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Research Article

Narrative Intervention for Children With Autism Spectrum Disorder (ASD)

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Purpose: This study was conducted to determine whether a narrative intervention program that targeted the use of mental state and causal language resulted in positive gains in narrative production for children with autism spectrum disorder (ASD).
Method: Five children (2 girls and 3 boys) who had been diagnosed with ASD participated in the study. Children ranged in age from 8 to 12 years and were recruited through an autism clinic. Intervention was provided for two 50-min individual sessions per week for a total of 21–33 sessions (depending on the student). Children's spontaneous stories, collected weekly, were analyzed for overall story complexity, story structure, and the use of mental state and causal language. Following a multiple-baseline across-participants design, data were collected for lagged baseline and intervention phases over a 6-month period.
Results: All of the children made gains on all 3 measures of narration after participating in the instruction, with clear changes in level for all 5 children and changes in trend for 4 of the 5 children. The gains were maintained after intervention was discontinued.
Conclusion: The results demonstrate the efficacy of the 3-phase narrative instruction program for improving the fictional narration abilities of children with ASD.

Children encounter narratives in virtually every facet of their lives, so it is not surprising that most first graders are proficient at understanding and creating stories (Skarakis-Doyle & Dempsey, 2008). Narrative discourse is a means for communicating perceptions, feelings, values, and attitudes within cultural contexts (Nelson, 1996). The ability to produce coherent and cohesive narratives has been linked to competence in socialization (McCabe & Marshall, 2006), working memory (Duinmeijer, de Jong, & Scheper, 2012), and academics (Wellman et al., 2011).

Children diagnosed with autism spectrum disorder (ASD) often experience difficulty comprehending and producing narratives, and these difficulties extend well into their adolescent and adult years (Eigsti, de Marchena, Schuh, & Kelley, 2011). Their narrative difficulties appear to be linked directly to core symptoms of ASD such as failure to plan, difficulty using and integrating information from multiple sources, a hyper-focus on details at the expense of gist-level propositions, and limited use of mental state and causal language to encode goals and motivations of characters (Capps, Losh, & Thurber, 2000).

Executive functioning (EF), theory of mind (ToM), and weak central coherence theories have become prominent accounts of the core social and communication deficits experienced by children with ASD. Each of these theoretical perspectives predicts deficits in narrative proficiency. According to the EF theory, children with ASD demonstrate deficits in one or more of the cognitive processes (e.g., working memory, inhibition, goal maintenance) that underlie the ability to plan appropriate responses and inhibit inappropriate responses. Consistent with EF theory, narratives of children with ASD are often disorganized, include limited causal relationships, and/or reflect poor understanding of the main ideas (King, Dockrell, & Stuart, 2013). According to ToM, a core deficit in ASD is an inability to infer the emotional or mental states of others. Deficits in ToM have been shown to significantly impair one's ability to engage in ongoing social interactions and to develop the linguistic knowledge (e.g., mental state and causal language) necessary for understanding the relationship between events in discourse (Eigsti et al., 2011). Finally, weak central coherence theory links the social-communicative problems experienced by children with ASD to a preference for attending to specific details at the expense of integrating information into holistic mental representations. This could

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lead to difficulties organizing information into coherent stories (Loukusa & Moilanen, 2009). To date, no single theory sufficiently accounts for all of the symptoms underlying difficulties in narrative by children with ASD. However, each of the three principle theories of ASD predicts difficulties in the ability to understand and produce coherent and cohesive narratives.

Narrative Proficiency of Children With ASD

Stories produced by children with ASD may be similar in length and complexity to those told by their typically developing peers. However, there are often notable differences in story organization and in the establishment of causal coherence for conveying events in meaningful chains (Diehl, Bennetto, & Young, 2006). These differences may result from a failure to appreciate narrative structure as a tool for organizing experiences in cohesive and coherent ways (Solomon, 2004). Studies that have compared stories told by children with ASD with those produced by age-matched and verbal mental-age-matched children with Down syndrome illustrate deficits in story organization and causal coherence. In these studies, children with ASD were significantly less likely than children with Down syndrome to recognize and acknowledge central themes or motivations and goals of characters. As a result, their stories were less causally coherent and organized than stories told by children with Down syndrome (Grazzani & Ornaghi, 2012; King et al., 2013; Stringfield, Luscre, & Gast, 2011). Even when children with ASD include internal state verbs and adverbs in their stories, they are more likely to use descriptive fragments (e.g., "He is sad. His dog ran away.") and less likely to represent the thoughts and feelings of characters within a causal framework (e.g., "The boy was sad because his dog ran away"; Rollins, 2014).

The Importance of Story Structure and Causal Frameworks

Stein and Glenn (1979) proposed that stories are characterized by macrostructure and microstructure elements. The macrostructure of a story consists of settings plus episodes, which contain propositions such as initiating event (problem/event), internal response (feelings about the initiating event), attempt (goal-directed actions related to the initiating event), consequence (consequence of the actions), and reaction (feelings about the consequence). Stories also contain a microstructure, which consists of the words and sentences that combine to form the macrostructure. Aspects of the microstructure such as causal conjunctions can signal the storyteller's understanding of causal relationships within the story. Research has shown that children's understanding and use of causal connections in narratives predicts reading comprehension (White, van den Broek, & Kebndeou, 2007) and influences writing (van den Broek, Linzie, Fletcher, & Marsolek, 2000) and analogic thinking (McGill, 2002) as well as causal reasoning and decision making (Perales, Catena, & Maldonado, 2004).

Narrative Intervention for Children With ASD

We located two reports of the outcomes of narrative intervention with school-age children with ASD. Petersen et al. (2014) studied the outcomes of a narrative intervention that focused on improving personal narratives for children with ASD. Using a single-subject, multiple-baseline across-behaviors design, these authors targeted two to three story grammar elements and two to three syntactic structures that had been identified as deficient in each child's baseline stories. Narrative instruction was provided for up to 12 sessions by three graduate-level clinicians participating in clinical training at a university clinic. The clinicians used customized stories that modeled the story elements and linguistic forms that had been targeted for each child. Instruction involved picture icons and story drafting with the aid of "sticky notes." Linguistic instruction was provided through verbal modeling and prompting during the sessions. The clinicians followed a loosely scripted series of eight steps involving modeling, retelling, and generating stories that was similar in nature to the intervention described by R. B. Gillam and Ukrainetz (2006), Petersen, Gillam, Spencer, and Gillam (2010), and S. L. Gillam and Gillam (2014). In each step the visual and verbal support that was provided to the participants was reduced.

One of the three children made large gains in his use of the specific story grammar elements (e.g., action, problem, emotion, end emotion, plan, location) that were targeted and in his use of various linguistic forms (e.g., temporal conjunctions, causal adverbial subordination, temporal adverbial subordination, adverbs, adjectival subordination). The other two children made moderate gains during intervention for some target structures and minimal gains for others. None of the children maintained their improvements immediately after treatment ended.

Dodd, Ocampo, and Kennedy (2011) studied the outcomes of a narrative intervention for improving knowledge of mental state and causal language for school-age children with ASD. They recruited 18 children with ASD between the ages of 9 and 12 years to participate in one of two narrative interventions: perspective taking instruction or narrative-based language instruction (NBLI). Perspective taking instruction focused on knowledge of character emotion and cognitive states and on perspective taking. NBLI targeted sequencing, organization, use of transitional wording, and vocabulary not related to emotion and cognitive states (Dodd et al., 2011). Over the course of 6 weeks, children received instruction in groups of five for 30-min sessions three times per week. The *Story Grammar Marker* (Moreau & Fidrych-Puzzo, 1994), which is a visual manipulative representing story grammar elements, was combined with story mapping strategies to teach story grammar elements and perspective taking for children in the perspective taking instruction group. Advanced story mapping procedures were used to teach concepts to children in the NBLI group. Change in narrative skill was measured by asking children to retell a story from the perspectives of various characters. In addition, retells were evaluated for the number and

diversity of psychological terms that were used. The authors reported a large effect size (d = .96) for pre- to posttest differences in retells for children in the perspective taking condition and a moderate effect size (d = .41) for those in the NBLI condition. The authors interpreted these findings as evidence that children who received instruction in perspective taking and vocabulary related to character emotion and cognitive states demonstrated greater growth in these skills than children who did not receive this instruction. However, there was no global measure of narrative proficiency outside of the outcome measures used to assess production of mental terms and perspective taking skill. Therefore, we cannot determine with any certainty that either instructional approach resulted in children telling better stories.

This article reports the findings of a multiple-baseline across-participants study conducted to assess the efficacy of a three-phase narrative intervention program. We asked whether narrative instruction designed to increase the ability to produce stories containing complete episodes as well as mental state verbs and adverbs (e.g., *think*, *know*) and causal conjunctions (e.g., *because*, *so*) resulted in improvements in the narratives produced by children with ASD. We used a multiple-baseline across-participants design with two sets of children (three who were higher functioning and two who were lower functioning). Intervention began for the first participant in each set after three baseline sessions. The beginning of subsequent intervention phases for the additional participants was lagged by three sessions. Follow-up testing was conducted to determine whether the intervention effects were maintained after intervention was discontinued. No measure of generalization to other skills (e.g., social, educational) was administered.

Method

Participants

Five children (two girls and three boys) between 8 and 12 years of age were recruited through an autism clinic. All the participants were monolingual English speakers with an educational diagnosis of autism. The children had standard scores of 70 or above on the screening portion of the Universal Nonverbal Intelligence Test (UNIT; Bracken & McCallum, 1998). They were characterized as *verbally fluent* on the Autism Diagnostic Observation Schedule (ADOS-2; Lord et al., 2012). Four of the children earned standard scores at or below 85 on the Clinical Evaluation of Language Fundamentals–Fourth Edition (CELF-4; Semel, Wiig, & Secord, 2003). One child's CELF-4 scores were above average (114), but her stories lacked coherence or cohesiveness (see Table 1 for mean scores on the UNIT and the CELF-4).

We collected spontaneous stories about picture prompts before intervention. Three children (Rosa, Violet, and Jack) produced stories that contained basic story elements (initiating event, attempts, consequences) but did not contain internal responses or plans. Their stories, although sometimes long and detailed, had ambiguous story organization and deficiencies in the establishment of causal and temporal coherence. Whereas Rosa and Violet sometimes made reference to characters and settings by name, Jack never did so. In terms of microstructure, neither Rosa nor Violet used subordinated clauses containing causal language, and they rarely used mental (e.g., *thought*) and linguistic (e.g., *said*, *yelled*) verbs. Jack used coordinated and subordinated clauses, adverbs, and elaborated noun phrases inconsistently but never used causal terms (e.g., *because*) to connect elements in his stories. Two other participants, Bob and Gary, did not tell stories with basic episodes. When asked to create stories about single scenes that depicted possible initiating events, Bob and Gary provided simple descriptions of objects or actions (e.g., "There's a boy," "They are on the beach"). They were not observed to use coordinated clauses, subordinated clauses, adverbs, mental or linguistic terms, or elaborated noun phrases in their descriptions.

Table 1. Mean scores on the Clinical Evaluation of Language Fundamentals–Fourth Edition (CELF-4) and the Universal Nonverbal Intelligence Test (UNIT) for all participants prior to participation in the intervention program.

Participant	Age (years;months)	CELF-4	UNIT
Set 1			
Rosa	10;8	85	85
Jack	8;4	79	103
Violet	9;5	114	115
Set 2			
Bob	10;9	62	78
Gary	9;6	48	91

Outcome Measures

We elicited spontaneous narratives during each baseline session, after every other instructional session, and during two follow-up sessions by asking children to create a story that corresponded to a single-scene prompt. Five different examiners collected the stories after showing the participants photos that contained obvious initiating events such as children losing pets or money, missing buses, or getting injured. The examiners said, "I am going to show you a picture. I want you to make up a story using this picture. Tell the best story you can. You can think about it for a minute. Start when you are ready." No prompting or materials used during instructional sessions were used during the testing session. Examiners did not prompt the students except to ask whether their story was completed. Stories were recorded using a digital recorder and uploaded to a secure server.

Research assistants who were blind to the purpose of the research transcribed the stories told by children according to Systematic Analysis of Language Transcripts conventions (Miller & Chapman, 2004). The spontaneous narratives were transcribed verbatim with the inclusion of both child and examiner utterances when applicable. The stories were segmented into communication units (Loban,

1976) that consisted of an independent main clause and any phrases or clause(s) subordinated to it. Each transcript was checked by a second research assistant for word spelling, mazing, morpheme segmentation, and utterance segmentation. All transcription disagreements were resolved as the two transcribers listened to the digital recording together for a third time.

The Monitoring Indicators of Scholarly Language (MISL) rubric was used to measure narrative proficiency, knowledge of story elements, and perspective taking in spontaneous stories told by children (S. Gillam & Gillam, 2013). There are seven items on the MISL used to measure macrostructure and six items to measure microstructure. For macrostructure, each item (character, setting, initiating event, internal response, plan, attempt, and consequence) was weighted to a score of 2 and reflected whether an element was *absent* (score of 0), *emerging* (score of 1), *present* (score of 2), or *elaborated* (score of 3). The total possible score for macrostructure was 21. For an elaborated discussion of the scoring guidelines for the MISL, see the online supplemental materials.

For each of the six items that measured microstructure, a score of 0 was assigned if no exemplars were present, a score of 1 was assigned if the story contained one example of the structure, a score of 2 was assigned if two different exemplars were present, and a score of 3 was assigned if there were three or more different exemplars of the structure within the story. The MISL microstructure items for this project included coordinating conjunctions, subordinating conjunctions, adverbs, mental verbs, linguistic verbs, and elaborated noun phrases. The scores on each scale ranged from 0 to 3. The total possible score for microstructure was 18.

The total combined macrostructure and microstructure score on the MISL was used as an index of overall narrative complexity. In addition, we created two subscales of items specifically for this study. The Story Knowledge Index was calculated by combining the critical elements of a story (initiating event + internal response + plan + attempt + consequence). The Perspective Taking Index was calculated by adding scores earned for internal response, plan, and mental/linguistic verbs.

As a check on the accuracy of the original transcription and coding process, 20% of the transcripts were retranscribed. Percentage of agreement between primary and secondary transcribers was 96% for communication-unit segmentation and 96% for the identification of mazes. The first and second authors, who were not blind to the purpose of the study, independently scored 20% of the deidentified transcripts of the narratives using the MISL rubric. Interrater reliability for the MISL total score was 95%. The interrater reliability scores for the story knowledge and perspective taking indexes were 96% and 97%, respectively.

Narrative Intervention

The intervention used in this study is manualized and was implemented in a university clinic. Parents observed sessions but did not participate in them. The narrative intervention contained three phases—Phase 1: Teaching Story Elements, Phase 2: Connecting and Elaborating Stories, and Phase 3: Creating and Editing Stories. During Phase 1, participants were taught core story elements (character, setting, initiating event, internal response, plan, attempt, consequence, and reaction). Each element was depicted with an icon (e.g., smiley face for internal response; rocket taking off for initiating event) and included on a storyboard. Each story element was explained and illustrated using wordless picture books designed specifically for the intervention program. These books were loaded onto iPads. As the clinician told the story shown on the iPad, each story element was verbally defined and examples were provided. After all the elements were addressed, the children participated in lessons during which they were asked to identify each element in the model stories and to use them in creating new stories. The new stories (e.g., parallel stories) were similar to the modeled stories but differed in one or two elements (e.g., different characters, a different action). Parallel stories were drafted onto a storyboard containing the story icons by drawing stick pictures (Ukrainetz, 1998). Once the participants were successful in creating and retelling their own stories with the icons and storyboards, they practiced telling them without the support.

At the end of each phase we conducted contextualized, literature-based activities using children's trade books (see S. L. Gillam, Gillam, & Reece, 2012). References for all of the literature books used in the instruction may be found in the online supplemental materials. Each literature unit began with a prestory presentation to show children the book and title and was followed by a word review. After the vocabulary review, the book was read to the child. As the story was read, the clinician highlighted the story elements verbally and by using the icons and graphic organizers. Children were asked to answer questions related to the story elements and to retell the story with and without icons, picture manipulatives, and storyboards. During each phase, children engaged in minilessons targeting knowledge and use of concepts that contribute to narrative proficiency. For example, in Phase 1, children were engaged in lessons teaching the concepts of *before* and *after*, first within the context of the literature book and then in independent practice activities involving real-life situations (e.g., you must cook the brownies before you eat them).

After each participant completed the 18 lessons in Phase 1, exit testing was conducted to determine whether children were prepared to move on to Phase 2. In order to begin Phase 2, children had to (a) identify by name all of the icons, (b) give satisfactory examples and/or definitions for each icon, (c) be able to create a story about a picture that contained all of the elements (with assistance), and (d) answer comprehension questions related to the story elements. In the event that one or more of these criteria were not met, specific instructions and additional materials were provided in the manual relative to each skill and were used to reteach them. This process continued until the exit-testing criteria were met.

Phase 2 (Connecting and Elaborating Stories) was designed to teach linguistic structures, concepts, and vocabulary for use in creating more elaborate, complex stories. Instruction in Phase 2 highlighted the importance of making connections between story grammar elements and using mental state and causal language, and it included instruction designed to broaden knowledge of microstructure (e.g., use of coordinating and subordinating conjunctions, adverbs, elaborated noun phrases, and mental state and causal language). Children were introduced to the use of dialogue as a way to elaborate their stories (e.g., *said*, *yelled*, *told*) and participated in activities focused on the inclusion of complicating events as a means to produce more complex stories. During all lessons, emphasis was placed on establishing and maintaining connections between the story elements by using mental state and causal language. For example, children were encouraged to create stories that contained words such as *because* and *so* to explain why a character felt a certain way or why he or she planned to take various actions.

At the end of Phase 2, children participated in contextualized, literature-based activities that were based on a different, slightly more complex children's trade book that contained multiple examples of elaborated noun phrases. The lessons were similar to that of Phase 1; however, additional icons (e.g., dialogue, plan again) and a more elaborate story board that incorporated plan-again icons were added to provide support for the creation of more elaborated stories. Activities were conducted within the context of the literature book and then in independent practice activities involving the use of vertical structuring. For example, children were given a scenario ("The boy fell off his chair") and asked to tell how the character in the scenario felt (Child: "embarrassed"). Then, children were asked to explain why the character may have felt that way (Child: "because he fell off his chair"). The two responses were combined by the clinician and modeled back to the child (Clinician: "The boy was embarrassed because he fell off his chair."). This procedure provided the child with a model of the use of causal state language in a complex sentence.

Exit testing was conducted to determine whether children were prepared to move on to Phase 3 (Creating and Editing Stories). In order to begin Phase 3, children were required to create a story about a picture that included all of the story elements, the words *because* or *so*, and two or more feeling words plus one or more mental or linguistic verbs, one or more adverbs, and one or more elaborated noun phrases. They also had to answer comprehension questions and recall story details. Additional instructions and materials were used to reteach any of the skills children demonstrated continued difficulty with until they met the exit-testing criteria.

Phase 3 was designed to give children multiple opportunities to create, tell, edit, and revise their own spontaneously generated stories with and without icon and storyboard support. All of the lessons were conducted within the context of literature books that contained multiple, embedded episodes and more complex concepts, vocabulary, and syntax than Phases 1 and 2. Phase 3 began with literature-based activities and was followed by guided and independent practice activities on the use of cause-and-effect relationships signaled by conditional clauses containing the adverbs *if* and *then*. The structure was taught using the content of the book (e.g., if the whale gets stuck, then he should ask others for help pushing him off the sand) and then extended to real-life situations (e.g., if you found a puppy, then you should try to find the owner). Clinicians used additional books to teach this concept when children did not appear to be demonstrating sufficient understanding.

The major focus of Phase 3 was to provide children with opportunities to develop independence in their understanding and use of narrative macrostructure and microstructure. In addition, lessons were designed to foster metacognitive skills necessary for children to judge the adequacy of their own stories. Toward this end, children were taught to use a self-scoring rubric to edit their stories. The rubric contained questions targeting macrostructure and microstructure elements in stories. For example, the rubric asked, "Does the story have at least 2 characters?" and "Does my story have words that relate to thinking or dialogue?" Children used the self-scoring rubric first with the book *Little Croc and Whale* (Maddox, 2009) and then in stories created from sequenced scenes and single-scene prompts.

Treatment Fidelity

An observation checklist was designed to accompany each lesson taught in the intervention program. The intervention observation checklist was used by a member of the research team who observed the session to track that all aspects of the lesson were being taught. If fidelity fell below 85% for any lesson, the research staff held a short meeting with the interventionist immediately after the lesson to talk about what was omitted. There were sessions during which the intervention failed to meet the minimum fidelity requirement; however, it was usually due to the fact that there was insufficient time to complete the lesson. The omitted information was always introduced in the following session after a brief review of the previous session. A member of the research team who did not observe the lesson in person rated 20% of the lessons via videotape. Interrater reliability for implementation of lessons was calculated point by point and was 95% or greater for all of the lessons that were viewed.

Design

We used a concurrent multiple-baseline across-participants design. The five participants were divided into two sets. The first set of participants with higher language ability included Rosa, Violet, and Jack. The second set of participants with lower language ability included Bob and Gary. Within each set, participants began baseline at the same general point in time to control for external influences on participant performance (Carr, 2005). The onset of intervention was lagged for the other participants in each set to control for maturation and history threats to

internal validity. The first child in each set (Rosa and Bob) started intervention at the same time.

Data Analysis

Following Kratochwill et al. (2010), we used the following steps for conducting visual analysis of the data from this project. First, we observed whether there was a predictable pattern in the data during the baseline phase. Next, data obtained within the baseline and intervention phases were evaluated for the presence of predictable patterns. After within-phase inspection, we examined whether there was evidence that the intervention phase was associated with the expected change in total MISL scores. Features that were used to examine within-phase and between-phases (baseline and intervention) data patterns included (a) level (mean scores for data within a phase), (b) trend (slope of best-fitting straight line for data within phase), (c) variability (range of data about the best-fitting straight line), (d) immediacy of effect (change in level between last three data points in baseline and first three data points in intervention), (e) overlap (proportion of data from one phase that do not overlap with data from previous phase), and (f) consistency of data patterns across phases (extent to which there is consistency in the data patterns in baseline and intervention; Kratochwill et al., 2010).

There is debate in the literature about the use of visual analysis and statistical procedures for interpreting outcomes in single-subject studies (Scruggs & Mastropieri, 2001). Proponents of the use of visual analysis have pointed out that single-case studies do not meet the assumptions upon which many statistical methods depend. This is particularly relevant for studies with children from low-incidence populations such as ASD who may not meet the assumption for homogeneity of variance. Furthermore, under some conditions, alternate statistical analyses may mask patterns in the data that a visual analysis would ascertain. However, the American Psychological Association (APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008) recommends that all studies submitted for publication include measures to make it easier to interpret findings across studies. Following recommendations by Olive and Smith (2005), we calculated percent of nonoverlapping data (PND) across the baseline and treatment phases (number of data points during the treatment phase that did not overlap with the highest baseline point / the total number of data points in the treatment phase) and percent of improvement over baseline (PIB), which is (the quotient of the average of the last three intervention data points − the baseline average) / the baseline average × 100. We also combined the use of standard mean difference (SMD_{all}) with procedures for conducting visual analysis for evaluating the magnitude and strength of intervention effects in this project. SMD_{all} was calculated from the mean performance data during baseline and intervention divided by the standard deviation of the baseline mean. The data for SMD_{all} are presented as online supplemental materials. In addition to SMD calculations, the supplemental materials include a qualitative summary of each child's response to the instruction. This information is included to provide clinicians with a more complete understanding of the nature of the changes that were made by each of the participants.

Data Interpretation

The baseline and intervention scores for the MISL total, the MISL Story Knowledge Index, and the MISL Perspective Taking Index are illustrated in Figures 1, 2, 3, and 4. PND and PIB for each participant for the total and each index are shown in Tables 2, 3, and 4, respectively. Recall that the self-generated stories on which these data points were based were collected once weekly.

Participant Set 1 (Rosa, Jack, and Violet)

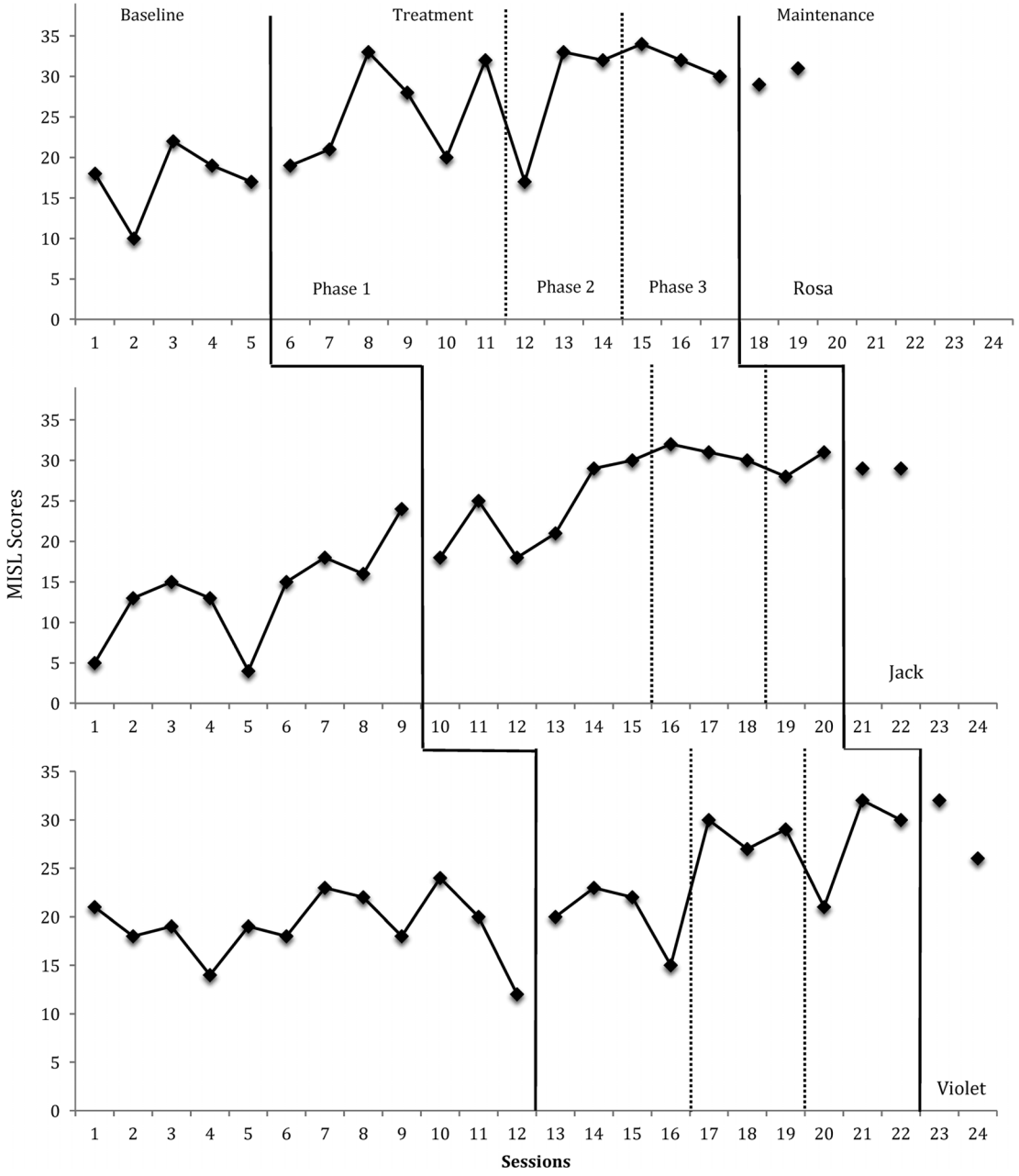
Rosa

Baseline. Visual data for Rosa's MISL, Story Knowledge Index, and Perspective Taking Index scores are presented in Figures 1 and 2. Rosa attended five baseline sessions prior to beginning intervention. There was a decreasing trend in all three narrative indexes during the last three baseline sessions. Rosa earned high scores (2 or higher) during baseline on the MISL for use of character (gave characters' names), but other macrostructure items (e.g., setting, initiating event, action, consequence) varied widely, with her highest scores earned during Baseline Session 2 (a story about a scene depicting a crowd of people at the beach). At no time did Rosa score a 2 or higher on internal response or plan during baseline, nor did she earn a score greater than 1 for use of mental verbs. Rosa used linguistic verbs during Baseline Session 1; however, only one of the subsequent four baseline stories contained a linguistic verb (i.e., *said*).

Intervention. Rosa attended 23 intervention sessions spread across 11 weeks. She spent nine sessions in Phase 1, eight in Phase 2, and six in Phase 3, and she participated in two follow-up sessions. MISL scores were obtained once weekly (after every other intervention session) for a total of 12 data points. Figures 1 and 2 show clear trend and level from baseline to intervention for all three narrative indexes. The effects were not stable until the third phase of the intervention program. MISL scores for eight of the 12 stories that were produced during the intervention phase were above the highest scores obtained during baseline (MISL = 22), resulting in a PND of 67%.

Rosa's Story Knowledge Index scores increased to the criterion of 10 or above within the first 2 weeks of intervention and were maintained for all but three of the 12 data points during intervention. The PND for the Story Knowledge Index was 75%, and there was a large PIB (256%). Rosa's narratives reflected greater knowledge of critical story elements (initiating event, action, and consequence scores of 2 or higher) for all of the sessions during intervention with the exception of Session 9. Rosa's Perspective Taking Index increased to criterion within 2 weeks after

Figure 1. Results of Monitoring Indicators of Scholarly Language (MISL) scores for Rosa, Jack, and Violet.



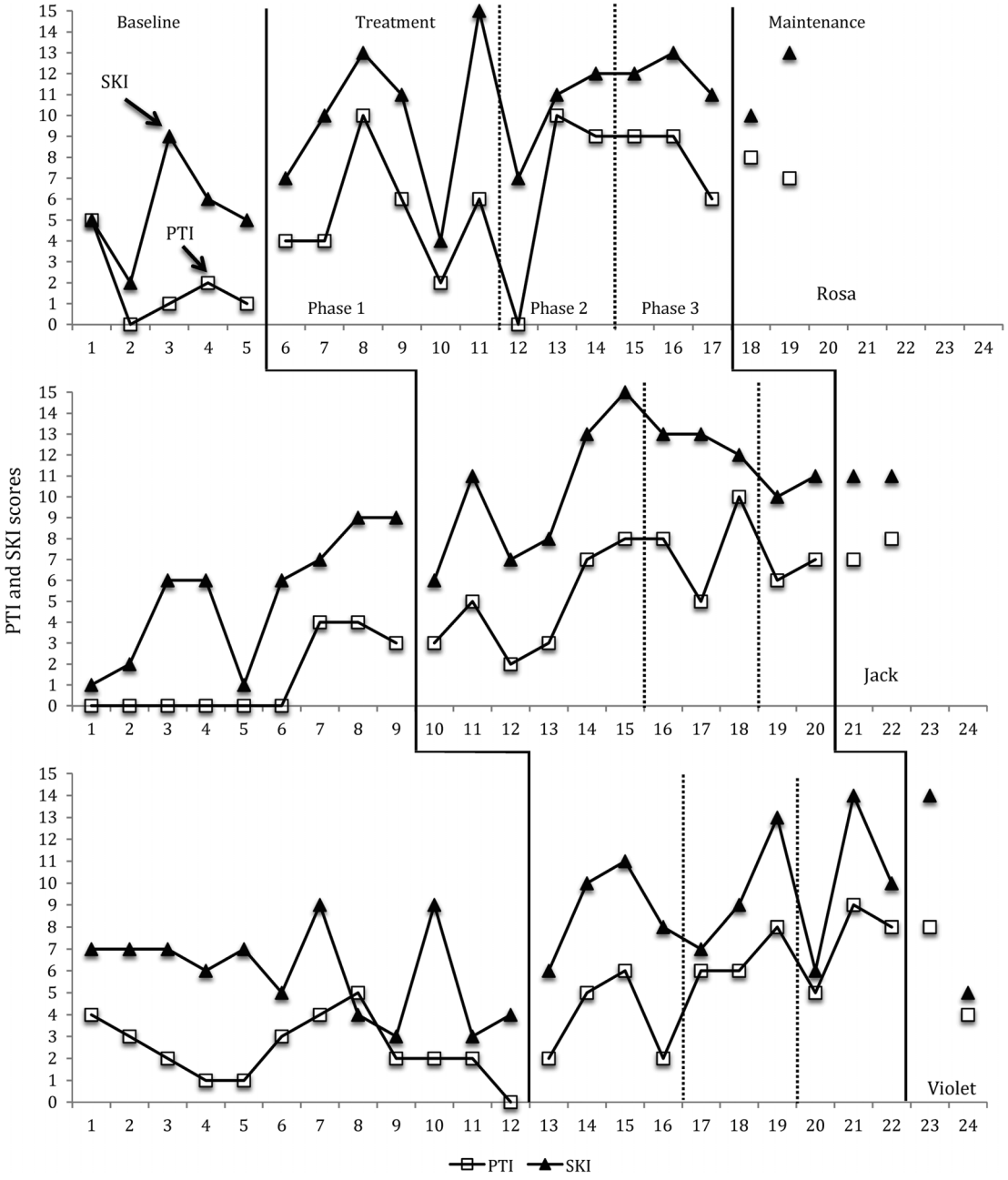
beginning intervention and was maintained for all but two of the eight data points. The PND for her Perspective Taking Index score was 67%, with an 86% improvement over baseline.

Maintenance. Rosa completed two maintenance sessions. For all three measures (MISL, Story Knowledge Index, and Perspective Taking Index), her scores remained well above her highest baseline scores. In addition, Rosa's Story Knowledge Index and Perspective Taking Index scores remained at or above criterion, demonstrating appropriate knowledge of story structure, mental state, and causal language for both time points (Story Knowledge Index ≥ 10; Perspective Taking Index ≥ 6).

Jack

Baseline. Jack remained in baseline for nine sessions prior to beginning intervention. His MISL scores were highly variable and followed an upward trend during baseline. Jack's parents were anxious for him to begin treatment, so we decided to go ahead and initiate treatment

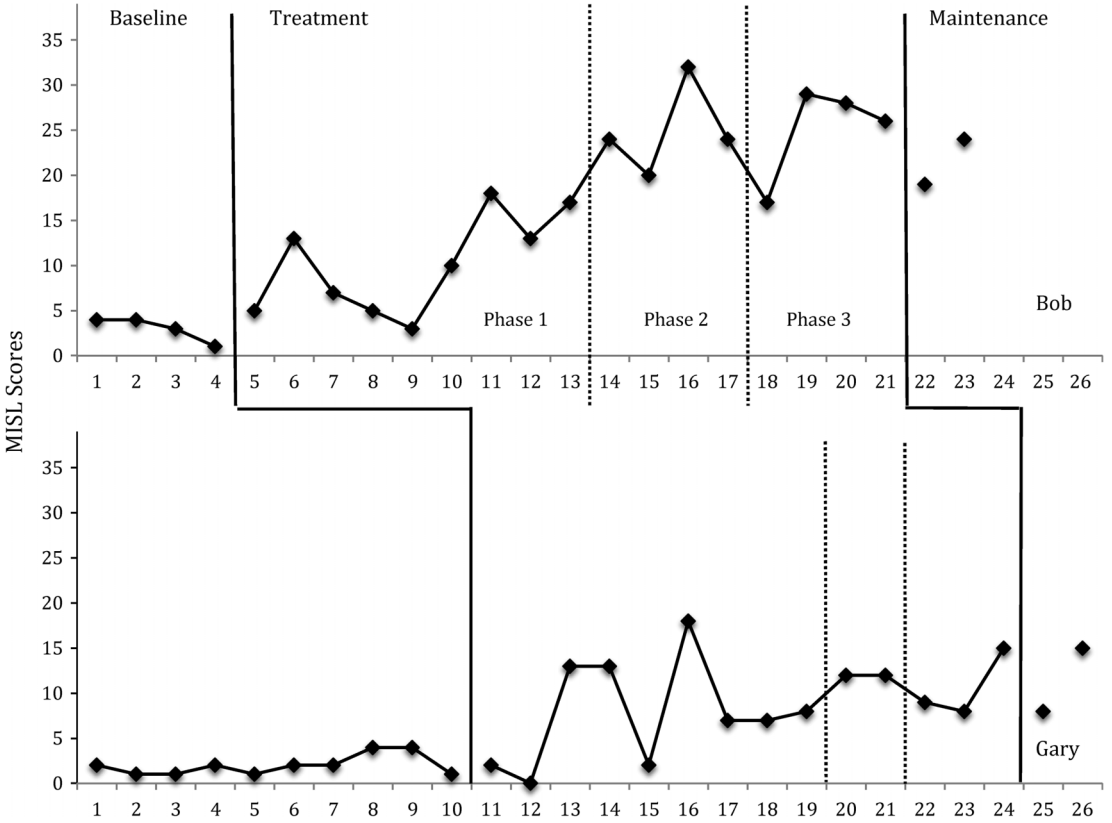
Figure 2. Results of Perspective Taking Index (PTI) and Story Knowledge Index (SKI) for Rosa, Jack, and Violet.



even though his baseline data were trending upward. Jack demonstrated knowledge of the crucial elements of stories (initiating event, action, and consequence scores of 2 or higher) in six of the nine baseline sessions. Jack included an internal response in one story during baseline but did not include plans, mental verbs, or linguistic verbs. At no time during baseline did Jack meet the minimum criteria for perspective taking (Perspective Taking Index ≥ 6).

Intervention. Jack participated in 21 intervention sessions across 11 weeks. He spent 11 sessions in Phase 1, six in Phase 2, and five in Phase 3, and he participated in two follow-up sessions. His scores on the MISL, the Story Knowledge Index, and the Perspective Taking Index trended upward at a rate that was consistent with the baseline trend. Therefore, Jack's results do not rule out history or maturation threats to internal validity. Similar to Rosa, there were consistent changes in level of performance across all three measures. Jack's MISL scores for eight of 11 of his stories were at or above his highest baseline score of 24. The PND for the MISL was 73%, and he evidenced 116%

Figure 3. Results of Monitoring Indicators of Scholarly Language (MISL) scores for Bob and Gary.



improvement over baseline. Jack's Story Knowledge Index scores increased to criterion (scores greater than 10) by the end of Phase 1 of intervention, and he maintained this level for all but three data points. For the Story Knowledge Index, the PND was 73%, and there was a 234% improvement over baseline. After intervention began, Jack maintained the criterion score of 6 or above on the Perspective Taking Index, and he maintained that level for all but one of the 11 data points. For perspective taking, the PND was 73%, and there was 527% improvement over baseline.

Maintenance. Jack participated in two maintenance sessions. His MISL, Story Knowledge Index, and Perspective Taking Index scores were stable with his performance during Phase 3 of intervention and were well above his highest baseline scores. In addition, Jack's Story Knowledge Index and Perspective Taking Index scores remained at or above criterion for demonstrating knowledge of story structure, mental state, and causal language.

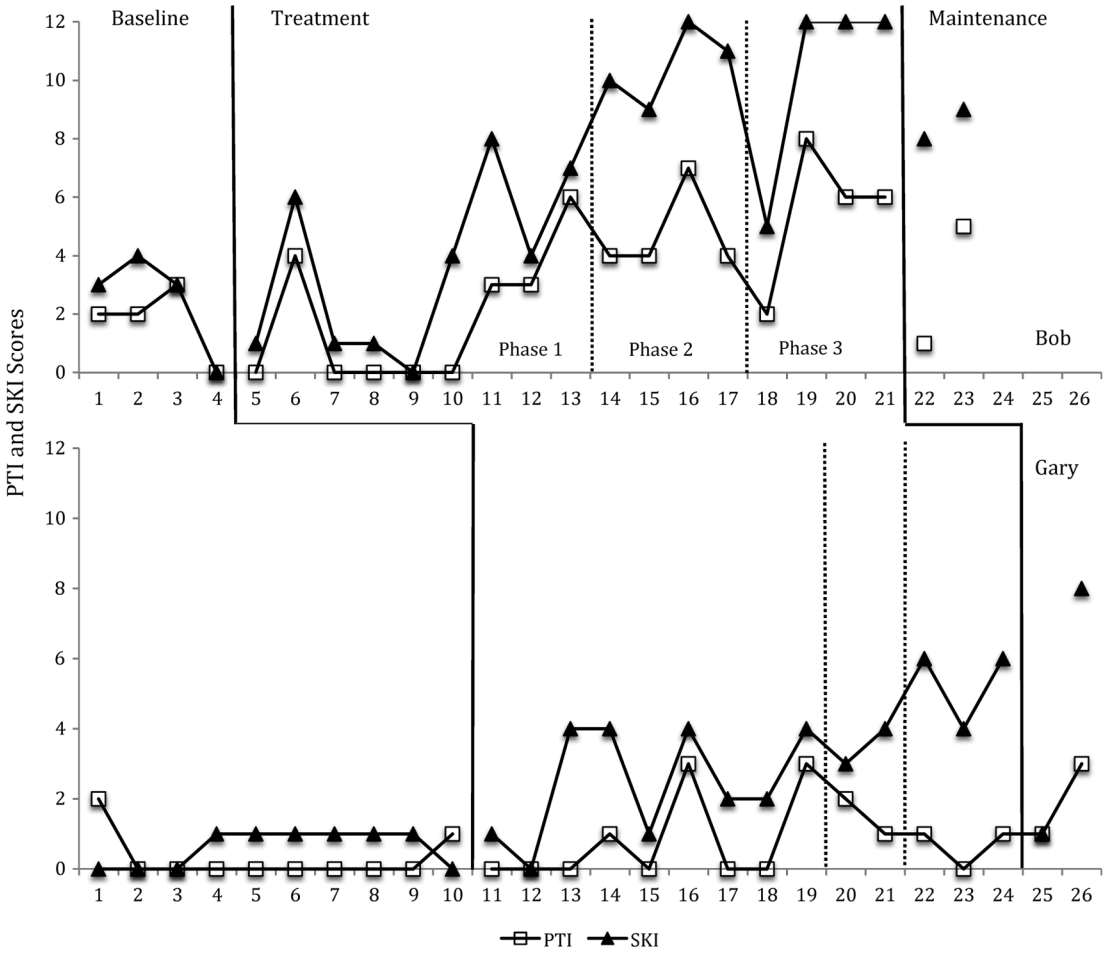
Violet

Baseline. Violet attended 12 baseline sessions prior to beginning intervention. There were downward trends in her MISL, story knowledge, and perspective taking scores during baseline, which controlled for history and maturation effects for Rosa. She earned a score of 2 or higher for internal response in one story she told during baseline. She earned scores of 1 or 2 for use of mental verbs during five of 12 baseline sessions and a score equal to or greater than 1 for linguistic verbs in 10 of 12 baseline sessions. At no time during baseline did Violet meet the minimum criteria for the Perspective Taking Index (≥6).

Intervention. Violet participated in 19 intervention sessions over 10 weeks. She spent eight sessions in Phase 1, six in Phase 2, and five in Phase 3, and she participated in two follow-up sessions. There were clear changes in trend and level after intervention was initiated, which supports the causal relationship between the intervention and the outcomes for both Violet and Rosa. There were six of 10 data points during intervention when the PND for the MISL was 60% and PIB was 46%. Violet's story knowledge scores increased to criterion within the first 2 sessions (≥10), and she maintained this level for five of the 10 data points. The PND for the Story Knowledge Index was 50%. PIB was 148%. After beginning intervention, Violet's Perspective Taking Index score increased to criterion (≥6) and was maintained for all but three of the 10 data points. PND for the Perspective Taking Index was 58%, and there was a 202% improvement over baseline.

Maintenance. For the first maintenance session, Violet's MISL, story knowledge, and perspective taking scores were

Figure 4. Results of Perspective Taking Index (PTI) and Story Knowledge Index (SKI) for Bob and Gary.



consistent with her performance during the last two intervention sessions. Performance on all three measures dropped during the second baseline sessions, but the scores on all three measures remained above the highest baseline scores.

Participant Set 2 (Bob and Gary)

Bob

Baseline. Visual data for Bob's MISL, Story Knowledge Index, and Perspective Taking Index Scores are presented in Figures 3 and 4. Bob attended four baseline sessions prior to beginning intervention. There were downward trends in MISL, story knowledge, and perspective taking scores during baseline. Bob did not produce any stories with basic episodes during baseline. He was not observed to meet criterion for story knowledge (a score of 10) or perspective taking (a score of 6) during baseline.

Intervention. Bob participated in 33 intervention sessions across 17 weeks. He participated in 17 sessions during Phase 1, nine in Phase 2, and seven in Phase 3, and he attended two follow-up sessions. There was a clear change in trend and level after intervention began in all three indexes. There was high variability in Bob's scores until Phase 3 of the intervention. Bob's MISL scores were above his highest baseline score during all but one of the intervention sessions. The PND for the MISL was 95%, and there was 822% improvement over baseline. Bob's story knowledge scores increased to criterion at the beginning of Phase 2 (after he had received approximately 9 weeks of instruction), and he maintained this level of story knowledge for all but two of the remaining seven data points. The PND for the Story Knowledge Index was 57%, and there was 464% improvement over baseline. Bob met criterion for the Perspective Taking Index (a score of 6) just before he met criterion for the Story Knowledge Index. His PTI scores remained at criterion for four of the remaining eight sessions. The PND was 53%, and there was 280% improvement over baseline.

Maintenance. Bob participated in two maintenance sessions. His MISL scores and his story knowledge scores remained above the baseline levels for both maintenance sessions. Bob's perspective taking scores fell below the

Table 2. Monitoring Indicators of Scholarly Language (MISL) total score, percent nonoverlapping data (PND), and percent improvement over baseline (PIB) for each participant.

Participant	Baseline *M* (*SD*)	Treatment *M* (*SD*)	PND (%)	PIB (%)
Set 1				
Rosa	17.20 (4.44)	27.58 (6.40)	71	86
Jack	13.67 (6.16)	26.64 (5.30)	77	116
Violet	19.00 (3.46)	24.90 (5.51)	58	46
Set 2				
Bob	3.00 (1.41)	16.56 (9.16)	95	822
Gary	2.00 (1.15)	9.69 (4.73)	81	433

Table 4. Perspective Taking Index (PTI) score, percent nonoverlapping data (PND), and percent improvement over baseline (PIB) for each participant.

Participant	Baseline *M* (*SD*)	Treatment *M* (*SD*)	PND (%)	PIB (%)
Set 1				
Rosa	1.80 (1.92)	6.25 (3.28)	71	86
Jack	1.22 (1.86)	5.82 (2.48)	77	527
Violet	2.42 (1.44)	5.70 (2.36)	58	202
Set 2				
Bob	1.75 (1.26)	3.19 (2.69)	53	280
Gary	0.30 (0.67)	0.92 (1.12)	19	123

highest baseline level during the first maintenance session but increased to the average of the scores obtained during treatment for the second baseline session.

Gary

Baseline. Gary's MISL, Story Knowledge Index, and Perspective Taking Index scores are shown in Figures 3 and 4. Gary attended 10 baseline sessions prior to beginning intervention. His baseline scores for all three indexes were low and flat. Gary demonstrated limited knowledge of the crucial elements of stories in all baseline sessions. He did not meet our criterion for story knowledge or perspective taking during baseline.

Intervention. Gary participated in 27 intervention sessions across 14 weeks. He attended 17 sessions spent in Phase 1, three in Phase 2, and seven in Phase 3, and he participated in two follow-up sessions. There were clear changes in level and slope for the MISL and Story Knowledge Index, with the clearest change occurring for story knowledge. Performance on the Perspective Taking Index varied widely with a downward trend across Phases 2 and 3 of the intervention. Gary's MISL scores were above his highest score obtained during baseline for 11 of the 14 sessions after which data were collected. The PND for the MISL was 81%, and there was a 433% improvement over baseline. Gary's story knowledge scores were above his highest baseline score for all but one of the 13 intervention data points. The PND for the Story Knowledge Index was 79%, and there was an 803% improvement over baseline. Gary included internal responses and plans in three of his 13 stories. He included mental verbs in four stories and linguistic verbs in five of his stories. The PND for the Perspective Taking Index was very small (19%), and there was a 123% improvement over baseline.

Maintenance. Gary participated in two maintenance sessions. His MISL and story knowledge scores dropped during the first maintenance session. However, scores on all three measures increased to levels that were near the highest intervention score for the MISL and the Perspective Taking Index. His score for the Story Knowledge Index during the second maintenance session was well above any of the scores he earned during intervention, however his performance remained variable. The variability in Gary's performance that was observed during intervention continued during maintenance.

Table 3. Story Knowledge Index (SKI) score, percent nonoverlapping data (PND), and percent improvement over baseline (PIB) for each participant.

Participant	Baseline *M* (*SD*)	Treatment *M* (*SD*)	PND (%)	PIB (%)
Set 1				
Rosa	5.40 (2.51)	10.50 (3.08)	75	256
Jack	5.22 (3.15)	10.82 (2.82)	73	234
Violet	5.92 (2.11)	9.40 (2.76)	50	145
Set 2				
Bob	2.50 (1.73)	6.76 (4.40)	57	464
Gary	0.60 (0.52)	3.21 (1.81)	79	803

Discussion

Our research goal was to determine whether the introduction of a three-phase approach to narrative intervention caused reliable changes in overall story complexity, knowledge of story structure and causality, and knowledge of mental state and causal language in verbal children with ASD. Our multiple-baseline study documented clear changes in level of performance after the intervention was initiated (see Figures 1–4). There were clear changes in level for all five participants and changes in trend from baseline to intervention phases of the study for four of the five participants, suggesting that the intervention caused the changes in the dependent measures while controlling for a variety of threats to internal validity related to history, maturation, subject selection, instrumentation, testing, or statistical regression. One participant, Jack, had a rising trend during baseline. For that participant, it is possible that outside influences and/or maturation contributed to his changes in narration. However, the data from the other four participants combine to make a good case for experimental control.

All of the children who participated in the study demonstrated moderately large to extremely large gains in overall narrative proficiency after intervention was

implemented, as measured by the MISL total score. Moreover, the children maintained many of their gains up to four weeks after intervention ended. We did not assess the children's use of language in other contexts (such as conversation), so we cannot comment on the extent to which this intervention is likely to generalize to other types of discourse.

Recall that we reported three metrics of changes in level from baseline to intervention phases: SMD_{all}, which is discussed in the online supplemental materials, PND, and PIB. The PND scores ranged from 58% to 95%, and the PIB ranged from 86% to 822%. Improvement in overall narrative proficiency was most notable for the participants in Set 2 (Bob and Gary), who demonstrated very low levels of narrative skills before intervention. Bob and Gary earned MISL scores during intervention that were four times higher than their baseline scores. The children in Set 1 (Rosa, Violet, and Jack), who started the study with somewhat higher narrative abilities, also made notable gains in narrative proficiency.

The Story Knowledge Index, which measured the coherence among story elements by weighting scores for initiating event, internal response, plan, action, and consequence, improved noticeably for both sets of participants after instruction. Across the five children, PND ranged from 50% to 79%, and PIB ranged from 145% to 803%. The children in Set 1 (Rosa, Violet, and Jack) reached the minimum criterion for demonstrating basic story knowledge (a score of 10 or higher) during treatment and maintained that level of performance. The children in Set 2 (Bob and Gary) made improvements in their story knowledge scores during treatment, but neither Bob nor Gary reached criterion on this measure.

Perspective taking, measured by combining scores for internal response, plan, and the use of mental and linguistic verbs on the MISL, was shown to improve noticeably for all five children in the study. The PND for perspective taking ranged from 19% to 77%, and PIB ranged from 86% to 527%. The children in Set 1 (Rosa, Violet, and Jack) met the criteria for basic knowledge and use of perspective taking, but the children in Set 2 (Bob and Gary) did not. We do not believe intensity of instruction was the major factor in explaining this finding because Bob and Gary received more instruction (≥27 sessions) than Rosa and Jack (19–23 sessions). The most likely explanations for this finding were that Bob and Gary had lower initial language proficiency and more skills to learn over the course of the study than Rosa, Violet, and Jack. This relates to the issue of cognitive resource allocation and the potential to overload children's capacity during instruction. A number of the intervention sessions focused on language targets such as the use of adverbs and elaborated noun phrases. It is possible that these lessons might have overtaxed Bob and Gary's cognitive and linguistic abilities. For children with ASD, lessons on adverbs and elaborated noun phrases might be more effective if they are provided after story knowledge and perspective taking have been well established. This could prevent children's cognitive and linguistic resources from being overtaxed during intervention activities.

Clinical Implications

The instruction that was provided in this study resulted in positive outcomes for narrative comprehension and production for children with ASD. Specifically, children demonstrated overall gains in story complexity that reflected improvements in both story structure knowledge and the mental state and causal language used in stories. Children with ASD with lower language skills performed better on the Story Knowledge Index than the Perspective Taking Index, whereas the children with higher language skills performed well on both. Extended instruction may be required for children with lower language abilities to fully master the mental verbs and adverbs in stories.

The children with ASD who participated in this study made remarkable gains in their narrative skills over a relatively short period of time. One potential reason for their success may be related to the way the causal coherence, macrostructure, and microstructure elements were taught. The narrative curriculum used in this study provided children with maximum external support for learning and for retrieval of information used in comprehending and composing fictional narratives. For example, in early lessons, children are provided a great deal of scaffolding using external visual cues (e.g., icons representing the story elements) and graphic organizers that provide a visual means for organizing each of the icons for representing stories. Over time, the organizational scaffolds are reduced adaptively, according to the level of mastery students demonstrate on the comprehension and composition tasks. This approach may play a critical role in ensuring the success of narrative instruction for children with ASD, who frequently demonstrate weak verbal memory performance that may be attributed to inherent organizational deficits (Phelan, Filliter, & Johnson, 2011). We did not include a measure of how improvement in narrative proficiency may have generalized to social or academic skills. We plan to do so in the future.

Summary

The results of this single-case study demonstrated that a three-phase narrative intervention program resulted in changes in overall story complexity, story grammar knowledge, and perspective taking in five children with ASD. The improvements were generally maintained after intervention ended. The intervention was manipulated systematically, the outcome variables were measured by multiple assessors with good interrater reliability, and the intervention effects were demonstrated at four different points in time. There were clear changes in level between baseline and intervention phases for all five participants and changes in trend for four of the five participants. These findings underscore the importance of providing external organizational scaffolds that were integrated with particular linguistic structures that clarified the causal relationships between the events.

Children were given the opportunity to practice telling coherent and cohesive stories in phases starting with learning about story grammar elements with an emphasis on how they relate to each other. In Phases 2 and 3, children gradually took on more responsibility for integrating macrostructure and microstructure elements, with a clear emphasis on overtly marking causal relationships between events in the story and the character's responses to those events. The results of this study provide evidence of the feasibility of implementing a three-phase narrative instruction program with verbal children with ASD.

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