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Embedding perseverative interest of a child with autism in text may result in improved reading comprehension: A pilot study

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Abstract

Objective: We investigated the effects of embedding the perseverative interest (PI) of a child with autism (i.e. cars) within texts on reading comprehension. **Methods:** A PI text condition (text altered to include cars) was compared with a non-PI text condition (same story without cars inserted) in an alternating treatment design. Dependent variables were responses to reading comprehension questions and number of words uttered during an oral retell (i.e. curriculum-based measures [CBMs]). The reading level, instructional routines, and therapist were held constant across the randomly alternated conditions. **Results:** Both CBMs suggested that reading comprehension was enhanced when the story included the child's PI. **Conclusions:** These preliminary findings suggest that embedding the PIs of students with autism spectrum disorder within readings may result in more accurate responses to reading comprehension questions and more detailed oral retelling. These findings are discussed in terms of potential directions for future research.

Keywords

Autism spectrum disorder, motivation, perseverative interests, reading

History

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Intervention research for people with autism spectrum disorders (ASD) has primarily focused on reducing problem behavior, teaching self-help skills and improving communication [1–4]. However, as the number of children identified with ASD continues to increase [5], so do the demands placed on schools to provide effective academic instruction for this population [6]. Reading is a fundamental academic skill and a major priority for students during elementary school. Previous research suggests that children with ASD may not benefit from existing reading interventions to the same extent as other students [7–9], Al Otaiba and Fuchs [10] reported rates of nonresponse to these interventions as high as 50% for students identified with low-incidence disabilities, including ASD. This nonresponsiveness may be due, in part, to the unique reading profiles presented by some students with ASD. Specifically, students with ASD may be able to say the correct words when shown text, but they may not be able to demonstrate comprehension of those words [11–18]. This deficit in reading comprehension is reported even when students with ASD are compared with IQ-matched students with other intellectual or developmental disabilities [16].

Despite the growing number of students with ASD in schools and the deficits in reading associated with ASD, a recent review of reading comprehension interventions for students with ASD identified only 12 studies published between 1980 and 2012, only 9 of which utilized an

experimental design [6]. Interventions identified in that review included strategy instruction [19–21], explicit instruction [22–24], and anaphoric cueing [17, 25]. The review's findings suggest that these approaches may also improve reading comprehension for students with ASD, albeit perhaps to a lesser extent [10]. The aforementioned reading interventions were initially created to address reading deficits in students with learning disabilities, and modifications to these interventions specific to the characteristics inherent to an ASD diagnosis have not been evaluated. Additionally, the overall evidence-base involving reading interventions for students with ASD must be considered sparse given the limited number of studies and the limitations present in several of those studies [6].

The National Autism Center's National Standards Project identified treatments based on the science of applied behavior analysis (ABA) as having the strongest evidence base [26]. ABA-based interventions include antecedent strategies (i.e. modification of events that occur before targeted behavior) designed to increase a person's motivation to engage in learning tasks [27]. One approach to improving motivation during academic instruction involves modifying tasks to incorporate the idiosyncratic interests and preferences of the student [28–30]. Embedding the obsessions and/or perseverative interests (PIs), which are inherent to the diagnosis of ASD within intervention materials and procedures has been shown to be effective in increasing task engagement [31–33], correct responding [34, 35], and overall productivity [36–38]. Odom et al. [39] examined intervention studies involving students with ASD and reported that incorporating students' interests within learning tasks to be a promising educational

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practice that deserves further investigation. In this current study, we sought to determine the potential benefit of embedding a PI into a reading task for a child with ASD. The aim of this pilot study is to determine if a PI (an inherent characteristic of children with ASD that is often considered an obstacle to learning) can be used as a means to tailor reading interventions specifically for children with ASD.

Method

Research design

An alternating treatments design [40] was used to compare measures of reading comprehension following a condition in which the student read stories containing their PI to a condition with grade-level matched readings absent the PI. Two measures commonly used by teachers to evaluate reading comprehension (i.e. answers to reading comprehension questions and oral story retelling) were used. Sessions were 30-min in duration and were conducted four to five times per week for two weeks with one to two sessions per day.

Participant and setting

To be included in this study the student had to have: (a) a diagnosis of an ASD; (b) an Individualized Education Program objective related to improving reading comprehension skills; (c) grade level or above grade-level word identification skills based on previous assessment results and teacher records; (d) ability to attend to one-on-one tasks with an instructor; (e) ability to answer oral questions (e.g. who, what, where, and when) aloud; and (f) an identifiable PI that was agreed on by multiple stakeholders (teachers, parents, and behavior therapist). The first child referred to the project by the school counselor met these criteria and completed the study. Jim was an 8-year-old male in second grade diagnosed with autism. He attended both the general education classroom with inclusion support and the special education self-contained classroom for modified instruction during approximately 50% of his school day. Jim's teachers reported that he demonstrated a marked deficit in reading comprehension. Teachers noted that Jim would monotonously read grade-level text with few errors, but that he often failed to demonstrate any form of reading comprehension on formal or informal assessments. The intervention setting was the school counselor's office at a table with two chairs. This setting was chosen to avoid the distractions inherent to a classroom and to hold the setting constant across conditions. Jim, a researcher, and the school counselor were present during sessions. The office contained typical office furniture, a few toys, and other materials commonly found in school settings. No effort was made to make the environment austere or to reduce distractions inherent in such a school setting. The same researcher implemented all procedures and sessions took place at the same time of day throughout the study.

Procedures

Identifying PI

Jim's PI was identified through a four-step assessment process involving direct observation, teacher questionnaire, student questionnaire, and a free operant preference assessment.

First, Jim was observed across multiple school settings (classroom, lunch, hallway, etc.) and the researcher made note of specific items or topics Jim spent a substantial amount of time talking about and playing with. Next, Jim's classroom teacher completed a brief questionnaire developed by the authors that was designed to identify a PI. The questionnaire items were developed based on the definition of PI provided by Charlop et al. [33]. Specifically, a PI is an intense preoccupation with an object, activity, or a concept that the individual will continually seek out, talk about, or write about and, when interrupted, may cause the individual irritation. The questionnaire included 10 fill in the blank style questions; for example, "The student gets agitated if interrupted while talking, reading and/or writing about [blank]?" and "The student often talks about [blank] with peers and/or adults". The questionnaire was rephrased and then given to the participant (teacher and student questionnaires available upon request). Finally, during a free operant preference assessment [41] that included cars and other age-appropriate toys, Jim spent 100% of the time engaged with the cars. All four steps of this process identified cars as a PI and Jim's teachers and school counselor agreed with this conclusion.

Text selection and adaptations

In order to identify and modify texts, a pool of 22 second-grade narrative stories were downloaded from the Reading A-Z website [42], which provides a database of reading passages organized by the grade-level. Half of the 22 passages were randomly selected for modification to include the PI and the remaining half were left unaltered. None of the unaltered texts involved cars. Modification of text entailed replacing key elements in the story with cars. For example, if the main character rode a train in the original story, then he rode in a car in the modified PI story. As a second example, the main character could be changed from some animal, person, or object to a car. Anthropomorphizing cars in this manner is not unusual within children's literature or animated children's movies. The illustrations were also altered by adding drawings depicting cars where possible. Passages were presented using the same paper and font with all illustrations in black and white in both conditions. By changing only a few keywords throughout the story (e.g. train to car) the reading difficulty was held constant across conditions despite modifications to the text.

Reading sessions

Both conditions (PI and non-PI) involved identical procedures. Specifically, Jim was brought to the one-on-one therapy room (i.e. school counselor's office), given a story, and asked to read aloud. After Jim finished reading, the researcher praised him for completing the story, and then immediately asked the reading comprehension questions. Regardless of whether the answers to the questions were correct or incorrect, the researcher provided praise (e.g. "that was an interesting answer, good job", "thanks for responding, good work"). Finally, the researcher set a timer for one minute and asked Jim to "tell me about what happened in the story we just read". The only difference between PI and non-PI conditions was the presence or absence of cars in the

story. The PI and non-PI stories were alternated in a random sequence per the alternating treatment design. However, if three conditions in a row were the same condition then the other condition was implemented twice in order to keep a balance in the number of presentations of each condition.

Dependent variables and data collection

Reading comprehension was assessed with two curriculum-based measures (CBMs). Researcher-developed CBMs have been used in previous research involving students with ASD [43, 44]. In this study, the CBMs consisted of five short answer questions designed to evaluate reading comprehension and an oral story retelling task. The five reading comprehension questions were created specifically to fit each story but always involved three questions regarding specific facts (e.g. “What did Mr. Racecar want for his birthday?”) and two questions involving more inference (e.g. “How did the car solve the problem?”). Questions were answered verbally. The percentage of questions answered correctly was calculated for each session and graphed. The oral retelling CBM followed the same procedure as described in the Dynamic Indicators of Basic Early Literacy Skills [43]. Specifically, after reading each passage, Jim was given one minute to provide as much detail as possible about the story. The instructor counted the number of relevant words (i.e. on-topic directly related to the story) spoken by the participant. The number of words spoken during retelling was then graphed.

A second independent observer collected interobserver agreement data on the answers to the reading comprehension questions during 100% of sessions. An agreement was defined as both observers agreeing that each answer was correct or incorrect. The percentage of agreement was then calculated by dividing the number of agreements by the number of agreements plus disagreements for each session. The resulting

percentages were then averaged to obtain a total percentage agreement for the measure across the course of the study. The mean agreement for Jim’s reading comprehension was 96%. Given the simplicity of counting words during the oral retelling, formal interobserver agreement scores were not calculated for that measure.

Results

Table I reports mean scores for the reading comprehension measure during the PI and the non-PI conditions. Overall, Jim’s scores on reading comprehension measures were higher during the PI treatment ($M=70\%$) than during the non-PI condition ($M=38\%$). Additionally, the data path in the PI condition was considerably more stable (range=40–100%) relative to the non-PI condition (range=0–80%). Figure 1 displays Jim’s reading comprehension question scores during both conditions.

Table I also reports mean scores on the retell measure during the PI and the non-PI conditions. Overall, Jim’s retell performance was better during the PI condition ($M=8$ words per minute [wpm]), relative to his performance during the non-PI treatment ($M=4$ wpm). His retell scores were more stable during the PI condition (range=4–10 wpm), as compared with the non-PI condition (range=0–8 wpm). During three sessions of the non-PI condition, Jim produced 0 words when asked to retell the story, despite his accurate reading of the text. Figure 2 displays Jim’s retell performance during PI and non-PI condition. Visual analysis of the graph reveals a divergence in the data paths with a consistently lower number of wpm during the non-PI condition.

Discussion

These findings suggest that the inclusion of a student with ASD’s PI within stories may reveal higher levels of reading comprehension compared with stories absent the PI. Specifically, in terms of the reading comprehension questions, Jim scored 32% higher, on average, during the PI condition compared with the non-PI condition. On the oral retell measure, Jim used 50% more words, on average, to describe the PI text compared with the non-PI text. These findings replicate and extend previous research demonstrating the potential benefit of incorporating idiosyncratic PIs into

Table I. Mean scores for reading comprehension and retell probes.

Dependent variable	PI condition M (R)	Non-PI condition M (R)
RCM	70% (40–100)	38% (0–80)
RT	8 wpm (4–10)	4 wpm (0–8)

M , Mean; PI, Perseverative Interest; R , Range; RCM, Reading Comprehension Measure; RT, Retell Measure; wpm, words per minute.

Figure 1. Percentage of correct responses on reading comprehension questions during PI and non-PI conditions for Jim.

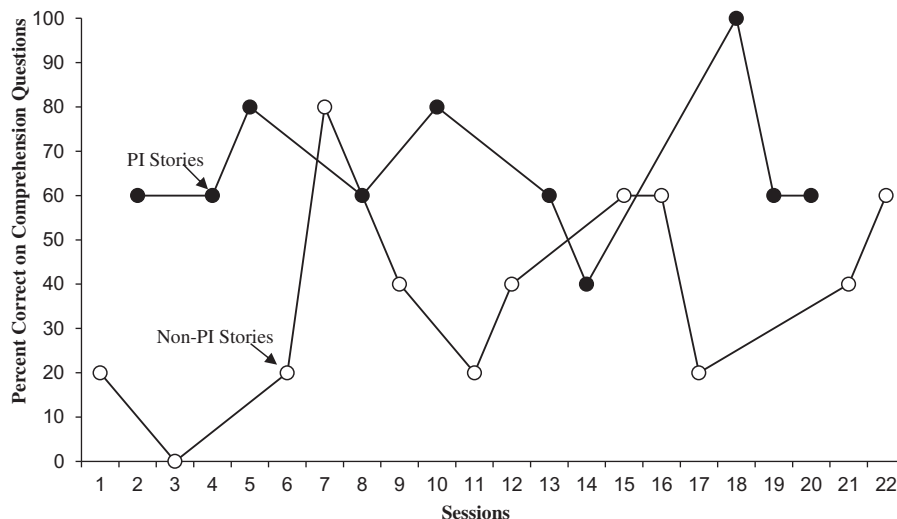
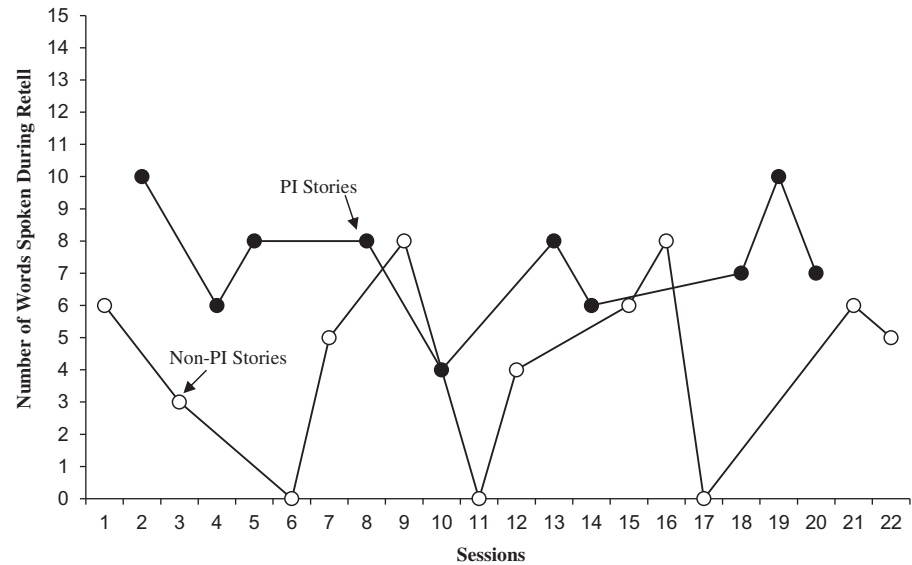


Figure 2. Number of correct words retold during PI and non-PI conditions for Jim.



interventions for challenging behavior, communication, and self-help skills [31–33, 45].

It is important to note that this study did not aim to teach reading comprehension and no specific instructional strategies (outside of merely repeatedly practising answering questions and retelling stories) were implemented. Instead, we demonstrated that the presence or absence of PIs within reading passages may have an effect on two measures commonly used by teachers to quickly assess reading skills. If these findings are replicated and limitations to the current study are sufficiently addressed in future studies, this finding may have several implications for practitioners involved in teaching reading to students with ASD. First, when teachers aim to assess a student with ASD's progress toward meeting goals related to reading comprehension, it would be important to ensure that the reading passages either all involve the PI or all lack the PI in order to help ensure that changes in performance across probes can be attributed to actual skill development and not to the presence or absence of the PI. For example, a teacher that assessed reading comprehension at the beginning of the year using a story that involved the PI and then reassessed weeks later using a story absent that interest might mistakenly believe no progress had been made. Second, it is possible that this finding might be used to develop a strategy to teach reading comprehension. One possibility involves, including the PI in stories when reading comprehension strategies are initially taught and then gradually fading the PI from the stories as reading comprehension skills are acquired could lead to more efficient acquisition of such skills in students with ASD.

Future research in this area should aim to address several limitations of this preliminary study. First, replication of these findings with additional participants is essential. Second, while the alternating treatment design allowed for a direct comparison of the two conditions, a weakness was the potential for carryover effects between the conditions. Carry over effects may have contributed to overlap in data paths. A multiple-baseline across participants could address both of these limitations [40]. Third, the oral retell measure, although commonly used [44], may not be a strong indicator of true reading comprehension and more robust and empirically

supported measures should be considered in future research. Fourth, we did not systematically measure engagement (e.g. time on-task or active participation) or challenging behavior and it is possible that including the PI may influence these variables. Fifth, PI can be socially stigmatizing and inappropriate in some contexts. For example, a child with a PI in something obscure or thought to be silly by other children (e.g. a PI that involves door hinges) might experience additional social difficulties if their PI is made more obvious to classmates. Furthermore, it is possible that increasing exposure to the PI may result in the child becoming increasingly interested in the topic and experiencing new obstacles related to PI (e.g. increased agitation when the object or topic of interest is denied or interrupted). Future research investigating these potential pitfalls and collecting data on the social validity of this approach is warranted. Finally, the dependent variables in this study are considered proximal measures of reading comprehension, yet they were selected for their simplicity, common use among in-service teachers, and amenability to single-subject design data collection and display methods. However, using standardized measures that may detect distal reading comprehension outcomes is warranted in future studies.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

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