Effects of an adapted story grammar intervention on the listening comprehension of children with autism☆

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ABSTRACT

Children with autism spectrum disorder (ASD) often develop the word reading skills necessary to read text but struggle with reading comprehension. Comprehension skills are often under addressed in early elementary settings leaving children with ASD at a disadvantage once they are expected to read for meaning. This study investigated the impact of an adapted story grammar intervention on the listening comprehension of five children with ASD in kindergarten through second grade. The intervention embedded evidence-based practices shown to support the learning of children with ASD during story grammar instruction. All participating children demonstrated increased correct responding to fact and inference questions following intervention. Data suggest that all participants required visuals to participate in and learn from the intervention. Social validity data indicate the classroom teacher perceived the intervention as helpful and feasible. Implications for instruction and future research are discussed.

1. Introduction

School-age learners with autism spectrum disorder (ASD) are more likely to have difficulty comprehending text than their typically developing peers (Brown, Oram-Cardy, & Johnson, 2013), and are often considered poor comprehenders scoring average/above average on word recognition, and at least 1 SD below the mean on comprehension measures (e.g., McIntyre et al., 2017; Nation, Clarke, Wright, & Williams, 2006). The high proportion, approximately 1/3, of children with ASD demonstrating this profile far exceeds that of their typically developing peers (7–10%; e.g., Lucas & Norbury, 2014; McIntyre et al., 2017). These challenges learners with ASD experience reading for meaning are likely to reflect the complex nature of reading comprehension.

Comprehension is the active process of gaining meaning from text whether reading independently or listening to someone read aloud (Allington and McGill-Franzen, 2008); Cain & Barnes, 2018). Listening comprehension is the understanding of oral language to interpret words, sentences and discourse. Reading comprehension requires these skills plus effective decoding (Hoover & Gough, 1990). As children become decoders, their listening comprehension becomes increasingly predictive of reading comprehension (Cain & Barnes, 2018). Skilled comprehenders (whether listening or reading) create and integrate information to form a mental representation of text and apply strategies to build and refine these mental models (Pearson & Cervetti, 2017). A mental model is not fixed and requires flexible thinking as readers integrate prior knowledge with new information read (Wilkinson & Son, 2011).

Therefore, comprehension requires knowledge to generate new knowledge from text (Duke, Peasron, Strachan, & Billman, 2011). These tasks present a range of challenges for learners with ASD as they have trouble with higher order information processing that includes organizing information, connecting past and present experiences/events, linking concepts, determining relevant from extraneous information, and planning (Tsatsanis & Powell, 2014).

Emerging evidence correlates the poor performance of children with ASD on reading comprehension assessments with low scores on language measures including vocabulary and oral language comprehension (Brown et al., 2013; Lucas & Norbury, 2014; McIntyre et al., 2017; Nation et al., 2006; Norbury & Nation, 2011; Ricketts, Jones, Happe', & Charman, 2013), which is consistent with the profiles of typically developing children described as poor comprehenders (Duke & Carlisle, 2011; Landi & Ryherd, 2015). Children with ASD also have greater difficulty responding to questions that require inferencing (Lucas & Norbury; McIntyre et al., 2017).

Preliminary research has linked the poor performance of learners with ASD on reading comprehension assessments with low scores on social communication measures of autism symptomology (e.g., McIntyre et al., 2017; Norbury & Nation, 2011; Ricketts et al., 2013). Compared to their typically developing peers, learners with ASD have greater difficulty comprehending texts that require social knowledge; however, when the need for social knowledge is minimized in text, children with ASD perform similarly to their peers (Brown et al., 2013). Inherently, learners with ASD struggle with social cognition including theory of mind or the ability to infer the thoughts, feelings, and mental states of others (Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008). This difficulty with social knowledge has implications for interpreting narrative texts. It is well established that comprehension is enhanced when the reader has prior knowledge of the topic/content (Catts & Kamhi, 2017). Therefore, it is not surprising that texts requiring social knowledge compromise the comprehension of learners with ASD.

1.1. Instruction

Interventions that address listening comprehension early or before children are expected to read independently for meaning may potentially offset later reading comprehension difficulties (Kim, 2017). Comprehension instruction involves teaching the cognitive processes involved in reading for understanding including making inferences, monitoring comprehension, and understanding text structure (Wilkinson & Son, 2011). Such interventions go beyond strategy instruction alone and engage children in high quality discussions about content through higher order questioning (Duke & Carlisle, 2011).

Emerging evidence indicates that children with ASD can benefit from reading comprehension strategy instruction with some adaptations (e.g., El Zein, Solis, Vaughn, & McCulley, 2014), and learn the cognitive processes used to generate meaning from text (Randi, Newman, & Grigorenko, 2010). One strategy shown to improve comprehension of narrative text is knowledge of story grammar (Duke et al., 2011; Landi & Ryherd, 2015). Typically, story grammar (SG) instruction teaches children the SG elements (e.g., characters, setting, events, problem, and solution), and how to strategically apply these elements to remember relevant information (Duke et al., 2011). Such instruction involves explicitly describing, modeling, and guiding students to apply the strategy followed by opportunities for students to independently use their acquired knowledge of SG (Duke et al., 2011). These interventions involve quality discussions and higher order questioning (e.g., inference making) many learners with ASD find challenging.

Studies teaching SG to children with ASD generally incorporated evidence-based practices (Wong et al., 2015) shown to support the learning of children and youth with ASD. For example, SG interventions embedded graphic organizers (GO), visuals, prompting, and modeling procedures. Two studies taught elementary age children (ages 8–12) with ASD to identify the characters, setting and events on a story map GO (Bethune & Wood, 2013; Stringfield, Luscre, & Gast, 2011). Both interventions incorporated systematic instructional procedures including a system of least prompts. Prompts included verbal, gestural or physical prompts to sort words on the GO (Bethune & Wood, 2013) or helped participants locate the answer in text (i.e., look in book, point to page/sentence with answer, provide answer; Stringfield et al., 2011) to correctly label the map. Although there was some overlap with baseline for a participant in a study (Bethune & Wood, 2013), participants increased their ability to respond to fact questions and maintained gains at intervention levels for 1–5 weeks (Bethune & Wood; Stringfield et al., 2011).

Borrowing a term from Vygotsky, Senokossoff (2016) identified a group of studies that applied strategies to create a "cognitive apprenticeship." These studies identified a comprehension task that learners with ASD generally find challenging, and the adult provided prompting and feedback to help learners with ASD engage with text content and think through the processes necessary to successfully complete the task. Two SG studies employed such strategies (Whalon & Hanline, 2008; Williamson, Carnahan, Birri, & Swoboda, 2015). Whalon and Hanline taught 3 elementary age children (7–8) to ask and respond to questions using a SG framework (i.e., characters, setting, event, problem, and solution) in a partner reading format while reading picture books. Williamson and colleagues taught 3 adolescents (ages 16–17) to complete character event maps while reading chapters from the Hunger Games. The character maps identified important events from the chapter and participants (1) described the events in their own words, and (2) explained why they were important. In both studies, the adult initially modeled the task by verbally walking participants through the mental processes used to complete the task. The adults faded their roles providing modeling and corrective feedback as needed. All participants increased their ability to ask (Whalon & Hanline, 2008), and respond (Williamson et al., 2015) to fact and inference questions. Collectively, these studies suggest that SG instruction can help learners with ASD generate and respond to fact and inference questions with some adaptations.

The purpose of this study was to determine the impact of a SG intervention that pairs components of effective comprehension instruction (i.e., SG and discussion) with evidence-based practices shown to support learners with ASD on the listening comprehension of young children with ASD. The following research question was explored: What is the effect of an adapted SG intervention on the listening comprehension of young children with ASD (K-2)?

Table 1
Participant Standard Scores and Percentile Ranks on the TERA-3.

Name	Alphabet	Conventions	Meaning	Reading Quotient
Al	14 (91%)	8 (15%)	7 (16%)	98 (45%)
Bo	9 (37%)	7 (16%)	6 (9%)	83 (13%)
Cy	8 (25%)	4 (2%)	3 (1%)	68 (1%)
Dex	3 (1%)	3 (1%)	2 (< 1%)	53 (< 1%)
Ed	11 (63%)	5 (5%)	7 (16%)	85 (16%)

2. Method

2.1. Participants/Setting

After human subjects approval, participants meeting the following criteria were recruited from a public elementary school in the southeast: (a) a medical diagnosis of ASD as indicated in school records, (b) in grades K-2, and (c) teacher reported ability to verbally respond to questions. Participants received their education in a self-contained classroom for children with ASD. Three participants (Al, Bo, and Ed) were included in a general education classroom for at least 30 min a day. In the self-contained setting, the teacher reported the reading curriculum included Wonders (30 min.) and Reading Mastery (30 min.). Students also received computer assisted reading instruction (Lexia; Success Maker) 15 min a day. The classroom included 1 teacher and 3 paraprofessionals. All sessions were conducted in a one to one context.

Prior to the study, doctoral students with experience testing students with disabilities administrated the Test of Early Reading Ability (TERA-3; Reid, Hresko, & Hammill, 2001). The TERA-3 was given to describe participant early reading abilities and confirmed their ability to respond to questions. The measure includes 3 subtests (i.e., alphabet, conventions, meaning) with a mean of 10 and a standard deviation (SD) of 3, and a reading quotient composite score with a mean of 100 and SD of 15 (See Table 1). Information related to diagnosis was gathered with the teacher from participant records.

Al was a 5-year-old black male diagnosed with autism by a psychologist at age 4. Diagnostic tools included the Gilliam Asperger's Disorder Scale and Autism Spectrum Rating Scale (ASRS). Al's Preschool Language Scale (PLS-5) standard score was 67 (mean of 100; SD of 15), and he received language services. Al's teacher noted that his spontaneous language was emerging, and he responded verbally to routine questions. Al's teacher stated he read some sight words and displayed beginning decoding skills but struggled to comprehend.

Bo was a 7-year old white male diagnosed with autism by a school psychologist at the age 4 using the ASRS. His PLS-5 total standard score was 59, and he received language services. Bo verbally responded to questions and his teacher described him as a fluent reader with an IEP goal to improve comprehension and accurately answer –wh questions.

Cy was a 7-year old white male diagnosed with autism by a psychologist using the Autism Diagnostic Observation Schedule (ADOS), Social Communication Questionnaire (SCQ) and Repetitive Behavior Scales Revised (RBS-R). Cy scored a 48 (mean 100; SD 15) on the Receptive Expressive Emergent Language Test Edition 2 and received language services. His teacher noted that Cy scripted conversations with others. His teacher described him as a fluent reader, and one of his IEP goals was to improve comprehension. Cy often became upset by changes in routine and at times responded by saying "no", pacing, hitting, crying, and screaming.

Dex was a 7-year old Asian male diagnosed with autism by a psychologist at age 4 using the ADOS, SCQ, and RBS-R. He received occupational therapy and language services. His PLS-5 standard score was 55. Dex's teacher noted he was beginning to verbally request needs/wants, and often engaged in echolalia to request. According to his teacher, Dex identified a number of sight words, but was unable to decode. He had IEP goals of answering -wh and yes/no questions.

Ed was a 5-year old white male diagnosed with autism by a psychologist at age 2 and later by a school psychologist using the ASRS. Ed received services for speech (stuttering) and language. Ed scored a 66 on the PLS-5. According to his teacher, Ed mastered all kindergarten sight words, but was still learning to decode, and had an IEP goal to improve comprehension.

2.2. Experimental design

A withdrawal design was used and chosen for several reasons. First, academic behaviors are often, but not always considered non-reversible (Ledford & Gast, 2018); however, many of these academic skills are mastery skills (e.g., alphabet, sound letter correspondence, sight words) that are expected to maintain once taught. Comprehension is not a mastery skill, but rather a "growth construct" that continues to develop over time (Duke & Carlisle, 2011, pp. 200). As a result, a short-term comprehension intervention is unlikely to have a lasting effect for struggling comprehenders (Allington & McGill-Franzen, 2008; Duke & Carlisle, 2011) indicating that when the intervention is removed performance is likely to return to near baseline levels. Moreover, previous studies including participants with ASD and comprehension as a dependent variable applied ABAB designs and findings showed the data reversed to at or near baseline levels (e.g., Carnahan & Williamson, 2013; Kamps, Leonard, Potucek, & Garrison-Harrell, 1995). Second, an ABAB is preferred because it clearly demonstrates whether a change (level or trend) in the dependent variable resulted from the introduction and withdrawal of the independent variable (Ledford & Gast, 2018). Third, the heterogeneity across participants was less conducive to a multiple baseline across participants design (Ledford & Gast, 2018).

It was our intent to conduct an ABAB design, but after the initial baseline and intervention conditions a slight modification was

Table 2
Sample Comprehension Test Questions from Dragons Love Tacos.

Story Grammar Element	Question
Character	Who are the main characters in the story?
Character	Who cannot eat spicy salsa?
Setting	Where does the story take place?
Event	What do dragons love?
Event	What kind of party did the boy have?
Event	What do you need to have at a dragon taco party?
Problem	What was the problem?
Problem	What happened to the boy's house?
Solution	How did they solve the problem?
Solution	How can you stay safe at a dragon taco party?

made. That is, in the initial A and B phase, we found that participants did not independently, verbally respond to questions on the comprehension test, but they did respond during the intervention sessions (phase B) when presented with visual options. Because the use of visuals as a way for learners with ASD to respond without further prompting is well established in the literature (Wong et al., 2015), we used visual supports as a response mode option during sessions and on the comprehension test in subsequent baseline (A') and intervention (B') sessions. All phases consisted of at least 5 sessions or until a clear pattern of responding was established.

2.3. Dependent variable

The dependent variable was the percentage of participant correct responses on a comprehension test. Immediately following instruction in all baseline and intervention conditions, the interventionist administered a 10-item researcher developed comprehension test. The 10 items specifically targeted SG including 2 questions about characters, 1 about setting, 3 about events, 2 about the problem, and 2 about the solution (See Table 2). All character, setting and event questions were fact, and all problem and solution questions were inference. Two members from the research team with expertise in reading interventions and prior experience teaching reading checked all items for these criteria. Fact questions requested a response that could be located directly in the book, and responses to inference questions required the reader to integrate information from the text with their background knowledge. Inference questions specifically asked participants to synthesize the problem or solution that was not directly stated in text or interpret the emotion/feelings of a character based on a story event (e.g., "How does the chameleon feel about changing colors?"; "Why is Farmer Brown furious?").

In the first baseline and first intervention condition, the interventionist read scripted questions and waited 5-s for a verbal response. Beginning in the second baseline phase and continuing in each subsequent baseline and intervention phase, the test was delivered using the SMART Notebook app. Like previous conditions, the interventionist read the scripted questions and waited 5-s for a verbal response. Different from the first baseline and intervention phases, if the student failed to respond to the question within 5-s or responded incorrectly, the interventionist shared 3 visual options, but no feedback was provided. The order of the response options was randomized, and the visual used to depict the response varied. All sessions were video recorded for coding. Responses were coded as unprompted correct if the child correctly answered the question verbally within 5-s of the question being asked. Responses were coded as correct with visuals if the child responded correctly by selecting the appropriate visual option within 5-s.

2.3.1. Interobserver agreement

Two independent coders viewed videos from a prior study until they reached a minimum 80% agreement on three of five videos. Once reliable, a randomly selected 30% of all sessions from each phase were coded for agreement. Reliability was calculated by dividing the number of agreements by the number of agreements plus the number of disagreements and multiplying by 100. Reliability was greater than 80% across participants and conditions: Al mean 100% and 96% (70–100%), Bo mean 97% (80–100%) and 97% (80–100%), Cy mean 98% (90–100%) and 98% (90–100%), Dex mean 94% (80–100%) and 100%, Ed 94% (90–100%) and 98% (90–100%) in baseline and intervention conditions respectively. With the exception of one session with Al (IOA = 70%), IOA was consistently above 80%.

2.4. Procedures

Across conditions, the interventionist read a book aloud and asked scripted questions during reading. Sessions took approximately 30 min. Interventionists were graduate students with prior experience teaching children with ASD.

2.4.1. Materials

Selected books were considered high interest for read alouds with children in kindergarten through second grade, contained engaging pictures, and included all SG elements (i.e., characters, setting, events, problem, solution). For a book list, please contact the first author. Books were counterbalanced and randomly assigned using a random numbers chart in sets of ten to a condition ensuring that some participants read a book in intervention whereas others read the same book in baseline. A different book was read in every

session. Scripted questions during reading were similar to questions on the comprehension test and targeted SG. Questions included generic questions that required the child to identify the main characters, setting, problem and the solution (e.g., "Who are the main characters?"; "What is the problem?"). Although questions posed during reading and on the comprehension test addressed the same content, questions varied. During reading questions emphasized content of the page read ("What did the bear do?"; "How does bear feel now?") and comprehension test questions added context ("What did the bear do after he woke up?"; "How did the bear feel at the end of the story?"). Visual response options were presented on the Smart Notebook app and included two plausible distractors (e.g., other characters, feasible solutions based on content). Contact the first author for examples.

2.4.2. Baseline A

In the initial baseline condition (A), the interventionist read the book aloud and asked 10 scripted comprehension questions. If the child failed to respond or responded incorrectly, the interventionist did not comment, confirm or correct. The interventionist did provide praise for attending and working hard.

2.4.3. Baseline A'

The second and third baseline condition (A') were the same as the first but added three visual options as a response mode. If the child failed to respond within 5-seconds or responded incorrectly, the question was repeated, and three visual options were immediately labeled and shown on the Smart Notebook app. If the student responded incorrectly or did not respond, the interventionist continued reading.

2.4.4. SG intervention B

Intervention sessions differed from baseline by adding before (defining characters, setting, events, problem solution), during (responding to questions) and after (story map) reading activities using a SG framework. First, using the Smart Notebook app, participants were taught using time delay to match (1) a definition ("The people, animals or creatures in the story."; "The trouble in the story."), and (2) a question (e.g., "Where does the story take place?; What happened?") to the corresponding SG element. The activity began with a 0-second time delay in which the interventionist read the definition/question and matched it to the SG element moving it with her finger. Then, a 5-second delay was introduced. The interventionist read the definition and labeled the elements of the story. If the child failed to move the SG element within 5 s, the interventionist verbally prompted the child to move the definition or question to the appropriate element.

During reading, the interventionist read the book and asked scripted questions as in the baseline condition but added a system of least prompts and expansion. If the child did not respond within 5 s or responded incorrectly, the adult verbally labeled three options on the Smart Notebook App (e.g., *Who is the main character? Sliver Fish, Pout Pout, or clam* [pointing]). If the child responded incorrectly or failed to respond within 5 s, the interventionist removed an option and prompted the child to look at the book while re-reading part of the text or describing an illustration, and then re-asking the question offering the binary choice *("I'm a pout-pout fish with a pout-pout face. Who is the main character? Pout-Pout fish or clam?" [pointing])*. If the child responded incorrectly or did not respond within 5 s, the interventionist modeled the correct response and explained how she came to the answer (e.g., *The story starts by telling us that Pout-Pout fish has a Pout-Pout face. Each page is about Pout-Pout [flipping through]. Pout Pout is our main character."*). The child was asked to imitate or touch the correct response. Regardless of the prompting level, following a correct response, the interventionist expanded and linked the response back to the story element *("Yes,"Pout-Pout Fish is the main character or who the story is about. Great job!")*.

After reading, the interventionist presented a story map on the app. The story map included the characters, setting, problem and solution with the corresponding question taught before reading using time delay (e.g., Who are the characters in the story?). Next to each story grammar element was a box with a star followed by 3 visual response options. The interventionist labeled the elements of a story and three visual options and waited 5 s for the child to respond verbally or by dragging the response option to the star. If the child responded incorrectly or did not respond, a system of least prompts was initiated. First, the interventionist reread part of the text (e.g., *"The fish is swimming underwater."*). If the child failed to respond correctly or within 5 s, the interventionist showed the student the correct response in text and on the iPad (e.g., *"Look, the octopus and fish are swimming underwater [pointing]. They live in the ocean. The setting is the ocean.")*. After providing the correct response, the interventionist gave behavior specific praise (e.g., *"Yes, the setting is the ocean. Great job!"*). Once the story map was complete, the interventionist read the map aloud.

2.4.5. SG2 intervention B'

This condition is the same as SG Intervention with the addition of the visual response options as a response mode to the comprehension test.

2.4.6. Procedural fidelity

Thirty percent of sessions were coded using a procedural checklist to determine if baseline and instructional procedures were delivered as intended. Baseline checklists ensured researchers followed all baseline procedures and did not implement any of the prompting or feedback described in the intervention condition. The intervention checklist measured the extent to which all before, during and after reading procedures were consistently implemented. Checklists also ensured the comprehension test was administered with fidelity. Results suggest that interventionists routinely followed the protocol in baseline and intervention conditions. Baseline conditions averaged 94% (66–100%), 96% (83–100%), 89% (83–100%), 92% (83–100%), 98% (86–100%), and intervention 98% (94–100%), 97% (93–100%), 94% (76–100%), 98% (90–100%), and 96% (90–100) for Al, Bo, Cy, Dex, and Ed

respectively.

2.4.7. Social validity

The classroom teacher watched randomly selected 2-minute video clips taken during baseline and final intervention sessions and answered questions (e.g., What, if any, differences did you notice in the first and second video?) regarding her perceptions of intervention effectiveness (Ledford & Gast, 2018).

2.5. Data analysis

The dependent variable (i.e., percentage correct on a comprehension test) was analyzed visually for changes. Visual patterns within and across phases were inspected (Kratochwill et al., 2010). An effect size estimate was calculated using Tau-U. Tau-U is a nonparametric effect size (ES) that is easily interpreted as the degree of overlap across phases (.60 suggests 60% of intervention data points were higher than baseline). Baseline trend of .20 or higher was controlled for a more conservative estimate. Tau-U was computed using the calculator at http:// www.singlecaseresearch.org (Vannest, Parker, & Gonen, 2011). Estimates between .20 and .60 are considered moderate, .60–.80 large, and above .90 strong (Vannest & Ninci, 2015).
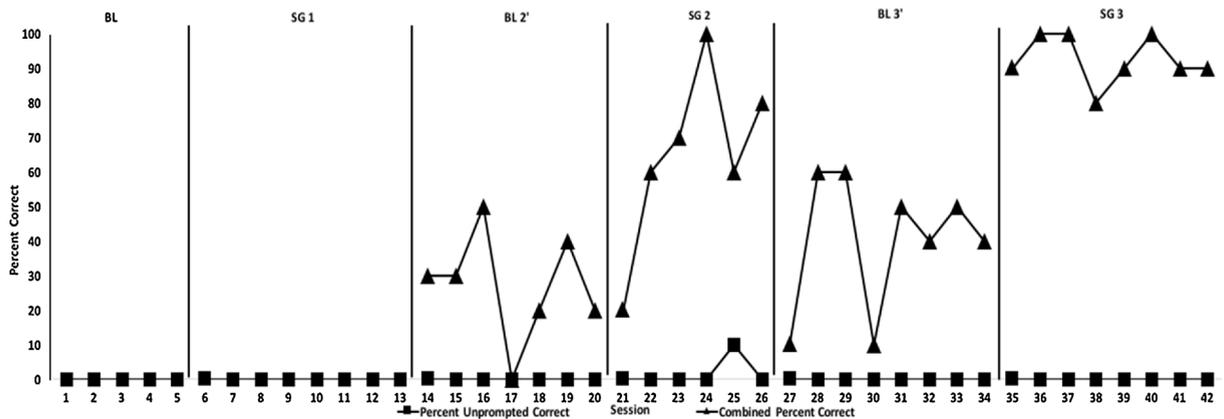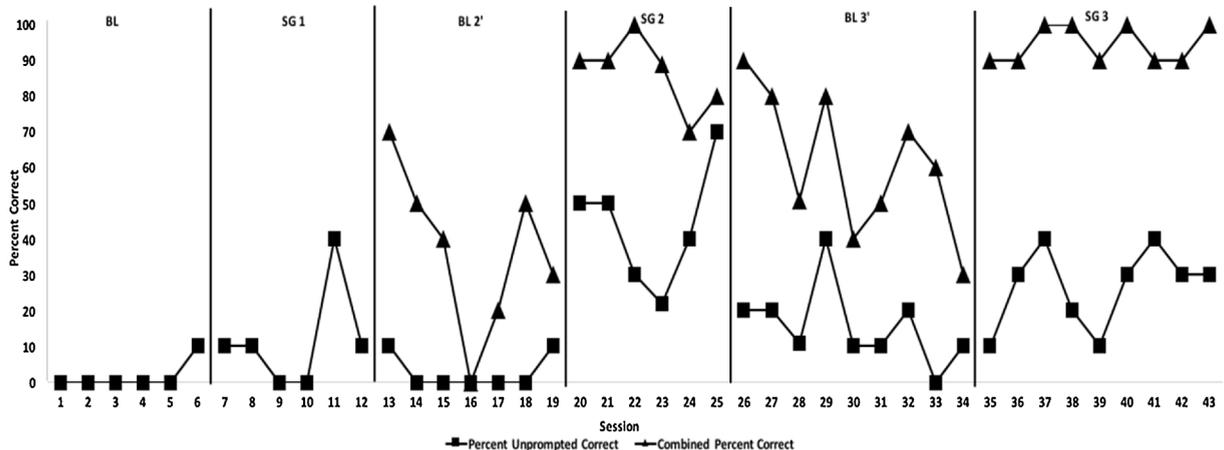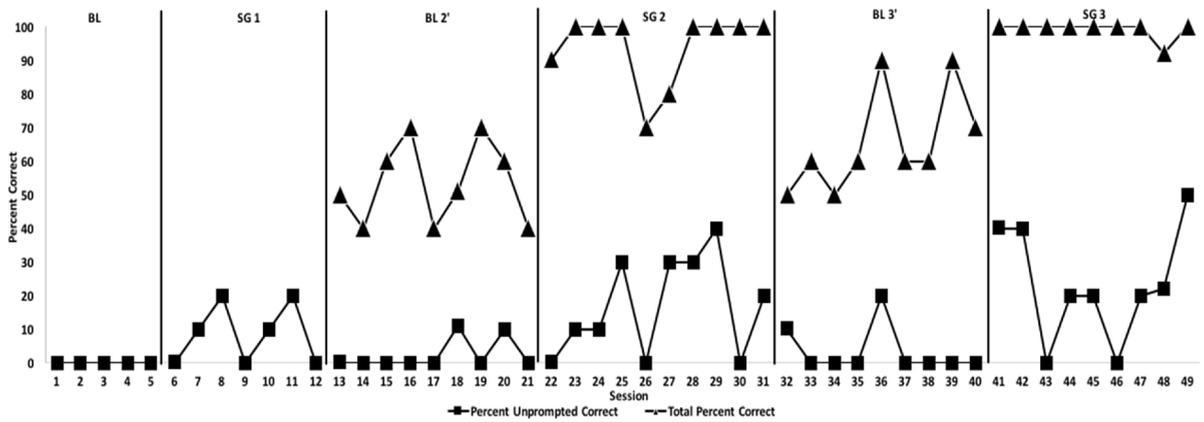

Fig. 1. Frequency and Percentage of Unprompted Correct Responses and Combined Percent Correct by Participant.

Cy

Dex
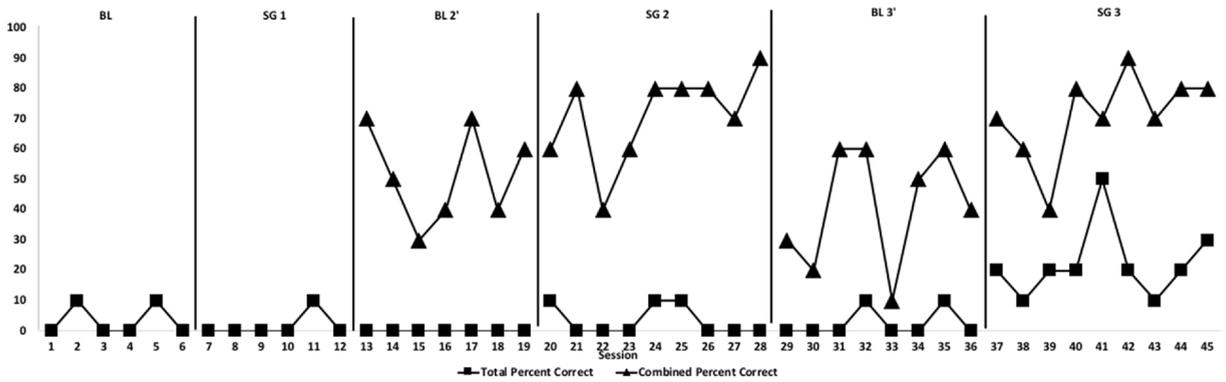
Ed

Fig. 1. (*continued*)

3. Results

Fig. 1 provides the (1) percentage of unprompted correct verbal responses, and (2) a combined percent correct on the comprehension test for each participant. The combined percent correct is the percentage of correct unprompted responses plus the correct responses when presented with 3 visual options. Table 3 indicates the average number and percentage of correct responses to fact and

Table 3

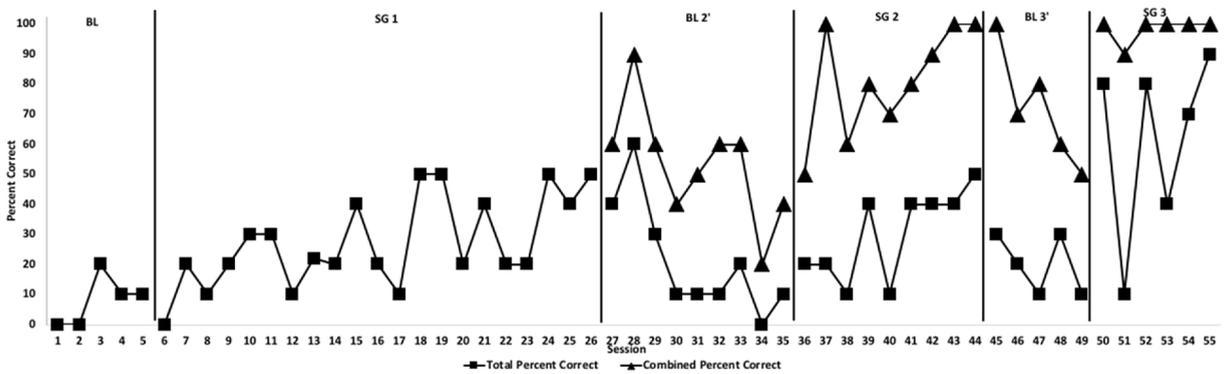Average Number of Correct Responses to Fact and Inference Questions on the Comprehension Test (DV).

Child	Question Type	BL 1	SG 1	BL 2	SG 2	BL 3	SG 3	Total BL	Total SG
Al	Spontaneous Fact	0	0	0	.17 (3%)	0	0	0	.05
	Spontaneous Inference	0	0	0	0	0	0	0	0
	Fact Visuals			1.43 (24%)	4.0 (67%)	2.38 (40%)	5.75 (96%)	1.87 (31%)	5.0 (83%)
	Inference Visuals			1.29 (32%)	2.33 (58%)	1.63 (41%)	3.5 (88%)	1.60 (40%)	3.0 (75%)
Bo	Spontaneous Fact	.67 (11%)	.83 (14%)	.29 (5%)	3.17 (53%)	1.44 (24%)	2.33 (39%)	.73 (15%)	2.14 (36%)
	Spontaneous Inference	0	.33 (9%)	0	1.17 (29%)	.11 (3%)	.33 (8%)	0	.57 (14%)
	Fact Visuals			2.14 (36%)	2 (33%)	2.68 (45%)	3.44 (57%)	2.44 (41%)	2.87 (48%)
	Inference Visuals			1.29 (32%)	2.17 (54%)	1.89 (47%)	3.33 (83%)	1.63 (41%)	2.87 (72%)
Cy	Spontaneous Fact	0	.57 (10%)	.22 (4%)	1.2 (20%)	.33 (6%)	1.78 (30%)	.22 (4%)	1.23 (21%)
	Spontaneous Inference	0	.29 (7%)	0	0.5 (13%)	0	.56 (14%)	0	.46 (12%)
	Fact Visuals			3.33 (56%)	4.6 (77%)	4.56 (76%)	4.22 (70%)	3.95 (66%)	4.42 (74%)
	Inference Visuals			1.78 (45%)	3.1 (78%)	1.67 (61%)	3.33 (83%)	1.72 (43%)	3.21 (80%)
Dex	Spontaneous Fact	.17 (3%)	.17 (3%)	0	.33 (6%)	.13 (2%)	1.33 (22%)	.10 (2%)	.67 (11%)
	Spontaneous Inference	.17 (4%)	0	0	0	0	.89 (22%)	.10 (3%)	.29 (7%)
	Fact Visuals			3.29 (55%)	3.78 (63%)	2.75 (46%)	3.22	3.0 (50%)	3.56 (59%)
	Inference Visuals			1.86 (47%)	3.0 (75%)	1.13 (28%)	1.67 (42%)	1.47 (37%)	2.39 (60%)
Ed	Spontaneous Fact	.4 (7%)	1.95 (33%)	1.78 (30%)	2.33 (39%)	1.4 (23%)	4.0 (67%)	1.42 (24%)	2.39 (40%)
	Spontaneous Inference	.4 (10%)	.76 (19%)	.33 (8%)	.67 (17%)	.6 (15%)	2.17 (54%)	.47 (8%)	.97 (24%)
	Fact Visuals			1.56 (26%)	3.0 (50%)	2.6 (43%)	2.0 (33%)	1.93 (32%)	2.6 (43%)
	Inference Visuals			.67 (17%)	2.11(53%)	2.6 (65%)	1.67 (42%)	2.0 (50%)	1.93 (48%)

inference items on the comprehension test.

Al. Visual analysis indicates that Al's unprompted correct verbal responding remained at or near zero (Tau-U = .05). After adding three visual options to the comprehension test in the second baseline, Al variably responded to questions using the visuals, but scores were consistently below 50% with scores ranging from 0 to 50% correct (mean = 27%). Following the introduction of the second intervention phase, Al's percentage of correct responding with visuals remained variable with scores ranging from 20 to 100% correct, but trended up above baseline levels by the second session (mean = 65%). In the third baseline condition, Al's correct responding with visuals declined with scores ranging from 10 to 60% correct (mean = 40%) resulting in a level change but immediately increased and stabilized in the final intervention phase ranging from 80 to 100% (mean = 93%) correct. Data from intervention phases are consistently above baseline levels. Results illustrate that Al required visual options to respond to questions across phases. His correct responding with visuals was highest during intervention showing a functional relation, and his combined percent correct Tau-U was .89 (strong).

Al increased his correct responding with visuals to fact and inference questions during intervention phases (Table 3). On average, Al responded to 1.87 (31%) fact and 1.60 (40%) inference questions correctly in baseline conditions and 5.0 (83%) fact and 3.0 (75%) inference questions in intervention conditions. Al's average number of correct responses progressed over time with a mean number of correct responses to fact questions reaching 5.75 (96%), and inference questions 3.5 (88%) in the final intervention condition.

Bo. In the initial baseline and intervention conditions, Bo's percentage of unprompted correct responses were stable and low ranging from 0 to 10% in baseline (mean 2%), and 0 to 40% (mean = 12%) in intervention. After introducing the three visual response options in the second baseline phase, Bo immediately increased his unprompted correct responding continued to be low and stable ranging from 0 to 10% (mean = 2.9%), and although variable, he immediately began to use the visuals to correctly respond (range 0–70%; mean = 37%). Once the intervention was reintroduced, Bo immediately increased his correct unprompted responding and his combined percent correct with a range of 20–70% (mean = 52%), and 70–100% (mean = 87%) correct respectively resulting in a level shift. In the 3rd baseline condition, Bo's unprompted correct responding immediately dropped, but remained variable trending downward with a range of 0 to 40% (mean = 16%). His combined percent correct gradually trended downward with scores ranging from 30 to 90% (mean = 61%) correct. Once intervention was reinstated, Bo's combined percent correct immediately increased and stabilized with scores ranging from 90 to100% (mean = 94%) illustrating a shift in level. Bo's unprompted correct responding only minimally improved (range = 10–40%; mean = 27%) and remained variable throughout this phase consistently overlapping with baseline. Bo's correct unprompted correct responding and correct responding with visuals was consistently higher in intervention phases, but his unprompted correct responding remained variable demonstrating overlap with baseline phases. The figure shows a clear functional relation for the combined percent correct responses, but overlap obscures the relation for percent unprompted correct responses. The Tau-U for percent unprompted correct responses was .62 (moderate), and total percent combined was .95 (strong).

Table 3 shows that Bo improved his ability to spontaneously respond to fact questions correctly during intervention conditions with a mean of .73 (15%) correct in baseline phases and 2.14 (36%) in intervention phases, but only minimally to inference questions with a mean increase from 0 in baseline to .57 (14%) in intervention phases. Bo's ability to respond to fact questions with visuals remained relatively stable across baseline and intervention phrases with an average of 2.44 (41%) correct in baseline and 2.82 (48%)

in intervention sessions. Bo increased his correct responding to inference questions using visuals in intervention sessions from a mean of 1.63 (41%) in baseline to 2.87 (72%) in intervention conditions. Bo's highest level of correct responding to fact and inference questions was in the third intervention phase, but his unprompted, spontaneous responding remained variable.

Cy. In the initial baseline condition, Cy's correct unprompted responding remained stable at 0. Once intervention was introduced, Cy slightly increased his correct unprompted responses, but his level of responding remained low and variable (range: 0–20%; mean = 8.6%). When visuals were added to the test in the second baseline, Cy's correct unprompted responses remained low and stable (mean = 2%). His combined percent correct was variable ranging from 40 to 70% (mean = 54%). Once intervention was reintroduced, although variable with several data points overlapping with baseline, Cy showed a small improvement in his unprompted correct responses ranging from 0 to 40% (mean = 17%). Cy's combined percent correct immediately increased in this phase with a clear level change and scores ranging from 70 to 100% (mean = 94%). In the return to baseline condition, Cy's correct unprompted responses and correct percent combined immediately decreased ranging from 0 to 20% (mean = 3%), and 50 to 90% (mean = 66%) respectively. His correct percent combined was highly variable in this phase. Once intervention was reinstated, Cy's unprompted correct responding immediately improved, but remained variable (range = 0 to 50%; mean = 24%); however, his combined percent correct immediately increased and stabilized (range = 90–100%; mean = 99%). Cy's correct unprompted correct responding was consistently higher in intervention conditions, but also variable overlapping with data points in baseline phases. His combined percent correct was consistently higher and more stable in intervention than baseline conditions. Although his unprompted correct responding remained variable, a functional relation is demonstrated for both Cy's percent unprompted correct and total percent correct responses. The Tau-U for correct verbal responding was .61 (moderate), and combined percent correct was .88 (strong).

Table 3 shows that Cy's spontaneous, correct responding to both fact and inference questions was modest from near 0 in baseline conditions to a mean of 1.2 (21%) on fact items and .46 (12%) inference items correct. Overall, Cy's correct responding to fact questions with visuals was higher in the intervention conditions (mean = 4.42 items; 74%) compared to baseline conditions (mean 3.95 items; 66%). Cy improved his ability to respond to inference items using visuals averaging 1.72 in baseline (43%) and 3.21 (80%) items in intervention phases.

Dex. In the initial baseline and intervention conditions, Dex's unprompted correct responding was low and stable ranging between 0 and 10%. In the second baseline condition, visuals were added to the test and Dex's unprompted correct responding remained stable at 0 whereas his correct responding with visuals was variable ranging from 30 to 70% (mean = 47%). Once intervention was reinstated, Dex's unprompted correct responding remained low and stable ranging from 0 to 10%, and his combined percent correct was variable ranging from 40 to 90% (mean = 71%), but trended upward stablizing the 5th session. In the third baseline condition, Dex's unprompted correct responses remained low and stable ranging from 0 to 10%, and his combined percent correct remained variable while also decreasing with a range of 10 to 60% (mean = 41%) illustrating a change in level with some overlap with the previous intervention condition. Once intervention was reintroduced, Dex's unprompted correct responding increased, but was variable ranging from 10 to 50% (mean = 22%) with some overlap with baseline. His combined percent correct trended upward with scores ranging from 40 to 90% (mean = 71%). Dex's combined percent correct was consistently higher in intervention than baseline conditions although variability is noted in all phases. Although his unprompted correct responding only improved in the final intervention condition, a functional relation is demonstrated for the combined percent correct. The Tau-U for unprompted correct responses and combined percent correct were .43 (moderate) and .75 (large) respectively.

Dex's responses to fact and inference questions were highest in intervention phases (Table 3). Gains in spontaneous correct responding were minimal with the greatest improvement noted in the third intervention condition with an increase in the average number correct from .13 (2%) fact and 0 inference questions in baseline to 1.33 fact (22%) and .89 (22%) inference questions during intervention. Dex showed the greatest improvement in his ability to respond to inference questions with visuals. On average, Dex responded correctly to 1.47 (37%) inference questions with visuals in baseline, and 2.39 (60%) in intervention phases.

Ed. In the initial baseline, Ed's correct verbal responding ranged from 0 to 20% (mean = 8%) correct. Once the intervention was introduced, Ed steadily began to increase, but also demonstrated variability with scores ranging from 0 to 50% (mean = 27%) correct. This gradual upward trend was interrupted by several dips to baseline levels. To determine whether Ed would increase his correct responding at a faster rate with additional supports, we returned to baseline conditions. In the second baseline, correct spontaneous responses and combined percent correct showed a gradual downward trend. Unprompted correct responses ranged from 40 to 50% in early sessions to 0 to 20% in later sessions (mean = 21%), and the combined percent correct ranged from 20 to 90% (mean = 53%). Once intervention was reinstated, Ed immediately increased his correct unprompted responding ranging from 10 to 50% (mean = 30%), and combined percent correct from 50 to 100% (mean = 81%) illustrating an upward trend. In the third baseline, Ed's scores immediately trended downward with unprompted correct responses ranging from 10 to 30% (mean = 20%), and combined percent correct from 50 to 100% (mean = 72%). In the final intervention condition, Ed's unprompted correct responding increased showing a variable but upward trend with scores ranging from 10 to 90% (mean = 62%), and his combined percent correct stabilizing with scores consistently between 90 to 100% (mean = 98%). Ed's unprompted correct responding and combined percent correct were consistently higher in intervention than baseline conditions with scores trending upward in intervention and downward in baseline phases indicating a functional relation. The Tau-U was .57 (moderate) for the unprompted correct responses and .73 (large) for the combined percent correct.

Ed's responses to fact and inference questions improved over time with the larger increases in spontaneous correct responding in the final intervention phase (Table 3). In this phase, Ed improved his average unprompted correct responding to fact questions from 1.4 (23%) items in baseline to 4.0 (67%) in intervention, and to inference questions from .6 (15%) in baseline to 2.17 (54%) in intervention. Table 3 highlights that Ed's use of visuals declined by the final phase as he spontaneously responded to at least half of

the questions correctly.

Social Validity. The classroom teacher noted participants were "more engaged" and/or "more interested" in the books during intervention. She also thought Al was more "enthusiastic" and "paid a lot more attention." She was not surprised that Al needed visuals to respond and thought it "goes along with his language impairment." Since the intervention, his teacher noticed that Bo was a "much happier reader" and "more conscious when reading." When asked about Cy, his teacher said that he was accurately "answering some of the more in-depth questions" in intervention sessions. After viewing clips of Dex, his teacher noted he was "less impulsive and more interested in the story" during the intervention. When asked about Ed, she said he was "very interactive with you socially" and felt "he remembered the story" in intervention sessions. When asked about feasibility, she said, "this would be fabulous" because many teachers struggle to address the comprehension of children with ASD.

4. Discussion

This study investigated the impact of an adapted SG intervention on participants' correct responding to comprehension questions. All participants improved their combined spontaneous correct and correct responses with visuals (Tau-U .73–.95), and/or their spontaneous, correct responding (Tau-U .05–.62) suggesting that although participants responded to questions verbally, they continued to require visual supports.

Consistent with the literature (e.g., Brown et al., 2013; Lucas & Norbury, 2014; McIntyre et al., 2017), participants with ASD responded better to fact than inference questions. Al increased his correct responses to fact and inference questions with visuals, and three participants (Bo, Cy, Ed) increased their spontaneous correct responses to fact questions thereby decreasing their need for visuals. Dex began to improve his spontaneous, correct responding to fact questions by the 3rd intervention phase. Four participants (Al, Bo, Cy, Dex) showed little to no improvement in their spontaneous, correct responding to inference questions, but improved their correct responding to inference questions with visuals. Ed increased his spontaneous correct responding to inference questions with his highest gains in the final intervention condition.

All participants demonstrated a gradual increase with their greatest gains in the final intervention phase. By the 3rd intervention phase combined spontaneous correct responding and correct responding with visuals stabilized for 4 of the 5 participants with scores ranging between 80 and 100% on the comprehension test; yet, although participant spontaneous correct responding improved for 3 participants, such responses remained variable. Dex's combined correct responding was more variable throughout, but on average, higher in intervention phases.

4.1. Implications

Results indicate that many young children with ASD (ages 5–7) will likely require supports to engage in discussions about text and increase correct responding. Children learn skills more effortlessly when these skills are just outside of their current skill repertoire (Schreibman et al., 2015). Participants were more likely to respond to fact questions correctly in baseline sessions than inferencing items indicating some knowledge of this skill prior to intervention. All participants improved their ability to respond to inference questions with visuals suggesting that visual supports may be one way for individuals with ASD to participate in and learn from instruction targeting less familiar skills. For example, Ed improved his correct responding with visuals immediately and by the third intervention condition, he improved his spontaneous correct responding to inference questions. Similarly, Bo, Cy, and Ed also appeared to use visuals to respond to fact questions less often over time as their independent correct responding increased. Participants with more limited spontaneous communication (Al and Dex) may have required additional practice and prompting during reading to improve their correct responses to fact and inference questions using visuals. The visuals paired with adult language modeling may have served as a form of augmented input. That is, the visuals may not only provide a way for learners with ASD to respond but may also facilitate understanding (Beukelman & Mirenda, 2013).

Although all participating children experienced benefits from the intervention, the ability to spontaneously respond remained variable. The intent of strategy instruction is for learners to become increasingly comfortable with the strategy and use it effortlessly and automatically when reading. This level of use may require more time/opportunities to apply strategies, and participants did achieve their highest and most stable levels of correct responding in the final intervention phase. Yet, for struggling readers, comprehension strategy instruction is likely a long-term investment that will require more than a focus on the strategy alone (Allington & McGill-Franzen, 2008). Research has shown that both skilled and poor comprehenders benefit from inference interventions that help learners make connections between text and background knowledge, but more research is needed to fully understand the long-term benefits (McMaster & Espin, 2018). Therefore, it is likely that no single short-term strategy is likely to result in long term gains. Learners struggling to develop effective comprehension will need multiple strategies and ongoing instruction.

Children may benefit from additional instruction that emphasizes the language skills necessary to complete the task such as pre-teaching content vocabulary needed to answer text questions (Kamhi & Catts, 2017) as the ability to make inferences is linked to depth of vocabulary knowledge with each influencing the other (Oakhill & Cain, 2018). The current study taught the vocabulary necessary to understand SG, but not vocabulary specific to content. Because knowledge is essential for comprehension and effective strategy use (Catts & Kamhi, 2017), the knowledge necessary for narrative text often requires social understanding that is not explicitly stated, but rather inferred by the reader (Duke et al., 2011). The trouble children with ASD experience with theory of mind limits prior knowledge necessary to understand social motivations and intentions of characters making interpretation of narrative text difficult (Norbury & Nation, 2011). Learners with ASD may benefit from additional instruction that involves deciphering character thoughts/feelings and how these emotions or motivations impact actions and influence important SG elements.

4.2. Limitations

Several study limitations should be noted. First, a withdrawal design was used, and although correct responding trended downward in baseline conditions, these downward trends were not immediate resulting in some overlap. Although immediate changes in level/trend are always preferred, an effect that gradually trends downward in the reversal phase but does not reach initial baseline levels can still show effects (Ledford & Gast, 2018). Future research may consider other design options as variability and data that trends downward may indicate a learning effect. Moreover, maintenance data were not collected, so it is unclear if gains would maintain after the second and final intervention phase. Second, the absence of behavior specific praise in baseline may have deflated baseline performance. Third, the prompting hierarchy involved looking back at text to locate or determine a response. For inference items, this may be insufficient, and require direct instruction. Fourth, knowledge plays a key role in comprehension, and using different books in each session varies the background knowledge needed for each reading, which may increase variable responding. Finally, the use of visual supports on the comprehension test also increases the likelihood of variable responding. Three visual options give participants a 33% chance of selecting the correct option. Future studies may increase the number of visual response options or consider a longer intervention aimed to intentionally fade the use of visual supports as children increasingly respond spontaneously.

4.3. Conclusions

There are several things that good readers do when engaging in text that present challenges for learners with ASD including integrating information or details to gain an understanding of the whole text, attending to only what is relevant, activating important and relevant background knowledge, and setting goals for reading and monitoring understanding (Norbury & Nation, 2011). Although this study shows that children can benefit from SG instruction, it unlikely that any one strategy is sufficient to support the comprehension of learners with ASD. Future research should explore comprehensive comprehension instruction for learners with ASD.

References

Allington, R. L., & McGill-Franzen, A. (2008). Comprehension difficulties among struggling readers. In S. E. Israel, & G. G. Duffy (Eds.). *Handbook of research on reading comprehension* (pp. 551–568). New York, NY: Routledge.

Bethune, K. S., & Wood, C. L. (2013). Effects of wh- question graphic organizers on reading comprehension skills of students with Autism Spectrum disorders. *Education and Training in Autism and Developmental Disabilities, 48*(2), 236–244.

Beukelman, D. R., & Mirenda, P. (2013). *Augmentative and alternative communication: Sup porting children and adults with complex communication needs* (4th ed.). Baltimore: Paul H. Brookes.

Brown, H. M., Oram-Cardy, J., & Johnson, A. (2013). A meta-analysis of the reading comprehension skills of individuals on the autism spectrum. *Journal of Autism and Developmental Disorders, 43*, 932–955. https://doi.org/10.1007/s10803-012-1638-1.

Cain, K., & Barnes, M. A. (2018). Reading comprehension: What develops and when? In K. Cain, D. L. Compton, & R. K. Parrila (Eds.). *Theories of reading development* (pp. 257–282). Philadelphia, PA: John Benjamins Publishing Company.

Carnahan, C. R., & Williamson, P. S. (2013). Does compare-contrast text structure help students with autism spectrum disorder comprehend science text? *Exceptional Children, 79*, 347–363.

Catts, H. W., & Kamhi, A. G. (2017). Prologue: Reading comprehension is not a single ability. *Language, Speech, and Hearing Services in Schools, 48*, 73–76.

Colle, L., Baron-Cohen, S., Wheelwright, S., & van der Lely, H. K. (2008). Narrative discourse in adults with high-functioning autism or Asperger syndrome. *Journal of Autism and Developmental Disorders, 38*, 28–40.

Duke, N. K., & Carlisle, J. F. (2011). The development of comprehension. In M. L. Kamil, P. D. Pearson, E. B. Moje, & P. Afflerbach (Vol. Eds.), *Handbook of reading research: Vol. IV*, (pp. 199–228). London: Routledge.

Duke, N. K., Pearson, P. D., Strachan, S. L., & Billman, A. K. (2011). Essential elements of foster-ing and teaching reading comprehension. In S. J. Samuels, & A. E. Farstrup (Eds.). *What research has to say about reading instruction* (pp. 51–93). (4th ed.). Newark, DE: International Reading Association.

El Zein, F., Solis, M., Vaughn, S., & McCulley, L. (2014). Reading comprehension interventions for students with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 44*, 1303–1322.

Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal, 2*, 127–160.

Kamhi, A. G., & Catts, H. W. (2017). Epilogue: Reading comprehension is not single ability – Implications for assessment and instruction. *Language, Speech, and Hearing Services in Schools, 48*, 104–107.

Kamps, D. M., Leonard, B., Potucek, J., & Garrison-Harrell, L. (1995). Cooperative learning groups in reading: An integration strategy for students with autism and general education peers. *Behavioral Disorders, 21*, 89–109.

Kim, Y. S. (2017). Why the Simple View of Reading is not simplistic: Unpacking component skills of reading using a direct and indirect effect model of reading (DIER). *Scientific Studies of Reading, 21*, 310–333.

Kratochwill, T. R., Hitchcock, J., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2010). *Single-case designs technical documentation.* Retrieved from What Works Clearinghouse website:http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

Landi, N., & Ryherd, K. (2015). Understanding specific reading comprehension: A review. *Language and Linguistics Compass, 11*, 1–24.

Ledford, J. R., & Gast, D. L. (Eds.). (2018). *Single case research methodology: Applications in special education and behavioral sciences*(3rd ed.). New York: Routledge.

Lucas, R., & Norbury, C. F. (2014). Levels of text comprehension in children with autism spectrum disorders (ASD): The influence of language phenotype. *Journal of Autism and Developmental Disorders, 44*, 2756–2768. https://doi.org/10.1007/s10803-014-2133-7.

McIntyre, N. S., Solari, E. J., Gonzales, J. E., Solomon, M., Lerro, L. E., Novotry, S., ... Mundy, P. C. (2017). The scope and nature of reading comprehension impairments in school-age children with higher-functioning autism spectrum disorder. *Journal of Autism and Developmental Disorders, 47*, 2838–2860. https://doi.org/10.1007/s10803-017-3209-y.

McMaster, K. L., & Espin, C. A. (2018). Reading comprehension instruction and intervention: Promoting inference making. In K. Cain, D. L. Compton, & R. K. Parrila (Eds.). *Theories of reading development* (pp. 463–487). Philadelphia, PA: John Benjamins Publishing.

Nation, K., Clarke, P., Wright, B., & Williams, D. (2006). Patterns of reading ability in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 36*, 911–919.

Norbury, C., & Nation, K. (2011). Understanding variability in reading comprehension in adolescents with autism spectrum disorder: Interactions with language status and decoding skill. *Scientific Studies of Reading, 15*, 191–210.

Oakhill, J., & Cain, K. (2018). Children with specific text comprehension problems. In K. Cain, D. L. Compton, & R. K. Parrila (Eds.). *Theories of reading development* (pp. 359–378). Philadelphia, PA: John Benjamins Publishing.

Pearson, P. D., & Cervetti, G. N. (2017). The roots of reading comprehension instruction. In S. E. Israel (Ed.). *Handbook of research on reading comprehension* (pp. 12–56). (2nd edition). New York: Guilford Press.

Randi, J., Newman, T., & Grigorenko, E. (2010). Teaching children with autism to read for meaning: Challenges and possibilities. *Journal of Autism and Developmental Disabilities, 40*, 890–902.

Reid, D., Hresko, W., & Hammill, D. (2001). *Test of early reading ability* (3rd ed.). Austin: Pro-Ed.

Ricketts, J., Jones, C. R. G., Happe', F., & Charman, T. (2013). Reading comprehension in autism spectrum disorders: The role of oral language and social functioning. *Journal of Autism and Developmental Disorders, 43*, 801–816. https://doi.org/10.1007/s10803-012-1619-4.

Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G., ... Halladay, A. (2015). Naturalistic developmental behavioral interventions: Empirically validated treatments for autism spectrum disorder. *Journal of Autism and Developmental Disabilities*. https://doi.org/10.1007/s10803-015-2407-8 Advanced online publication.

Senokossoff, G. W. (2016). Developing reading comprehension skills in high-functioning children with autism spectrum disorder: A review of the research, 1990-2012. *Reading and Writing Quarterly, 32*, 223–246. https://doi.org/10.1080/10573569.2014.936574.

Stringfield, S. G., Luscre, D., & Gast, D. (2011). Effects of a story map on accelerated reader post-reading test scores in students with high- functioning autism. *Focus on Autism and Other Developmental Disabilities, 26*, 218–229. https://doi.org/10.1177/1088357611423543.

Tsatsanis, K. D., & Powell, K. (2014). Neuropsychological characteristics of autism spectrum disorders. In F. R. Volkmar, S. J. Rogers, R. Dan, & K. A. Pelphrey (Eds.). *Handbook of autism and pervasive developmental disorders* (pp. 302–331). (4th ed.). Hoboken: Wiley.

Vannest, K. J., & Ninci, J. (2015). Evaluating intervention effects in single-case research designs. *Journal of Counseling & Development, 93*, 403–411.

Vannest, K. J., Parker, R. I., & Gonen, O. (2011). *Single Case Research: Web based calculators for SCR analysis (Version 1.0) [Web-based application].* Available fromCollege Station, TX: Texas A&M University. www.singlecaseresearch.org.

Whalon, K., & Hanline, M. F. (2008). Effects of a reciprocal questioning intervention on the question generation and responding of children with autism spectrum disorder. *Education and Training in Developmental Disabilities, 43*, 367–387.

Wilkinson, L. A., & Son, E. H. (2011). A dialogic turn in research on learning and teaching to comprehend. In M. L. Kamil, P. D. Pearson, E. B. Moje, & P. Afflerbach (Vol. Eds.), *Handbook of Reading research: Vol. IV,* (pp. 359–387). London: Routledge.

Williamson, P., Carnahan, C. R., Birri, N., & Swoboda, C. (2015). Improving comprehension of narrative using character event maps for high school students with autism spectrum disorder. *The Journal of Special Education, 49*, 28–38. https://doi.org/10.1177/0022466914521301.

Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., & Schultz, T. R. (2015). Evidence-based practices for children, youth, and young adults with Autism Spectrum disorder: A comprehensive review. *Journal of Autism and Developmental Disorders, 45*, 1951–1966. https://doi.org/10.1007/s10803-014-2351.