The school consisted of two certified teachers, one of whom was a Board Certified Associate Behavior Analyst (BCABA), and 10 students, half functioning at the high end of the spectrum and half with cognitive impairments. This school was located on the campus of a small, accredited, private school serving elementary through high school students with mild disabilities. Each participant was paired with a child with cognitive impairments who did not have ASD. During each activity, the participant and his or her partner would sit in close proximity with each other and the materials. Each activity chosen was one that the participant had already mastered independently and in which he or she enjoyed engaging. Thus, the

requirement for reciprocal communication was the only objective new to the participants.

*Henry.* Henry's first activity was reading, during which he and his partner would sit next to each other at a table with several familiar books from which to choose. His second activity, drawing, also took place at a table and included colored paper, markers, and crayons. Henry's final activity, doing puzzles, took place on the floor and the children had the choice of a floor puzzle to complete together.

*Aidan.* Aidan's first activity was pretend play in the "kitchen," which included a small table and chairs, toy stove set, plastic food, and plastic plates and utensils. His second activity was puzzles, which included the same setting and materials as Henry's puzzle play. Aidan's final activity, playing with modeling clay, took place at a table and included the clay and a variety of tools, such as cookie cutters, mallets, and rolling pins.

*Moira.* Moira's first activity was pretend play in the kitchen, which included the same setting and materials as Aidan's kitchen play. Her second activity was play in the sandbox, which was outside and included the sand and tools, such as pails, shovels, and sifters. Moira's third activity was a math game involving matching manipulatives labeled with numerals to manipulatives labeled with drawings corresponding with the numerals. This activity took place on the floor in close proximity with her partner.

## Research Design

The study used a multiple baseline design with embedded withdrawal across three 5-minute activities for each of the three participants. Baseline data were collected on all three activities per participant. Once two sessions of baseline data had been collected for the first activity, the intervention was implemented in that activity while baseline was continued in Activities 2 and 3. Only two baseline data points were collected during the first activity due to the low rate of scripted statements, which were the focus of the study, for each participant. Although data were collected and graphed for unscripted statements, these data were not considered when making phase-change (e.g., switching from baseline to intervention) decisions because unscripted statements, particularly those that occurred during baseline, were frequently not communicative or related to the activity.

During intervention in the first activity, when the participant's scripted statements occurred at a frequency of at least twice the highest baseline data point, or more than two scripted statements occurred if no scripted statements occurred during baseline, for a minimum of three

sessions, the intervention was implemented in the second activity. The same sequence was followed in implementing the intervention in the third activity. The activities were introduced in a discontinuous, rotating approach (e.g., Moira had kitchen for Sessions 1, 4, 7, etc.; sandbox for Sessions 2, 5, 8, etc.; and math game for Sessions 3, 6, 9, etc.) to ensure that each activity was implemented the same number of times, to prevent boredom for the participants when several sessions were implemented in the same day, and for ease of implementation across a number of researchers. Following intervention, each of the activities returned to baseline conditions for two sessions of data collection.

In addition to visually analyzing the graphed results to evaluate the effects of the social scripts and visual cue intervention, the percentage of nonoverlapping data (PND; Scruggs & Mastropieri, 1998) was calculated for each participant. Marquis et al. (2000) criticized the use of PND as too easily influenced by outliers in the baseline or by differing phase lengths; however, Campbell (2004) and Olive and Smith (2005) conclude that PND is valid for documenting the effects of interventions in single-subject research. To calculate PND, the number of treatment data points that exceed the highest baseline data point is divided by the total number of data points in the treatment phase and multiplied by 100 (Scruggs, Mastropieri, & Casto, 1987). PND scores greater than 90% represent highly effective treatments, scores from 70% to 90% reflect effective treatments, scores between 50% and 70% suggest questionable treatments, and scores less than 50% are indicative of ineffective treatments (Scruggs & Mastropieri, 1998).

*Script instruction.* Prior to data collection, each of the three participants was taught his or her scripts to mastery (i.e., until he or she could read the entire script without errors or prompts). Each participant initially was given three sets of 10 phrases with line drawings accompanying them. The 10 phrases were similar across the three activities but varied slightly according to the content of the activity. Aidan's scripts were reduced from 10 to 6 per activity when it became apparent that he was not as fluent a reader as the other two participants. In addition, the line drawings for his scripts were enlarged to support his reading of the scripts. During script instruction, scripted phrases were presented one at a time and the participant was asked to read each. If he or she was unable to read a phrase, these were reviewed and reread several times. Script instruction took place once or twice per day until the participants could each read their scripts independently. Once each participant could read his or her scripts independently, baseline data were collected.

*Response definitions.* During each baseline and intervention session, data were collected under three main categories: scripted statements, unscripted statements, and perseverative speech. Observers recorded all phrases and sentences spoken by the participants during each 5-minute session and then analyzed the entire segment to produce the frequency counts. Phrases or sentences were recorded as scripted statements when they were word-for-word the same as the phrases listed on the participants' cue cards and if only one word was different or absent (see Figure 1 for an example of Henry's script). If any statement was used more than once, then the repetitions also were counted. Any phrases or sentences that were not scripted or were two or more words different from the scripted statements were recorded as unscripted statements. Unscripted statements were counted as perseverative speech if they were repeated word-for-word three or more times within that 5-minute session. That is, when the same statement was repeated three or more times, all occurrences of that phrase were counted as perseverative speech and not in the category of unscripted statements. Perseverative speech included delayed echolalia that was out of context. Examples included repetitive recitations of scripts from video games or television commercials that did not relate to the activity and were not conversational and phrases that were context appropriate but more perseverative in nature than conversational because they were repeated word-for-word multiple times (e.g., "I made a volcano. I made a volcano. I made a volcano. I made a volcano.").

Two independent observers (the first, third, and fourth authors) collected data simultaneously to calculate reliability for 52% of Henry's sessions (35% of baseline, 59% of intervention, 33% of return to baseline), 42% of Aidan's sessions (27% of baseline, 55% of intervention, 0% of return to baseline), and 42% of Moira's sessions (41% of baseline, 45% of intervention, 20% of return to baseline). Observer agreement was calculated using a frequency ratio by dividing the smaller total of statements recorded by an observer by the larger total recorded by the other observer, multiplied by 100 (Kazdin, 1982). Throughout the course of the study, observer agreement was calculated at 95% (range 70–100%) for Henry, 89% (range 71–100%) for Aidan, and 92% (range 70–100%) for Moira.

*Baseline.* Baseline and intervention sessions were each 5 minutes long and took place between two and four times per week per participant, depending on school attendance and holidays. During baseline sessions, each participant and a partner were brought to an activity and told what they could do (e.g., "It's time to do some reading"). An adult researcher and occasionally a second adult observer sat near the participant and partner throughout each session to write down the participant's

verbal statements. No other instructions or prompts were given. The only exception was that if a participant or his or her partner tried to leave the activity, then he or she was reminded to remain until the 5-minute timer went off.

*Script and quiet picture intervention.* Intervention sessions were each 5 minutes long. Intervention conditions were similar to baseline conditions with the addition of the scripts. Each phrase and accompanying pictures were typed onto 3" × 5" colored note cards. Every 30 seconds, a card was held up behind the participant's partner to prompt the participant to say the phrase on the card. The card was held up until the participant said the scripted statement. In addition, Henry was taught to tap his partner on the arm to get his attention as he said each phrase because it was noticed that his partner frequently did not respond if Henry did not gain his attention first. For each participant, during the intervention phase, scripts were faded over three steps. First, the last half of the script was cut off and only the first half was presented. Then, all but the first word and picture of the script were removed. Finally, in the return-to-baseline conditions, the entire script and note card were removed. Points at which script fading occurred are indicated with arrows on Figures 2 through 7.

Intervention was initiated with Henry prior to beginning with the other two participants. The researchers discovered that perseverative speech was still occurring frequently and introduced a quiet picture (i.e., a 3" × 3" line drawing of a face with the index finger in front of the mouth indicating "shhh"). Prior to the activities, the participants were shown the quiet picture and told that if it was held up, they needed to "stop saying the same thing." This picture was held up by the adult sitting behind the participant's peer when a participant said a phrase more than once and each subsequent time the participant said the phrase. No verbal reprimand accompanied the presentation of the quiet picture. If the participant continued to repeat the phrase a third time, the adult then used an exaggerated gesture (i.e., pointing) and held the picture closer to the participant and within his or her eyesight (no closer than 3 feet in front of his or her face). The quiet picture was initiated for Henry during the third day of intervention for Activity 1 and was implemented along with the scripts for each of the other participants. Quiet pictures were not faded out until the return-to-baseline conditions.

## Results

Henry's scripted and unscripted statements increased during intervention (Figure 2). During the reading activity,

**Figure 1**  
**Sample of Henry's Reading Script**

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Good reading, [name].  
 [Name], do you like to read?  
 Do you want to read?  
 Wow that's good!  
 I'll get a book.  
 You get a book.  
 I'm using [name of book].  
 This is fun!  
 Let's read some more.  
 [Name], what do you want to do?

---

his scripted statements ranged from 0 to 2 ( $M = 1.00$ ) during baseline but sharply increased (range = 9–14,  $M = 10.75$ ) during intervention. As the script was faded, scripted statements began to decrease slightly during the remainder of the intervention phase. During the return-to-baseline conditions for reading, Henry's scripted statements returned to 0 for all sessions. Similar patterns were noted for Henry's other two activities: drawing and puzzles. Means for scripted statements during the drawing activity were 0.33 during baseline (range = 0–2), 6.83 during intervention (range = 4–9), and 0.00 during the return-to-baseline conditions. Means for scripted statements during the puzzle activity were 0.00 during baseline, 7.78 during intervention (range = 5–13), and 0.00 during the return-to-baseline conditions.

Henry's unscripted statements also increased during intervention, although the data were much more variable during baseline sessions and less so during intervention. During two of the three activities, the number of unscripted statements returned to near-baseline numbers during the return-to-baseline conditions. During the reading activity, Henry's unscripted statements ranged from 0 to 2 ( $M = 1.00$ ) during baseline, increased (range = 0–10,  $M = 3.38$ ) during intervention, but did not clearly decrease during the return-to-baseline conditions (range = 0–8,  $M = 4.00$ ). However, from visually inspecting the data, it appears that during intervention, unscripted statements began to increase, whereas scripted statements began to decrease as the script was faded. Means for unscripted statements during the drawing activity were 5.00 during baseline (range = 0–11), 9.75 during intervention (range = 4–26), and 2.00 (range = 1–3) during the return-to-baseline conditions. Means for unscripted statements during

the puzzle activity were 3.78 (range = 0–10) during baseline, 4.78 during intervention (range = 2–10), and 2.50 (range = 2–3) during the return-to-baseline conditions.

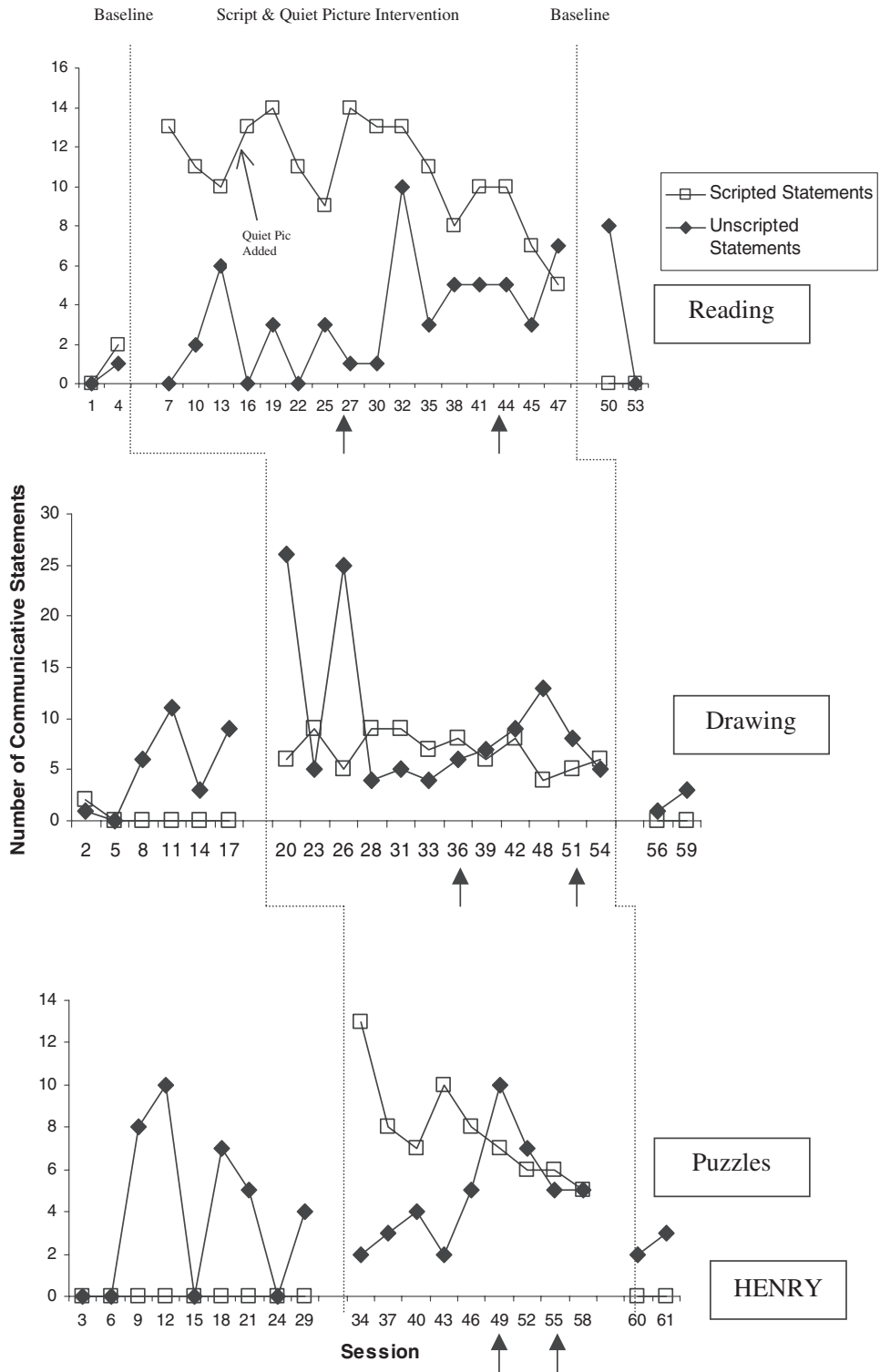
Henry's perseverative speech significantly decreased throughout intervention (see Figure 3). These results were maintained during the return-to-baseline conditions. During Henry's first activity—reading—perseverative speech averaged 9.50 statements (range = 9–10) during baseline, decreased to 1.00 (range = 0–13) during intervention, and remained low at 2.00 (range = 0–4) during the return to baseline. In comparison, total communicative statements averaged 1.50 (range = 0–1) during baseline, increased to 14.13 (range = 0–10) during intervention, and fell to 4.00 (range = 0–8) during the return-to-baseline conditions. During the drawing activity, means for perseverative speech were 8.50 (range = 0–27) during baseline and dropped to 0 during intervention and the return-to-baseline conditions. Means for total communicative statements were 5.33 (range = 0–11) during baseline, 9.75 (range = 11–32) during intervention, and 2.00 (range = 1–3) during the return to baseline. During Henry's final activity—puzzles—he averaged 15.22 perseverative acts during baseline (range = 0–59), 0 (range = 0) during intervention, and 1.50 (range = 0–3) during return to baseline. Means for total communicative statements were 3.78 (range = 0–10) during baseline, 12.56 (range = 10–17) during intervention, and 2.50 (range = 2–3) during the return to baseline.

To augment the visual analysis, PND calculated for Henry reveal a score of 100% for scripted statements, a score of 38% for unscripted statements, and a score of 92% for total communicative statements. The PND for scripted statements suggests a highly effective intervention, the PND for unscripted statements indicates an ineffective intervention, and the PND for total communicative statements reflects a highly effective intervention.

Aidan's data are displayed in Figure 4. During kitchen play, Aidan used no scripted statements during baseline. His use of scripted statements increased during intervention, ranging from 3 to 18 statements ( $M = 7.77$ ), and dropped back to 0 during the return to baseline. Aidan's results were similar during the puzzle and clay activities. Means for scripted statements during the puzzle activity were 0.50 during baseline (range = 0–3), 8.78 during intervention (range = 6–13), and 0 during the return-to-baseline conditions. Means for scripted statements during the clay activity were 0.29 (range = 0–1) during baseline, 8.00 during intervention (range = 6–10), and 0 during the return-to-baseline conditions.

Aidan's unscripted statements during baseline, intervention, and return to baseline are difficult to interpret with visual inspection; however, the means during his

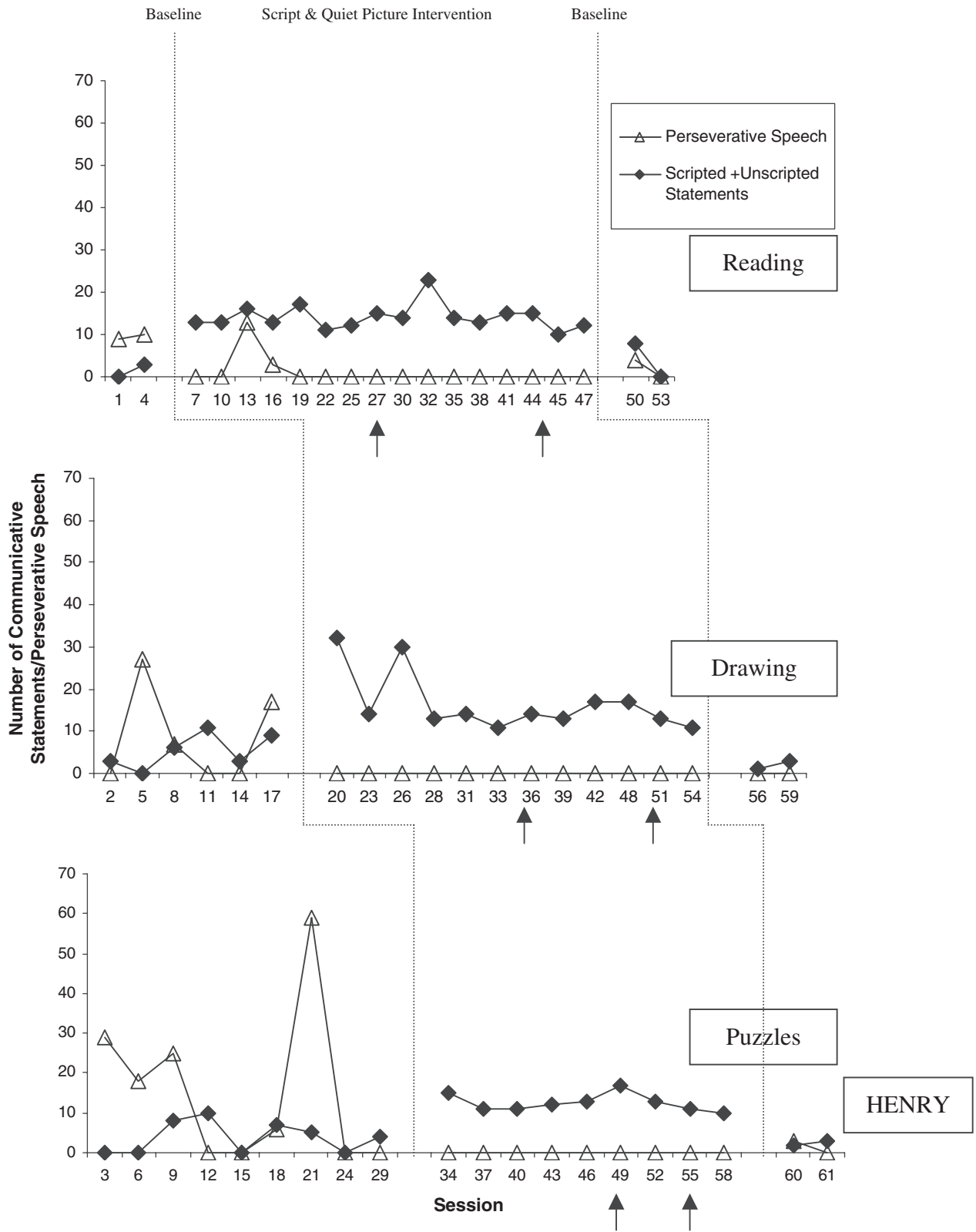
**Figure 2**  
**Henry's Scripted Versus Unscripted Communicative Statements**



Note: Arrows indicate each fading step. Session numbers for each activity are not continuous because the participant rotated through each activity and sessions were numbered accordingly. For example, Session 1 was the Reading activity, Session 2 was the Drawing activity, and Session 3 was the Puzzle activity.



**Figure 3**  
**Henry's Communicative Statements Versus Perseverative Speech**



Note: Arrows indicate each fading step.

first and third activities demonstrate an increase during intervention and decrease during return to baseline. During kitchen play, Aidan's unscripted statements averaged 5.00 (range = 5) during baseline, increased (range = 3–19,  $M = 10.31$ ) during intervention, and decreased during the return-to-baseline conditions (range = 4–9,  $M = 6.50$ ). Means for unscripted statements during the puzzle activity were 8.50 during baseline (range = 5–19), 9.56 during intervention (range = 5–16), and 7.50 (range = 6–9) during the return-to-baseline conditions. Means for unscripted statements during the clay activity were 9.57 (range = 5–17) during baseline, 14.00 during intervention (range = 9–21), and 5.50 (range = 4–7) during the return-to-baseline conditions.

Aidan's use of perseverative speech significantly decreased throughout intervention; however, during the return-to-baseline conditions, these results were reversed (see Figure 5). During Aidan's first activity, kitchen play, perseverative speech averaged 7.50 statements (range = 3–12) during baseline, decreased to 3.31 (range = 0–14) during intervention, and increased to 44.50 (range = 33–56) during the return to baseline. Total communicative statements averaged 5.00 (range = 5) during baseline, increased to 18.08 (range = 13–27) during intervention, and decreased to 6.50 (range = 4–9) during the return-to-baseline conditions. During the puzzle activity, means for perseverative speech were 26.00 (range = 0–54) during baseline, dropped to 2.78 (range = 0–6) during intervention, and then increased to 21.50 (range = 21–22) during the return to baseline. Means for total communicative statements were 9.00 (range = 0–19) during baseline, 18.33 (range = 11–29) during intervention, and 7.50 (range = 6–9) during the return to baseline. During Aidan's final activity, clay, he averaged 25.86 (range = 5–49) perseverative statements during baseline, 3.14 (range = 0–10) during intervention, and 20.00 (range = 13–27) during the return to baseline. Means for total communicative statements were 9.86 (range = 5–17) during baseline, 22.00 (range = 9–21) during intervention, and 5.50 (range = 4–7) during the return to baseline.

PND calculated for Aidan reveal a score of 100% for scripted statements, a score of 41% for unscripted statements, and a score of 67% for total communicative statements. The PND for scripted statements suggests a highly effective intervention, the PND for unscripted statements indicates an ineffective intervention, and the PND for total communicative statements reflects a questionable intervention.

Moira's scripted statements increased from baseline to intervention and decreased during the return to baseline for each of her three activities (see Figure 6). During

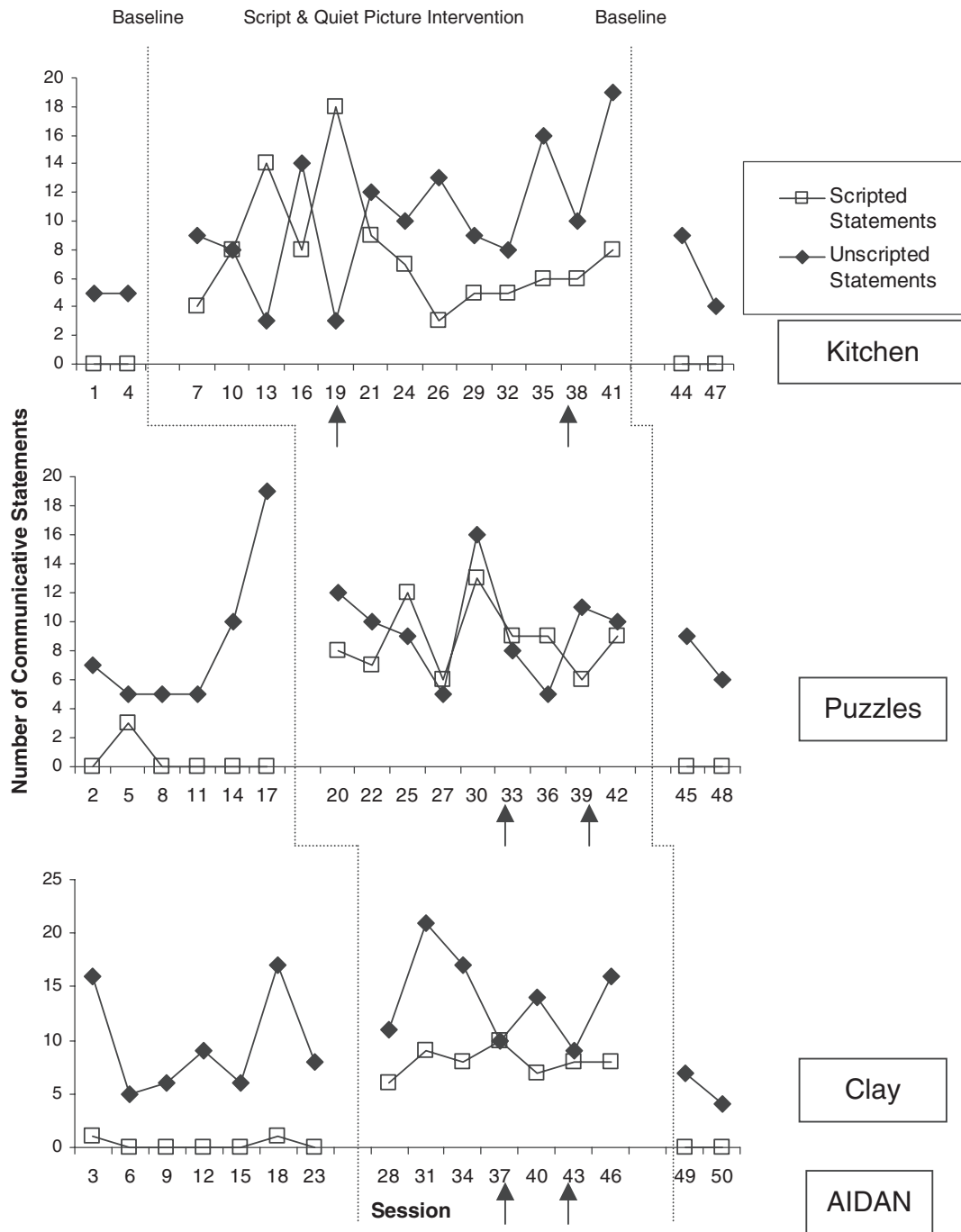
kitchen play, Moira used no scripted statements during baseline. Her use of scripted statements increased during intervention, ranging from 8 to 15 statements ( $M = 10.29$ ) and ranged from 0 to 9 ( $M = 4.50$ ) during the return to baseline. Moira's results were similar during the sandbox activity and math game. Means for scripted statements during the sandbox activity were 0.86 during baseline (range = 0–3), 9.50 during intervention (range = 7–13), and 1.50 (range = 0–3) during the return-to-baseline conditions. Means for scripted statements during the math game were 1.25 (range = 0–6) during baseline, 6.43 during intervention (range = 3–10), and 4.00 (range = 2–6) during the return-to-baseline conditions.

During kitchen play, Moira's unscripted statements averaged 13.00 (range = 12–14) during baseline, 11.71 (range = 2–19) during intervention, and 12.50 (range = 10–15) during the return-to-baseline conditions. Means for unscripted statements during the sandbox activity were 15.57 during baseline (range = 10–24), 8.40 during intervention (range = 4–11), and 4.00 (range = 4) during the return-to-baseline conditions. Means for unscripted statements during the math game were 21.00 (range = 11–29) during baseline, 19.00 during intervention (range = 10–29), and 19.00 (range = 17–21) during the return-to-baseline conditions.

Moira's use of perseverative speech significantly decreased throughout intervention and these results were maintained during the return-to-baseline conditions (see Figure 7). During Moira's first activity, kitchen play, perseverative speech averaged 23.00 statements (range = 21–25) during baseline, decreased to 7.64 (range = 0–26) during intervention, and decreased to 2.00 (range = 0–4) during the return to baseline. Total communicative statements averaged 13.00 (range = 12–14) during baseline, increased to 22.00 (range = 10–27) during intervention, and decreased to 17.00 (range = 15–19) during the return-to-baseline conditions. During the sandbox activity, means for perseverative speech were 29.00 (range = 10–42) during baseline, dropped to 1.90 (range = 0–5) during intervention, and increased to 0 (range = 0) during the return-to-baseline conditions. Means for total communicative statements were 16.43 (range = 11–25) during baseline, 17.90 (range = 11–21) during intervention, and 5.50 (range = 4–7) during the return to baseline. During Moira's final activity, the math game, she averaged 18.25 (range = 0–44) perseverative statements during baseline, 0.43 (range = 0–3) during intervention, and 2.00 (range = 0–4) during the return to baseline. Means for total communicative statements were 22.25 (range = 11–30) during baseline, 25.43 (range = 19–33) during intervention, and 23.00 (range = 23) during the return to baseline.

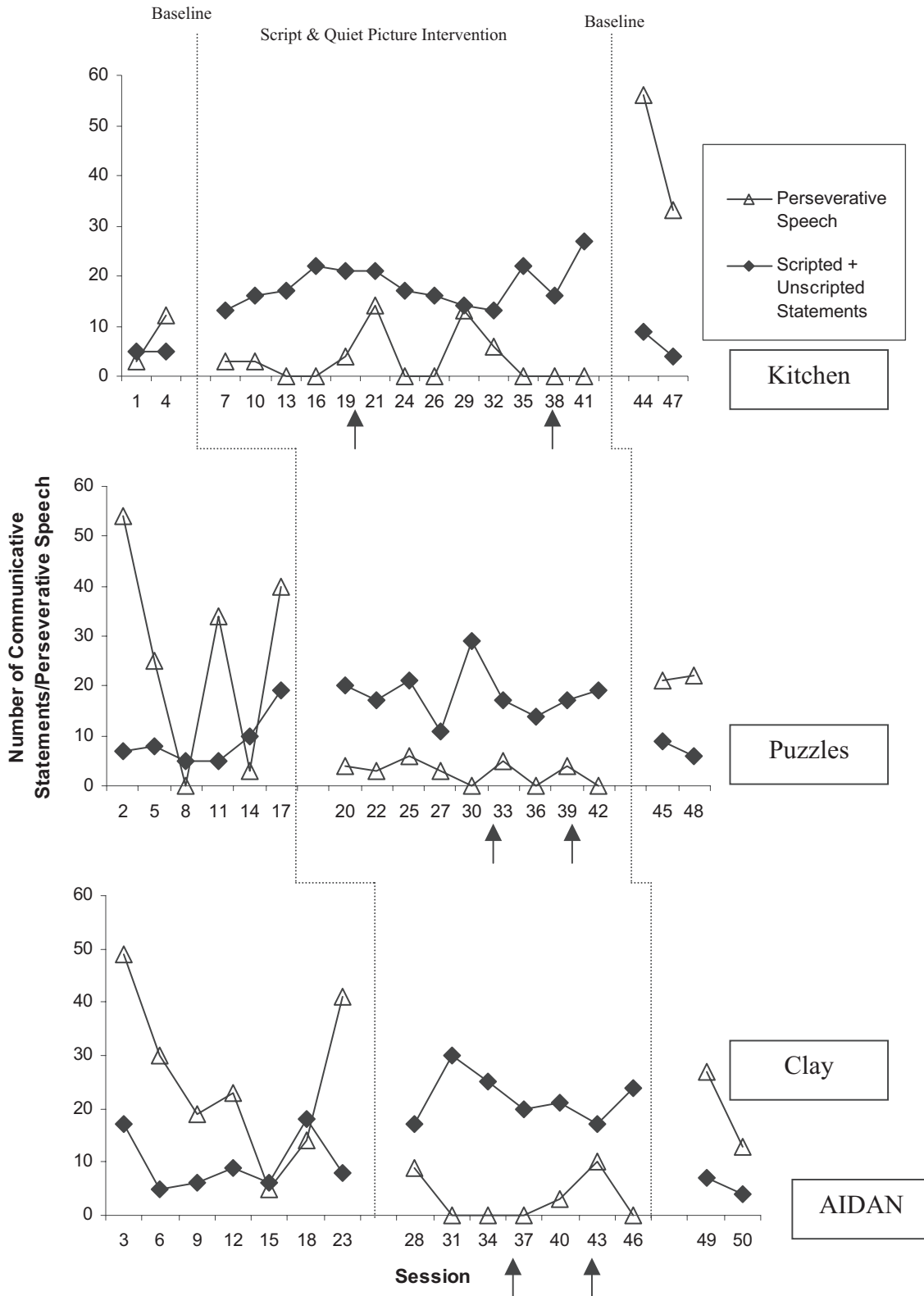
*(text continues on page 92)*

**Figure 4**  
**Aidan's Scripted Versus Unscripted Communicative Statements**



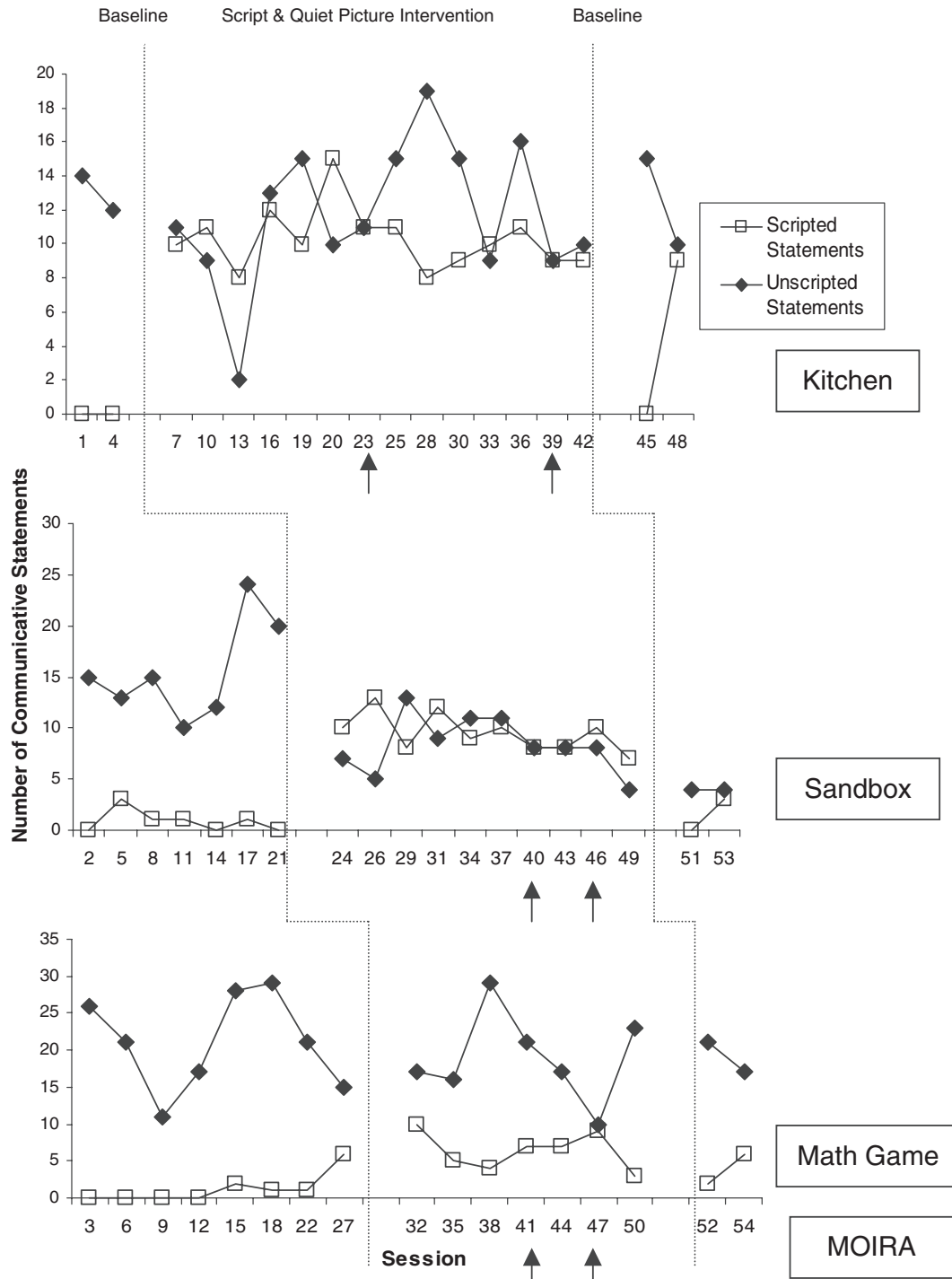
Note: Arrows indicate each fading step. Session numbers for each activity are not continuous because the participant rotated through each activity and sessions were numbered accordingly. For example, Session 1 was the Kitchen activity, Session 2 was the Puzzle activity, and Session 3 was the Clay activity.

**Figure 5**  
**Aidan's Communicative Statements Versus Perseverative Speech**



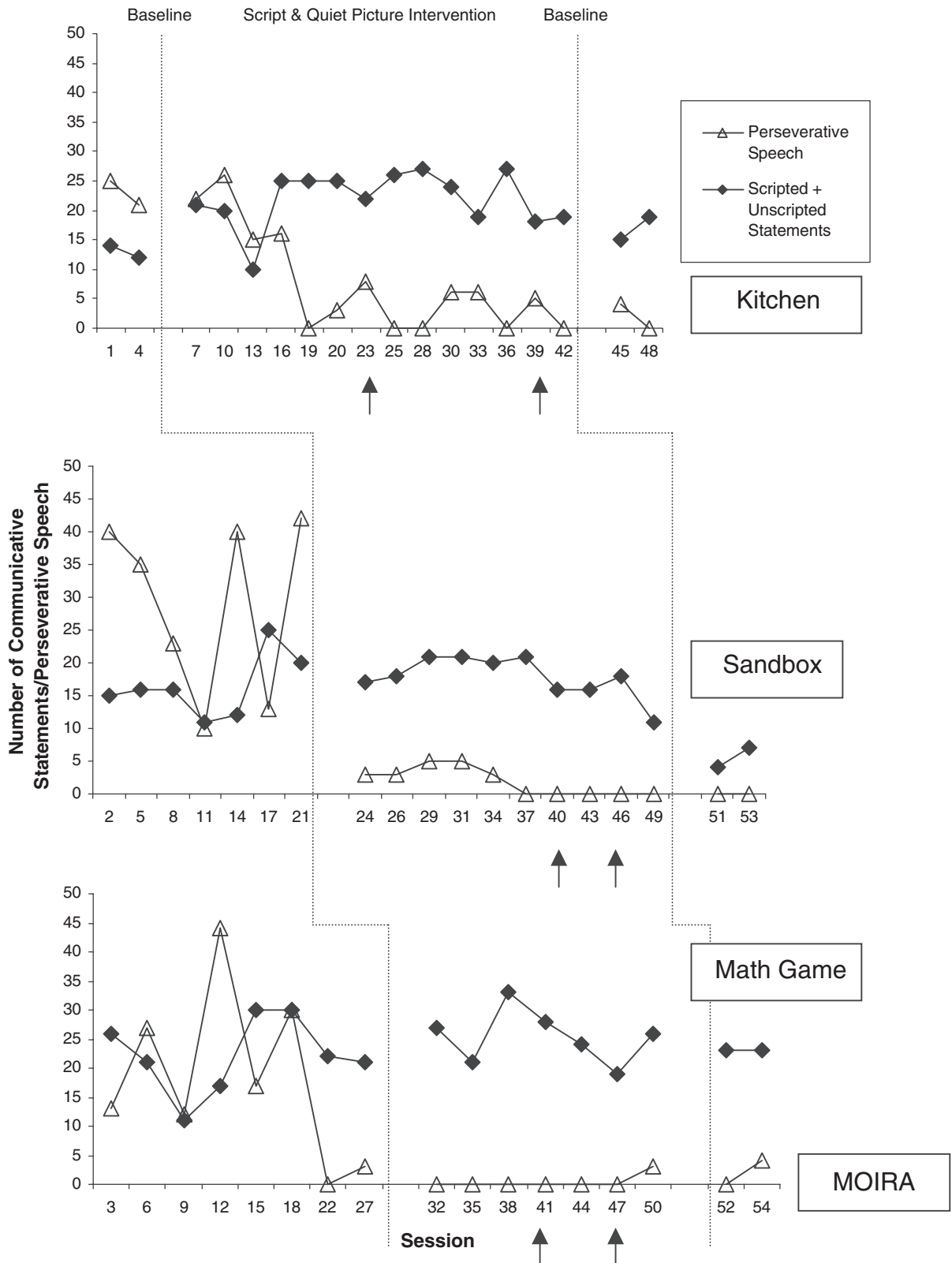
Note: Arrows indicate each fading step.

**Figure 6**  
**Moira's Scripted Versus Unscripted Communicative Statements**



Note: Arrows indicate each fading step. Session numbers for each activity are not continuous because the participant rotated through each activity and sessions were numbered accordingly. For example, Session 1 was the Kitchen activity, Session 2 was the Sandbox activity, and Session 3 was the Math Game activity.

**Figure 7**  
**Moira's Communicative Statements Versus Perseverative Speech**



Note: Arrows indicate each fading step.

PND calculated for Moira reveal a score of 90% for scripted statements, a score of 16% for unscripted statements, and a score of 45% for total communicative statements. The PND for scripted statements suggests a highly effective intervention, the PND for unscripted statements indicates an ineffective intervention, and the PND for total communicative statements reflects a questionable intervention.

## Discussion

Prior research has demonstrated that the use of written scripts increases peer initiations and promotes the continued use of unscripted exchanges in children with ASD, particularly those with limited expressive language. In addition, these scripts were found to generalize to settings other than those in which the scripts were taught (Krantz & McClannahan, 1998). As a result of instruction in and subsequent fading of scripts, students with autism have learned to initiate interactions with peers. Script instruction has resulted in increased peer initiations and unscripted initiations (Krantz & McClannahan, 1993). The present study demonstrated similar findings using written scripts with students with ASD, though the fact that the participants engaged in high rates of perseverative speech complicated the interpretation of the results, particularly the examination of unscripted statements. The present study contributes to the literature by providing a partial replication of previous studies, further proving the efficaciousness of this intervention. In addition, this study applied scripts to older, higher functioning, elementary-age students, who nonetheless had significant delays in using sociocommunicative skills. Finally, this study provides a variation on previous research with the addition of a visual cue used to decrease repetitious speech that interfered with the participants' abilities to communicate effectively with peers.

All three participants' scripted statements increased from baseline to intervention and decreased again in the return-to-baseline conditions. Henry clearly showed an increase in unscripted statements during intervention; however, such a relationship is not as clear via visual inspection of Aidan's and Moira's data. PND results for scripted statements for all three participants indicate that this is a highly effective treatment. By investigating the averages of unscripted statements within baseline, intervention, and return to baseline, the means during Aidan's first and third activities demonstrate an increase during intervention and decrease during return to baseline. Moira's unscripted statements did not show a clear

pattern throughout any of her three activities. Prior to intervention, both Aidan and Moira had high rates of unscripted statements. PND results for unscripted statements for all three participants indicate that this is an ineffective treatment. Although frequent, these phrases were rarely appropriate or directed at their partners. For example, during session four, the kitchen activity, Aidan said, "Sunday, Monday" and "there's the camera," but these phrases were unrelated to the content of the activity, were made under his breath, and were not directed toward his partner. Aidan often repeated lines from books, movies, and songs. If these were not repeated more than two times during a session, they counted as unscripted statements, although they were not necessarily communicative.

The procedures outlined in this research show potential for positive social outcomes, particularly for students who make context-related comments at extremely high rates and repeatedly such that they annoy their peers. Moira had high rates of unscripted statements prior to intervention; thus, there was little room for change in unscripted statements throughout intervention. However, she spoke so much that she overwhelmed her partner. Her comments were generally on topic but too frequent and usually repetitive. Increasing Moira's unscripted statements was therefore not a goal of this research, although increasing the quality of those interactions was a goal. Whereas previous studies (Krantz & McClannahan, 1993, 1998) focused on fading scripts while maintaining and increasing unscripted and elaborated statements, such an analysis is not as readily made in the present study due to the complexity and frequency of the participants' perseverative speech.

The most striking result of the current research was the participants' decreased perseverative speech during intervention. Prior to intervention, all three of the participants used high rates of repetitive speech. Henry often repeated portions of television commercials and programs and phrases from video games. For example, during the first baseline for the reading activity, Henry repeated "don't you dare" and "call XXX-XXXX for free installation" (a commercial) more than twice. During Session 3 of baseline for the puzzles activity, he repeated phrases such as, "Robot Jones" and "It's Captain Planet," all of which were unrelated to the activities. Aidan often repeated phrases that were appropriate to the activity but they were repeated numerous times in an echolalic manner. He also repeated phrases from songs and books. For example, during session five of baseline for the puzzle activity, he repeated "a puzzle" 16 times. During Session 9 of baseline for the clay activity, he repeated "he threw that cat

down” seven times. Moira typically repeated phrases that were context appropriate but these phrases were repeated so frequently that they were annoying to her peers. For example, during Session 1 of baseline for the kitchen activity, she repeated “here’s some water” six times and “a pizza is ready” 10 times. The implementation of the quiet picture quickly decreased perseverative speech for Henry. Aidan and Moira responded as well, although not as quickly as Henry. Henry and Moira maintained these decreases, demonstrating low rates of this repetitive speech even in the return-to-baseline conditions. Aidan, however, did not maintain decreased rates of perseverative speech during the return-to-baseline conditions. It is possible that Aidan might have maintained the results had the intervention continued for longer or if there had been a more gradual fading of the use of the quiet picture.

A major limitation to this research may have been the length of time the intervention was implemented. It appears that the participants’ responses were under stimulus control of the script cards, preventing their generalization of use of the scripted phrases when the cards were completely removed. Indeed, although this study partially replicates previous research on script interventions, the participants did not maintain the use of scripted statements once they were removed. It is possible that the scripts were removed too rapidly for the participants and that a more gradual removal of the scripts may have resulted in maintenance of the script phrases and generalization to more novel, but related, phrases. In addition, given the nature of the disability included in the study, it would be an advantage to increase the length of the study and even consider continuing the study throughout the course of 2 school years to decipher how the students react to extended breaks or to the increased amount of exposure to scripts. Future research could extend the use of scripts throughout a school year or more to determine if students maintain the results when exposed to the visuals for a longer time.

Another limitation of this research is that although there is clearly an experimental effect replicated across the three participants in regard to scripted statements, the question still remains, What, if any, was the qualitative improvement of the participants’ communicative interactions? Thus, future research in this area may be strengthened by including data collection regarding the contextual appropriateness or inappropriateness of each scripted and unscripted statement.

Finally, this study would have been strengthened from the addition of generalization and long-term maintenance data. Anecdotally, Moira’s mother did comment that approximately 1 month following the completion of

the study, Moira responded to the use of a quiet picture to reduce inappropriate and repetitive comments during Sunday School classes; however, this study would have benefited from data collection regarding these long-term effects as well as the collection of social validity data from the participants’ teachers and parents.

Overall, this study demonstrated that the use of scripts and visual cues can increase communicative speech and decrease perseverative speech. The use of visuals is less invasive and less socially stigmatizing than verbal prompts or reminders. They are also less distracting for other students who may be in the same classrooms as the individuals who are using prompts and cues. In addition, such strategies have value to teachers in that they are easily and quickly implemented with a minimum of materials. This research contributes to and extends previous research on scripts and visual cues by reporting results with participants who engaged in a large amount of perseverative speech and by adding the use of a visual cue to the implementation of visual scripts.

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