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ORIGINAL PAPER

Reading Instruction for Students with Autism Spectrum Disorder: Comparing Observations of Instruction to Student Reading Profiles

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Abstract

Despite a marked increase in the volume of research investigating issues about reading interventions for students with ASD (e.g., Bailey and Arciuli, Rev J Autism Dev Disord 7(2):127–150, 2020; Chiang and Lin, Focus Autism Other Dev Disab 22(4):259–267, 2007), very few studies have examined the current reading practices experienced by children with ASD in the schools. This mixed-method study reports on the observed reading instruction and reading performance of students ($N = 39$) with autism spectrum disorder (ASD) in grades 4–8 (ages 9–14 years.) across two separate geographic regions of the USA. Data collection included systematic observations of tier 1 and tier 2/3 reading instruction. Students were also assessed with standardized measures of word recognition, language, and reading comprehension. The purpose of this investigation was to contribute to the limited corpus of observation research on reading instruction for students with ASD within the context of describing student performance on battery of standardized measures. A total of 168 lesson sessions totaling 7497 min of observed class time were completed and the battery of measures were administered to students. Results of the observations indicated that 44–48% of instructional time across different tiers of instruction were dedicated to comprehension monitoring consisting of answering teacher directed questions. Minimal amounts of time were dedicated to word recognition instruction. According to findings from the assessment battery, approximately 46% of students had below average scores on word recognition and reading comprehension measures. Study findings suggest a mismatch between student needs and the manner in which they were addressed.

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Introduction

Educators, policy makers, and parents have all expressed concern over how students with autism spectrum disorder (ASD) are performing with reading when compared to their peers in general education and to students with learning disabilities (LD) (Fleury et al., 2014; Wei et al., 2011). In response to this concern, a large volume of single case design studies investigating approaches to intervention and reader profile studies investigating the associations between reading, language, and cognitive processes have increased dramatically in the last 10 years (see Bailey et al., 2020; Chiang & Lin, 2007). However, very few observation studies of reading for students with ASD are part of the current base of literature (e.g., Whalon & Hart, 2011). While the field continues to investigate evidence-based practices, observation of instruction help to assess the current state of instructional practices within applied settings (Swanson et al., 2012). Direct observations of instruction can help explain the focus-areas of reading instruction being provided (e.g., word reading, comprehension) to students and how they are performing in key areas of reading.

Reading Observation Research

Although researchers have utilized a variety of observation methods to investigate school practice in reading for students with LD and EBD (e.g., McKenna, Garwood, & Solis, 2021b; McKenna et al., 2015), this type of research appears to be less commonly utilized by those vested in service delivery for students with ASD. In the only observation study of reading for children with ASD that we are aware of, Whalon and Hart (2011) conducted observations and interviews of three students with ASD in kindergarten, 2nd, and 5th grades to determine the reading instruction provided during instruction in an inclusionary setting. Findings suggested that students in this study showed strengths in decoding with low language and reading comprehension. Observations of instruction indicated a lack of focus on comprehension with much of the instruction being teacher-directed questioning with students assuming a passive role with question responses rather than actively constructing knowledge.

Reader Profile Studies of ASD

Studies from 30 years ago generally supported the idea that students with ASD demonstrated profiles of high decoding and low comprehension (e.g., Frith & Snowling, 1983). These early findings provide a plausible explanation as to why many practitioners are under the impression that many students with ASD have a reading profile of average to above average decoding skills and low comprehension. However, more recent studies have reported higher levels of heterogeneity in students' performance on word reading and comprehension measures while also

taking into account other factors such as language (Lucas & Norbury, 2014). Larger sample sizes and longitudinal studies of linguistic profiles have provided opportunities for more sophisticated analyses such as the use of latent variables and model fit indices to inform interactions and make predictions (Lucas & Norbury, 2014; McIntyre et al., 2017; Ricketts, 2011; Solari et al., 2017, 2019). Collectively these studies strongly support the conceptualization of reading performance in students with ASD as not associated with a consistent profile which in turn requires an intervention to address the heterogeneity associated with ASD.

Reading Intervention Research

One recent systematic and quality analysis of reading interventions for children with ASD focused on word recognition and reading comprehension instruction Bailey & Arciuli, 2020). Bailey and Ariciuli (2020) reviewed reading interventions over a 10-year span consistent with key components of instruction outlined by the National Reading Panel (NRP; National Institute of Child Health and Human Development, 2000). In this systematic review, effect sizes were reported in addition to an analysis of study quality based on a pre-established criterion specific to studies of individuals with ASD (Reichow et al., 2008). A total of 19 studies published between 2009 and 2017 met their inclusion criteria and were included in the review.

For students in the middle grades (4th to 8th), three single case design studies provided word recognition instruction, focused on letter-sound relationship and word reading accuracy for students ages 11–15 years. All three studies showed gains in discrete phonetic skill development (Ainsworth et al., 2016; Bailey et al., 2011; Leytham et al., 2015), although across this area of instruction issues of quality with research design were noted according to the quality indicator analysis included in the systematic review (Bailey & Ariciuli, 2020). Three single case design studies provided reading comprehension instruction for students from ages 10 to 15 years (Howorth et al., 2016; Turner, 2017; Zakas et al., 2013. Findings from these studies showed consistent gains compared to baseline conditions and also had relatively high-quality ratings according to the analysis conducted by Bailey and Ariciuli, 2020). The instruction included instructional routines designed to support self-monitoring, use of visual organizers, main idea summarization strategy instruction, and question generation. Older reviews of reading comprehension intervention have also identified similar types of reading interventions (El Zein et al., 2014). It was noted that most studies employed a participant screening procedure designed to capture students with average to above average decoding and low reading comprehension.

Conceptual Framework

The Simple View of Reading (SVR) is a commonly ascribed empirical framework that has been validated with typically developing students (Catts et al., 2003), and more recently through multiple investigations utilizing samples of students with ASD (Lucas & Norbury, 2014; McIntyre et al., 2017; Ricketts, 2011). The SVR provides a heuristic for determining different profiles of reading performance that

is helpful for consideration of instructional targets for intervention. For example, students with reading difficulties stemming primarily from word reading difficulties should be provided instruction and intervention that emphasizes of a focus on this difficulty. Students with reading difficulties who have adequate decoding skills but have comprehension difficulties should be provided instruction and intervention that targets their area of need. Historically, students with ASD have been described as commonly having profiles of average to above average decoding ability and low reading comprehension (Frith & Snowling, 1983). However, more recent findings from reader profile studies have diverged from the commonly thought of profile of high decoding and low comprehension (McIntyre et al., 2017). The findings from this study will be framed in light of the SVR across two sources of data: (a) observations of reading instruction, and (b) student assessment data. We will further contextualize the findings from the perspective of multi-tiered system of support (MTSS) which is an instructional framework that relies on tiered levels of instruction based on findings from universal screeners of all students and progress monitoring measures for students in need of additional instruction (National Center on MTSS, 2020). Tier 1 is provided to all students and typically includes vocabulary and comprehension instruction for students in 4th grade and above (Capin et al., 2022). Instruction provided for tiers 2 and 3 is for students who are behind and in need of remediation of particular discrete skills (Reed et al., 2012). The difference between tier 2 and 3 is based on the intensity of need for students as evidenced from progress monitoring data. Use of the framework has shown to support improvements with reading outcomes for struggling readers in the upper grades (e.g., Vaughn et al., 2010).

Purpose and Research Questions

As prevalence rates of children identified as ASD continue to increase dramatically in the USA (1 in 88 children in 2008, 1 in 68 children in 2014, and 1 in 59 children in 2018) (Centers for Disease Control and Prevention, 2020) so does the need for research designed to obtain an understanding of typical instructional practices and present levels of performance in reading for children with ASD. In light of the landmark Supreme Court case providing clarification regarding the interpretation of the Free and Appropriate Public Education (FAPE) clause (Yell & Bateman, 2019), school districts are now required to go above and beyond the previous held "de minimis" standard. An important step in fulfilling this requirement is to gain a better understanding of current school practice for a population of students that continue to have poor performance compared to their general education peers and other associated disability categories (Wei et al., 2011).

The purpose of this study was to add to the limited observation research on instructional practices provided to students with ASD across different tiers of instruction while also taking into account their performance on standardized measures of reading, language, and cognitive processes. At this time, we did not locate an observation study involving students with ASD that has been published for students in the middle grades. We used mixed methods including direct observation

of reading and student assessment data. We set out to answer the following research questions: (1) What instructional practices do teachers use when providing instruction to students with autism spectrum disorder? (2) What are the differences and similarities with instructional practices between tier 1 and tier 2 instruction for students with ASD? (3) How are students with ASD performing in key areas of reading based on standardized measures (e.g., word recognition, comprehension)?

Method

Participants and Setting

A purposive sampling procedure (e.g., student selection criteria; Miles & Huberman, 1994) was used to identify students with autism spectrum disorder in grades 4–8. District personnel were asked to nominate students for participation that met the following criteria: (a) eligible for special education services under the ASD disability category with no comorbidities other than qualifying for speech and language services; students with comorbid intellectual disability (ID) were excluded because the nature of instruction and intervention for this student population is likely qualitatively different, due to the manner in which this disability adversely affects school performance; (b) History of not passing the high-stakes state reading exam or a reading goal on their individualized education plan (IEP), (c) students with average cognitive functioning (i.e., IQ scores on a standardized measure in the average range), (d) did not participate in the state's alternative assessment, and (e) not identified as a student with limited English proficiency. An IEP describes the educational programming that will occur for students who have qualified for services under the Individual with Disabilities Education Act (IDEA) in the United States. We relied on the school personnel to determine students with average cognitive functioning and did not verify this with any assessment data. Parental consent and student assent were obtained for participants as approved by the universities' Institutional Review Board requirements. Permissions were obtained for 39 student participants. Community members were not involved in this study (see Table 1).

Table 1 Student demographic data

Variable	Mid-Atlantic Schools		Southwestern Schools		Total	
	n	%	*n*	%	*n*	%
Gender						
Male	17	77.3	14	82.4	31	79.5
Female	5	22.7	3	17.6	8	20.5
Race/Ethnicity						
Black	1	4.6	2	11.8	3	7.7
Hispanic	3	13.6	14	82.3	17	43.6
White	18	81.8	1	5.9	19	48.7

The school sites were from two states (Mid-Atlantic, Southwestern) with data collected for 2 years at the Mid-Atlantic site and 1 year at the Southwestern site. At the Mid-Atlantic site, data collection occurred across three rural school districts with a total of nine schools. At the western site, there were three near urban school districts with a total five schools. In total, data was collected from six districts with 14 schools. Data collection occurred for two school years (SY) (SY 2015–16, SY 2016–17).

Mid-Atlantic Schools

Two school districts from the Mid-Atlantic region participated in the study. District #1 is a near-urban district with two middle schools and six elementary schools that had approximately 8235 students at the time of the study. The racial and ethnic makeup of the district #1 was 1.4% Asian, 14.2% Black, 25.5% Hispanic, 0.4% Native American, and 58.5% White. District #2 is located in a rural area with one middle school and two elementary schools. The racial and ethnic makeup of district #2 was 0.3% Asian, 13.2% Black, 10.1% Hispanic, 5.5%, Native American, and 70.9% White.

Southwestern Schools

Three near-urban school districts from the Southwestern region participated in the study. District #3 had 14 elementary and 4 middle that had approximately 19,000 students at the time of the study. The racial and ethnic makeup of district #3 at the time of the study was 5.3% Asian, 3.7% Black, 79.8% Hispanic, 0.7% Native American, and 9.2% White. District #4 had 22 elementary and 6 middle that had approximately 32,000 students at the time of the study. The racial and ethnic makeup of district #4 at the time of the study was 3.3% Asian, 13.2% Black, 73.3% Hispanic, 0.9% Native American, and 6.7% White. District #5 had 22 elementary and 6 middle that had approximately 32,000 students at the time of the study. The racial and ethnic makeup of district #5 at the time of the study was 3.1% Asian, 12.2% Black, 77.7% Hispanic, 0.3% Native American, and 4.3% White.

Instrumentation

The following sources of data contributed to this investigation: (1) observations of reading instruction provided to students with ASD using a validated measure, and (2) battery of standardized measures of reading, language, and cognitive processes.

Student Observations of Reading Instruction

Student observations of reading instruction provided by teachers were completed using the Instructional Content Emphasis—Response to Intervention (ICE-RTI) which is an adapted version of the ICE-R (Edmonds & Briggs, 2003). The coding protocol for the ICE-RTI yields the following data: multi-dimensional descriptors of

reading instruction, time allocation for components and subcomponents of reading instruction, student grouping, materials utilized, and tiers of instruction. The taxonomical design of the instrument was derived from studies of instructional content. The categories and sub-categories of reading instruction were culled from an extensive literature review of reading intervention programs, review of national and state reading standards, and research on best practices of literacy instruction. The categories of instruction include the following: phonological awareness, word study/phonics, word reading fluency, oral language development, vocabulary, comprehension, text reading, and writing. During observations the ICE-RTI captures distinct instructional activities by assigning numeric descriptions of what is being taught, how it's being taught, and what type of materials are being used. The dimensions of data include identification of main instructional categories, sub-categories, grouping, materials, levels of engagement, and instructional quality. The ICE-R has previously been used in reading observation studies within multitiered instructional models (Swanson et al., 2012).

Standardized Battery of Student Assessment Measures

We selected a battery of standardized measures with sound psychometric properties that was also feasible to complete in two brief sessions of approximately 30 min each, taking into account breaks and transitions. The administration of the assessments occurred prior to the observations of classroom reading instruction. The measures capture student level data in the areas of word reading, language, and reading comprehension.

Test of Word Reading Efficiency—2 (TOWRE; Torgesen et al., 2012)

The TOWRE is a nationally normed, individually administered 5-min test of students' ability to quickly and accurately recognize sound units and common words with two subtests: (1) sight word reading, (2) phonemic decoding efficiency. For both subtests, students were asked to read as many words as possible in 45 s per subtest. The alternate form reliability is reported as 0.91–0.97 (Torgesen et al., 2012.

The Clinical Evaluation of Language Fundamentals, 5th Edition Recalling Sentences Subtest (CELF-RS; Wiig, Secord, & Semel, 2013)

The CELF-5 Recalling Sentences (CELF-RS) subtest measures semantic and syntactic language skills. Students are asked to repeat sentences that increase in length and complexity. The CELF-RS is used to screen for and diagnose the severity of language disorders of students ages 5–21. The reliability coefficients range from 0.71 to 0.86 for subtests and the interscorer decision agreement for subtests that require clinical judgments and interpretation of scoring rules range from 0.88 to 0.99.

Woodcock-Johnson IV, Passage Comprehension Subtest (WJ-PC; McGrew et al., 2014)

The WJ-PC is a nationally normed, individually administered assessment used to assess reading comprehension. Items require students to supply a missing word to sentences and then paragraphs of increasing complexity. Reliability coefficients for the WJ-PC range from 0.81 to 0.89 (McGrew et al., 2014).

Procedures

Observer and Assessor Training

The first author, who has extensive experience with the ICE-RTI, trained teams of graduate research assistants (GRAs) at both sites. Four GRAs conducted observations at the mid-Atlantic site and four at the Western site. The GRAs all had backgrounds in special education and reading instruction and attended an initial 6-h training session on conducting the classroom observations. Training topics included the purpose of the ICE-RTI, the different dimensions of instruction captured, and coding form data entry. Observers were trained to follow a seven-step procedure: (1) observe and record classroom instruction, (2) summarize instructional events, (3) assign codes for multidimensional description, (4) indicate level of engagement, (5) rate instructional quality, (6) text reading by students, and (7) note any special circumstances. Engagement was operationalized as being high (almost all students actively involved with the learning activity), medium (most students), or low (more than half not participating in the learning activity). Instructional quality was operationalized and rated on four-point scale—Excellent, high average, low average, week. The level of instructional quality was judged based on descriptions across the scale for the following: explicit language use, number of examples, opportunities to practice, immediate and corrective feedback, responsiveness to students, monitoring and feedback, scaffolds, and appropriate pacing and wait time.

Written and video examples were provided on how to determine the multidimensional elements of specific instructional events, followed by GRAs working through additional examples with guided and independent practice. At the end of the training each GRA was assigned to independently code two video recorded lessons, which were compared to a gold standard (Gwet, 2001) established by the first author. The videos were coded by the first author who served as the gold standard. Interobserver agreement (IOA) was calculated by as the total number of agreements divided by the total number of items. All GRAs obtained agreement above 90% after coding of the second video.

A second day of training provided explicit instruction on the administration of the standardized battery of student measures. Training topics consisted of description and practice with administration protocols, scoring procedures, and issues specific to working with children with ASD including appropriate use of testing accommodations according to IEPs. These accommodations included checking for understanding with test directions, taking breaks, and chunking the testing sessions to avoid fatigue. The training had extensive reliability checks to a gold standard established by the first author from video recordings and mock testing sessions. Working closely

with school personnel, the battery was administered based on information included on each student's IEP (see accommodations described above).

Instructional Observations

Case managers for each consented student were asked to identify tier 1 and tier 2/3 reading instruction provided over a typical school day. The research team explained to case managers that tier 1 instruction was thought of as general education instruction, whereas tiers 2 and 3 included targeted intervention instruction typically in small groups or one-to-one. Some students received multiple sessions of reading instruction (e.g., tier 1 and tier 2/3) and others only received one session of reading per day (i.e., only tier 2). The observations focused on the instruction received by the consented student being provided by all teachers providing reading instruction. Observers sat in a location that was selected to minimize distractions while also providing acceptable proximity to the target student. If students were absent on the days scheduled for observations an attempt was made to reschedule. If the student was absent upon rescheduling the observation was cancelled. The observation schedule was designed to capture instruction at the beginning, middle, and end of the school year for all students. Three observations were conducted for 37 students. Due to multiple absences, two observations were conducted for the remaining two students.

Data Analysis

Based on descriptive field notes, GRAs coded the instructional components present during the observations and entered the data into a spreadsheet. To establish reliability, a GRA independent of the observations and assessments reviewed field notes and the data reported in the spreadsheet as a form of double coding. Using an exact agreement method, the initial reliability was 86.7% with all disagreements discussed until 100% agreement was achieved. The assessment data protocols were reviewed and checked for data entry accuracy along with double scoring the conversion of raw scores to standardized scores. The interrater reliability for the assessment data was 98.6%. All the disagreements were associated with data entry errors, which were corrected.

Results

A total of 168 lesson sessions totaling 7497 min of observed class time were completed. Tier 1 instruction was observed for 52 the lesson sessions and tier 2/3 for 116 lesson sessions. Of that total 5752 min (76.7% of total time) were coded as observed instructional time with the other time being coded for logistics or non-instructional time. Logistics represents activities such as taking roll and announcements. Non-instructional time includes activities such as breaks

Table 2 Main instructional components observed

Focus area of instruction	Minutes (*n*)	% of total
Code-based instruction		
Phonological awareness	38	< 1
Word Study/phonics	305	6.2
Word reading fluency	52	< 1
Reading fluency (connected text)	58	1.1
Spelling	91	1.9
Meaning-based Instruction		
Oral language development	51	1.0
Vocabulary	393	6.8
Comprehension	2813	48.9
Text reading	1142	19.9
Writing	809	14.1

%total = minutes (*n*) divided by total minutes (5752 min) of instruction observed

and free time. Classes ranged in length from 14 to 96 min with a mean time of 45 min. The battery of standardized reading, language, and cognitive measures was obtained for all 39 students. Based on the results of this data collection, we provide answers to the research questions posed.

RQ1. What Instructional Practices Do Teachers Use When Providing Instruction to Students With Autism Spectrum Disorder?

Table 2 summarizes the main components of reading instruction that were observed and coded across all tiers of instruction (e.g., core instruction, tier 2 or tier 3 intervention). The percent of word study and phonics instruction observed was 9.5% which was much less frequent than the vocabulary, comprehension and writing instruction which was observed for 90.5% of instructional time. As expected at grade levels 4–8 phonological awareness (PA) instruction was observed for less than 1% of instructional time. PA, word-reading fluency, reading fluency, spelling, and oral language each composed from 0 to 1.9% of instructional time, excluding any opportunity to further describe the instruction. Therefore, these components are not described in detail.

Word Study and Phonics

Word study instruction including letter/sound relationships, irregular words, and word reading application activities was observed for 6.2% (305 min) of instruction. Given that students were in grades 4–8, we expected to see less instruction in this area, although for students with evidence of reading problems, we anticipated higher percent in line with findings from other observation studies (e.g., Swanson et al., 2012). This expectation also aligns with recommendations from recent research suggesting that older students with low reading performance often need word recognition instruction (Vaughn et al., 2022). Students spent 57.7% (176 min) learning and

applying letter-sound correspondence activities including common spelling and syllable patterns and sorting words with common characteristics. Students spent 38.4% (117 min) working on accurate word recognition including irregular words that do not follow the usual rules of pronunciation.

Vocabulary

Vocabulary instruction providing opportunities for students to develop knowledge of essential words was observed for 6.8% (393 min) of instruction. Instructional strategies that focused on deriving meaning from semantic knowledge including morphology, synonyms/antonyms, and word categorization (28.4% of vocabulary time) was similar in use to strategies designed to promote discussion of words and the use of context clues (29.3% of vocabulary time). To a lesser extent, students were taught vocabulary through dictionary use and definition practice (22.1% of vocabulary time). Mnemonic strategies to learn word-meanings was not observed. The remainder of instructional time comprised vocabulary activities not captured by the sub-category descriptors (20.1% of vocabulary time).

Comprehension

Comprehension instruction was the most frequently observed (2813 min). As part of comprehension instruction, the majority of instructional time was spent on comprehension monitoring activities (63.7%, 1791 min), in which students read text followed by answering questions posed by the teacher or on a worksheet. Worksheets were used approximately 30% of comprehension monitoring instruction. Comprehension strategy instruction in which teachers provide explicit instruction on specific strategies to support comprehension was observed to a much lesser degree (13.1%, 368 min) compared to the total time of comprehension instruction. The remainder of instructional time was designed to preview and make predictions about text (8.0%, 225 min), to answer listening comprehension questions from read alouds with no student access to text (3.9%, 112 min), and other forms of instruction designed to support students gaining meaning from text (11.3%, 317 min).

Text Reading

Time spent with students reading text without instructional supports being inherently built into the routine (e.g., listening to recordings of text) was observed for 19.9% of the time (1,142 min). The observation time of text reading was evenly distributed between peer supported reading (35.3%, 409 min), teacher supported (32.8%, 375 min), and independent reading (31.3%, 375 min).

Writing

Writing instruction was observed for 14.1% (809 min). Instruction designed to support the mechanics of writing (e.g., grammar and punctuation) was observed for

Table 3 Tier one instructional components observed

Focus area of instruction	Minutes (*n*)	% of total
Code-based Instruction		
Phonological awareness	0	0
Word study/phonics	66	3.9
Word reading fluency	0	0
Reading Fluency (connected text)	0	0
Spelling	8	< 1
Meaning-based Instruction		
Oral language development	5	< 1
Vocabulary	174	10.2
Comprehension	750	44.1
Text reading	257	15.1
Writing	440	25.9

%total = minutes (*n*) divided by total minutes (1700 min) of Tier One instruction observed

Table 4 Tier two/three instructional components observed

Focus area of instruction	Minutes (*n*)	% of total
Code-based Instruction		
Phonological Awareness	38	< 1
Word Study/phonics	239	5.9
Word reading fluency	52	1.2
Reading Fluency (connected text)	58	1.4
Spelling	83	2
Meaning-based Instruction		
Oral language development	46	1.1
Vocabulary	219	5.4
Comprehension	2063	51.1
Text reading	870	21.6
Writing	369	9.1

%total = minutes (*n*) divided by total minutes (4037 min) of instruction observed

43.5% (352 min). Shared writing activities designed to support composition, revision, and publishing was observed for 56.5% (457 min).

RQ2. What are the differences and similarities with instructional practices between tier 1 and tier 2 instruction for students with ASD?

For research question 2, we looked at a subset of the data by calculating instructional time according to the identified tier of instruction from the observations. See Table 3 for a summary Tier 1 observations and Table 4 for a summary of tier 2/3 observations. Tier 1 class sizes ranged in size from 11 to 31 students with an average of 17 students. Tier 2/3 class sizes ranged in size

from 1 to 15 students with an average of 7 students. Tier 1 instruction was observed for 1700 min, a much smaller amount of time then the 4037 min of tier 2/3 instruction. This indicates that most children with ASD in this study were only receiving reading instruction from instruction considered to be tier 2 by the schools. A substantial difference between the tiers of instruction was the amount of time devoted to word recognition instruction, which was negligible in tier 1. While there was more time devoted to word recognition in tier 2, it only accounted for less than 5% of the total instructional time. This is somewhat in line with current thought in the field on implementation of an MTSS model for older grades with the emphasis on tier 1 being placed on vocabulary and reading comprehension instruction (Reed et al., 2012). More instructional time was devoted to vocabulary instruction in tier 1compared to tier 2 although this only accounted for 10% of the total time compared to 5% for tier 2. There was also a marked difference in writing instruction with a much larger percentage (25.9%) provided in tier 1 compared to only 9.1% in tier 2.

The area of instruction that was most similar across tiers was the amount of instructional time observed for comprehension. Because comprehension has historically been a primary area of concern for children with ASD, the following is a more in-depth comparison of comprehension instruction across instructional tiers. Within this area of instruction, comprehension monitoring activities were most prevalent in tier 1 (42%, 320 min) and tier 2/3 (71.3%, 1471 min). Despite cognitive strategy instruction being considered a foundational component of intervention instruction (Swanson, 1999), comprehension strategy instruction was far less prevalent with tier 2 instruction (8.1%, 169 min) then what was observed with tier 1 instruction (26.5%, 199 min). A higher percentage of instruction on building background knowledge and making prediction was observed in tier 1 (10.4%, 78 min) when compared to tier 2 (1.3%, 27 min).

RQ3. How are Students with ASD Performing in Key Areas of Reading and Language Based on Standardized Measures (e.g., word recognition, comprehension)?

Table 5 Descriptive statistics for standardized measures

Variable	*n*	*M*	SD	Range
Age	39			
Word recognition				
TOWRE Sight SS	39	78.3	15.2	55 – 107
TOWRE Decoding SS	39	85.8	20.4	55 – 131
TOWRE Composite SS	39	80.4	17.8	54 – 117
Language ability				
CELF-5 SS	37	3.5	2.7	1 – 9
Reading comprehension				
WJ-PC SS	39	77.2	20.8	31–111

n number of students, *M* mean, *SD* standard deviation, *SS* standard scores, *CELF-5* The clinical evaluation of language fundamentals recalling sentences subtest, *TOWRE* test of word reading efficiency

The data from these measures is presented descriptively in reference to the normative samples used for test development (see Table 5). For the TOWRE and WJ-PC, standard scores are presented with a score of 100 indicative of an average score. One standard deviation is represented by 15 standard score points. In reference to the normative samples, standard scores ranging from 85 to 115 would be considered within the low average and high average range. Scores outside of this range represent performance that is thought of as children with below average performance or having significant reading difficulties.

As expected, the sample of students with ASD in this study on average had standard scores on word recognition measures and reading comprehension scores well below 85 for both reading comprehension (WJ-PC, $M = 77.2$, SD = 20.8) and word recognition (TOWRE, $M = 80.4$, SD = 17.8). The standard scores for the CELF-5 use a different scale, with a score of 10 representing an average score, and one standard deviation represented by 3 standard score points. The scores for the participants in this study are indicative of children with severe language delays with mean scores more than two standard deviations from the normative average ($M = 3.5$, SD = 2.7). See Table 1 for a summary of scores from the battery of standardized measures.

These results were somewhat expected based on the participation criteria requiring evidence of reading problems and also broadly including students with ASD as long as they were not taking an alternative state assessment. It is also noteworthy that the standard deviations were consistently large, representing a broad range of performance. This finding is in line with more recent reader profile studies of ASD (i.e., McIntyre et al., 2017) and represents the neurodiversity that is present across the autism spectrum.

Within the context of the Simple View of Reading (SVR), we were also interested in understanding how students were performing across the domains of word recognition and reading comprehension (see Fig. 1). By categorizing students based

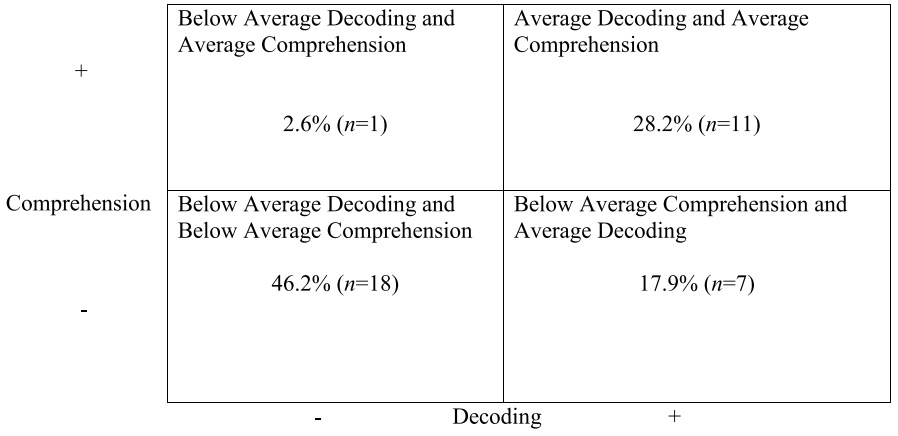

Fig. 1 Reading comprehension and decoding profiles, *Note* Below Average Decoding=Test of Word Reading Efficiency (TOWRE) composite standard scores < 85, Average Decoding=TOWRE standard scores >85, Below Average Comprehension=Woodcock Johnson Passage Comprehension subtest (WJ-PC) scores <85, Average Comprehension=WJ-PC scores >85

on the standard deviation cut points the number of students can be determined that had an average range of performance (from low average to high average, standard score (SS) range 85–115) or a below average performance (SS < 85). By organizing the data this way, we can get a sense of how students are performing according to the heuristic of the SVR. As depicted in Fig. 1, the largest percentage of students (46.2%) had comorbidity of low word recognition and reading comprehension performance. The second largest percentage of students (28.2%) had performance in the average range for word recognition and reading comprehension. Interestingly, only 17.9% of students had scores indicative of low comprehension and decoding within the average range. The literature has shown that reader profiles for students with ASD tend to skew towards this profile type (Frith & Snowling, 1983; McIntyre et al., 2017), which is counter to the findings reported here.

Discussion

Schools are mandated to provide instruction and support that confers "appropriate benefit" to students with disabilities who receive special education services (Yell & Bateman, 2019). Research investigating the manner in which schools educate students with disabilities can provide insight into the degree to which these mandates are achieved, identify potential leverage points to improve teacher preparation and school practice, and inform future investigations (McKenna et al., 2021a, 2021b). The purpose of this investigation was to describe the provision of reading instruction for a sample of middle grade students receiving special education services for ASD with comorbid reading difficulties. We also sought to identify the specific characteristics of these reading difficulties by using standardized measures of reading to develop profiles for each student. In addition, we made comparisons between observed instructional practices and types of instruction and intervention required by these students, as indicated by their reading profiles. The reader profiles in this study align with more recent findings from other reader profile studies (i.e., McIntyre et al., 2017), which indicate a high degree of heterogeneity with performance and a large percentage of students with comorbid difficulties with word recognition (i.e., decoding) and comprehension. Overall, the study findings suggest a mismatch between student needs and the manner in which they were addressed.

First, it appears that instructional programming for this sample of students was not informed by student data. Although 40% of students demonstrated severe deficits in word recognition, instruction in this area was completely absent from Tier 1 and was minimal at best during Tier 2. Previous studies have documented a disconnect between student needs and school practice. For example, instructional methods and supports for students with word reading difficulties tended to be absent from the IEP of secondary grade students with LD who had word reading difficulties.

Similar to a previous investigation, the majority of reading instruction appears to consist of reading sections of text and answering questions posed by teachers (Whalon & Hart, 2011). We base this conclusion on the amount of observed time students spent engaged in text reading in the absence of other instructional methods and activities designed to assess their comprehension (e.g., answering teacher

questions) relative to other types of instruction that could potentially address their reading difficulties such as systematic phonics instruction, word reading, and cognitive strategy instruction (Scammacca et al., 2015). An alignment between student needs and instructional methods is necessary, particularly when attempting to differentiate instruction (Bryant et al., 2016).

Secondly, it is possible that school teams used tier 2 intervention as a means to differentiate core reading instruction for at least some students in this sample. We base this conclusion on the tendency for some students to receive tier 2 reading instruction in the absence of core reading instruction. Researchers have previously expressed concerns with the manner in which schools implement tiered systems of support (see Fuchs & Fuchs, 2017). In regards to this investigation, tier 2/3 intervention appears to be inconsistently utilized as supplemental instruction, which is not an intention of a tiered system.

Thirdly, despite known issues with language, there was very little language or vocabulary instruction present. Poor language comprehension of students with ASD has previously been documented (Whalon & Hart, 2011), as has the association between language skills and reading performance (Bailey & Arciuli, 2020; Chiang & Lin, 2007). This finding also calls into question the degree to which this sample of students received reading instruction designed to confer "appropriate benefit", as indicated by a mismatch between identified student needs and observed instruction.

Implications for School Practice

The instructional methods and supports utilized in core instruction and supplemental intervention should align with identified student needs (Freemen et al., 2015). For example, students with word reading difficulties should be provided interventions that directly address explicit and systematic phonics instruction paired with opportunities to read connected text (Vaughn et al., 2022). Students with comprehension difficulties should receive instruction and intervention that directly address comprehension difficulties (e.g., explicit vocabulary instruction, cognitive strategy instruction) (Vaughn et al., 2022). Without this alignment between identified areas of need and instructional methods, students are unlikely derive appropriate benefit from reading instruction and intervention (Vaughn et al., 2022). As a result, schools may need to utilize valid and reliable measures of reading performance to identify student needs and the manner in which they change in response to instruction and intervention. In regards to making informed and timely adjustments to instruction in response to changing student strengths and needs, utilization of progress monitoring measures are necessary. Further, tier 2 and tier 3 intervention should be supplemental to core instruction and provided in a manner that supports skills targeted in core instruction. However, considering the shortage of highly qualified special educators and the conditions in which many of them work (see Bettini et al., 2021), it is no wonder that at least some schools face a significant challenge implementing tiered models of support with fidelity (Fuchs & Fuchs, 2017). Thus, stakeholders including those that draft and enact educational policies must respond to challenges faced by

public education due to the unfunded mandates associated with FAPE (see McKenna & Brigham, 2021).

Study Limitations

Several limitations are associated with this study. First, this sample of students is not representative of the population of students with ASD with comorbid reading difficulties. As a result, findings should not be generalized beyond this sample. Second, this study did not include an analysis of IEPs, which would have provided insight into the degree to which there was alignment between identified student needs, special education services and supports mandated through the provision of an IEP, and teacher observations. This line of research is important, as it would provide additional insight into the degree students with ASD who have reading difficulties are appropriately served by public education. Third, data on student behavior was not collected during this investigation. Standardized behavioral measures would have provided information useful in developing behavioral profiles for participating students (e.g., primarily externalizing, internalizing, or combined subtype), which could then be paired with the reading profiles that were developed. Behavioral progress monitoring data would have provided insight into the degree to which students accessed and actively participated in the instruction that they received.

Lastly, no information on IQ or symptom severity levels was collected. In the absence of this information, the degree of ASD symptomology severity is somewhat unknown. Information on student IQ and symptom severity would have helped inform the development of more nuanced student profiles.

Future Research

Findings from this investigation suggest five areas of consideration for future research. First, considering the dearth of investigations of school practice in reading for students with ASD, additional investigations are warranted across the grade span. Similar to this investigation, future studies should pair validated observation measures such as the ICE-RTI with student reading performance data collected with standardized measures to obtain a better understanding of the degree to which school practice aligns with identified student needs. Second, future investigations should include an analysis of IEPs to determine the degree to which data informs IEP development and the provision of instruction and services. It is expected that IEPs include a PLAAFP for each important area of need, as well as at least one corresponding measurable annual goal and services designed to confer appropriate benefit for each area of need. Third, future investigations of reading instruction can include interview and focus group data to further contextualize the findings. Focus groups of teachers provide opportunities to understand issues associated with how instructional decisions are made regarding the allocation of instructional time to specific methods and activities. Focus groups of students with ASD provide opportunities to understand what parts of instruction students like and dislike and their

perceptions of benefit. Fourth, observation studies can collect data to determine the degree to which teachers provide instruction during allotted instructional time. Observation research focusing on students with EBD have previously expressed a concern with instructional time lost due to managing student behavior and class transitions (McKenna et al., 2021a, 2021b; Vaughn et al., 2002). Currently, the degree to which the challenging behavior of students with ASD impacts the amount and quality of instructional time is unknown. Lastly, future investigations can include progress monitoring data or pre-post data on reading outcomes to determine the degree to which students with ASD benefit from typical school practice, as well as identify potential relationships between observed teacher behaviors and student outcomes. A line of observation studies such as this could inform future intervention studies by identifying potentially promising practices.

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Declarations

Conflicts of Interest All authors of the study report no conflicts of interest.

Informed consent Informed consent was obtained from all individual participants included in the study.

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