Title

Reading achievement for students with autism and students with learning disability: A comprehensive examination of five key areas of reading

Permalink

Author

Quan, Jenny

Publication Date

2014

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

Reading achievement for students with autism and students with

learning disability: A comprehensive examination of five key areas

of reading

A dissertation submitted in partial satisfaction of the requirements

for the degree of Doctor of Philosophy in Education

by

Jenny Lynn Quan

2014

ABSTRACT OF THE DISSERTATION

Reading achievement for students with autism and students with

learning disability: A comprehensive examination of five key areas

of reading

by

Jenny Lynn Quan

Doctor of Philosophy in Education

University of California, Los Angeles, 2014

Professor Connie Kasari, Chair

Students with ASD present as unique learners with individual characteristics which may

impact their reading performance, particularly related to word reading and comprehension.

While a relatively new area of research in reading, students with ASD demonstrate a pattern of

below average performance on standardized measures of reading achievement, with

comprehension identified as a salient area of deficit. Research remains limited in this area,

however, particularly with regard to assessment of the five key areas of reading (phonological

awareness, word reading/ decoding, fluency, vocabulary, comprehension). The current study

provides an in-depth look at the five key areas of reading for 28 elementary-school students with

a confirmed ASD and compares the reading performance of these students with a comparison group of 30 students with SLD who would be expected to show the reverse pattern of performance on reading measures (e.g., deficits in decoding and strengths in comprehension). Additionally, a mixed-methods approach is used in the exploratory examination of student reading behaviors related to comprehension. Findings indicate patterns of strengths and weaknesses for both groups of students across the five key areas, with both groups falling well below expected population norms and benchmarks in phonological awareness, decoding, fluency, and passage comprehension. In contrast, students from both groups excelled on a measure of supported comprehension. Students with ASD performed at higher levels than peers with SLD on measures of word reading and fluency, but not on measures of phonological awareness or decoding. Conversely, students with SLD performed at higher levels than peers with ASD on a measure of listening comprehension, but not on measures of vocabulary, supported comprehension, or passage comprehension. Exploratory investigation revealed that teachers perceived that students with SLD use reading behaviors at a higher rate and with a higher level of proficiency to promote comprehension than peers with ASD. Further, student interviews demonstrated that students who were low comprehenders used fewer and more passive strategies than students who were high comprehenders, regardless of ASD or SLD group membership. Implications for practice and future research are noted.

The dissertation of Jenny Lynn Quan is approved.

Jeffrey Wood

Sandra Graham

Tom Weisner

Diane Haager

Nancy Hunt

Connie Kasari, Committee Chair

University of California, Los Angeles

2014

For Seth who inspired the project, Briana, Angelica, and Alyssa who gave up vacations and retirement for the "love" of assessment, Debbie K. who filled out all the forms, Gina who psyched me, Katherine who tried to learn all the assessments in one day, the students, parents, and teachers who allowed me into their lives, and Tony, Bean, and Jilly who helped me to defend it all.

Couldn't have done it without you!

Table of Contents

LIST OF TABLES

ACKNOWLEDGEMENTS

Curriculum Vitae

Jenny Lynn Quan

EDUCATION
2006   M.S., Special Education, California State University, Long Beach
1998   B.A., Psychology, University of California, Los Angeles

RESEARCH EXPERIENCE
Project Interventionist
Title: Early Childhood Autism Assessment and Intervention, UCLA, 2009-2010
Supervisor: Connie Kasari, Ph.D.
This research examined parent-mediated response to Joint Attention Symbolic Play Engagement Regulation (JASPER), an evidence-based early intervention for children diagnosed with autism who were from underserved, impoverished backgrounds. Participated in assessment and intervention for children with autism who were 3-4 years old.

Project Consultant
Title: Special Education Teacher Quality and Reading Instruction, CSULA, 2008-2010
Supervisor: Diane Haager, Ph.D.
This project was a three-university study, which examined special education teacher quality in the teaching of reading for students K-6 in California, Colorado, and Florida. Teachers were provided with professional development and ongoing consultation to refine teaching skills in the area of reading. Participated in various aspects of research coordination, professional development for participating teachers, videotaping, and coding of videotapes.

Project Co-Coordinator
Title: Kids Adapting to Elementary School (KATES), UCLA, 2007-2008
Supervisor: Jeffrey Wood, Ph.D.
This project examined the impact of a school-based cognitive behavioral therapy for elementary school children with clinical levels of anxiety. Participated in research coordination, parent contacts, and administered ADIS (Anxiety Disorders Interview Schedule), School Friendship Interview, Vineland, and Parental Intrusiveness scale to children and parents. Additional duties included the supervision of 10-15 undergraduate students who worked as research assistants.

Project Co-Coordinator
Title: Efficacy of Number Sense Intervention for Students with Math Difficulties, 2007-2008
Supervisor: Cara Richards, Ph.D.
Assisted with development and implementation of an intervention designed to improve the number sense skills and strategies of first grade students with math difficulties, determined individual differences in student response to intervention, and presented profiles of students who were responsive and non-responsive.

Advocacy Intern, Mental Health Advocacy Services, Inc., 2007
Supervisors: Nancy M. Shea, Senior Attorney and Jodi Oguro, Staff Attorney
Worked with attorneys to ensure that mental health and special education needs were being met for juveniles housed at Central Juvenile Hall, Los Angeles, California. Also completed a literature review of educational practices pertaining to foster youth.

TEACHING EXPERIENCE
Education Specialist, Diagnostic Center of Southern California, CDE, 2010-Present
Education Specialist for in-depth, team assessments of students with mild to severe disabilities. Provide technical assistance to teachers and instructional assistants across Southern California regarding instruction and evidence-based practice for students with mild to severe disabilities.

Lecturer, CSULA, 2007-2010
Taught 52 quarter units to undergraduate, credential, and master's level students, including student teaching supervision. Courses taught included: Assessment of Individuals with Special Needs, Teaching Students with Reading and Writing Disabilities I, Advanced Methods and Models for Teaching Special Populations in General Education, Demonstration of Instructional Competencies, Advanced Research Methods in Special Education, Research in Mild to Moderate Disabilities, Introduction to Autism.

Special Education Teacher, EWCSD, Mulberry Elementary School, 2002-2007
Special Education Teacher in a Learning Center model designed to help K-5 students receiving special education services to meet IEP goals and objectives alongside peers identified as at-risk. Presented professional development seminars to fellow teachers. Member of the school leadership team, three years.

Special Education Teacher, Lowell Joint School District, Rancho-Starbuck, 2001-2002
SDC Teacher for grades 7-8 in language arts, math, and social studies.

Special Education Teacher, Rossier Park, NPS, 1999-2001
SDC Teacher for grades 6-9 in all subject areas.

PUBLICATIONS AND PRESENTATIONS
Quan, J., Haager, D., & Flores, A. (2013). ELL reading achievement and DIBELS. Presented at the Annual Conference of the Council for Exceptional Children in San Antonio, Texas (April 4, 2013).

Chang, Y., Quan, J., & Wood, J. J. (2012). Effects of anxiety disorder severity on social functioning in children with autism spectrum disorders. *Journal of Developmental and Physical Disabilities, 24*(3), 235-245. doi: 10.1007/s10882-012-9268-2

Weinberg, L. & Quan, J. (2008). Improving the educational functioning of children with disabilities in foster care. Presented at the Annual Conference of the Council for Exceptional Children in Boston, Massachusetts (April 2008).

Richards, C. C., Quan, J., & Pham, V. (2008). The efficacy of a number sense intervention for students with math difficulties. Presented at the Annual Conference of the Council for Exceptional Children in Boston, Massachusetts (April 2008).

Richards, C. C., & Quan, J. (2007). Examining young students' number sense: Strategy use and fluency. Presented at the Annual Conference of the Council for Exceptional Children in Louisville, Kentucky (April 2007).

Bergman, L. R., Holloway (Quan), J., & Piacentini, J. (1999). Selective mutism questionnaire: Preliminary findings. Presented at the 19th National Conference of the Anxiety Disorders Association of America in San Diego, California (March 1999).

HONORS
- Graduate Student Research Mentorship Grant (UCLA), Summer 2008 & 2010
- 2009-2010 Council for Exceptional Children Division of Research Doctoral Student Scholar
- UCLA Academic Senate 2009-2010, Graduate Council, Graduate Student Association Representative
- CTAP Mini-Grant, LACOE, California Technology Assistance Project, Region 11
- Southern California Federal Credit Union Student Impact Grant

While a relatively new area of research in reading, researchers are beginning to look at the reading performance and response to intervention of children with autism. Children with autism demonstrate a consistent pattern of below average performance on standardized measures of reading achievement (U.S. Department of Education, 2009 & 2010). Reading comprehension seems to be a salient area of deficit for most children with autism, regardless of strengths in word recognition (Huemer & Mann, 2010; Nation, Clarke, Wright, & Williams, 2006; U.S. Department of Education, 2010). This may be due to characteristics unique to this population of learners (e.g., weak central coherence), which impact learning and development (Nation & Norbury, 2005; Siegel, 2003). Assessment studies have attempted to provide a reading profile for students with autism (e.g., Huemer & Mann, 2010) and several studies have attempted to improve discreet reading skills through intervention (e.g., Flores & Ganz, 2007).

Research in this area remains limited, however, particularly with regard to the reading skills of students with autism across multiple domains of reading performance. Studies use divergent assessments and fail to assess all five key areas of reading (e.g., Huemer & Mann, 2010; Nation et al., 2006). In addition, most studies fail to include a high-quality confirmation of autism diagnosis and many studies fail to include measures of language ability or cognitive functioning, which may play a significant role in response to reading instruction (e.g., Huemer & Mann, 2010; Nation et al., 2006; Williamson, Carnahan, & Jacobs, 2012). Conversely, an extensive literature base exists for students with learning disabilities in terms of both reading achievement profile and interventions available to target areas of deficit, including the area of reading comprehension (e.g., Berkeley, Scruggs, & Mastropieri, 2010).

The current study provides a comprehensive assessment of the five key areas of reading for students with a confirmed autism spectrum disorder, including an exploratory examination of

student reading behaviors that may impact reading comprehension. This level of assessment is greatly lacking in the existing research. Only through a better understanding of the needs of this population in terms of reading performance can researchers and practitioners begin to design and implement appropriate, comprehensive reading interventions. Moreover, this study compares the reading performance of students with an autism spectrum disorder against a comparison group of students with learning disabilities who would be expected to show the reverse pattern of performance on reading measures (e.g., deficits in decoding and strengths in comprehension).

Literature Review

Children with ASD: Unique Learners

Autism spectrum disorder (ASD) is the umbrella term used to classify a group of developmental disabilities which are marked by delays and challenges in social, communication, and behavioral areas (Center for Disease Control and Prevention (CDC), 2012). The number of students receiving special education services for ASD has increased dramatically over the past 15 years. This increase is likely due to increased awareness of autism and expansion of diagnostic criteria, improved procedures for identification and data collection, as well as an increase in advocacy efforts, service availability, and staff training (U.S. Department of Education, 2010 & 2011). According to the most recent CDC (2012) data, approximately 1 in 88 children have autism. Of children with ASD, approximately 38% of these children (at age 8) exhibit signs of a comorbid intellectual disability (IQ $\leq$ 70), 71% demonstrate borderline functioning (IQ = 71-85), and 38% demonstrate average to above average functioning (IQ $\geq$ 85).

There are several developmental features that make children with ASD unique as learners. Among these features are deficits in executive functioning, as demonstrated by difficulties with initiation and planning, stereotypical/ repetitive behavior, and strategy formation

deficits (Bramham, 2009). Individuals with ASD show communication deficits and a weak central coherence, meaning that children with ASD tend to process information by components, rather than the whole or the "big picture" (Nation & Norbury, 2005). Each of these developmental features may contribute to struggles with comprehension for children with ASD. Further, Jolliffe and Baron-Cohen (1999) hypothesize that deficits in theory of mind development and central coherence may be tied to weak comprehension for children with high-functioning ASDs or Asperger's syndrome. Baron-Cohen, Leslie, and Frith (1985) also hypothesize that children with ASD fail to employ theory of mind (the ability to attribute mental states to self and others and to recognize others' beliefs, desires, or intentions), which may also impact understanding.

Additionally, Siegel (2003) describes several information-processing challenges that are unique to children with ASD, which may impact learning and development. These include difficulties in shifting attention, poor response to novelty, deficits in arousal regulation (over- or under-response to stimuli), perceptual inconstancy (preference for proximal stimuli), deficits in processing speed, and a lack of affiliative orientation (innate response to be with, interact with, and imitate others). These unique learner challenges may limit the number and quality of learning opportunities experienced by children with ASD, which may impact reading skill acquisition.

In looking specifically at reading comprehension, Williamson et al. (2012) theorize that students with ASD have challenges in the area of comprehension due to the three-way interaction of their learner characteristics (e.g., theory of mind, weak central coherence, executive functioning), their individual differences in language skills and prior experiences, and the type of text that they are reading. This interaction then influences the students' action strategies (e.g.,

they select productive or unproductive strategies), which then influences construction integration (e.g., how they are able to integrate the text with their experiences and prior knowledge). The result of the interaction, action strategy choice, and construction integration is three distinct comprehension profiles: Text bound, imaginative, and strategic. Text bound students are believed to be literal and reliant on the text for information. They have difficulty integrating the information with their own experiences. Imaginative students, in contrast, are subjective and reliant on their own personal experiences, and they lack integration with text. Strategic students demonstrate the most accurate text base with low-level inferences and are able to integrate relevant information from the text with their own personal experiences. Given this possible interaction between unique learner profiles and strategy selection, it is likely that students with ASD will require specialized supports to address challenges with reading achievement.

As students with ASD are very unique learners due to multiple, characteristic developmental and information-processing features, it is likely that the supports, strategies, and interventions that are best matched to their learning profile may differ greatly from those needed for peers without ASD.

ASD and Reading Skills

Acquiring reading skills can be a challenge for many students, but for students with disabilities it is an even more daunting task (Therrien, 2004). A few studies have specifically examined the reading achievement profile for students with ASD. In a study focused on reading skills for 32 children with ASD, Nation et al. (2006) found that approximately 65% percent of students had reading comprehension scores below one standard deviation (*SD*) for population norms, and 38% were more than two *SD*s below. Children who read with a high degree of accuracy, but who had deficient comprehension skills also showed deficits in vocabulary usage

and oral language comprehension. Additionally, several of the students had deficits in decoding (64% performed 1 or 2 *SD*s below average).

National data provides a contrasting look at the performance of students with ASD to students with a specific learning disability (SLD). On a measure of letter-word identification (from the *Woodcock-Johnson III*), 81% of students with ASD compared to 96% of students with SLD scored at or below the 50th percentile, with 70% of students with SLD scoring at or below the 20th percentile compared to 49% of students with ASD (U.S. Department of Education, 2009). Thus, students with ASD did perform better on a measure of word reading compared to reading comprehension; although if the 50th percentile is considered to be an indicator of average performance, then it is clear that students with ASD and SLD are performing below average compared to population norms in both areas.

On a standardized assessment of passage comprehension (from the *Woodcock-Johnson III*), roughly 88% of students with ASD (ages 6-21) scored at or below the 50th percentile, with 74% of those students scoring at or below the 25th percentile. This performance mirrors the performance of students with SLD, as roughly 92% of students with SLD scored at or below the 50th percentile, with 73% scoring at or below the 25th percentile (U.S. Department of Education, 2009). One problem with this assessment data is that the passage comprehension assessment requires students to first read passages, so students who are poor readers are limited by reading ability. Additionally, this measure uses a cloze procedure whereby students have to produce the correct word to fill-in-the-blank, which is only one measure of comprehension and may be challenging for student with difficulties with word recall or executive functioning (like students with ASD).

A slightly different pattern of decoding performance emerged in a recent comparison of reading profiles for children with ASD compared to children with dyslexia. Huemer and Mann (2010) found a deficit in comprehension skills despite relatively intact decoding skills for children with ASD, while children with dyslexia demonstrated poor decoding skills and stronger comprehension skills. Children with Asperger's performed the best on reading assessments compared to other groups, which was argued to be due to their potentially higher cognitive and language skills.

While these studies provide a foundational knowledge of reading achievement for students with ASD, several limitations were present in the studies. These limitations included a failure to confirm ASD disability, small sample size, failure to examine multiple aspects of intelligence and cognitive ability (e.g., only performance on one non-verbal subtest was used, if a measure was used at all), reliance on one or two measures to make generalizations about decoding and comprehension (e.g., typically only passage comprehension was used and measures of listening comprehension weren't included; "decoding" was often determined by having students read 10-20 words; etc.), and a lack of assessments focused on all five key areas of reading (phonemic awareness, phonics, fluency, vocabulary, and comprehension). Without sufficient controls for diagnosis, not to mention a thorough assessment of various aspects of reading ability and comprehension, it is difficult to have an accurate picture of performance or a direction to target future intervention.

As there has been a steady rise in the number of students served under the eligibility of ASD in special education programs since 1996, it is becoming more likely that teachers will be responsible for providing instruction for this unique population of students. Additionally, while the majority of students with ASD are in separate classes and do not participate in the standard

accountability testing, roughly 30% of students with ASD participate in the regular class for at least 79% of the school day and 42% participate in accountability testing (U.S. Department of Education, 2010). This means that it is essential that teachers, including general education teachers, be able to competently provide reading instruction so that these students may access curriculum, accountability testing, and graduation.

The Five Key Areas of Reading

It is clear that children with ASD have significant deficits in reading ability. Additional assessment research is needed to determine if deficits in reading persist in all five key areas of reading identified by the National Reading Panel (2000). The *five key areas* include *phonemic awareness*, *phonics*, *fluency, vocabulary*, and *comprehension* (National Institute of Child Health and Human Development (NICHHD), 2000; Therrien, 2004).

Phonological Awareness, Phonics, and Decoding. Phonemic awareness (a subset of phonological awareness) is the student's ability to recognize and manipulate spoken words in language (NICHHD, 2000; Whalon, Al Otaiba, & Delano, 2009). Examples may include skills, such as identifying the sounds in the word "mat" (/m/ /a/ /t/), deleting a sound (/a/ /t/), or substituting a sound (/m/ /a/ /n/). Similarly, phonics relates to the ability to understand the letter-sound relationships in reading and spelling; with this understanding, students are able to then decode text (NICHHD, 2000; Whalon et al., 2009).

Spelling is an important component of phonics and should parallel reading assessment, as spelling data can provide information regarding a student's knowledge of how print is represented. Spelling involves knowledge of phonology, orthography, syntax, and semantics; components critical to reading and which each contribute to a deeper understanding of the word (Al Otaiba & Hosp, 2010). Robbins, Hosp, Hosp, and Flynn (2010) found moderate to strong

correlations between decoding and spelling skills, with stronger correlations for more complex grapho-phonemic patterns for elementary school students. Spelling development progresses from simple grapho-phonemic patterns (e.g., consonant-vowel-consonant pattern, as in *cat*) to more complex patterns, such as the use of affixes in multisyllabic words (e.g., *preconception*). Based on these findings, the authors argue that spelling assessment, which examines a student's performance on a range of grapho-phonemic patterns, is an essential method to target areas in need of intervention in literacy development.

Fluency. Reading fluency is another key component requiring assessment. Fluency refers to the student's ability to read with speed, accuracy, and expression or prosody (NICHHD, 2000; Whalon et al., 2009). Many students with disabilities lack skill in this area, due to an inability to read sight words and phrases quickly or to decode text fluidly (Chard, Vaughn, & Tyler, 2002). This lack of automaticity, or smooth, natural transformation of text to oral language, may impede working memory for individuals reading without fluency, thereby exhausting brain resources and preventing comprehension (Chard et al., 2002; Therrien, 2004). Students who are able to decode and recognize high frequency sight words within a passage of text with automaticity are fluent readers.

Fluency is essential for students to accomplish tasks involving reading in a timely fashion and is related to comprehension. The ability to read with fluency becomes even more crucial, as curricular demands increase as students move to higher grade levels and literacy tasks become a core component of access to curriculum across content areas (e.g., science, history, language arts; Manset-Williamson & Nelson, 2005).

Vocabulary. Vocabulary is the ability to understand words read by connecting the word to oral vocabulary (NICHHD, 2000; Whalon et al., 2009). It is an important link to comprehension.

Comprehension. Manset-Williamson and Nelson (2005) perhaps state it best: "Comprehension is reading" (p. 61). Comprehension occurs at multiple levels, including word (e.g., vocabulary), sentence, and passage levels. Students must understand the meaning of words to be able to comprehend the text.

Clearly the five key areas of reading cover multiple aspects of the task of reading; all are interrelated, all are critical to reading success. To date, no research study has adequately assessed students with ASD in all five key areas of reading (e.g., Huemer & Mann, 2010; Nation et al., 2006). Previous research of reading performance for children with ASD is incredibly limited. Studies use divergent assessments, making comparability challenging, and fail to assess students in all five identified key areas of reading. In addition, most studies fail to include a confirmation of ASD diagnosis (or use limited assessments, such as only parent rating scales) and many studies fail to include measures of language ability or cognitive functioning, both which may play a significant role in response to reading instruction (e.g., Huemer & Mann, 2010; Nation et al., 2006; Williamson et al., 2012).

Current Study

The current study capitalizes on a comprehensive assessment of the five key areas of reading for students with a confirmed ASD; which is greatly lacking in the existing research. Only through a better understanding of the needs of this population in terms of reading performance can researchers and practitioners begin to design and implement appropriate, comprehensive reading interventions. Additionally, this study compares the reading performance

of students with ASD to a comparison group of students with SLD who would be expected to show the reverse pattern of performance on reading measures (e.g., deficits in decoding and strengths in comprehension; Huemer & Mann, 2010). Lastly, this study employs a mixed-methods approach in the exploratory examination of student reading behaviors related to comprehension. Specifically, this study examined the following three research questions: (a) To what extent are students with ASD and SLD displaying weaknesses in the five key areas of reading compared to population norms? (b) How does the performance of students with ASD compare to the performance of students with SLD in the areas of phonological awareness, word reading/ decoding, and fluency? (c) How does the performance of students with ASD compare to the performance of students with SLD in the areas of vocabulary and comprehension? To evaluate these questions, the following hypotheses were developed:

Hypothesis 1: In the areas of phonological awareness, word reading/ decoding, fluency, vocabulary, and comprehension students with ASD and SLD will perform at lower levels compared to population norms.

Hypothesis 2: Students with ASD will perform at higher levels than students with SLD on phonological awareness, word reading, decoding, and fluency tasks.

Hypothesis 3: Students with SLD will perform at higher levels than students with ASD on vocabulary and comprehension tasks.

Method

Participants

This sample included 59 children (18 females, 41 males), as well as their parents and teachers who expressed interest in a study of reading achievement for elementary and middle school students with ASD or SLD. Participants in this study were recruited from several districts in the

10

greater Los Angeles area. One district participated in this study as part of a collaborative project with the California Department of Education's Diagnostic Center of Southern California (CDE-DCSC). As a result, 60% of the participants were from this district. Students from nine additional districts were recruited through community word-of-mouth referrals from teachers, professors, tutors, and parents. One participant with SLD (word-of-mouth referral) was removed from the study after her parent withdrew consent on the first day of testing, due to concerns that participation would impact her special education services or eligibility.

Of the 58 remaining participants (17 females, 41 males), 30 had a special education eligibility of SLD and 28 had a clinical diagnosis of ASD (e.g., autism, autistic disorder, PDD-NOS, Asperger's). The sample included one set of male twins, both of whom had a diagnosis of ASD. The students' ages ranged from 90 to 147 months ($M = 122.43$, $SD = 14.14$), and they were enrolled in grades two through six at the time of assessment. The sample was racially and ethnically diverse (51.7% Hispanic, 23.9% Biracial or Multiracial, 10.3% White, 6.9% African American, 1.7% Chinese, 1.7% Russian, 1.7% Armenian, and 1.7% Filipino). Fifteen students were designated as English Language Learners (ELLs, 25.9%), while the majority of students had English as their primary language (43 students or 74.1%). The primary language spoken by ELLs was Spanish, although some students (even students not designated as ELLs) had exposure to various languages at home, such as Spanish, Mandarin, Russian, or Tagalog. Of the parents who reported average annual salaries ($n = 42$), 10.3% of the sample had annual family incomes of less than $10,000, 36.2% had annual family incomes above $60,000, and 53.5% had annual family incomes that ranged between these two values.

All students had low average to average cognition. For example, *Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV)* scores ($n = 36$) showed that the average *Full Scale*

score was 85.03 (*SD* = 12.67, *Range* = 56 to 109), the average *Verbal Comprehension* score was 85.94 (*SD* = 12.64, *Range* = 53 to 108), the average *Perceptual Reasoning* score was 92.83 (*SD* = 11.90, *Range* = 61 to 115), the average *Working Memory* score was 81.19 (*SD* = 11.48, *Range* = 54 to 97), and the average *Processing Speed* score was 93.00 (*SD* = 14.47, *Range* = 68 to 131). No students had borderline or lower scores across all subscales. Students who were administered assessments other than the *WISC-IV* by their school psychologists showed similar cognitive levels.

All of the students with SLD were receiving special education services (e.g., speech language, SDC, RSP, full inclusion) at the time of assessment; all but two of the students with ASD were receiving special education services. All of the students were in classrooms that focused on traditional curriculum; none of the students were in a classroom that targeted functional curriculum. Thirty-two percent of students were fully integrated in the general education classroom (including two students with no special education services), 32% received Learning Center or RSP-level support with the majority of the instructional day spent in the general education classroom, and 36% were in separate special education classrooms (SDCs). All of the students in SDCs were integrated with peers in a general education setting for portions of their days (e.g., recess, lunch, and one academic period).

In the participants' districts, SLD eligibility was determined using California Education Code requirements and included an established discrepancy between ability and reading achievement, with a processing disorder in at least one area (e.g., attention, auditory processing, etc.). Based on teacher reports, students with SLD had also not responded to previous intervention efforts. ASD eligibility had been previously determined by school districts through use of a combination of rating scales and/ or pediatrician report. In order to validate a clinical

diagnosis of ASD, students were assessed with the *SCQ* (parent-completed, screening measure)

and on the *ADOS* by research reliable assessors. All students met criteria for having an ASD.

Measures

    Autism Measures. The *Autism Diagnostic Observation Schedule (ADOS)* is a standardized,

semi-structured observation tool for assessment of the social and communication aspects

associated with ASD (Lord, Rutter, DiLavore, & Risi, 2001). For this study, Module 3 of the

ADOS was used to measure the range of a student's abilities in the social, communication, and

social-communication, and restricted and repetitive behavior areas. Only students with ASD

were administered this assessment.

    The *Social Communication Questionnaire- Lifetime* (*SCQ*; Rutter, Bailey, & Lord, 2003)

is a 40-item measure used to evaluate social functioning and communication skills in children

who may have an ASD. The Lifetime form focuses on the child's developmental history and

provides a cut-off score of 15 to screen for students who may have an ASD. Only parents of

students with ASD completed this measure for screening purposes.

    Measure of Receptive Vocabulary. *Peabody Picture Vocabulary Test, Fourth Edition*

(PPVT-4; Dunn & Dunn, 2007). The *PPVT-4* is designed to measure student receptive (hearing)

vocabulary. On the *PPVT-4*, students are orally given a word (e.g., *citrus*) and are then presented

with four different pictures. Students must correctly choose the one picture that best describes

the word (e.g., picture of an orange). Correlations with other measures of vocabulary and oral

language (e.g., *CASL, CELF-4*) range from 0.37 to 0.84 with the majority of scores above 0.72.

    Reading Achievement Measures. Reading achievement measures for this study were

selected through a collaborative process. As the initial phase of the research focused on a

collaborative project between one district in the greater Los Angeles area and the CDE-DCSC,

assessment resources most commonly used at these two sites were first considered to promote

practicality for teachers. Next, experts in the field were consulted regarding potential measures to

be included in the study; these experts had doctorates in education or a related field, were well

versed in reading assessment literature, and each had more than 20 years of experience in

education.

The guiding intent was to select measures that would provide an in-depth look at multiple

areas of reading for teachers to use to guide future instruction, which is an aspect greatly lacking

in the current literature and teacher practice. For example, measures such as the *Woodcock-*

Johnson III's (*WJ-III*) *Letter Word Identification* and *Passage Comprehension* are frequently

used to determine reading levels (e.g., the project district; Huemer & Mann, 2010); while these

measures do help to provide an overall reading level, they are quite limited in providing a teacher

with information regarding where to next target instruction (Additionally, the *WJ-III Passage*

Comprehension measure requires students to read paragraphs for themselves - a challenge for

students with limited decoding skills who often have average comprehension of material, which

would not be reflected in a test score on this subtest).

Each of these reading measures, including the extended versions of some measures (e.g.,

the *TORC-4*) and additional measures not included in the study (e.g., passage fluency measures

using *Read Naturally* or curriculum-based passages), was piloted with a group of eight students,

two teachers, and three instructional assistants. As the intent of the study was to provide teachers

with meaningful, useable information that could be directly linked to instruction, teacher input

was a key component. Following the pilot phase, modifications to the assessment battery were

made to incorporate input. The measures not included in the study failed to provide additional,

unique information.

In terms of excluded fluency measures, instructional staff indicated that knowing general performance in this area, based on a formal measure such as the *GORT-4*, was enough to indicate whether or not there was a need for intervention. Many of the teachers used *Read Naturally* to provide intervention in this area. They reported that since assessment was already built into the intervention program, it was not necessary to use multiple measures to assess this area for the purposes of reading achievement assessment.

For the current study, several measures were selected to assess reading ability in the five key areas of reading (phonological awareness, phonics, fluency, vocabulary, and comprehension). The measures for each key area are described below.

Phonological Awareness.

The Phonological Awareness Test 2 (PAT-2; Roberston & Salter, 2007). This test is a standardized assessment of a student's phonological awareness, phoneme-grapheme correspondences, and phonetic decoding skills. Test-retest coefficients were above 0.90 for all subtests and the total test. Internal consistency, inter-rater reliability, and content validity were reported by the publisher to be above desirable levels. For the purposes of this study, this test was used as an informal measure, as many of the students were above the age level for norming. To avoid an overlap of phonics assessments, only the *Rhyming, Segmentation, Isolation, Deletion, Substitution, and Blending* subtests were used to yield the *Phonological Awareness Total* for the current study.

Word Reading and Decoding.

Woodcock-Johnson III (*WJ-III*; McGrew & Woodcock, 2001). This test uses a series of subtests to provide a comprehensive measure of general academic achievement. The *WJ-III* is frequently used by school districts in Southern California to assess students in special education,

annually, to determine general academic functioning. The *Letter-Word Identification* (*LWI*) subtest was used to provide a general level of word recognition, as the words on this subtest are primarily sight words. Test-retest correlations for the *LWI* subtest range from 0.79 to 0.96, with the majority above 0.87. Broad reading correlations with other academic measures (e.g., *KTEA* or *WIAT*) range from 0.67 to 0.76.

Quick Phonics Screener: A Diagnostic Phonics Assessment, Second Edition (*QPS*; Hasbrouck, 2011). This test is designed to determine student strengths and needs in phonics and decoding through assessment of skill sets organized along a "continuum of phonics skill development" (Hasbrouck, 2011), thereby providing teachers with individualized student information regarding areas in need of supplemental instruction or intensive intervention. Skills sets progress in difficulty from letter/ sound identification to early decoding skills (e.g., knowledge of consonant-vowel-consonant words) to more advanced decoding skills (e.g., vowel digraphs/ diphthongs and multisyllabic decoding). Students receive a point for each correctly produced skill, such as providing the sound for the letter *g* or correctly reading the short vowel sound in words like *sib* or *run*. For each skill set, first nonsense words and then real words are used. For the current study, only subtests one through nine were used.

Reading Excellence: Word Attack and Rate Development Strategies (REWARDS) Pre/Posttest (Archer, Gleason, & Vachon, 2000). *REWARDS* is an intervention program used by teachers to teach advanced decoding skills and to develop fluency with advanced decoding skills in intermediate and secondary readers. The *Pretest* is intended to determine student skill in reading multisyllabic words. For this test, the student reads a list of 20 words that target multiple skills (e.g., prefixes, suffixes, root word knowledge). Students receive credit both for the correct

number of words read and the correct number of skill points achieved (e.g., correctly reading the prefix *con-*).

Johnston Primary and Intermediate/ Secondary Spelling Inventories (Tests obtained by the project district from the 2001-2002 California Professional Development Institute). These spelling inventories are based on *Words Their Way* feature analysis (e.g., Johnston, Bear, Invernizzi, & Templeton, 2009) and provide teachers with a developmental look at student strengths and needs in decoding skills as they are applied in spelling. Skills progress in difficulty from early decoding skills (e.g., knowledge of consonant-vowel-consonant words) to more advanced decoding skills (e.g., vowel digraphs/ diphthongs and multisyllabic decoding). Students receive credit both for the correct number of words spelled and the correct number of skill points achieved (e.g., correctly spelling a word with the diphthong *oi* or correctly spelling the prefix *re-*).

Fluency.

Gray Oral Reading Tests 4 (GORT-4; Wiederholt & Bryant, 2001). The *GORT-4* provides standardized scores for reading rate, accuracy, and comprehension. It is generally used to identify students below peers in terms of oral reading proficiency, to determine student strengths and weaknesses in oral reading, to document progress regarding participation in intervention programs, and as a device for measurement of reading abilities for research purposes (Wiederholt & Bryant, 2001). For the purposes of the current study, fluency scores (rate and accuracy) were used to determine reading fluency. Internal consistency reliability coefficients for fluency ranged from 0.91 to 0.95 (for Form B used in the current study). For the Oral Reading Quotient (which combines fluency and comprehension performance), coefficients ranged from 0.96 to 0.98.

Vocabulary. The current study examined vocabulary in multiple, contrasting ways using three different subtests to provide an overall picture of vocabulary skill.

Test of Reading Comprehension, Fourth Edition (TORC-4; Brown, Wiederholt, & Hammill, 2009). The *TORC-4* is a standardized measure designed to provide an indication of reading comprehension skill in individuals. While the *TORC-4* uses five subtests to measure aspects of comprehension, only the *Relational Vocabulary* and *Text Comprehension* subtests were used for the purposes of the current study (as a result of pilot-based teacher input). For the *Relational Vocabulary* subtest, students are given three words, such as *red, green, blue* and are asked to circle two words (out of four choices) that are "the most like the words in the box," such as *yellow, circle, orange, or light*. For this study, all words were read aloud to students to create a supported condition, whereby limitations in decoding skills were eliminated. Cronbach coefficient alphas for the *Relational Vocabulary* subtest were above 0.89. Test-retest reliability correlations were above 0.82. Correlations between the *Relational Vocabulary* subtest and other measures of literacy ranged from 0.55 to 0.70, with an overall average correlation of 0.63.

Woodcock-Johnson III (*WJ-III*; McGrew & Woodcock, 2001). For the current study, the *Reading Vocabulary* (*RV*) subtest was used to provide a general level of vocabulary in terms of synonyms, antonyms, and analogies. On this subtest, students complete tasks in the areas of synonyms, antonyms, and analogies. Students are shown a list of words (e.g., yes, big, black) and must provide one word for each item. For example, for the antonyms subtest students are asked, "*A word that is the opposite of big is ____.*" Test-retest correlations for the *RV* subtest were above 0.82. Broad reading correlations with other academic measures (e.g., *KTEA* or *WIAT*) range from 0.67 to 0.76.

Comprehension. The comprehension measures used in this study were selected to provide contrasting means of input as they relate to comprehension output. Specifically, these three measures allowed for a comparison between listening comprehension (story read aloud only, with no visual text), supported comprehension (story read aloud, with visual text for the student to follow along), and passage comprehension (visual text only, read by student with an emphasis on fluency).

Kaufman Test of Educational Achievement, Second Edition (KTEA-2; Kaufman & Kaufman, 2004). The *KTEA-2* is designed to individually measure academic achievement. For the current study, only the *Listening Comprehension* subtest was used. For this subtest, a passage is read aloud to a student via CD. Students must rely solely on their ability to listen, as they are not permitted to follow along with the text. *KTEA-2* reliability coefficients range from 0.87 to 0.95. Internal reliability coefficients range from 0.77 to 0.85. Test-retest coefficients are above 0.90. The *KTEA-2* is well correlated with additional ability and achievement measures (e.g., *KABC-II*). Moderate to strong correlations were reported between the *Listening Comprehension* subtest and the *KABC-II*.

Test of Reading Comprehension, Fourth Edition (TORC-4; Brown, Wiederholt, & Hammill, 2009). The *TORC-4* is a standardized measure designed to provide an indicator of reading comprehension skill in individuals. While the *TORC-4* uses five subtests to measures aspects of comprehension, only the *Relational Vocabulary* and *Text Comprehension* subtests were used for the purposes of the current study (as a result of pilot-based teacher input). To create a supported comprehension modality, all passages from the *TORC-4* were read aloud to the student by the examiner. In this modality, students were thereby able to both hear the passage read aloud and follow along with the passage. Students were then required to answer

comprehension questions based on passages. Cronbach coefficient alphas for the *Text Comprehension* subtest were above 0.90. Test-retest reliability correlations were above 0.81. Correlations between the *Text Comprehension* subtest and other measures of literacy ranged from 0.33 to 0.55, with an overall average correlation of 0.42.

Gray Oral Reading Tests 4 (GORT-4; Wiederholt & Bryant, 2001). The *GORT-4* provides standardized scores for reading rate, accuracy, and comprehension. It is generally used to identify students below peers in terms of oral reading proficiency, to determine student strengths and weaknesses in oral reading, to document progress regarding participation in intervention programs, and as a device for measurement of reading abilities for research purposes (Wiederholt & Bryant, 2001). On this passage comprehension measure, students are required to read a passage for themselves with an emphasis on fluency. Internal consistency reliability coefficients for comprehension ranged from 0.95 to 0.98 (for Form B used in the current study). As described above, for the *Oral Reading Quotient* (which combines fluency and comprehension performance), coefficients ranged from 0.96 to 0.98.

Parent Measures. A modified version of the demographic form used in previously published intervention studies of children with autism (Kasari et al., 2006) was used for the current study. It includes child, parent, and family information including parent's level of education, ethnicity, and interventions that the child has received previously. Additionally, three questions were added to reflect the student's special interests, possible special interests in reading or books, and parental concerns about their child in school.

Procedure

The study procedures were approved by the UCLA Institutional Review Board. Participants were initially referred by either staff at the CDE-DCSC or by district staff

participating in a collaborative CDE-DCSC reading project. As the study progressed, word-of-mouth referrals were made by parents, teachers, professors at a local university, and community tutors who were familiar with participant requirements. Once referred, initial eligibility was confirmed via brief conversations, emails, and/ or document review with teachers or parents. Students qualified for the study if they had an ASD or SLD, participated in a classroom with academic curriculum in the 2nd to 6th grade, and did not have a comorbid physical or seizure disorder. All students who were referred ultimately qualified for participation in the study. Most students were assessed at their school, however, several students were assessed at the CDE-DCSC, a local university, or at their tutoring location.

The majority of reading achievement assessments were conducted by the primary investigator or by educators directly supervised by the primary investigator. Individuals who conducted assessments under supervision had a minimum of 15 years of experience in the field of special education and were highly skilled in assessment administration and behavioral strategies to obtain optimal performance. Cognitive assessments were administered primarily by school psychologists at the district or the CDE-DCSC and secondarily by the primary investigator (when recent assessments were not available).

The total amount of time needed to complete a student's assessment battery ranged from four to seven hours. For this reason, assessments were broken up into hour-long sessions and spread over the course of several days (when feasible) to prevent fatigue and optimize performance. The majority of students ($n = 47$) were assessed over the course of three or more days (not usually consecutive). Nine students were assessed across two days, and two students were assessed in one day.

Within sessions, success-level, preferred tasks were interspersed with more challenging, lengthy, or less preferred tasks to maintain behavioral momentum and to alleviate fatigue effects. For example, challenging comprehension passages (e.g., passages from the *TORC-4*) were alternated with sections of the *PPVT-4* or a few words from the *Johnston Spelling Inventories*. As such, student behavior and length of an assessment largely determined the order (rather than counterbalancing), as well as the frequency and number of breaks. When students demonstrated signs of fatigue, boredom, or waning attention (e.g., increased fidgeting in seats, looking around, expressing a need for a break, etc.), assessors returned to success-level or preferred tasks and then offered students a break.

Students were given roughly five minutes between tests and between 5-10 minutes between hour sessions (when multiple-day assessment was not available) to play a game, draw, or relax; when warranted by student behavior (as described above), breaks occurred more frequently. Students received small incentives, such as pencils, erasers, or small toys (e.g., rubber dinosaurs or *Hot Wheels* cars) as a thank you for participation. Students reported enjoying the assessment process thoroughly, despite some very lengthy and challenging assessments. Packets were sent home to parents and were given to teachers the week of assessments. Parent and teacher decisions to complete packets were independent of student participation; as a result, several did not to complete packets.

At the end of the assessment period, tests were scored and both teachers and parents received an individualized, comprehensive report of student test scores, highlighted areas of strength and challenge, and recommendations for instruction. Many of the instructional recommendations were reviewed in person with teachers and instructional assistants who

expressed interest. Feedback regarding the assessment process and reports was positive from both parents and instructional staff.

<div align="center">

Results

</div>

Preliminary Analyses

  Student Characteristics. There were no significant differences between the two groups (ASD or SLD) in terms of age or grade ($p > .05$). The mean age for both groups of students was 10 years old, and ages for both groups ranged from seven to twelve years old. Students were racially and ethnically diverse. The majority of students in both groups were designated as English speakers. While there were an even number of males and females in the SLD sample, 93% of the students with ASD were males. See Table 1.

  Exploratory Analyses: EO versus ELL Performance on Reading Measures. To examine whether EO versus ELL designation plays a role in ASD and SLD group differences on reading measures, descriptive statistics (*M, SD*) are provided in Table 2. Only a small number of students were in some groups (e.g., only 5 students with ASD were designated as ELLs). While EO means were generally higher than ELL means for both ASD and SLD groups, preliminary, exploratory analyses (e.g., 2x2 ANOVA) showed virtually no significant differences ($p < .05$) between EO and ELL performance on reading measures. Therefore, for the purposes of the current study, EO and ELL performance was collapsed across ASD and SLD groups.

  Reading Measures: Correlations. Correlations were run across all measures to determine overlap among measures and to determine variables for the multivariate analyses used to evaluate Hypotheses 2 and 3. Based on correlations, measures were grouped into code-focused (*WJIII LWI, QPS, REWARDS-W, REWARDS-FP, Johnston-W*, *Johnston-FP, GORT-4 FS*) and meaning-focused (*TORC-4 RV*, *WJIII RV, KTEA-2 LC*, *TORC-4 TC*, *GORT-4 CS)* variables. As

<div align="center">

23

</div>

the *PAT-2* (measure of phonological awareness) was similarly correlated with measures that examined both code- and meaning-focused skills, it was not included in either group. See Table 3 for correlations.

Potential Covariates: Age and *PPVT-4*. Based on findings from previous literature (e.g., Huemer & Mann, 2010), age and the *PPVT-4* were considered as potential covariates in the current study. Age was not significantly associated with either code- or meaning-focused measures (all correlations were below .30). The *PPVT-4* was not associated with code-focused measures, but was significantly associated with meaning-focused measures.

There was no significant difference in *PPVT-4* scores between ASD and SLD groups, $t(52) = -.83.$, $p=.41$. Shapiro-Wilk analysis showed normal distribution for dependent variables and covariate (*PPVT-4*) across ASD and SLD groups (significance was greater than .05). There was no significant interaction between the *PPVT-4* and student group (ASD or SLD) on the *TORC-4 RV*, $F(1, 50) = 1.60$, $p = .21$, *WJIII RV*, $F(1, 50) = 2.16$, $p = .15$, *KTEA-2 LC*, $F(1,50) = .74$, $p = .40$, *TORC-4 TC*, $F(1, 50) = .10$, $p = .76$, or *GORT-4 CS*, $F(1, 50) = 3.53$, $p = .63$; therefore, the requirement for homogeneity of regression slopes was satisfied.

Missing Data. There was no missing data for any of the reading measures. *PPVT-4* scores were not available for four African American students (1 with ASD; 3 with SLD). Analyses that involve the *PPVT-4* should therefore be interpreted with caution.

Hypothesis 1

To evaluate whether students with ASD and SLD are performing at lower levels compared to population norms in the five key areas of reading (phonological awareness, word reading/ decoding, fluency, vocabulary, and comprehension), each group was compared on mean

scores with population norms. For tests which yielded only raw scores, student performance was compared against skill-level benchmarks. See Tables 4 and 5 for mean scores.

Phonological Awareness. Phonological awareness was assessed using the *PAT-2*. Only skill-level benchmarks were available for this test, as most students were past the age appropriate for norming. On this test, students are expected to score near 130 by the end of first grade (Torgesen & Mathes, 1998). On the *PAT-2*, students with ASD had a mean score of 98.71 (*SD* = 17.01; *Range* = 51 to 115). Students with SLD had a mean score of 105.50 (*SD* = 10.00; *Range* = 84 to 120). Both groups performed below expected norms in the area of phonological awareness.

Word Reading and Decoding. Word reading and decoding were assessed using the *WJIII LWI, QPS, REWARDS-W, REWARDS-FP, Johnston-W*, and *Johnston-FP*. Population norms were available for the *WJIII LWI* and skill-level benchmarks were available for the *QPS* and *Johnston-W*. Performance on these tests will be discussed below.

WJIII LWI. Students with ASD showed strengths in word reading with the majority of students (61%) falling within one *SD* of population norms on the *WJ III LWI*; only one student performed above one *SD*. Six students (21%) had standard scores below one *SD* of population norms, three students (11%) fell below two *SDs*, and one student fell below three *SDs*. In contrast, students with SLD showed significant deficits in word reading, with few students falling within one standard deviation of population norms (33%). No students performed above one standard deviation. The majority of students (60%) in the SLD sample had standard scores below one *SD* of population norms and two students (7%) fell below two *SDs*.

QPS. Based on the California Common Core State Standards for English Language Arts in place at the time of the current study, students would be expected to have a total score of 212 by the end of second grade, as they should be able to decode two-syllable words with long vowel

patterns (California Department of Education, 2013). For the total *QPS* score, students with ASD

had a mean total score of 171.82 (*SD* = 42.15, *Range* = 46 to 211). Many students are not

meeting expected benchmarks in this area, as only 35% had scores above 200. Students with

SLD had a total *QPS* mean total score of 165.60 (*SD* = 32.35, *Range* = 66 to 208). Like students

with ASD, the majority of students are not meeting expected benchmarks, as only 7% of students

had scores above 200. Although there were three students who were in the second grade in each

group (and therefore might not be expected to have met the benchmark), one second grader had

the highest score (211) of the entire ASD group. Only one student in second grade was the lowest

scorer of the group (SLD); most second-grade students did not have the lowest scores for their

group. Further, as most students were in grades 3-6, they should have far surpassed this

benchmark.

To examine differences in word reading versus applied decoding skills, the *QPS* real- and

nonsense-word subtests were compared. Students with ASD had a mean score of 57.68 (*SD* =

16.92) for reading real words and a mean score of 49.07 (*SD* = 20.58) for reading nonsense

words. A paired-samples t-test was conducted to compare the number of correct words read in

real word and nonsense word conditions; there was a significant difference, $t(27)=-5.15$, $p =$

0.00. Considering that these subtests examine the same discreet decoding skills (e.g., reading

words with diphthongs), but in different ways (real words vs. nonsense words), students with

ASD demonstrate relative deficits in decoding skills compared to word reading. Similar to

students with ASD, students with SLD read real words (*M* = 54.57, *SD* = 13.29) significantly

more accurately than nonsense words (*M* = 46.86, *SD* = 14.89); $t(28)=-4.90$, $p = 0.00$. Again, as

nonsense words require students to apply decoding skills, whereas the real words could arguably

be read from memory, students with SLD demonstrate relative deficits in decoding skills

compared to word reading.

     Johnston Spelling Inventories. Based on the California Common Core State Standards for English Language Arts in place at the time of the current study, students would be expected to have a total word score (*Johnston-W*) of roughly 46 words by the end of second grade, as they should be able to decode and spell two-syllable words with long vowel patterns (California Department of Education, 2013). In terms of the total word score on the *Johnston-W*, students with ASD had a mean score of 25.39 (*SD* = 18.78, *Range* = 0 to 53). Many students are not meeting the expected benchmark in this area, as only 21% had word scores above 46. Students with SLD showed significant deficits, with a mean score of 14.80 (*SD* = 10.58, *Range* = 2 to 39). None of the students with SLD met the expected benchmark. It is also important to note that students are being compared against an ending second-grade benchmark, yet all but six students were in grades 3-6.

     Fluency. Fluency was assessed using the *GORT-4 FS*, for which population norms were available. On this test, 50% of students with ASD performed within one *SD* of population norms, 25% performed below one *SD*, and 21% performed below *SDs*. Only one student performed above one *SD*. Additionally, 57% of the ASD sample scored at or below the 25th percentile on this measure. Fluency was thus a relative strength for roughly half of the sample and an area of deficit for the remaining portion of the sample.

     In contrast, only 20% of students with SLD performed within one *SD* of population norms, 37% performed below one *SD*, and 43% performed below two *SDs*. No students performed above one *SD*. Further, on the *GORT-4 FS*, 50% of students scored between the 2nd and 25th percentile, and another 43% scored at or below the 1st percentile. See Table 6. These findings highlight fluency as being a significant area of deficit for students with SLD.

Vocabulary. Vocabulary was assessed using the *TORC-4 RV* and the *WJIII RV*, for which population norms were available.

TORC-4 RV. On the *TORC-4 RV*, 64% of students with ASD performed within one *SD* of population norms and 25% fell below one *SD*. One student performed below two *SDs*, and two students were above one *SD*. Students with SLD performed somewhat better, as 77% of students with SLD performed within one *SD* of population norms and 23% fell below one *SD*.

WJIII RV. On the *WJIII RV*, 54% of students with ASD fell within one *SD* of population norms, 32% fell below one *SD*, and 14% fell below two *SDs*. Again, students with SLD performed comparatively better, as 70% fell within one *SD* of population norms, 23% fell below one *SD*, and 7% fell below two *SDs*.

Comprehension. Comprehension was measured through three different modalities using the *KTEA-2 LC* (listening comprehension), *TORC-4 TC* (supported comprehension), and *GORT-4 CS* (passage comprehension). Population norms were available for all three tests.

KTEA-2 LC. On the listening comprehension measure (*KTEA-2 LC*), the majority of students with ASD (53%) were within one *SD* of population norms ($M = 83.29$, $SD = 15.31$), with 18% performing below one *SD* and 25% below two *SDs*. Only one student performed above one *SD*. In contrast, the majority of students with SLD (74%) were within one *SD* of population norms, with 13% performing below one *SD*. No students fell below two *SDs*; four students (13%) performed above one *SD*.

TORC-4 TC. The majority of students with ASD (78%) performed within the average range (within 1 *SD* of population norms; an additional student performed above 1 *SD*) on the supported comprehension (*TORC-4 TC*) measure. Only 14% performed below one *SD* and only one student performed below two *SDs*. Similarly, a great majority of students with SLD (93%)

performed within the average range (within 1 *SD* of population norms) on the *TORC-4 TC*. Only two students (7%) performed below one *SD*.

GORT-4 CS. The majority of students with ASD (53%) performed within one *SD* of population norms (*M* = 6.54, *SD* = 2.47) on the passage comprehension measure, with 36% of students performing below one *SD* of the mean and 11% below two *SDs*. Similarly, the majority of students with SLD (67%) performed within one *SD* of population norms, with 30% of students performing below one *SD* of the mean and 3% (1 student) below two *SDs*. It is interesting to note how many students demonstrated average comprehension on this measure, despite very limited reading skills on the same measure (as illustrated by poor performance on the *GORT-4* fluency measure; only 20% of students read with average fluency).

On the *GORT-4* comprehension measure, 75% of students with ASD fell at or below the 25th percentile, including 7% at or below the 1st percentile. Similarly, 70% of students with SLD fell at or below the 25th percentile, with 3% of those students falling at or below the 1st percentile. See Table 6.

Hypothesis 2

To evaluate whether students with ASD are performing at higher levels than students with SLD on phonological awareness, word reading, decoding, and fluency tasks, two analyses were conducted. Variables for the two analyses were determined by correlations conducted during preliminary analyses. First, to evaluate whether students with ASD are performing at higher levels than students with SLD on a phonological awareness task (*PAT-2*), one-way analysis of variance (ANOVA) was conducted to look at differences between groups. Next, to evaluate whether students with ASD are performing at higher levels than peers with SLD on word reading, decoding, and fluency tasks, multivariate analysis of variance (MANOVA) was

used to examine differences between groups on code-focused measures, which included: *WJIII LWI, QPS, REWARDS-W, REWARDS-FP, Johnston-W, Johnston-FP,* and *GORT-4 FS*.

Phonological Awareness. A one-way ANOVA was used to evaluate differences between ASD and SLD groups on a measure of phonological awareness, the *PAT-2*. There was no significant difference between groups on this measure $F(1,56) = 3.46$, $p = .07$.

Word Reading, Decoding, and Fluency. A MANOVA was used to examine differences between ASD and SLD groups on code-focused measures. These code-focused measures included word reading and decoding measures (*WJIII LWI, QPS, REWARDS-W, REWARDS-FP, Johnston-W, Johnston-FP*), as well as a measure of fluency (*GORT-4 FS*). Data were first examined for normality; no extreme outliers were identified. The plots obtained from SPSS appeared reasonably normal for all variables. Dependent variables were reasonably correlated. A non-significant Box's *M* test ($p = .06$) indicated homogeneity of covariance matrices of the dependent variables across groups. Levene's test indicated homogeneity of between-group variance for the *QPS* ($p > .05$), but not for the other measures ($p < .05$). Independent one-way analysis of variance (ANOVA) analyses were therefore used to further explore univariate outcomes.

The multivariate effect was significant for code-focused measures in respect to ASD or SLD group, $F(7,50) = 2.83$, $p < .05$, Pillai's Trace $= 0.28$, partial $\eta^2 = .28$. Univariate tests showed that there were significant differences between groups (ASD and SLD) on code-focused measures including, *WJIII LWI* $F(1,56) = 5.26$, $p < .05$, partial $\eta^2 = .09$, *REWARDS-W* $F(1,56) = 9.91$, $p < .01$, partial $\eta^2 = .15$, J*ohnston-W* $F(1,56) = 7.13$, $p < .05$, partial $\eta^2 = .11$, and *GORT-4 FS* $F(1,56) = 11.56$, $p < .01$, partial $\eta^2 = .17$, with students with ASD performing at higher levels than students with SLD on word reading and fluency measures. Significant differences

were not found on additional code-focused measures (*QPS*, *REWARDS-FP, Johnston-FP*; *p* > .05).

Given the issues with homogeneity of variance across ASD and SLD groups for measures other than the *QPS*, independent one-way ANOVAs were used with Brown-Forsythe F and Welch's F adjustments. Adjusted Forsythe F and Welch's F statistics confirmed original findings (significant differences between groups for *WJIII LWI*, *REWARDS-W*, *Johnston-W*, and *GORT-FS*, *p* < .05; nonsignificant differences between groups for *QPS, REWARDS-FP, Johnston-FP*, *p* >.05), thus the violation of homogeneity did not create a threat to the validity of the results.

Thus, with regard to Hypothesis 2, students with ASD performed at significantly higher levels than students with SLD on word reading and fluency tasks (*WJIII LWI*, *REWARDS-W*, *Johnston-W*, and *GORT-FS*). Students with ASD did not perform at significantly higher levels than peers with SLD, however, on measures that required students to apply discreet decoding skills (*QPS, REWARDS-FP, Johnston-FP*) or phonological awareness skills (*PAT-2*).

Hypothesis 3

To evaluate whether students with SLD are performing at higher levels than students with ASD on vocabulary and comprehension tasks, MANOVA and multivariate analyses of covariance (MANCOVA) analyses were used to examine differences between the two groups. For these analyses, meaning-focused measures were examined. Meaning-focused measures included vocabulary (*WJIII RV, TORC-4 RV*) and comprehension (*GORT-4 CS, KTEA-2, TORC4-TC*) measures. For the MANCOVA, the *PPVT-4* was used as a covariate.

Vocabulary and Comprehension. Data were first examined for normality; no extreme outliers were identified. The plots obtained from SPSS appeared reasonably normal for all variables. Dependent variables were reasonably correlated; therefore, a MANOVA was

31

conducted. A non-significant Box's *M* test ($p = .19$) indicated homogeneity of covariance matrices of the dependent variables across groups. Levene's test indicated homogeneity of between-group variance for meaning-focused measures ($p > .05$).

The multivariate effect was significant by group, $F(5,52) = 2.88$, $p < .05$, Pillai's Trace = .22, partial $\eta^2 = .22$. Univariate tests showed that there was only a significant difference between groups (ASD and SLD) on the *KTEA-2* (listening comprehension) measure $F(1,56) = 13.78$, $p < .001$, partial $\eta^2 = .20$, with the SLD group performing at a higher level than the ASD group (estimated marginal means and standard error provided) *SLD M* = 97.57, *SE* = 2.67 *ASD M* = 83.29, *SE* = 2.77. Significant differences were not found between groups on additional meaning-focused measures ($p > .05$).

To determine the potential impact of the *PPVT-4* as a covariate, the MANCOVA was also used. A non-significant Box's *M* test ($p = .13$) indicated homogeneity of covariance matrices of the dependent variables across groups. Levene's test indicated homogeneity of between-group variance for meaning-focused measures ($p > .05$). Additionally, there was no significant interaction between the covariate (*PPVT-4*) and the independent variable (ASD or SLD) on any of the dependent variables ($p > .05$).

With the *PPVT-4* as covariate, the multivariate effect was significant by group, $F(5,47) = 5.65$, $p < .05$, Pillai's Trace = 0.38, partial $\eta^2 = .38$. Similar to the findings of the MANOVA, univariate tests showed that there was only a significant difference between groups (ASD and SLD) on the *KTEA-2* (listening comprehension) measure when controlling for receptive vocabulary $F(1,51) = 26.54$, $p < .000$, partial $\eta^2 = .34$, with the SLD group performing at a higher level than the ASD group. Significant differences were not found between groups on additional meaning-focused measures ($p > .05$).

Thus, with regard to Hypothesis 3, students with SLD performed at a significantly higher level than students with ASD only on a measure of listening comprehension (*KTEA-2*), even when controlling for receptive language (*PPVT-4*). Students with SLD did not perform at significantly higher levels than peers with ASD, however, on measures of vocabulary (*WJIII RV, TORC-4 RV*) or across measures of comprehension (*GORT-4 CS, TORC4-TC*), despite controlling for receptive language (*PPVT-4*).

Exploratory Examination of Student Reading Behaviors and Comprehension

The final area of analysis is a mixed-methods, exploratory investigation of student reading behaviors related to comprehension for students with ASD or SLD in an attempt to unpack comprehension processes.

Method

Participants

All 58 students (28 with ASD, 30 with SLD) from the current study participated in this portion of the study. Teachers for 41 of the students (18 with ASD, 23 with SLD) also completed rating scales.

Measures

Reading Strategy Interview (Klingner, Vaughn, & Boardman, 2007). Designed to be an informal measure to elicit a student's understanding of the reading process and knowledge of various reading strategies, this measure was used to enhance quantitative findings from reading achievement measures. Interviews were conducted in an informal, one-to-one setting and were videotaped when permitted. To help elicit responses, a colorful book which focused on plants and which included all of the components necessary to illustrate prompts (e.g., headings, bold

print, pictures, etc.) was used during the interview. Prompts for this interview can be found in Appendix A.

Reading Behavior Checklist (Klingner et al., 2007). This measure uses a checklist to elicit teacher awareness of student reading behaviors that are related to comprehension. This measure was converted to a Likert-scale (Almost Always, Sometimes, Rarely) for the current study. This measure examines student behaviors related to book choice, independent reading, use of reading strategies, and participation in a community of readers.

Students' Understanding of Narrative Text Checklist (Klingner et al., 2007). This measure uses a checklist to elicit teacher awareness of student proficiency in understanding narrative text (comprehension of text). This measure was converted to a Likert-scale (Student does not engage in behavior, Student is beginning to engage in behavior, Student is developing the behavior, Student is proficient in the behavior). This measure examines student proficiency with reading behaviors, such as predicting outcomes, retelling the story, and naming characters.

Procedure

Student Interviews. Interviews were intentionally conducted at the end of the assessment period, to ensure that a rapport had been first developed with each student. This rapport was important, as several students were shy or slow to warm up at the beginning of the assessment period and would likely have been reluctant to expand on responses. All students were prompted with the open-ended topic question first. When students had responses, they were always prompted with "What else would you do?" or "Anything else?" until they no longer had new ideas or responses. When students had difficulty with responses, students were prompted with yes/ no type subquestions (see Appendix A) and were given an example using the book (e.g., if the question asked about an unknown vocabulary word, a word from the book, such as

glands, would be shown). Once they responded and the examiner was sure that they understood the question through examples, students were asked to elaborate ("Tell me about that" or "What else would you do?"). Most interviews were videotaped (with student and parent consent).

Identification of Exemplar Cases. To more fully explore reading strategy differences related to comprehension performance, exemplar interviews were selected to compare ASD and SLD groups who performed in the low and high ranges of comprehension, as well as to compare hyperlexic and dyslexic profiles. Since the sample size was not large, a case-by-case selection process was used to select students from each group who best matched each other, while also fitting the profile of interest. Gender was not a major matching factor, as there were fewer girls in the ASD sample. Additionally, as there were significant differences between the two groups in terms of listening comprehension, with the ASD group scoring much lower than the SLD group (by as much as 10 standard score points), this measure was not used to determine cases, as there were not comparable cases at the extreme ends of performance. As such, the *TORC-4 TC* (supported comprehension; students hear text read aloud and see the text) and the *GORT-4 CS* (passage comprehension; text read by the student with an emphasis on fluency), were the measures used for identifying low and high comprehenders; this was fortunate, as they relate to performance when looking at text and thus reading strategy usage (which was the focus of the interviews). For full transcripts of each interview, refer to Appendix B.

Results

Preliminary Analyses

Missing Data. The *Reading Behavior Checklist* and *Student's Understanding of Narrative Checklist* were completed for 64% of students with ASD and 77% of students with SLD. Data points were missing across disability groups (36% missing for students with ASD;

23% for SLD), grade levels (67% missing for 2nd, 25% for 3rd, 30% for 4th, 11% for 5th, and 42% for 6th), and EO/ ELL designation (28% missing for students designated as EO; 33% missing for ELL). There does not appear to be any systematic error attributed to this missing data, although the percentage of missing data for the second graders was elevated, due to the small number of participants in the second grade ($n = 6$). These measures were used for exploratory analysis only.

Teacher Ratings of Student Reading Behaviors and Skill Proficiency

The *Reading Behavior Checklist* was completed by teachers for 41 of the students (ASD = 18, SLD = 23). Significant differences were found between ASD ($M = 20.39$, $SD = 5.03$) and SLD ($M = 23.87$, $SD = 5.66$) groups ($p < .05$). Teachers perceived students with SLD as using significantly more reading behaviors which promote comprehension than students with ASD.

The *Students' Understanding of Narrative Checklist* was also completed by teachers for 41 of the students (ASD = 18, SLD = 23). Significant differences were found between ASD ($M = 22.50$, $SD = 6.56$) and SLD ($M = 27.13$, $SD = 6.75$) groups ($p < .05$). Teachers perceived students with SLD as having significantly greater proficiency in skills related to comprehension of narrative text than students with ASD.

The findings from teacher ratings are interesting in relation to the hypotheses and reading performance results. Significant differences were found on teacher ratings of reading strategy behaviors and proficiency between ASD and SLD groups. Yet, differences in comprehension between ASD and SLD groups were only found on a measure of listening comprehension. Thus, if these differences in reading strategy use and behaviors were accurate, one would expect differences between ASD and SLD groups across measures.

Student Interview Responses

36

Overall, students had the greatest number of responses to questions focused on vocabulary, as they were familiar with classroom tools, such as dictionaries, glossaries, the computer, the Internet, cell phones/ *iDevices*, asking a peer or teacher, or using picture clues. Additionally, for almost all of the students with SLD and a few of the students with ASD and limited decoding skills, the first response to the vocabulary question was "sound it out." Students had the second greatest number of responses to questions aimed at pre-reading skills, such as doing a book walk, skimming the passages, looking at the pictures, reading the titles and headings, making predictions, or thinking about what was already known about a topic. This last strategy was particularly popular for the book section regarding a Venus flytrap, as students showed great interest in this plant.

Students were rarely able to generate responses related to post-reading strategies and had to be heavily prompted to obtain any response. Students typically described 1-2 strategies in response to during reading questions ("make a movie in my mind" or "tell a peer what I just read") and questions related to confusion or struggles with comprehension ("ask a teacher" or "look at the pictures"). For these areas, it was unusual for a student to respond to the open-ended question; yes/ no questions had to be used for almost all students.

Exemplar Cases: High Range of Performance on Comprehension Measures. For this grouping, both students had deficits in code-focused skills (phonological awareness, word reading/ decoding, and fluency), but were not the poorest readers of the sample. Sam's performance on isolated code-focused skills was slightly higher than Riley's performance; however, in terms of fluency, both students performed the same. This helped to provide a better comparison on the *GORT-4 CS*, on which comprehension scores were impacted by reading ability. Both students demonstrated average (but above grade level) performance on the *KTEA-2*

and the *GORT-4* comprehension measures. In the supported comprehension modality (visual text read aloud), Sam's performance was in the "superior" range, while Riley's was in the "high average" (above grade level) range. For a performance comparison of these students on the project measures, please refer to Table 7.

   Sam. Sam is a 7-year-old, second grade student with ASD. He is biracial (White and Hispanic). Historically, Sam was diagnosed as having PDD-NOS, ASD, and some hyperactivity. He was not taking any medications at the time of the assessment. He receives special education services under the eligibility category of autistic-like. He is fully integrated in the general education environment and receives resource and speech / language services through a consultation model. Sam scored 19 on the *SCQ*. On the *ADOS*, Sam reported that he is lonely and does not have a close friend. His *ADOS* scores included the following: Communication=2; Social Interaction=5; Imagination/ Creativity=1; Stereotyped Behaviors/ Restricted Interests=1). Sam has average cognitive functioning based on the *WISC-IV* (VCI=86, PRI=96, WMI=97, PSI=97, FSIQ=90).

   Sam only speaks and hears English at home. His father obtained a GED after dropping out of high school; his mother is working on her Master's Degree in Special Education (for preschool students). Sam's family dynamics are complex. His parents have recently separated after over 10 years of a difficult marriage. While his father earns a decent living working for a large delivery service (above $60,000 annually), his mother has been a stay-at-home mom for most of his life with odd jobs here and there. His parents do not share finances, so his mother struggles financially and is often without food or gas. Sam is the middle child, with an older sister and younger brother. He currently resides with his mother and siblings; the children stay with their father every other weekend. Neither of his siblings have a disability, but his mother

has a severe learning disability and has struggles with depression and anxiety. With these personal struggles, his mother has had difficulty getting Sam to school on time and regularly, so he is now under contract with the attendance board. His mother relies on her extended family considerably, so Sam is very close with his maternal grandmother, aunt, and uncle. Sam attended a full inclusion preschool at age 3, due to language and adaptive functioning deficits.

His mother reported that it can be difficult to tell Sam apart from a typical peer on a "good day," but that he has "autism days" where he becomes incredibly hyperactive and is constantly engaging in stereotypical/ repetitive behaviors. His family describes him as very affectionate. His special interests include trains, *Minecraft* (including watching mods on *YouTube*), and playing video and *iPad* games. He also enjoys building with magnetic tiles and *Legos*.

Sam was assessed over a period of four days during his winter break. He was the only student in the room at the time of assessment. He was assessed for 1-2 hours each day. He had moments of high energy during the assessment, so behavioral supports were in place to promote optimal performance. For example, the assessor alternated the tests, so that success-level tasks were interspersed with more challenging, longer, or less-preferred tasks. For example, he would complete 1-2 passages on the *TORC-4* and then complete 5-10 spelling words on the *Johnston* spelling test before returning to the *TORC-4*. He also received more frequent breaks to maintain behavioral momentum. In between tests, he enjoyed playing games with the assessor, particularly a card game called *Whack-a-Mole*. He became upset if he didn't win, so the assessor let him win each game. Sam also enjoyed earning small prizes at the end of the day, such as colored pens, *Hot Wheels* cars, and small balls.

Sam has very blue eyes and somewhat unruly, light brown hair. He has fair skin, but has a tan. He is of average height for his age, but is very thin (his mother reported that he has very limited food preferences). When he smiles, he has a slightly mischievous look in his eyes. During the assessment, Sam was friendly, made great eye contact, smiled frequently, and made many jokes. On the day of the interview, he was dressed in an *Angry Birds* black t-shirt and long, black gym pants with a blue stripe down the side.

[Sam immediately begins flipping through the book, then smiles at the interviewer.]
I: Okay, Sam, here's what I want you to do… Pretend your teacher says that you have to read that book for science class…So show me what you would do. [Sam continues to flip through pages and look at pictures.]

I: So tell me about what you're doing? [Sam continues to look at the book, while moving around in a couple rigid postures, with a few flapping hand mannerisms. He appears nervous that the camera is on and begins to make several unintelligible vocalizations ["chicananeedo'' and laughs] while pointing at pictures in the book and then makes repeated facial expressions (such as squinting his eyes and raising his cheeks, which seem to be stereotypical/ repetitive behavior). The facial expressions (e.g., squeezing eyes and mouth together; making his mouth rigid and wide as if making a noise) continue throughout the interview. He seems very interested in looking at the pictures and continues to do so.]

I: So, you're looking at the pictures, what else are you doing? [He continues to look at the pictures.] So, you would do some reading, what else would you do?
S: [Laughs.] Yes.
I: What else would you do?
S: Uhhh… Look at the interesting pictures… [He flips pages and points to a few pictures.]

Sam appears to have a genuine interest in the book, which continues throughout the interview. At times, this interest makes it challenging for him to respond to questions. He also exhibits several physical and vocal repetitive and stereotypical behaviors during the interview. These behaviors do not appear to impact his interest in the material.

I: Okay, let me ask you some questions... Would you read the title of the book and the headings?
S: [After a moment of facial and body movements, looks at Interviewer. Appears to be thinking about the question.] Ya.
I: Would you look at the pictures?
S: [Looks at pictures, nods]. Ya.

I: We already said that… Would you make a prediction about what you think it's going to be about?
S: [Looks at Interviewer, takes a moment to think.] Ya…

[Regarding an unknown vocabulary word]
I: What could you do, could you use a dictionary or a glossary?
S: [Long pauses. Whispers.] A dictionary. I said a dictionary…
I: You would use a dictionary?...
I: Would you look for clues in story or in the pictures?
S: Ya… clues in the story…[Spinning in chair a bit.]

I: Would you get help from the pictures or the drawings?
S: Yes.

Sam responds to affirmatively to several of the prompts. He continues to look at pictures very carefully. At one point, he becomes so interested in the material that he has trouble continuing with the interview until he has discussed it fully.

S: [Looks at Interviewer with a serious expression.] Those plants… have sticky, like, mouths…[gestures to mouth]… and then the bugs go on their mouth, and then… and then they eat it.
I: Right.
S: It go down their throat…[Motions down his throat.]
I: Right.
S: And then… [Motions to his stomach. Looking intently at Interviewer while he describes it.]… they got their…[unintelligible] seed is like, in their tummy, and then their's roots…

While he has acquired many reading strategies, he is honest about the strategies that he does not use.

I: Do you imagine that the person who wrote the book is talking to you?
S: No…
I: What do you do when you come to a word that you don't understand?
S: [Flipping pages] I stare off into space!!! [Laughs.]

I: What about when you come to a part of the story that's confusing? What do you do?
S: Nothing…
I: You just do nothing…Would you skip it?
S: No, I do nothing…
I: Would you read it again?... Or do you just keep reading?
S: [Singsong.] I just keep reading.

Sam's responses indicate that he has acquired a several reading strategies to support comprehension, but does use the full range of strategies. It is possible that given his young age and newly acquired reading skills, he has not yet had ample opportunities to practice these skills. It also demonstrates how important pictures and visual supports are for him. When he has pictures and visual supports (such as the boldface word, *glands*), he is much more engaged and eager to look at the book and respond to questions. As the interview becomes more verbal, his behaviors, such as moving around in his chair, indicate that he is much less engaged. Additionally, one of Sam's repetitive behaviors is referring to "poop" and toileting topics; on the *ADOS*, he reported that this annoys others, but he cannot stop himself. This behavior increased when Sam was less engaged with the material or the questions being asked.

  Riley. Riley is a 7-year-old, second grade student with SLD. He is biracial (White and Hispanic). His mother described him as having undiagnosed ADHD. As such, behavioral supports were used throughout his assessment to promote optimal performance. Riley has average cognitive functioning based on the *Kaufman Assessment Battery for Children- Second Edition (K-ABC-II*; Fluid-Crystallized Index (FCI)=107, Sequential (GSM)=88, Simultaneous (GV)=93, Learning (GLR)=94, Planning (GF)=90).

  Riley's mother very recently remarried, so he currently resides with his mother, stepfather, brother, and stepsister. He is the youngest sibling (his brother and stepsister are both 11). He only hears and speaks English at home. His mother has had some college and has attended vocational school. She currently works part-time as a hair stylist/ manager at a salon. His biological father has some college, but no information was provided regarding his profession. The annual salary for the family is above $60,000. Riley changed schools this year, and his maternal grandparents moved back to California to provide afterschool care for him. His

mother reports that both her mother and brother have dyslexia. Riley attended preschool. He began to receive intervention services in kindergarten and was placed on a 504 plan in first grade. His mother's most troubling concerns for Riley include his inability to read and his struggles with writing.

Riley was assessed over a period of two days. The first day, he was assessed at his tutoring site at a small table. There were four tutors and four students who worked quietly near him for this part of the assessment. The second day, he was assessed after school at a local school in a large classroom. He was the only student in the classroom at the time of assessment. He was assessed for 2-2.5 hours each day. Like Sam, during the assessment, he had moments of high energy. As such, behavioral supports were used throughout his assessment to promote optimal performance. The assessor alternated the tests, so that success-level tasks were interspersed with more challenging, longer, or less-preferred tasks. This helped to maintain his focus and decrease his impulsivity. Similar to Sam, he would complete 1-2 passages on the *TORC-4* and then complete 5-10 spelling words on the *Johnston* spelling test before returning to the *TORC-4*. He also received more frequent movement breaks. In between tests, he enjoyed playing games with the assessor, particularly a card game called *Blink*. Riley also enjoyed earning small prizes at the end of the day, such as stickers, pencils, or small toys.

Riley appears to be of average height for his age and is slightly stocky. He has fair skin, blue eyes, and light brown hair. He knows he is adorable and uses this fact to his advantage with assessors, teachers, and tutors, particularly through his smile. He was friendly, smiled frequently, and made good eye contact with the assessor. For his interview, he wore a red t-shirt, jeans, and a thin, navy windbreaker.

[Riley begins flipping through the book immediately; even before the Interviewer has sat down to begin the interview.]

I: All right, my friend, show me what you would do if you had to read that book for school.
R: Throw up. [Laughs.]
I: [Chuckles.] Show me what you would do if you had to read that book for school. Show me what you'd do.
R: I would show them the picture [angles the book toward the Interviewer to show pictures]... go like this... I would go...[pretends to read] blah, blah, blah, blah... well, pretend I'm actually reading [smiles at Interviewer]. Blah, blah, blah, blah, um, blah, blah, blah. [Pauses as he looks at the pictures for real.]
I: So, let me ask you some questions. Before you start reading, do you look through it and read all the titles or headings?
R: [Thinks for a second.] Certain... sometimes. [Smiles. Looks at Interviewer.]
I: What about, do you ever look at the pictures to figure out what it's going to be about?
R: [Quietly to himself] Do I ever look at the pictures... [Louder] Yes.

[In response to an unknown vocabulary word.]
I: So what could you do if you didn't know what that word means?
R: I would ask someone...
I: You could ask someone... What else could you do?
R: I can... look in a dictionary.
I: Um... Look in a dictionary. Could you do anything else?
R: I can go online, also.
I: Oh, awesome. What about, what do you do when you come to a part of the book that you don't understand, like it's confusing, what do you do?
R: [Some movement in his chair throughout, but listening and engaged.] I literally think, and if I still don't get it, I usually go and ask for help.
I: Okay. And then, what about when you're finished reading, when you're all done reading... [Riley gives a slightly questioning glance.] So say you learned all about meat-eating plants, Venus flytraps, what would you do?
R: The teacher says I have to read it again.

Similar to Sam, Riley appears to have a genuine interest in the book, which continues throughout the interview. He appears to know how to seek out information and how to get help from various sources. He reports that he does use several strategies while reading; even more interesting, he applies the strategies as needed (e.g., "certain times").

I: Do you want me to read that title for you? It says, meat-eating plants. What do you think it's going to be about?
R: [He laughs and sits back in his seat.] Plants that eat bugs. [Smiles and fidgets in chair.]
I: I think you're probably right... What about, what do you do when you're reading? Do you ask yourself about what you've read so far?
R: [Smiles, repeats question to himself, and thinks for a second.] I have no idea.
I: Do you picture, like, what you're reading like as a movie in your head?

44

R: [Smiles, repeats question to himself, and thinks for a second.] Yes. [Nods head. Whispers.]
Certain times.

Both Sam and Riley show a genuine interest in learning and find opportunities to discuss the material. They both began looking through the book immediately and were fairly quick to respond to questions. They report the use of several strategies when reading and are honest about not using other strategies, with which they are likely less familiar or have had fewer opportunities to practice in their young reading careers. Riley even reports that he uses some strategies as needed, which shows flexibility with strategy usage. Both students demonstrate moments of hyperactivity, but this does not seem to impact their interest in the book or reporting of strategy usage.

Exemplar Cases: Low Range of Performance on Comprehension Measures. Both of these students had limited code-focused skills, but were not the poorest readers of the sample. It is also important to note that for this group only, there were not students with SLD who were well matched to ASD counterparts. The poorest performers on comprehension measures who also had ASD (three students), had much lower scores on comprehension, vocabulary, and cognitive measures than any students with SLD who performed the lowest for their group. From an observational standpoint, the lowest-performing students with ASD tended to be less verbal, less interactive, and did much less smiling during the assessment period. Additionally, students with SLD tended to perform poorly in only one area of comprehension, while performing much higher on other measures. As such, the following students, Lynn and Brandon, were selected for comparison.

Lynn had stronger code-focused skills, as she had participated for several years in a targeted intervention program; Brandon's intervention was not as targeted (per observations). Lynn also had stronger performance on vocabulary measures and listening comprehension. Both

students had poor to below average performance on the *TORC-4* and *GORT-4* comprehension measures. For a performance comparison of these students on the project measures, please refer to Table 8.

   Brandon. Brandon is a 10-year-old, fifth grade student with ASD. He is biracial (African American and Hispanic). He has been diagnosed as having ASD and receives special education services under the eligibility category of Autism. His secondary area of eligibility is Speech or Language Impairment. His is designated as an ELL student. Brandon receives SDC-level services through a Learning Center model, which means that he is pulled out from the general education classroom during language arts, math, and in the afternoon to address study skills.

   Brandon scored 17 on the *SCQ*. On the *ADOS*, Brandon reported that he has friends and named a few classmates, but was not able to specify what made them friends. His *ADOS* scores included the following: Communication=5; Social Interaction=11; Imagination/ Creativity=1; Stereotyped Behaviors/ Restricted Interests=0. Brandon has a range of cognitive skills, with several areas within the below average to average range based on the *WRAML* (Story Memory=5, Sentence Memory=5, Number/Letter=5, Verbal Scaled Score=17; Picture Memory=8, Design Memory=9, Finger Windows=7, Visual Scaled Score=24; Verbal Learning=9, Sound Symbol=7, Visual Learning=7, Learning Scaled Score=23).

   Brandon is an only child, who resides with his mother and father. His parents report that he hears and speaks primarily English at home, but is also exposed to Spanish. His mother has her Master's Degree in Education and is a teacher. His father has a Ph.D. and was formerly a chief of campus safety at a local college, but has recently been laid off. As a result, his dad has taken over the before and afterschool care for Brandon. The annual family income is above $60,000. Brandon attended preschool, but received no early intervention services. His parents are

very concerned about his lack of academic progress at school, socialization with typical peers, positive relationships and friendships, as well as his future independence, career and goals, and life skills.

Brandon was assessed over a period of two weeks during summer school. He was assessed roughly one hour per day (roughly 3 days per week) in an empty classroom, with one other student who was working quietly with an aide. The assessor alternated the tests, so that success-level tasks were interspersed with more challenging, longer, or less-preferred tasks. In between tests, he enjoyed playing with the other student, particularly with building-type materials like *Marbulous*. Brandon also enjoyed earning small prizes at the end of the day, such as small toys. Across assessments, Brandon demonstrated very flat affect, with only a few smiles directed to the assessor. Similar affect was noted during observations of his classroom and when he played on the playground. His affect changed noticeably, however, during supported break time activities and during the supported pretend play component of the *ADOS*; during these times, he was smiling, excited, and laughing.

Brandon has very curly black hair, brown eyes, and darker-toned skin. He has braces. He is of average height for his age and is fairly thin. He does not smile much, but when he does smile, his whole face lights up. He arrived for assessments wearing black shorts and cartoon t-shirts.

[Brandon sits looking at book, but does not flip through pages. Brandon has monotone speech throughout the interview and rarely changes facial expressions.]
I: I just want you to show me… if you had to read this book for school… show me what you would do.
B: [Looks at Interviewer, then back at book. Turns to first page.] I would read it all of it…[Flips to second page.]
I: You would read all of it?
B: I mean, just some…
I: What would you look at, do you think?
B: This page. [Points to page.]…

I: So when you're gonna read a book, do you through all the pictures of the whole book, or do you kinda just start reading?
B: [Still on same two pages.] Start reading.
I: Start reading? Okay. Do you ever read, like, the titles or the headings?
B: Headings.
I: Like this would be like a title. Do you read the titles?...[Long pause. No response from Brandon.] What about, um, do you ever make a prediction about, what it's going to be about?
B: It's going to be about…about plants? [Looks up.]

I: So what do you do while you're reading? What do you think about while you're reading?
B: [Long pause.] We just… read some… and figure out if we can take a break. [Stretches.]

I: Okay, read some and see if you can take a break… Do you ever stop… when you take a break, do you ask yourself what you've just read?
B: Yes. [No longer really looking at the book. Puts hand on chin.]
I: Okay. And when you… and in your brain, when you read something, do you picture it? Do you picture the people, and the places that you're reading about?
B: Yes.

Brandon does not immediately begin to look through the book; in fact, unless prompted, he does not look past the first few pages. Additionally, he uses limited words in responses to questions and does not demonstrate use of pre-reading strategies. It is difficult to get him to engage in any discussion of the material throughout the interview. His go-to strategy appears to be "just start reading" when directed. While Brandon responds affirmatively that he does use these strategies, he does not pair verbal responses with gestures or behaviors that indicate he does use these strategies. He also demonstrates some passive behaviors, as illustrated below.

I: What could you do to find out what that word means?
B: [Long pause.] You could ask them.
I: Who would you ask?
B: A teacher.
I: A teacher. What else could you do? What if your teacher's busy?
B: You… can… just…just wait.
I: You just wait?
B: Wait.

I: Okay. And then after you finished reading the whole book, what do you do?
B: You stop… and wait…
I: You stop and wait…
B: Yes.

Brandon also reports that he does not use several of the strategies:

I: Do you ever use the pictures to help you figure out what it means?
B: No.
I: Do you ever think about what you've read?
B: No.
I: No? Do you, um, do you ever tell people about what you read, like tell your mom or dad?...
B: No.
I: No? Uh, do you compare it with what you already knew?
B: No.
I: No?

While Sam and Riley reported that they did not use some strategies, they were much younger than Brandon, who has arguably had many more years for strategy instruction and practice. Yet, Brandon reports that he does not use simple strategies, like using pictures to help with confusion during reading.

Overall, Brandon demonstrates a lack of interest in the material, as he does not flip through the pages of the book or look closely at pictures. Additionally, while he endorses use of several of the strategies, this is not confirmed through his interview behaviors (e.g., he does not use the pictures to help him understand the text). Further, he has acquired several passive behaviors, such as waiting for a break, skipping confusing parts, or waiting for the teacher.

Lynn. Lynn is a 5th grade student with SLD. She is Russian, and while she hears Russian spoken at home, she is not designated as an ELL as her primary language is English. She receives resource support for reading intervention, alongside Henry (who is described in the next section). Lynn has borderline to low average cognition based on the *WISC-IV* (VCI=79, PRI=79, WMI=80, PSI=85, FSIQ=75).

Lynn lives with her mother, father, and older brother. Her mother has a Bachelor's Degree; her father completed high school. Her mother is a housewife and does not work outside the home. Her father is self-employed (job details are unspecified). The annual family income is

between $50,000 and $55,000. Lynn attended preschool, but did not have formal intervention until 3rd grade, when she was entered into a public school and placed on a 504 plan. Her parents report that concerns for Lynn include memory and focus, as well as study strategies best suited to her needs.

Lynn is a very shy student, so efforts were taken to make her as comfortable as possible during testing to obtain optimal results. Lynn was assessed over a period of one week during the spring. She was assessed 1-2 hours per day, with one other student who was working quietly with an aide. Assessment locations varied with the needs of the school and included the principal's office, the school psychologist's office, and the cafeteria. The assessor alternated the tests, so that success-level tasks were interspersed with more challenging, longer, or less-preferred tasks. In between tests, she enjoyed playing with the other student, the aide, and the assessor, particularly card games like *Blink*. Lynn also enjoyed earning small prizes at the end of the day, such as pencils, erasers, or other small school supplies.

Lynn has slightly curly, light brown hair, light brown eyes, and is tan. She is slightly taller than average height for her age and is fairly thin. She wore her medium-length hair up in a rubber band with a butterfly clip on the side for the assessments. She arrived for assessments dressed in shorts with a t-shirt or hoodie. During the assessment, Lynn was shy, but friendly, particularly as she became more comfortable with assessors. Once she warmed up, she became involved in the games and jokes with other students, like Henry.

[Lynn is presented with the book. She begins the interview by covering her face and saying "What do I do?" and "I don't know!" before any questions have been asked. She has been shy throughout the assessment process, but is especially shy with the camera on. She does not touch the book.]
I: Tell me what you would look at…
L: [Smiles. Looks up briefly, then down at the book.] Uh…Everything…
I: Everything being like what?
L: Uh… pictures, pretty much only…

I: Uh huh. Pictures, that's right. What about titles, or headings?
L: N…not really. [Laughs. Continues to look at pictures on same page.] No.

I: Do you ask yourself before you start reading what you already know about plants and insects?
L: No.
I: No?… And then, what about [Lynn looks up at Interviewer and smiles.]
L: Pretty much no…
I: Don't worry, you're doing awesome. What about when you're reading, do you think about what you're reading? [Lynn looking up now. Looks briefly confused.] Like, as you're reading it?
L: Um…no… [Smiles, but looks questioningly at the Interviewer.]

I: Okay, um…do you stop and ask yourself what you've read so far?
L: Um… Uh…[Smiles.] I don't know…
I: No? Okay… Do you picture in your mind the people, places, and events that you're reading about?
L: [Makes a face, as if she has tasted something bad.] No.
I: Not really?
L: No…I mean, I don't know… [Moves around in chair a bit.]
I: Sometimes maybe? [Lynn makes almost imperceptible shrug. Flips to next page in book.] Do you imagine that the person who wrote the book is talking to you?
L: [Looks up at Interviewer and laughs.] No. [Flips quickly to next page.]

Although she is shy at first, Lynn becomes more comfortable throughout the interview, yet she does not endorse use of reading strategies. One of the only strategies she endorsed was the use of pictures. She does not immediately take an interest in the book and flips through the book quickly, without really looking at the pictures.

I: What do you do when you come to a word you don't understand?
L: I skip it…
I: You skip it?

I: So, what could you do if you… You said you normally would skip it…[Lynn plays with her hair.] but what would you do if you absolutely had to know what it means? What would you do?
L: … Uh…I would look what it means…[unintelligible]
I: Where would you look?
L: I would read it…
I: Oh, like read the paragraph?
L: Um hmm…
I: What else could you do?
L: Um…I don't know. [Laughs and looks at Interviewer.]

I: Alright. And then… what about using like a dictionary or a glossary, do you think you might ever do that? [Lynn thinks, then shakes head, no.] Or just really skip it? [Laughs.]

L: [Laughs.] Really skip it…[Flips page.]
I: And then, when you come to a part that's confusing, what do you do? [Lynn looks at Interviewer.]…
L: [Stops flipping pages. Thinks. Shakes head.] I have no idea… [Smiles.]

Lynn reports that she is more likely to skip confusing words and text than to use other strategies. She has difficulty articulating that she might sound out an unknown word or possibly use the context of the paragraph. Eventually, Lynn takes a slight interest in the content of the book.

I: Now, have you ever seen a plant with a fork and a knife?
L: [Raises eyebrows.] That'd be funny, but no…[Both laugh.]
I: No, but look at this, it's called meat-eating plants…
L: Ew!

Lynn does not endorse the use of many post-reading strategies, as illustrated below.

I: So, say you finished that whole book, what would you do?
L: [Big smile.] I'm done… [Closes book.] Now, we'll all go to sleep. [Laughs.]
I: [Laughs.] Okay. Do you think about what you read?
L: No. [Shakes head.] No.
I: Like if you learned all about the Venus flytrap, would you think about it a little bit?
L: No.
I: Would you… tell anybody about it?
L: No.
I: Would you be like, "Oh mom. I learned all about the Venus flytraps."
L: [Shakes head. Laughs.] No… I'd be like…[Pauses.] Oh whatever, maybe…[Laughs.]

Similar to Brandon, Lynn shows a lack of interest in the material. She flips through pages, without examining content. When she does report use of a strategy, it is without confidence, and usually followed up by "I don't know" or "Maybe." Similar to Brandon, she has acquired several passive reading behaviors, such as skipping confusing material and relying on teacher direction for how and when to use the information.

Exemplar Cases: Hyperlexic versus Dyslexic Profiles. While the majority of the participants in this study struggled in both areas of decoding and comprehension, a small group

of participants had extreme differences between the two areas in terms of performance. For the purposes of this study, these students were grouped into "hyperlexic" and "dyslexic" profiles.

Hyperlexia is broadly discussed in the autism literature to describe individuals who have exceptional word recognition and reading accuracy, despite having cognitive or linguistic deficiencies and diminished comprehension skills (Frith & Snowling, 1983; Minshew, Goldstein, Taylor, & Siegal, 1994; Nation, 1999). Dyslexia shares a similarly broad usage in the literature and is typically characterized by deficits in word recognition, decoding, spelling, and fluency; which may ultimately impact reading comprehension and vocabulary development as access to text is limited (National Center for Learning Disabilities, 2013). Thus, at the most basic conceptualization, hyperlexia and dyslexia present with contrasting profiles and provide an interesting opportunity for comparison.

For the current comparison, the student with hyperlexia (Yu) had code-focused skills at least two grade levels above comprehension skills. For example, on the *WJI-III LWI* and *GORT-4 Fluency* measures, Yu scored in the 4th to 5th grade range; in contrast, on comprehension measures, such as the *GORT-4* and *KTEA-2*, he scored within the 1st grade and preschool ranges, respectively.

In contrast, the student with dyslexia (Henry) had comprehension skills at least two grade levels above code-focused skills. For example, on the *WJI-III LWI* and *GORT-4 Fluency* measures, Henry scored in the 1st to 2nd grade range; in contrast, on comprehension measures, such as the *KTEA-2* and *TORC-4*, he scored above the 15 and 17 year-old range, respectively. Despite his limited decoding skills, he also managed an average comprehension score on the *GORT-4.*

Of note, Henry scored higher on the *QPS* and the *PAT-2* than Yu, who overall, had better word reading skills (e.g., *LWI* and fluency). This is not surprising, however, as Henry has participated in years of phonological awareness and decoding intervention. Yu, on the other hand, relies on his memory of sight words for reading, and therefore does not have phonological awareness activity experience nor decoding skills; this lowers his skill-focused scores in these areas (for example, the *QPS* uses nonsense words to help analyze decoding skills without students being able to rely on memory of sight words). For a performance comparison of these students on the project measures, refer to Table 9.

Yu. Yu is a 10-year-old, fourth grade student with ASD. He is Chinese. He is designated as an ELL, as he speaks/ hears primarily English at home, but is also exposed to Mandarin. Yu is diagnosed with autism and receives special education services under the eligibility category of autism. He is in an SDC to address his individualized needs.

Yu scored 28 on the *SCQ*. On the *ADOS*, Yu reported that he does have friends at school, but is lonely when no one is at his house to play, such as his cousins. He also reported that he may want to get married one day, if he meets a "pretty girl." His *ADOS* scores included the following: Communication=2; Social Interaction=5; Imagination/ Creativity=1; Stereotyped Behaviors/ Restricted Interests=2). Yu has below average to average cognitive functioning based on the *WISC-IV* (VCI=75, PRI=106, WMI=88, PSI=106, FSIQ=90).

Yu is the middle child of two sisters, neither of whom have a disability. He resides with his mother, father, and sisters. His parents report that he hears English most at home, in addition to Mandarin. His parents both speak English well, but have relatively thick accents. Both of his parents have graduate school degrees. His mother is a home engineer and musician (who works part-time), and his father is a physician. They make over $60,000 a year. Yu attended preschool

and received early intervention (DTT) at the age of four years. One of his areas of special interest, per parent report, is *Legos*. His parents report concerns for Yu in the areas of comprehension, social/ communication, and maturity. His teacher reports that his ability to decode is a strength. She also reports that he demonstrates a lack of comprehension, due to his inability to connect with the text.

Yu was assessed over two, nonconsecutive days, the first of which happened to be his birthday. Because of this, special efforts were taken to control for fatigue effects and to make the day as fun as possible for his birthday. He had moments of high energy during the assessment, particularly for tasks above his level of understanding or for tasks that were very verbal (without hands-on or visuals supports), so behavioral supports were in place to promote optimal performance. The assessor alternated the tests, so that success-level tasks were interspersed with more challenging, longer, or less-preferred tasks. He was given longer breaks between sessions, where he enjoyed playing with *Marbulous*. He was assessed in a private testing room at the Diagnostic Center. During the assessment, Yu was friendly, made good eye contact, smiled and laughed frequently, and often tried to playfully tease the assessor. He selected a few small prizes at the end of the day, such as fun school supplies.

Yu has straight black hair, dark brown eyes, and medium-toned skin. He is of average height for his age and is fairly thin. He wore tan slacks and a red hoodie to the interview.

I: What do you do before you start reading? [Yu looks at cover of book, looks away, claps hands in repetitive manner, then looks back at book.]
I: So, if you had to read that book for science class, what would you do?
Y: [Looks away from book, while playing with pages. With odd prosody and tone, almost robotic.] Open the book… [Pauses expectantly. Throughout the majority of the interview, Yu has good eye contact and is smiling. He ends most of his statements with a high pitched and/ or questioning tone.]
I: Okay, keep going.

Y: [Begins flipping pages.] I would like to read it…And [Closes book, looks away.] … Type up, type… I would like to write it in my notebook? [Moving book around in hand, but not looking at it.]
I: Alright. What would you write in your notebook?
Y: [Still playing with book. Puts book down to look closer into the camera. Moving around a lot, no longer sitting in seat, but leaning on table.] Look in the camera, okay? I would like to…to write it in my science study guide.
I: Okay. Do you look at the title and the headings? Let me show you. [Interviewer shows example in the book.] So here's the title, Amazing Plants…
Y: Um, yeah…
I: Here's a heading…
Y: I do it.
I: Yeah? What about, do you look at the pictures?
Y: [Looking away from the book] Yes.
I: Do you make a prediction about what you think that book's going to be about?
Y: [Silly voicing.] Yeah…
I: What do you think that book's going to be about?
Y: [Opens and looks down at book. Slams book shut.] Plants!

I: Okay, ready. So, when you're reading, do you picture the people, places, and events in your mind that you're reading about?
Y: [Continuing to laugh, rubbing eyes with hands.] Yes.
I: Oh yeah? Do you imagine that the person who wrote the book is talking to you?
Y: [Still laughing. Continues to cover eyes with hands.] Yes.

Yu does report using some pre-reading and during reading strategies, yet his behavior is often in contradiction with the strategy he is describing. For example, he says that he would "read it," but then looks away from the book. Similarly, he says he would use the pictures, but then looks away from the pictures.

I: What would you do if you came to a word like glands, and you don't know what it means?
Y: I would like to… just… do it.
I: What would you do if you don't know what that word means, and you have to know what that word means? What could you do?
Y: I could… wait…
I: Wait for what?
Y: Wait…

I: What about if you come to a part of the book that is confusing? What do you do?
Y: [Sits back down on his knees. Sucking on fingers.] I… would… do it.
I: Do it? What does that mean?
Y: [Yu looks down at his fingers. Smiles. Long pause. Looks at interviewer.] …I would just… do what you asked me to.

Yu states that he would use a dictionary or a "word box" (not shown here) to help him with a word that he does not understand, yet he is not able to elaborate on this. He demonstrates the use of several passive reading strategies, such as waiting or doing what his teachers asks.

I: If you didn't understand what you just were reading, would you just skip it… would you ask for help… What would you do?
Y: [Continues sucking on fingers. Shrugs shoulders. Long pause.] I don't know.
I: You don't know? Okay. And after you finished reading, what do you do?
Y: [Rubbing fingers on table.] I answer questions…
I: You answer questions?... Only cause your teacher asks you questions?
Y: Yeah.
I: Do you ever tell your mom or anybody what you learned from a book?
Y: No[t] really.
I: No?
Y: No.

Yu did not endorse the use of post-reading strategies without the direction of a teacher (e.g., to answer questions). Further, he has become very much disengaged by the end of the interview. This may be due to his struggles to answer highly verbal, open-ended questions. While he demonstrates a degree of hyperactivity during the interview, this can't be the only reason for his limited strategies and low comprehension, as both Sam and Riley had similar energy levels during the interview, but had a great interest in the book and mentioned several strategies. It is also important to note that he only looked at the book for the first 29 seconds of a 3:26-minute interview.

Henry. Henry is an 11-year-old, fifth grade student with SLD. He was the highest performer on the *KTEA-II Listening Comprehension* measure, as he remarkably, only missed four questions on the entire measure. Currently, he receives RSP services to address his reading needs. His RSP teacher, who has worked with both him and Lynn for multiple years, reported that Henry struggles with dyslexia (including letter reversals and difficulty learning to decode). He has received a great deal of intervention to target decoding skills, however, interventions

have not been very effective with him. This has frustrated his teacher, as he works harder to learn to read than any other student she has had. She reported that this lack of progress, despite great efforts, has also frustrated Henry. Further, this struggle with reading has limited his opportunities for learning and accessing the core curriculum, as he struggles to read the grade-level materials for himself (despite having excellent comprehension and a great interest in learning new things). Henry has average cognitive functioning based on the *WISC-IV* (VCI=108, PRI=88, WMI=80, PSI=103, FSIQ=94) and only hears and speaks English at home.

Henry's parents have recently divorced, so he currently lives with his mother, brother, and sister. He is the middle child of an older sister and younger brother, neither of whom have a disability. Per his mother's report, both his father and paternal grandfather have dyslexia.

Henry's mother has completed some college and is currently a student (who does not work outside the home). His father has completed high school and is working as a general contractor. Henry is fascinated by his father's occupation. During the administration of the *PPVT-4*, Henry would state excitedly, "My dad does that!" for every picture of a carpenter, builder, or construction worker. His family income is between $40,000 and $45,000 per year. Per his mother's report, Henry attended preschool. He began receiving intervention at six years of age in the first grade. His mother's greatest concern for him is his inability to read at grade level, particularly since she feels his development and other skills are advanced compared to same-age peers.

Henry was assessed over a period of one week during the spring. He was assessed for 1-2 hours per day, with one other student who was working quietly with an aide. Assessment locations varied with the needs of the school and included the principal's office, the school psychologist's office, and the cafeteria. The assessor alternated the tests, so that success-level

tasks were interspersed with more challenging, longer, or less-preferred tasks. Henry persevered through even the most challenging tasks, however, without complaint. Each test seemed to be a challenge for him to conquer. In between tests, he enjoyed playing with the other student, the aide, and the assessor, particularly card games like *Blink*. He also enjoyed earning small prizes at the end of the day, such as pencils, erasers, or other school supplies. During assessments, he conversed easily with assessors, smiled and laughed frequently, and demonstrated a mild sense of humor through jokes and play. He exudes confidence in his interactions with others and quickly picks up on (and uses) subtle humor. At times, he seemed much more like a young adult than a fifth grader.

Henry has very blonde, straight hair, green eyes, and is very fair-skinned. He is slightly taller than average height for his age, but of average weight. On most days, he wore a baseball cap, shorts, and t-shirt. For his interview, which was on career day at his school, he wore a red *Anaheim Angels* baseball uniform from head to toe.

I: So, Henry, suppose your teacher gave you that book to read for science…That's your assignment… Show me kind of what you would do.
H: [Immediately opens book.] Open it…[Flips to first pages.] Like on this page [points], I would look at the pictures [runs hand across pictures], I would read the boxes [points to picture with captioning], after reading the actual story [runs hands across first pages; looks at Interviewer]…And then I would read the [points to picture with caption again], what about the meat-eating plant [reads heading of paragraph]… called the Venus flytrap…[flips to next page; looks at pictures] and then I would go to the next page and I would read this and this [points to boxes with text]… and then I'd read the captions [points to captions]… [flips page] and then I go to the next page, and I read the information [runs hand across text on page] and read the captions [points] and then read the caption on this page [points]… look at the pictures, make sure I get the information [looks at Interviewer and smiles; flips page]…
I: Okay…
H: Look at the picture [runs hand over picture], read…read the directions for the experiment [points with emphasis; looks at next page]… look at more pictures and read the captions [runs hand over page] and what happens in the [looks at Interviewer; taps page repeatedly] like, experiment…
I: Okay, and then kinda skip to the end.
H: [Henry turns to last pages.] Like this far?
I: Yeah.

H: And the index [points to index] if I didn't know a word, I would like look through here [runs fingers over page] or if I wanted to learn about one thing, I'd look in the book… say, Roots, I'd go from page, I think, 30 [flips to page in book]… and then you'd learn about the roots [runs hand over page about roots; looks at page with the glossary]
I: That's…
H: …Glossary… [Looks at Interviewer, then runs hand over the glossary.] This is for if you didn't know a word in the story and you look in the glossary… [flips to next page, which is index again] and then yeah, the Index is for looking at words…[Looks at Interviewer.]

It is clear why Henry was a top comprehender in this study; with little prompting, he demonstrates numerous strategies. He verbalized his use of strategies, while also using gestures and pointing to illustrate his meanings. He did have some confusion between the purposes of the glossary versus the index, but he was one of the only students to mention both sources. His responses to, "What do you do before you start reading?" follow below.

H: [Looks down at book and points.] You read the title…
I: Okay…
H: And then, [motions hand] open the book?
I: Okay… So would you like kind of thumb through it and look at the pictures first, or would you just kind of dive in to reading the book…
H: I would kind of look through the pictures [motions with hand] and then dive in to read.
I: Okay… And then, would you make a prediction about what you think the book's going to be about?
H: [Smiles.] Well, I already know it's about Venus flytraps…
I: So, you've already made a prediction then, right?
H: Yes.
I: Okay. And then, would you ask yourself what you already know about Venus flytraps?
H: Yes.
I: How much do you know about Venus flytraps?
H: Actually, a lot [smiles].

Henry's responses come quickly and naturally. He's clearly engaged in the conversation, is interested in the topic, and reports using several of the pre-reading strategies. Below are some of his during reading strategies.

I: Do you ever stop and ask yourself what you've read so far, or do you just kind of keep going?
H: I stop and think of what I've read.
I: Ah… Okay. What about, do you make kind of like a movie or pictures in your…
H: Yes.

I: ... head as you're going along? Do you, you know how the book is written by the author? Do you imagine that the author is talking to you?
H: Yes. [Begins looking at book again.]
I: Um... What do you when you come to a word that you don't understand?
H: I, go to the glossary in the back...
I: Go to the glossary... Do you do anything else?
H: Er, I, er I'll ask my t- teacher, if it's not in the glossary...
I: Okay...anything else?
H: Um, er, I'll ask like a neighbor.
I: Okay...[silly tone] anything else?
H: [Smiles.] I'll ask Mom and Dad, if I'm at home...

Henry is able to provide response after response regarding strategies, including multiple

strategies for when he doesn't understand a word. He endorses use of several during and post-

reading strategies (below), including reading a book to pass a test. This also provides some

insight into his school's push toward achievement on state testing, as many activities and

interventions are geared toward improving test scores.

I: Okay, cool. Um, what do you do when you come to a part of the book or the text that is confusing?
H: You... re- reread it and if you still don't get it, you ask the teacher, like what does that mean [motions with hand].

I: Wow... That's awesome. What about, could you use the pictures or the drawings...
H: Yes.
I: ...do you think? Yeah. Um, and then after you finished reading the whole book, what would you do?
H: I'd go take an AR [accelerated reader] test on it...
I: [Laughs.] You'd take an AR test on it?... Um, if you didn't have to take an AR test on it, it was just kind of reading for learning...
H: fun...
I:... or for fun. What would you do?
H: Um... take a test on it, if it was for a test, or put it away.
I: Okay. I like how you're very test-oriented. Let's see, um...Do you ever think about what it is that you learned?
H: Yeah. Yes.
I: Do you compare the information with what you kinda already knew?
H: Yes.

Henry articulates numerous strategies throughout the interview and pairs his verbal

description with gestures and pointing at pictures. He is natural and quick to respond to

questions. He demonstrates use of several strategies before ever being prompted. He clearly

takes an active role in his own reading for comprehension and has many sources of support to

which to turn when he becomes confused or does not know a particular vocabulary word. This

provides a clear contrast to Yu's strategy usage, which illustrates limited, passive use of

strategies and need for teacher direction to apply strategies.

Summary of Interviews. The interviews demonstrate clear differences between the

strategy usage of high comprehenders (Sam, Riley, and Henry) compared to low comprehenders

(Brandon, Lynn, and Yu). Although one might expect striking differences in strategy use based

on diagnostic category, the differences between comprehension groups was much more salient

than the differences between similarly-performing ASD and SLD groups. While repetitive and

stereotypical behaviors emerged during both Sam's interview and Yu's interview, this did not

seem to hinder Sam's ability to comprehend and engage with material. Additionally, even though

Sam, Riley, and Yu demonstrated similar levels of hyperactivity or energy, this movement did

not impede comprehension nor engagement for Sam and Riley. Further, Sam and Riley were

some of the youngest students in the study, yet used more strategies than older students with low

comprehension levels. While it is important for positive behavioral supports to be in place to

promote optimal availability for learning, neither repetitive/ stereotypical nor hyperactive

behaviors can explain the differences between groups based on this strategy interview. In

contrast, the most distinct differences emerged between the high comprehenders, who

demonstrated a great deal of engagement with the material and actively used the reading

strategies which were familiar to them, and the low comprehenders, who relied on passive

strategies (such as waiting for teacher assistance or direction) and were much less engaged with

the material.

Discussion

      This study examined reading performance for students with an ASD or SLD in grades two through six in the five key areas of reading (phonological awareness, word reading/ decoding, fluency, vocabulary, and comprehension) and compared their scores to population norms and skill-level benchmarks. Next, the current study compared the reading performance of students with ASD in the five key areas of reading against a comparison group of students with SLD who would be expected to show the reverse pattern of performance on reading measures (e.g., deficits in decoding and strengths in comprehension). Finally, this study used a mixed-methods approach in the exploratory examination of student reading behaviors related to comprehension, allowing for enrichment of qualitative findings through interviews and observations. The findings have implications for assessment and intervention for students with ASD and SLD.

      The study yielded three main findings. First, students in both groups demonstrated patterns of strengths and weaknesses, but overall demonstrated performance at lower levels than population norms and skill-level benchmarks, particularly in the areas of phonological awareness, decoding, fluency, and passage comprehension. Students with ASD and SLD performed below expected skill-level benchmarks on measures of phonological awareness and decoding. On measures of phonological awareness, students in both groups failed to meet expected skill-level benchmarks for ending first grade. Similarly, in the area of decoding (for both reading and spelling), students failed to achieve skill-level benchmarks for the second grade despite the fact that roughly 90% of the students were in grades 3-6. Word reading was a relative strength for both ASD and SLD groups compared to applied decoding skills, as significant differences emerged between real word reading and nonsense word reading. On measures of

63

sight word reading and fluency, the vast majority of students with SLD performed far below population norms, with almost half (43%) performing below the first percentile in fluency. On these same measures, while half of the students with ASD had scores within the average range of performance compared to population norms, the other half scored well below norms.

This same pattern emerged for students with ASD on a measure of listening comprehension and for both groups on a measure of passage comprehension. While roughly half of the sample from both ASD and SLD groups had mean scores within the average range of population norms, the remaining half scored well below norms. These findings are consistent with Hypothesis 1 in which both students with ASD and SLD were expected to score well below population norms on phonological awareness, word reading/ decoding, fluency, and passage comprehension measures. In contrast, the majority of students with ASD and SLD performed near population norms in terms of vocabulary and on a measure of supported comprehension, although there were a small number of students with poor scores in both groups.

This comprehensive reading profile for students with ASD and SLD and performance comparison with population norms provides evidence that students are in need of comprehensive assessments and related interventions to address deficits across various domains of reading. Additionally, from an instructional standpoint, it may be of benefit to provide students with opportunities for supported input as students from both groups demonstrated comparatively superior performance on a measure of supported comprehension.

Second, in comparing the performance of students with ASD and SLD, students with ASD performed at significantly higher levels compared to peers with SLD on measures of word reading (both sight words and decodeable real words) and fluency. Also as expected, students

with SLD performed at a significantly higher level on a measure of listening comprehension. These findings were in line with Hypotheses 2 and 3.

Contrary to predictions, students with ASD did not perform at higher levels on measures of phonological awareness or decoding at the skill level, nor did students with SLD perform at significantly higher levels on measures of vocabulary, supported comprehension, or passage comprehension. The findings related to phonological awareness and skill-level decoding are not surprising, however, given that both groups were well below skill-level benchmarks in these areas. It highlights the fact that many students with ASD rely on sight word memory for reading, but may lack core skills. Students with SLD also performed better when asked to read real words compared to nonsense words, which indicates that students with ASD and SLD would benefit from both sight word and decoding intervention components.

The finding that there were not significant differences between ASD and SLD groups in terms of vocabulary is somewhat surprising, as communication is one of the core deficits of ASD, so one might expect deficits in vocabulary due to language delays. This finding provides evidence, however, that these students were well matched for comparison on comprehension measures, as vocabulary is a link to comprehension. Perhaps one reason that significant differences emerged only on a measure of listening comprehension is that visual supports are an important support for students with ASD (NPDC, 2010), yet students with SLD have learned to compensate for poor decoding skills by sharpening listening skills. Further, perhaps no significant differences emerged on the measure of passage comprehension, because a large percentage of students with ASD (similar to students with SLD) struggled to read passages with fluency which impacted comprehension. Finally, when visual supports were in place for students

with ASD and reading supports were in place for students with SLD on a measure of supported

comprehension, the playing field was leveled and both groups of students excelled.

Lastly, this study provided an exploratory analysis of reading behaviors based on teacher

ratings and student self-reports. Teachers perceived that students with SLD use reading

behaviors to promote comprehension (e.g., make predictions, use pictures, generate questions) at

a higher rate and as having a higher level of proficiency in the use of these skills compared to

peers with ASD. However, on comprehension measures, significant differences were only found

between ASD and SLD groups on a measure of listening comprehension (which does not allow

for many of the teacher-rated strategies to be used, as students cannot see the text), and not on

measures where some of these skills could be used (such as the *TORC-4 TC*); thus, teachers'

perceptions may be inaccurate. Additionally, student self-reports (via strategy interviews)

showed that students who were low comprehenders used fewer and more passive strategies than

students who were high comprehenders, regardless of ASD or SLD group membership. If

inaccurate teacher perceptions and limited assessments alter intervention provision and practices,

this could be detrimental for students in need of intervention (e.g., low comprehenders with ASD

or SLD).

Implications for Practice

Reading follows a developmental path, which is greatly impacted by early deficiencies in

foundational reading skills, such as phonological awareness (Boscardin, Muthén, Francis, &

Baker, 2008). Evidence shows that students who are poor readers in the first grade continue to be

poor readers in the fourth grade, due to these early reading skill deficits (Juel, 1988). Assessment

is an integral part of the reading instructional process, as it assists with identification of

struggling students and guides instruction, so that intervention might target foundational reading

skills (Haager & Klingner, 2005). It is therefore essential that deficits in the five key areas of reading be identified early for both students with ASD and with SLD, so that teachers can help to ensure a pathway for reading success.

Current findings demonstrate how important it is for teachers to measure skills in different ways, particularly for students with ASD who tend to be strong word readers, yet have deficits in phonological awareness and decoding skills similar to that of peers with SLD. It is also essential that teachers assess the use of reading strategies for comprehension, including an examination of passive versus active strategies, for both students with ASD and with SLD.

Further, instruction will need to be individualized to target student needs. For example, Yu and Henry present with very unique needs, which require a highly individualized approach. For example, Yu is a great sight word and passage reader. It would be easy for a teacher to be misled regarding his actual level of understanding, as it is significantly lower than his reading ability level. Thus, he may be presented with materials which he can read, but are far above his level of comprehension. This in turn may lead to a decrease in engagement and learning, as demonstrated in the interview. Similarly, a student who is a strong sight word reader may mislead a teacher into the belief that phonological awareness and phonics development are not important intervention components, yet in the case of several participants, this lack of targeted instruction has prevented them from becoming better readers and spellers. In contrast, a student such as Henry, could be placed in a decoding-only intervention setting and be placed in general education without adequate supports for reading (such as assistive technology), which would deny him adequate opportunities to access material which he can comprehend (far above grade level).

Implications for Future Research

While exploratory analyses showed virtually no significant differences between EO and ELL performance on reading measures for either ASD or SLD groups, this is an area in need of future research. The present study was limited in the small numbers of students with ASD and ELL designation ($n = 5$). Since means in general were higher for EO students in both groups, future research may show significant differences with a larger sample size and may allow for control of other factors, such as socioeconomic status or teacher experience and education.

Further, it is possible that there were students with hyperlexia in the current study, and that the word reading and fluency scores for these students may have contributed to the overall differences between groups. Currently, there is not an accepted definition or assessment for hyperlexia. This should be a focus of future research.

Limitations

One limitation of the current study was the moderate sample size of 28 students with autism and 30 students with learning disabilities. Larger samples will allow for tests of moderation and provide more information on individual profiles of students that may suggest particular intervention strategies.

Table 1

Student Characteristics

Variable	Students with ASD ($n = 28$) n (%)	Students with SLD ($n = 30$) n (%)	Both Groups ($N = 58$) n (%)
Gender			
Female	2 (7)	15 (50)	17 (29)
Male	26 (93)	15 (50)	41 (71)
Race/ Ethnicity			
Hispanic	12 (42)	18 (60)	30 (51)
Biracial*	10 (35)	2 (7)	12 (21)
White	2 (7)	4 (14)	6 (10)
African American	1 (4)	3 (10)	4 (7)
Multiracial**	1 (4)	1 (3)	2 (3)
Chinese	1 (4)	0 (0)	1 (2)
Russian	0 (0)	1 (3)	1 (2)
Armenian	0 (0)	1 (3)	1 (2)
Filipino	1 (4)	0 (0)	1 (2)
English Language Learner Designation			
EO	23 (82)	20 (67)	43 (74)
ELL	5 (18)	10 (33)	15 (26)
Student Grade Level			
2nd	3 (11)	3 (10)	6 (10)
3rd	4 (14)	4 (13)	8 (14)
4th	6 (21)	7 (23)	13 (22)
5th	8 (29)	11 (37)	19 (33)
6th	7 (25)	5 (17)	12 (21)

Note. Racial/ ethnic status was indicated by parents on the Demographic Questionnaire and also on the IEP. In some cases, the IEP reflected biracial or multiracial status, but not in all cases.
*Biracial students were White & Hispanic (e.g., White & Mexican), Chinese & Japanese (twins), Hispanic and Czech, Hispanic &African American, Hispanic & Norwegian, and Filipino & African American.
**Multiracial students were Filipino, White, & Chinese and Hispanic, White, & Asian.
EO = English Only designation, ELL= English Language Learner designation

Table 2

Descriptive Statistics: EO vs. ELL Performance on Reading Measures

Area/ Measure	EO with ASD (*n* = 23)		ELL with ASD (*n* = 5)		EO with SLD (*n* = 20)		ELL with SLD (*n* = 10)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Phonological Awareness								
PAT-2[a]	100.4	16.83	92.60	18.97	106.90	9.75	102.70	10.41
Word Reading/ Decoding								
WJ-III LWI	90.70	14.88	78.60	18.28	82.95	7.69	77.20	7.64
QPS	176.09	42.56	152.20	37.98	170.25	33.44	156.30	29.45
REWARDS-W	8.78	6.64	4.60	5.94	3.90	4.96	2.40	3.20
REWARDS-FP	48.13	28.95	39.80	26.19	36.15	17.99	31.10	19.50
Johnston-W	27.70	18.44	14.80	18.42	16.10	10.81	12.20	10.14
Johnston-FP	95.00	45.35	62.00	46.50	73.00	28.53	60.60	26.15
Fluency								
GORT-4 FS	7.83	4.23	4.60	4.39	4.70	2.76	2.90	1.37
Vocabulary								
TORC-4 RV	8.22	2.98	6.80	1.79	8.20	1.85	7.80	1.99
WJ-III RV	85.22	13.10	77.60	13.20	90.05	11.20	84.80	8.98
Comprehension								
KTEA-2 LC	83.87	16.20	80.60	11.35	98.25	14.53	96.20	13.48
TORC-4 TC	9.26	2.78	7.20	2.28	10.25	1.71	9.10	2.08
GORT-4 CS	6.78	2.22	5.40	3.51	8.15	2.13	6.50	2.51

Note. PAT-2=Phonological Awareness Test (2nd Edition), Raw Score (130 points possible); *WJ-III LWI*=Woodcock Johnson (3rd Edition): Letter Word Identification; *QPS*=Quick Phonics Screener, Raw Score (202 points possible); *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read, Raw Score (20 points possible); *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read, Raw Score (78 points possible); *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points

possible); *GORT-4 FS*=Gray Oral Reading Test (4th Edition): Fluency Score; *TORC-4 RV*=Test of Reading Comprehension (4th Edition): Relational Vocabulary; *WJ-III RV*=Woodcock Johnson (3rd Edition): Reading Vocabulary; *KTEA-2*=Kaufman Test of Achievement, Second Edition; *TORC-4 TC*=Test of Reading Comprehension (4th Edition): Text Comprehension; *GORT-4 CS*=Gray Oral Reading Test (4th Edition): Comprehension Score. *PAT-2*[a]: Standard scores not available, as several students were older than the norming age. *$p <$ .05, **$p <$ .01.

Table 3

Pearson Bivariate Correlations between Measures

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1 PAT-2	---	.390**	.624**	.323*	.459**	.413**	.547**	.285*	.392**	.472**	.313*	.434**	.334*
2 WJ-III LWI		---	.655**	.756**	.768**	.765**	.779**	.833**	.549**	.440**	-.032	.250	.279*
3 QPS			---	.678**	.868**	.718**	.808**	.601**	.409**	.185	-.007	.175	.214
4 REWARDS-W				---	.886**	.829**	.841**	.749**	.300*	.117	-.190	-.080	-.019
5 REWARDS-FP					---	.826**	.871**	.718**	.354**	.111	-.181	-.027	.095
6 Johnston-W						---	.949**	.754**	.379**	.175	-.167	.017	.011
7 Johnston-FP							---	.722**	.397**	.248	-.084	.103	.145
8 GORT-4 FS								---	.449**	.315*	-.110	.137	.212
9 TORC-4 RV									---	.636**	.305*	.449**	.314*
10 WJ-III RV										---	.597**	.686**	.556**
11 KTEA-2 LC											---	.567**	.453**
12 TORC-4 TC												---	.545**
13 GORT-4 CS													---

Note. *PAT-2*=Phonological Awareness Test (2ⁿᵈ Edition), *WJ-III LWI*=Woodcock Johnson (3ʳᵈ Edition): Letter Word Identification; *QPS*=Quick Phonics Screener; *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read; *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read; *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points possible); *GORT-4 FS*=Gray Oral Reading Test (4ᵗʰ Edition): Fluency Score; *TORC-4 RV*=Test of Reading Comprehension (4ᵗʰ Edition): Relational Vocabulary; *WJ-III RV*=Woodcock Johnson (3ʳᵈ Edition): Reading Vocabulary; *KTEA-2*=Kaufman Test of Achievement, Second Edition; *TORC-4 TC*=Test of Reading Comprehension (4ᵗʰ Edition): Text Comprehension; *GORT-4 CS*=Gray Oral Reading Test (4ᵗʰ Edition): Comprehension Score. *$p < .05$, **$p < .01$.

Table 4

Descriptive Statistics: Standardized Reading Achievement Measures with Standard or Scaled Scores

Area/ Measure	Students with ASD (n = 28)		Students with SLD (n = 30)		Both Groups (N = 58)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Word Reading/ Decoding						
WJ-III LWI*	88.54	15.88	81.03	8.03	84.66	12.91
Fluency						
GORT-4 FS**	7.25	4.36	4.10	2.51	5.62	3.84
Vocabulary						
TORC-4 RV	7.96	2.84	8.07	1.87	8.02	2.37
WJ-III RV	83.86	13.21	88.30	10.66	86.16	12.06
Comprehension						
KTEA-2 LC**	83.29	15.31	97.57	13.99	90.67	16.20
TORC-4 TC	8.89	2.78	9.87	1.89	9.40	2.39
GORT-4 CS	6.54	2.47	7.60	2.36	7.09	2.45

Note. WJ-III LWI=Woodcock Johnson (3rd Edition): Letter Word Identification, Standard Score ($M = 100$, $SD = 15$); *GORT-4 FS*=Gray Oral Reading Test (4th Edition): Fluency Score, Standard Score ($M = 10$, $SD = 3$); *TORC-4 RV*=Test of Reading Comprehension (4th Edition): Relational Vocabulary, Scaled Score ($M = 10$, $SD = 3$); *WJ-III RV*=Woodcock Johnson (3rd Edition): Reading Vocabulary, Standard Score ($M = 100$, $SD = 15$); *KTEA-2*=Kaufman Test of Achievement, Second Edition, Standard Score ($M = 100$, $SD = 15$); *TORC-4 TC*=Test of Reading Comprehension (4th Edition): Text Comprehension, Scaled Score ($M = 10$, $SD = 3$); *GORT-4 CS*=Gray Oral Reading Test (4th Edition): Comprehension Score, Standard Score ($M = 10$, $SD = 3$). [a]ASD ($n = 27$), SLD ($n = 27$), Both Groups ($n = 54$). *$p < .05$, **$p < .01$.

Table 5

Descriptive Statistics: Informal Reading Achievement Measures with Raw Scores

Area/ Measure	Students with ASD (n = 28)		Students with SLD (n = 30)		Both Groups (N = 58)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Phonological Awareness						
PAT-2[a]	98.71	17.01	105.50	10.00	102.22	14.18
Word Reading/ Decoding						
QPS	171.82	42.15	165.60	32.35	168.60	37.20
REWARDS-W*	8.04	6.62	3.40	4.45	5.64	6.03
REWARDS-FP	46.64	28.20	34.47	18.33	40.34	24.19
Johnston-W*	25.39	18.78	14.80	10.58	19.91	15.89
Johnston-FP	89.11	46.50	68.87	27.94	78.64	39.06

Note. PAT-2=Phonological Awareness Test (2nd Edition), Raw Score (130 points possible); *QPS*=Quick Phonics Screener, Raw Score (202 points possible); *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read, Raw Score (20 points possible); *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read, Raw Score (78 points possible); *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points possible). *PAT-2*[a]: Standard scores not available, as several students were older than the norming age. $*p < .05, **p < .01$.

Table 6

GORT-4 Student Percentile Ranks for Fluency and Comprehension

GORT-4 Fluency

	Students with ASD (n = 28) n (%)	Students with SLD (n = 30) n (%)	Both Groups (n = 58) n (%)
Percentile Rank			
At or above 90th Percentile	1 (4)	0 (0)	1 (2)
Between 89th and 26th Percentile	11 (39)	2 (7)	13 (22)
Between 25th and 2nd Percentile	10 (36)	15 (50)	25 (43)
At or below 1st Percentile	6 (21)	13 (43)	19 (33)

GORT-4 Comprehension

At or above 90th Percentile	0 (0)	0 (0)	0 (0)
Between 89th and 26th Percentile	7 (25)	9 (30)	16 (28)
Between 25th and 2nd Percentile	19 (68)	20 (67)	39 (67)
At or below 1st Percentile	2 (7)	1 (3)	3 (5)

Table 7

High Comprehension Exemplar Cases: Sam and Riley

Area/ Measure	Sam (2nd Grade)	Riley (2nd Grade)
Phonological Awareness		
PAT-2[a]	103	89
Word Reading/ Decoding		
WJ-III LWI	88	91
QPS	132	66
REWARDS-W	0	0
REWARDS-FP	0	0
Johnston-W	4	2
Johnston-FP	50	20
Fluency		
GORT-4 FS	4	4
Vocabulary		
TORC-4 RV	13	9
WJ-III RV	111	111
Comprehension		
KTEA-2 LC	103	111
TORC-4 TC	16	12
GORT-4 CS	10	10
Receptive Vocabulary		
PPVT-4	120	118

Note. Standard scores provided, when available. Total scores provided where standard scores are not available. *PAT-2*=Phonological Awareness Test (2nd Edition), Raw Score (130 points possible); *WJ-III LWI*=Woodcock Johnson (3rd Edition): Letter Word Identification, Standard Score ($M = 100$, $SD = 15$); *QPS*=Quick Phonics Screener, Raw Score (202 points possible); *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read, Raw Score (20 points possible); *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read, Raw Score (78 points possible); *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points possible); *GORT-4 FS*=Gray Oral Reading Test (4th Edition): Fluency Score, Standard Score ($M = 10$, $SD = 3$); *TORC-4 RV*=Test of Reading Comprehension (4th Edition): Relational Vocabulary, Scaled Score ($M = 10$, $SD = 3$); *WJ-III RV*=Woodcock Johnson (3rd Edition): Reading Vocabulary, Standard Score ($M = 100$, $SD = 15$); *KTEA-2*=Kaufman Test of Achievement, Second Edition, Standard Score ($M = 100$, $SD = 15$); *TORC-4 TC*=Test of Reading Comprehension (4th Edition): Text Comprehension, Scaled Score ($M = 10$, $SD = 3$); *GORT-4 CS*=Gray Oral Reading Test (4th Edition): Comprehension Score, Standard Score ($M = 10$, $SD = 3$); *PPVT-4*=Peabody Picture Vocabulary Test (4th Edition), Standard Score ($M = 100$, $SD = 15$). *PAT-2*[a]: Standard scores not available, as several students were older than the norming age.

Table 8

Low Comprehension Exemplar Cases: Brandon and Lynn

Area/ Measure	Brandon (5th Grade)	Lynn (5th Grade)
Phonological Awareness		
PAT-2[a]	66	106
Word Reading/ Decoding		
WJ-III LWI	79	92
QPS	160	208
REWARDS-W	3	17
REWARDS-FP	41	66
Johnston-W	7	39
Johnston-FP	48	119
Fluency		
GORT-4 FS	3	8
Vocabulary		
TORC-4 RV	4	7
WJ-III RV	56	88
Comprehension		
KTEA-2 LC	65	89
TORC-4 TC	5	6
GORT-4 CS	3	6
Receptive Vocabulary		
PPVT-4	61	83

Note. Standard scores provided, when available. Total scores provided where standard scores are not available. *PAT-2*=Phonological Awareness Test (2nd Edition), Raw Score (130 points possible); *WJ-III LWI*=Woodcock Johnson (3rd Edition): Letter Word Identification, Standard Score ($M = 100$, $SD = 15$); *QPS*=Quick Phonics Screener, Raw Score (202 points possible); *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read, Raw Score (20 points possible); *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read, Raw Score (78 points possible); *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points possible); *GORT-4 FS*=Gray Oral Reading Test (4th Edition): Fluency Score, Standard Score ($M = 10$, $SD = 3$); *TORC-4 RV*=Test of Reading Comprehension (4th Edition): Relational Vocabulary, Scaled Score ($M = 10$, $SD = 3$); *WJ-III RV*=Woodcock Johnson (3rd Edition): Reading Vocabulary, Standard Score ($M = 100$, $SD = 15$); *KTEA-2*=Kaufman Test of Achievement, Second Edition, Standard Score ($M = 100$, $SD = 15$); *TORC-4 TC*=Test of Reading Comprehension (4th Edition): Text Comprehension, Scaled Score ($M = 10$, $SD = 3$); *GORT-4 CS*=Gray Oral Reading Test (4th Edition): Comprehension Score, Standard Score ($M = 10$, $SD = 3$); *PPVT-4*=Peabody Picture Vocabulary Test (4th Edition), Standard Score ($M = 100$, $SD = 15$). *PAT-2*[a]: Standard scores not available, as several students were older than the norming age.

Table 9

Hyperlexic and Dyslexic Exemplar Cases: Yu and Henry

Area/ Measure	Yu (4th Grade)	Henry (5th Grade)
Phonological Awareness		
PAT-2[a]	108	116
Word Reading/ Decoding		
WJ-III LWI	97	76
QPS	188	197
REWARDS-W	11	2
REWARDS-FP	64	78
Johnston-W	39	9
Johnston-FP	123	62
Fluency		
GORT-4 FS	10	1
Vocabulary		
TORC-4 RV	9	10
WJ-III RV	76	92
Comprehension		
KTEA-2 LC	61	135
TORC-4 TC	9	13
GORT-4 CS	5	7
Receptive Vocabulary		
PPVT-4	72	123

Note. Standard scores provided, when available. Total scores provided where standard scores are not available. *PAT-2*=Phonological Awareness Test (2nd Edition), Raw Score (130 points possible); *WJ-III LWI*=Woodcock Johnson (3rd Edition): Letter Word Identification, Standard Score ($M = 100$, $SD = 15$); *QPS*=Quick Phonics Screener, Raw Score (202 points possible); *REWARDS-W*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Words Read, Raw Score (20 points possible); *REWARDS-FP*= Reading Excellence: Word Attack and Rate Development Strategies Pre/Posttest: Correct Number of Feature Points Read, Raw Score (78 points possible); *Johnston-W*=Johnston Primary and Secondary Spelling Inventories-Words: Correct Number of Words Spelled, Raw Score (65 points possible); *Johnston-FP*=Johnston Primary and Secondary Spelling Inventories-Feature Points: Correct Number of Features Spelled, Raw Score (165 points possible); *GORT-4 FS*=Gray Oral Reading Test (4th Edition): Fluency Score, Standard Score ($M = 10$, $SD = 3$); *TORC-4 RV*=Test of Reading Comprehension (4th Edition): Relational Vocabulary, Scaled Score ($M = 10$, $SD = 3$); *WJ-III RV*=Woodcock Johnson (3rd Edition): Reading Vocabulary, Standard Score ($M = 100$, $SD = 15$); *KTEA-2*=Kaufman Test of Achievement, Second Edition, Standard Score ($M = 100$, $SD = 15$); *TORC-4 TC*=Test of Reading Comprehension (4th Edition): Text Comprehension, Scaled Score ($M = 10$, $SD = 3$); *GORT-4 CS*=Gray Oral Reading Test (4th Edition): Comprehension Score, Standard Score ($M = 10$, $SD = 3$); *PPVT-4*=Peabody Picture Vocabulary Test (4th Edition), Standard Score ($M = 100$, $SD = 15$) . *PAT-2*[a]: Standard scores not available, as several students were older than the norming age.

Appendix A.

Strategy Interview

- What do you do before you start reading?
    - Do you read the title and headings?
    - Do you look at the pictures?
    - Do you predict what the passage might be about?
    - Do you ask yourself what you already know about the topic?

- What do you do while you're reading?
    - Do you think about what you're reading?
    - Do you stop sometimes and ask yourself what you've read about so far?
    - Do you picture in your mind the people, places, and events you're reading about?
    - Do you imagine that you're talking with the author while you're reading?

- What do you do when you come to a word you don't understand?
    - Do you look for clues and try to figure it out?
    - Do you use a glossary or dictionary?

- When you come to a part of the text that is confusing, what do you do?
    - Do you read it again?
    - Do you just keep reading?
    - Do you try to get help from pictures or drawings?

- After you finish reading, what do you do?
    - Do you think about what you've read?
    - Do you do something with the information you've learned?
    - Do you compare what you've just read with what you already knew?

Appendix B.

Reading Strategy Interview Transcripts

High Comprehension Exemplar Case: Sam
Interview length: 7 minutes, 41 seconds
[Sam immediately begins flipping through the book, then smiles at the interviewer.]
I: Okay, Sam, here's what I want you to do… Pretend your teacher says that you have to read that book for science class…So show me what you would do. [Sam continues to flip through pages and look at pictures.] Show me what you would do first.
S: [Quietly.] Why you filming this?
I: [Whispers.] So I can write your answers down…
S: [Whispers.] Okay.
I: So tell me about what you're doing? [Sam continues to look at the book, while moving around in a couple rigid postures, with a few hand mannerisms. He appears nervous that the camera is on and begins to make several unintelligible vocalizations ["chicananeedo'' and laughs] while pointing at pictures in the book and then makes repeated facial expressions (seem to be stereotypical/ repetitive behavior). The facial expressions (e.g., squeezing eyes and mouth together; making his mouth rigid and wide as if making a noise) continue throughout the interview. He seems very interested in looking at the pictures and continues to do so.]
I: So, you're looking at the pictures, what else are you doing? [He continues to look at the pictures.] So, you would do some reading, what else would you do?
S: [Laughs.] Yes.
I: What else would you do?
S: Uhhh… Look at the interesting pictures… [He flips pages and points to a few pictures.]
I: Interesting pictures…
S: And that's it… [Looks questioningly, but smiling, at the examiner.]
I: That's it? Okay, let me ask you some questions... Would you read the title of the book and the headings?
S: [After a moment of facial and body movements, looks at Interviewer. Appears to be thinking about the question.] Ya.
I: Would you look at the pictures?
S: [Looks at pictures, nods]. Ya.
I: We already said that… Would you make a prediction about what you think it's going to be about?
S: [Looks at Interviewer, takes a moment to think.] Ya…
I: So, would you say to yourself, "Oh, this has a lot of pictures of…"
S: [Looks at pictures.] Bugs?... Bugs?... [Looks questioningly.]
I: A lot of pictures of bugs, and what else?... Let me show you one too. I always ask kids about this picture. Look at this picture… [Points to picture of cartoon Venus flytrap with a fork, knife, and steak. Sam smiles.] Is that a silly picture?
S: Yes, it's a bug, but like a, a animal bug. [Laughs, looks at Interviewer.]
I: Like a bug? [Laughs.] Let me tell you, it's says meat-eating plants…
S: [Looks carefully.] Where is that page?
I: It says it right there. [Points to words.] Meat-eating plants.
S: No, I meant like, where is the page… [unintelligible]

80

I: Well, I think it's going to tell you about it right there [Points to other page with picture of real Venus flytrap.]… It's going to tell you about that one over there…

S: [Studying picture.] Hmm…

I: Let's see… Have you ever seen a plant pick up a steak, and a fork, and a knife? [Sam still looking at other picture, "No."] Do you think that's silly?

S: [Looks at Interviewer with a serious expression.] Those plants… have sticky, like, mouths…[gestures to mouth]… and then the bugs go on their mouth, and then… and then they eat it.

I: Right.

S: It go down their throat…[Motions down his throat.]

I: Right.

S: And then… [Motions to his stomach. Looking intently at Interviewer while he describes it.]… they got their…[unintelligible] seed is like, in their tummy, and then their's roots…

I: That's right! [Sam looks back at book.] So do you think this is just a silly way to make you interested in what you're reading?

S: [Points to the silly picture.] This is the… uh, the throat…right here…it goes in the [tube]…

I: Oh… Almost like a a human throat?

S: [Quietly.] Yeah.

I: So what do you think this book is going to be about?

S: Cause I saw the bugs… swallowed… like [in the book]…[Starts flipping pages, looking at new pictures.]

I: Oh…

S: Is this a grasshopper [unintelligible]… [Tilts head to look carefully.]

I: I don't know what that is… Alright, let's see… So what you ask yourself what you already know about plants and things before you start reading…[Sam flips through the book, looking carefully at new pictures.] or do you just start reading?

S: [Without ceasing his looking at various pictures.] Start reading… [Laughs at picture.]

I: What about while you're reading, do you think about what you're reading?

S: No. [Continues to flip through book, looking at pictures]

I: Do you sometimes stop and ask yourself what you've read so far?

S: No. [Smiles]

I: Do you picture in your mind the people, places, and events you're reading about?

S: Oh my God, Jenny! Look it…

I: [Silly tone.] Oh no!

S: Giant flies… [Sam looks at the interviewer, then back at page. Interviewer acknowledges, repeats the question]. Yes! [Turns head in a swift motion while saying it.]

I: Do you imagine that the person who wrote the book is talking to you?

S: No…

I: What do you do when you come to a word that you don't understand?

S: [Flipping pages] I stare off into space!!! [Laughs.]

I: [Interviewer laughs.] You stare off into space, oh no!... What could you do though?

S: Poop on the toilet… [Smiles.]

I: [Slightly silly tone.] No… don't say things like that. Okay, look at this word right here. [Points to word.] There's a word I always ask kids. Do you know what glands are?

S: This? [Points to picture.]

I: No, that's not a gland… So if you didn't know what glands are, what could you do?

S: Wait. Meat-eater…[Reading word. Continues to mouth words as he tries to sound them out.]
I: [Whispers.] Meat-eating plants…So, Sam, if you didn't know what glands are, what could you do?
S: [Long pauses, seems distracted as he looks/ points at other pictures] Oh, he has a little son! [Points at picture.]
I: What could you do? Could you…
S: Poop on a toilet? [Laughs, smiles.]
I: Could you ask a teacher?
S: [Whispers.] Yes…Wait. No… Not ask a teacher!
I: What would you do then?
S: Sound it out?...
I: Sound it out… Okay, what else could you do? Say you know how to read it, you just don't know what it means?S: I… [unintelligible.] Everyone of you… [unintelligble.] put this on Youtube? [unintelligble.] … talking…
I: No, I don't put this on Youtube, no way… Un uh.. [Sam smiles.]
I: What could you do, could you use a dictionary or a glossary?
S: [Long pauses. Whispers.] A dictionary. I said a dictionary…
I: You would use a dictionary?...
I: Would you look for clues in story or in the pictures?
S: Ya… clues in the story…[Spinning in chair a bit.]
I: What about when you come to a part of the story that's confusing? What do you do?
S: Nothing…
I: You just do nothing…Would you skip it?
S: No, I do nothing…
I: Would you read it again?... Or do you just keep reading?
S: [Singsong.] I just keep reading.
I: Would you get help from the pictures or the drawings?
S: Yes.
I: And after you finish the WHOLE book, or someone read it to you… What would you do? [Long pause] Like, do you think about what you've learned?
S: Look, I'm not pushing myself… [Moving in chair.]
I: Would you think about all the new things that you've learned?
S: No… Wait, yes, I mean.
I: What would you do with the new information that you've learned?
S: Yes, I would…
I: What would you do, like, would you tell somebody?... Like, would you say, Alyssa [his sister], look at what I just learned about the Venus flytrap…
S: Well, I already learned about that one… [Points to picture.]
I: Well, what if you learned about glands?
S: I don't know what glands are…
I: Glands are the things inside that Venus flytrap that make that sticky substance… [Points to picture.] Those are glands. Did you know that people have glands too?
S: Where?
I: In our bodies. But our glands don't just make sticky substances… They make other things like hormones.
S: What?

I: Hormones? Hormones can make your body work… like they can make you grow… They can also make you grouchy [does a silly tone].
S: But where are they?
I: You can't see them.
S: But where are they in your body?
I: You have some right here. That's why when you get a sore throat, sometimes the doctor will feel right here… to see if those glands get swollen or not…[Sam smiles.] Cool, huh?
I: Do you compare what you've just read with what you already knew?
S: No. [Sam is clearly done with the interview. He is turning around in his chair, no longer looking at Interviewer.]
I: Okay, thank you very much, we're all done.

High Comprehension Exemplar Case: Riley
Interview Length: 2 minutes, 52 seconds
[Riley has begun flipping through the book immediately; even before the Interviewer has sat down to begin the interview. Riley is smiling throughout the interview.]
I: All right, my friend, show me what you would do if you had to read that book for school.
R: Throw up. [Laughs.]
I: [Chuckles.] Show me what you would do if you had to read that book for school. Show me what you'd do.
R: I would show them the picture [angles the book toward the interviewer to show pictures]… go like this… I would go…[pretends to read] blah, blah, blah, blah… well, pretend I'm actually reading [smiles at Interviewer]. Blah, blah, blah, blah, um, blah, blah, blah. [Pauses as he looks at the pictures for real.]
I: So, let me ask you some questions. Before you start reading, do you look through it and read all the titles or headings?
R: [Thinks for a second.] Certain… sometimes. [Smiles. Looks at Interviewer.]
I: What about, do you ever look at the pictures to figure out what it's going to be about?
R: [Quietly to himself] Do I ever look at the pictures… [Louder] Yes.
I: How about… Do you make a prediction about what it's going to be about?... [Riley smiles.] Like, let's look at a picture together. Right here. Look at that funny picture. [Points to picture of cartoon Venus flytrap with a fork, knife, and steak.]
R: Right here? [Stands and points to a different picture, with a real Venus flytrap with a bug in its mouth.]
I: Right here, and then look at that one right there. What do you think this book's going to be about?
R: Bugs. [Looks up and smiles.]
I: Bugs? You think so?
R: [Quietly to himself]. Yeah.
I: Do you want me to read that title for you? It says, meat-eating plants. What do you think it's going to be about?
R: [He laughs and sits back in his seat.] Plants that eat bugs. [Smiles and fidgets in chair.]
I: I think you're probably right… What about, what do you do when you're reading? Do you ask yourself about what you've read so far?
R: [Smiles, repeats question to himself, and thinks for a second.] I have no idea.
I: Do you picture, like, what you're reading like as a movie in your head?

83

R: [Smiles, repeats question to himself, and thinks for a second.] Yes. [Nods head. Whispers.] Certain times.

I: How about… look at this word right here. This word says glands. Do you know what glands are?

R: Like zoom… like zoom in… like… [makes a motion with his hand]

I: Not like a lens or glance, but glands [carefully articulates]… Do you know what glands are?

R: [Shakes head.] No…

I: So what could you do if you didn't know what that word means?

R: I would ask someone…

I: You could ask someone… What else could you do?

R: I can… look in a dictionary.

I: Um… Look in a dictionary. Could you do anything else?

R: I can go online, also.

I: Oh, awesome. What about, what do you do when you come to a part of the book that you don't understand, like it's confusing, what do you do?

R: [Some movement in his chair throughout, but listening and engaged.] I literally think, and if I still don't get it, I usually go and ask for help.

I: Okay. And then, what about when you're finished reading, when you're all done reading… [Riley gives a slightly questioning glance.] So say you learned all about meat-eating plants, Venus flytraps, what would you do?

R: The teacher says I have to read it again.

I: [Laughs.] You're teacher says you have to read it again… [Laughs.] Now say you're teacher wasn't around, what would you do when you just finished reading?

R: [Playing with pants while thinking, but then looks up at Interviewer.] I'll get another book and read it again.

I: Oh, okay. What about, do you ever tell your mom about anything that you've read, or anyone… teachers or friends…?

R: [Nods and smiles.] Yes.

I: Okay, cool.

Low Comprehension Exemplar Case: Brandon

Brandon 4:29

[Brandon sits looking at book, but does not flip through pages. Brandon has a monotone speech throughout the interview and rarely changes facial expressions.]

I: I just want you to show me… if you had to read this book for school… show me what you would do.

B: [Looks at Interviewer, then back at book. Turns to first page.] I would read it all of it…[Flips to second page.]

I: You would read all of it?

B: I mean, just some…

I: What would you look at, do you think?

B: This page. [Points to page.]…

I: So when you're gonna read a book, do you through all the pictures of the whole book, or do you kinda just start reading?

B: [Still on same two pages.] Start reading.

I: Start reading? Okay. Do you ever read, like, the titles or the headings?

B: Headings.

I: Like this would be like a title. Do you read the titles?...[Long pause. No response from Brandon.] What about, um, do you ever make a prediction about, what it's going to be about?

B: It's going to be about…about plants? [Looks up.]

I: About plants, that's right. Do you ask yourself what you know already about plants?

B: They're… they need water?

I: They need water…Do you know a lot about plants, do you think?

B: [Wipes his nose.] Um…Um…[long pauses]

I: Not too much? Have you ever heard of this one, called a Venus flytrap?

B: [Looks at picture, then Interviewer.] No.

I: Have you heard of those before?

B: No.

I: Well, look at what this title says. It says that it's a meat-eating plant…Look at that picture. [Brandon looks at two pictures.] What do you think of that picture?

B: [Looks questioningly at Interviewer.] It's like a trap?

I: It's like a trap. And see over here, they're making a joke. Do you see the joke?

B: [Looks at picture, then Interviewer.] They make this one into a joke? [Points at two pictures.]

I: Yeah. But see this one's a joke… Do you know why it's a joke?

B: Cause they're fooling around?

I: [Laughs.] Cause it's got like a steak… and a knife… Have you ever seen a a plant with a steak, and a fork and a knife?

B: [Stares at picture with a long pause. Then small smile.] No. I've never seen those.

I: I've never seen that before, so that's a joke, huh? [Laughing tone.] But I think what they really mean is that it eats…it eats insects. [Points to other picture. Brandon looks at it for a long time.] Um…So what do you do while you're reading? What do you think about while you're reading?

B: [Long pause.] We just… read some… and figure out if we can take a break. [Stretches.]

I: Okay, read some and see if you can take a break… Do you ever stop… when you take a break, do you ask yourself what you've just read?

B: Yes. [No longer really looking at the book. Puts hand on chin.]

I: Okay. And when you… and in your brain, when you read something, do you picture it? Do you picture the people, and the places that you're reading about?

B: Yes.

I: Do you ever imagine, you know how a book is written by an author, do you ever imagine that the author is talking to you… Brandon?

B: Yes.

I: Yeah… what about, do you know what this word means, glands?

B: No… I don't know… what [it is]

I: Yeah, I don't know either. What could you do to find out what that word means?

B: [Long pause.] You could ask them.

I: Who would you ask?

B: A teacher.

I: A teacher. What else could you do? What if your teacher's busy?

B: You… can… just…just wait.

I: You just wait?

B: Wait.

I: Is there anything you could do to not have to wait? Like, is there anywhere that you could find out what that word means?
B: [unintelligible, maybe "Target"]
I: Is there anyway, any other way, that you could find out what that word means?
B: Sound it out.
I: Sound it out. Okay. And that would help you read it, right?
B: Yes.
I: Okay. When you come to a part, like a paragraph, that you read, that's confusing, what do you do?
B: Um… What do I do?... Um… Uh, uh, uh, I don't know…
I: Could you…do you just kind of keep reading… and skip it… or do you like, ask the teacher…
B: Ask the teacher?
I: You ask the teacher, okay. Do you ever use the pictures to help you figure out what it means?
B: No.
I: No? Okay. And then after you finished reading the whole book, what do you do?
B: You stop… and wait…
I: You stop and wait…
B: Yes.
I: Do you ever think about what you've read?
B: No.
I: No? Do you, um, do you ever tell people about what you read, like tell your mom or dad?...
B: No.
I: No? Uh, do you compare it with what you already knew?
B: No.
I: No? Okay, good man.

Low Comprehension Exemplar Case: Lynn
Lynn 4:22
[Lynn is presented with the book. She begins the interview by covering her face and saying "What do I do?" and "I don't know!" before any questions have been asked. She has been shy throughout the assessment process, but is especially shy with the camera on. She does not touch the book.]
I: Lynn… [Friendly tone.] If you had to read that book for science class, show me what you would do…[Lynn uses one hand to slide the book toward herself. The other hand continues to cover her face.] Like how would you look it over first… what would you do? [Lynn opens the book to the title page. She then forcefully, but with a smile, flips to the next page.] Tell me what you would look at…
L: [Smiles.] Uh…Everything…
I: Everything being like what?
L: Uh… pictures, pretty much only…
I: Uh huh. Pictures, that's right. What about titles, or headings?
L: N…not really. [Laughs. Continues to look at pictures on same page.] No.
I: Not really. Would you… um…Do you always kinda look through it first, or do you just take it and start reading it?
L: I take it and start reading it, I think. [Laughs.]
I: Okay. Do you predict what it might be about?

L:…Sometimes.

I: What do you think this one's going to be about?

L: [Looks at first page of open book.] Animals… Um…Insects…

I: Insects…

L: [Looks at second page.] Plants…

I: Plants? Uh huh… Do you ask yourself before you start reading what you already know about plants and insects?

L: No.

I: No?... And then, what about [Lynn looks up at Interviewer and smiles.]

L: Pretty much no…

I: Don't worry, you're doing awesome. What about when you're reading, do you think about what you're reading? [Lynn looking up now. Looks briefly confused.] Like, as you're reading it?

L: Um…no… [Smiles, but looks questioningly at the Interviewer.]

I: Do you think, like, ew, that insect is gross. [Lynn laughs.] I would hate to cross that in a dark alley…[No response from Lynn. She begins fidgeting with her hair.] Okay, um…do you stop and ask yourself what you've read so far?

L: Um… Uh…[Smiles.] I don't know…

I: No? Okay… Do you picture in your mind the people, places, and events that you're reading about?

L: [Makes a face.] No.

I: Not really?

L: No…I mean, I don't know… [Moves around in chair a bit.]

I: Sometimes maybe? [Lynn makes almost imperceptible shrug. Flips to next page in book.] Do you imagine that the person who wrote the book is talking to you?

L: [Looks up at Interviewer and laughs.] No. [Flips quickly to next page.] Oh gosh! I can't look at that… [Closes page.]

I: [Interviewer laughs. Lynn smiles and resumes flipping her page.] What do you do when you come to a word you don't understand?

L: I skip it…[unintelligible]… Ew… [Looking at picture again.]

I: You skip it? So let's look at… So usually you skip it…[Turns to page.] This word right here, glands, do you know what that means?

L: No. [Shakes head and smiles.]

I: So, what could you do if you… You said you normally would skip it…[Lynn plays with her hair.] but what would you do if you absolutely had to know what it means? What would you do?

L: … Uh…I would look what it means…[unintelligible]

I: Where would you look?

L: I would read it…

I: Oh, like read the paragraph?

L: Um hmm…

I: What else could you do?

L: Um…I don't know. [Laughs and looks at Interviewer.]

I: Alright. And then… what about using like a dictionary or a glossary, do you think you might ever do that? [Lynn thinks, then shakes head, no.] Or just really skip it? [Laughs.]

L: [Laughs.] Really skip it…[Flips page.]

I: And then, when you come to a part that's confusing, what do you do? [Lynn looks at Interviewer.] Like, say you read that paragraph about glands and it was really, really confusing, what would you do?
L: [Stops flipping pages. Thinks. Shakes head.] I have no idea… [Smiles.]
I: Okay. It's funny, I, I notice…
L: [Interrupts.] That feels like an interview! Like I'm doing a interview!! [Laughs.]
I: You are doing an interview!
L: Oh my…
I: It's called the strategy interview…
L: Ohh…
I: But you know what's funny? I realize I wasn't filming your face, I was filming your butterflies [on her shirt], cause I was busy reading, so my camera was tilted down…[Lynn looks down at her shirt and smiles. They both laugh.] Okay. Let's see… So if it's confusing, would you ever look at the pictures to kind of help you figure it out… or…
L: [Looks at pictures on page. Moves head from side to side.] I don't know…
I: Like, look at this picture here. What's going on here?
L: A plant is eating meat…[Smiles as if that is silly.]
I: Yeah, what's that all about?
L: It looks gross though…It does. [Smiles at Interviewer.]
I: Now, have you ever seen a plant with a fork and a knife?
L: [Raises eyebrows.] That'd be funny, but no…[Both laugh.]
I: No, but look at this, it's called meat-eating plants…
L: Ew!
I: I wonder what, what that's about… Have you ever heard of meat-eating plants? [Lynn shakes head no.] What about this one over here?
L: Yeah…
I: The Venus flytrap…
L: [Nods head.] I saw one, it was like so… I don't know… this… [uses hands to show how big]…
I: I saw one, like a little tiny one, at Lowe's. [Lynn laughs.] They were selling them…I should buy one, just for my own fascination…[Lynn laughs.] Let's see, what else do we have? So after you finished reading, what do you do? So, say you finished that whole book, what would you do?
L: [Big smile.] I'm done… [Closes book.] Now, we'll all go to sleep. [Laughs.]
I: [Laughs.] Okay. Do you think about what you read?
L: No. [Shakes head.] No.
I: Like if you learned all about the Venus flytrap, would you think about it a little bit?
L: No.
I: Would you… tell anybody about it?
L: No.
I: Would you be like, "Oh mom. I learned all about the Venus flytraps."
L: [Shakes head. Laughs.] No… I'd be like…[Pauses.] Oh whatever, maybe…[Laughs.]
I: [Laughs.] Would you compare it, like, with what you already knew about the Venus flytrap?
L: Maybe.
I: Alright. Guess what? [Lynn laughs.]

Hyperlexia Exemplar Case: Yu
Yu 3:26
I: What do you do before you start reading? [Yu looks at cover of book, looks away, claps hands in repetitive manner, then looks back at book.]
I: So, if you had to read that book for science class, what would you do?
Y: [Looks away from book, while playing with pages. With odd prosody and tone, almost robotic. Yu has good eye contact and is smiling. He does this throughout the interview.] Open the book… [Pauses expectantly.]
I: Okay, keep going.
Y: [Begins flipping pages.] I would like to read it…And [Closes book, looks away.] … Type up, type… I would like to write it in my notebook? [Moving book around in hand, but not looking at it.]
I: Alright. What would you write in your notebook?
Y: [Still playing with book. Puts book down to look closer into the camera. Moving around a lot, no longer sitting in seat, but leaning on table.] Look in the camera, okay? I would like to…to write it in my science study guide.
I: Okay. Do you look at the title and the headings? Let me show you. [Interviewer shows example in the book.] So here's the title, *Amazing Plants*…
Y: Um, yeah…
I: Here's a heading…
Y: I do it.
I: Yeah? What about, do you look at the pictures?
Y: [Looking away from the book] Yes.
I: Do you make a prediction about what you think that book's going to be about?
Y: [Silly voicing.] Yeah…
I: What do you think that book's going to be about?
Y: [Opens and looks down at book. Slams book shut.] Plants!
I: Plants…
Y: [Looking at game in corner.] Okay, so can we play the thing? [Starts laughing to himself.]
I: Okay. So what do you think about while you're reading?
Y: [Yu continues to laugh to himself. Looks at examiner, still laughing.] Yeah. [Tries to grab the visual timer towards the camera.]
I: Oh… I'm going this way then. [Playfully.] He's cheating on the timer, uh oh. [Interviewer and Yu both laugh.] Okay, ready. So, when you're reading, do you picture the people, places, and events in your mind that you're reading about?
Y: [Continuing to laugh, rubbing eyes with hands.] Yes.
I: Oh yeah? Do you imagine that the person who wrote the book is talking to you?
Y: [Still laughing. Continues to cover eyes with hands.] Yes.
I: Alright, look at this word. [Yu looking towards the ceiling, but with his eyes closed.] I want to show you this word right here. [Yu looks at the word in the book.]
I: This word is called glands. Do you…
Y: Glands.
I: know what glands are?
Y: [Making noises. Stands and looks closer into camera.] No.

I: [Yu sits on knees in chair.] What would you do if you came to a word like glands, and you don't know what it means?

Y: I would like to… just… do it.

I: What would you do if you don't know what that word means, and you have to know what that word means? What could you do?

Y: I could… wait…

I: Wait for what?

Y: Wait…

I: Wait. Okay. Could you use a dictionary?

Y: [Looking around the room again. Picking on his cuticles. Gives response in a quiet tone.] Yeah.

I: Anything else you could use?

Y: [Long pause. Smiles.] I could use a… a word box…

I: A word box? [Yu stretches across table again.] What about if you come to a part of the book that is confusing? What do you do?

Y: [Sits back down on his knees. Sucking on fingers.] I… would… do it.

I: Do it? What does that mean?

Y: [Yu looks down at his fingers. Smiles. Long pause. Looks at interviewer.]…I would just… do what you asked me to.

I: If you didn't understand what you just were reading, would you just skip it… would you ask for help… What would you do?

Y: [Continues sucking on fingers. Shrugs shoulders. Long pause.] I don't know.

I: You don't know? Okay. And after you finished reading, what do you do?

Y: [Rubbing fingers on table.] I answer questions…

I: You answer questions?... Only cause your teacher asks you questions?

Y: Yeah.

I: Do you ever tell your mom or anybody what you learned from a book?

Y: No[t] really.

I: No?

Y: No.

I: Alrighty. All done.

Dyslexia Exemplar Case: Henry
Henry 5:38

I: So, Henry, suppose your teacher gave you that book to read for science…That's your assignment… Show me kind of what you would do.

H: [Immediately opens book.] Open it…[Flips to first pages.] Like on this page [points], I would look at the pictures [runs hand across pictures], I would read the boxes [points to picture with captioning], after reading the actual story [runs hands across first pages; looks at Interviewer]…And then I would read the [points to picture with caption again], what about the meat-eating plant [reads heading of paragraph]… called the Venus flytrap…[flips to next page; looks at pictures] and then I would go to the next page and I would read this and this [points to boxes with text]… and then I'd read the captions [points to captions]… and, I really can't look at the other pictures… [flips page] and then I go to the next page, and I read the information [runs hand across text on page] and read the captions [points] and then read the caption on this page

90

[points]… look at the pictures, make sure I get the information [looks at Interviewer and smiles; flips page]…

I: Okay…

H: Look at the picture [runs hand over picture], read…read the directions for the experiment [points with emphasis; looks at next page]… look at more pictures and read the captions [runs hand over page] and what happens in the [looks at Interviewer; taps page repeatedly] like, experiment…

I: Okay, and then kinda skip to the end.

H: [Henry turns to last pages.] Like this far?

I: Yeah.

H: And the index [points to index] if I didn't know a word, I would like look through here [runs fingers over page] or if I wanted to learn about one thing, I'd look in the book… say, Roots, I'd go from page, I think, 30 [flips to page in book]… and then you'd learn about the roots [runs hand over page about roots; looks at page with the glossary]]

I: That's…

H: …Glossary… [Looks at Interviewer, then runs hand over the glossary.] This is for if you didn't know a word in the story and you look in the glossary… [flips to next page, which is index again] and then yeah the Index is for looking at words…[Looks at Interviewer.]

I: And then so you're all done reading, what do you do?

H: [Looks at Interviewer, closes book, then smiles.] And then you put the book away.

I: And then you put the book away…[Laughs.] Okay. So, now let me ask you some questions… and I think you kind of already showed me a lot of the answers… What do you do before you start reading?... So like, before you're ever going to read the book, what do you do?

H: Like, like I didn't have the book… [Makes circular motions with his hands.]

I: Well, you have the book in front of you, but you've never read it before…

H: [Looks down at book and points.] You read the title…

I: Okay…

H: And then, [motions hand] open the book?

I: Okay… So would you like kind of thumb through it and look at the pictures first, or would you just kind of dive in to reading the book…

H: I would kind of look through the pictures [motions with hand] and then dive in to read.

I: Okay… And then, would you make a prediction about what you think the books going to be about?

H: [Smiles.] Well, I already know it's about Venus flytraps…

I: So, you've already made a prediction then, right?

H: Yes.

I: Okay. And then, would you ask yourself what you already know about Venus flytraps?

H: Yes.

I: How much do you know about Venus flytraps?

H: Actually, a lot [smiles].

I: A lot? Okay, cool…And then, so, right here [opens book for him], and you've already kind of made a prediction, but usually, I ask kids about this picture right here that has…what's, what's going on with that picture there?

H: Which one, this one or that one [points to two different pictures]?

I: [Points.] That one on that side.

H: [Points and looks at correct picture.] The Venus flytrap is eating a meat, because it's a meat eating plant [slight smile] and because people don't think that plants eat meat… [looking at Interviewer] but they actually do, they eat like flies…

I: Uh huh.

H: And other insects…[smiles] and they wouldn't have knife and forks, but… [Interviewer laughs.] they would just eat it whole…

I: So that's a pretty silly picture, huh?

H: Yeah…

I: What do you think they have such a silly picture?

H: Just for funny… I, I guess…

I: Yeah. Maybe get your attention a little bit? [Henry nods yes.] Alright, so let's see. What do you do while you're reading?... Um, do you think about what it is that you're reading as you're going along? [Henry nods yes.] Do you ever stop and ask yourself what you've read so far, or do you just kind of keep going?

H: I stop and think of what I've read.

I: Ah… Okay. What about, do you make kind of like a movie or pictures in your…

H: Yes.

I: … head as you're going along? Do you, you know how the book is written by the author? Do you imagine that the author is talking to you?

H: Yes. [Begins looking at book again.]

I: Um… What do you when you come to a word that you don't understand?

H: I, go to the glossary in the back…

I: Go to the glossary… Do you do anything else?

H: Er, I, er I'll ask my t- teacher, if it's not in the glossary…

I: Okay…anything else?

H: Um, er, I'll ask like a neighbor.

I: Okay…[silly tone] anything else?

H: [Smiles.] I'll ask Mom and Dad, if I'm at home…

I: Okay, alright, awesome…So look at this word right here… glands… [Henry looks.] Do you know what glands are?

H: Yeah, they're like… uh…[starts to flip to the glossary]

I: Oh, no…[silly tone] don't cheat, don't cheat…

H: [Smiles.] Yeah, they're like the, um, the…[moves fingers around in air]…glands…[snaps fingers]… um… glands are um…like…uh…

I: So, you could learn a little bit more about glands, right?

H: Yeah…

I: So, if you look at that page that I was showing you, [Henry flips back to page.] um, what could you do, say there's no dictionary, no Mom and Dad, or teacher, what could you do to figure out what that word means?

H: Go to the glossary… [Flips to glossary.]

I: But there's no glossary… Pretend there's no glossary…[Henry makes confused face.] There's no Mom and Dad… Could you maybe look for clues…

H: Yeah [looks back at page]. I'd read this paragraph [runs finger over paragraph with glands in it]…

I: And then pictures and things like that?

H: Yeah.

I: Okay, cool. Um, what do you do when you come to a part of the book or the text that is confusing?

H: You… re- reread it and if you still don't get it, you ask the teacher, like what does that mean [motions with hand].

I: Wow… That's awesome. What about, could you use the pictures or the drawings…

H: Yes.

I: …do you think? Yeah. Um, and then after you finished reading the whole book, what would you do?

H: I'd go take an AR [accelerated reader] test on it…

I: [Laughs.] You'd take an AR test on it?... Um, if you didn't have to take an AR test on it, it was just kind of reading for learning…

H: fun…

I:… or for fun. What would you do?

H: Um… take a test on it, if it was for a test, or put it away.

I: Okay. I like how you're very test-oriented. Let's see, um…Do you ever think about what it is that you learned?

H: Yeah. Yes.

I: Do you compare the information with what you kinda already knew?

H: Yes.

I: So maybe if you learned about Venus flytraps and glands, that would be something new, huh?

H: Um hmm.

I: Yeah. Alright, awesome! Bye, bye.

H: Alright.

REFERENCES

Al Otaiba, S., & Hosp, J. L. (2010). Spell it out: The need for detailed spelling assessment to inform instruction. *Assessment for Effective Intervention, 36*, 3-6. doi: 10.1177/1534508410384478

Archer, A. L., Gleason, M. M., & Vachon, V. (2000). *Reading Excellence: Word Attack and Rate Development Strategies*. Longmont, CO: Sopris West Educational Services.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). *Cognition, 21,* 37-46.

Berkeley, S., Scruggs, T. E., & Mastropieri, M. A. (2010). Reading comprehension instruction for students with learning disabilities, 1995–2006: A meta-analysis. *Remedial and Special Education, 31* (6), 423-436. doi: 10.1177/0741932509355988

Boscardin, C. K., Muthen, B., Francis, D. J., & Baker, E. L. (2008). Early identification of reading difficulties using heterogeneous developmental trajectories. *Journal of Educational Psychology, 100*(1), 192-208.

Bramham, J. et al. (2009). Executive functioning differences between adults with attention deficit hyperactivity disorder and autism spectrum disorder in initiation, planning and strategy formation. *Autism, 13*(3), 245-265. doi:10.1177/1362361309103790

Brown V., Wiederholt J., & Hammill D. (2009). *Test of Reading Comprehension, Fourth Edition*. San Antonio, TX: Pearson.

California Department of Education. (2013). *California common core state standards: English language arts & literacy in history/ social studies, science, and technical subjects*. Retrieved from http://www.cde.ca.gov/be/st/ss/documents/finalelaccssstandards.pdf.

Centers for Disease Control and Prevention MMWR. (2012). *Prevalence of autism*

spectrum disorders- autism and developmental disabilities monitoring network, 14 sites, United States, 2008. Retrieved from http://www.cdc.gov/mmwr/pdf/ss/ss6103.pdf.

Chard, D.J., Vaughn, S., & Tyler, B-J. (2002). A synthesis of research on effective interventions for building reading fluency with elementary students with learning disabilities. *Journal of Learning Disabilities, 35*(5), 386-406.

Dunn, L. M. & Dunn, D. M. (2007). *Peabody Picture Vocabulary Test, Fourth Edition.* Minneapolis, MN: Pearson Assessments.

Flores, M. M. & Ganz, J. B. (2007). Effectiveness of direct instruction for teaching statement inference, use of facts, and analogies to students with developmental disabilities and reading delays. *Focus on autism and other developmental disabilities, 22*(4), 244-251.

Frith, U. & Snowling, M. (1983). Reading for meaning and reading for sound in autistic and dyslexic children. *British Journal of Developmental Psychology, 1*, 329–342.

Haager, D., & Klingner, J. (2005). *Differentiating Instruction in Inclusive Classrooms*, Boston, MA: Pearson.

Hasbrouck, J. (2011). *Quick Phonics Screener: A Diagnostic Phonics Assessment, Second Edition*. Saint Paul, MN: JH Consulting and Read Naturally, Inc.

Huemer, S. V. & Mann, V. (2010). A comprehensive profile of decoding and comprehension in autism spectrum disorders. *Journal of Autism and Developmental Disorders, 40*(4), 485-493. doi:10.1007/s10803-009-0892-3

Johnston, F., Bear, D. R., Invernizzi, M., & Templeton, S. (2009). *Words their way word sorts for letter name-alphabetic spellers, Second Edition*. Boston, MA: Allyn & Bacon.

Jolliffe, T. & Baron-Cohen, S. (1999). The strange stories test: A replication with high-

functioning adults with autism or Asperger syndrome. *Journal of Autism and Developmental Disorders, 29*(5), 395-406.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*(4), 437-447.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in children with autism: A randomized control joint attention intervention. *Journal of Child Psychology and Psychiatry, 47,* 611-620.

Kaufman, A. S. & Kaufman, N. L. (2004). *Kaufman Test of Educational Achievement, Second Edition*. Circle Pines, MN: AGS Publishing.

Klingner, J. K., Vaughn, S., & Boardman, A. (2007). *Teaching reading comprehension to students with learning difficulties*. New York, NY: The Guilford Press.

Lord C., Rutter M., DiLavore, P.C., & Risi S. (2001). *Autism Diagnostic Observation Schedule*. Los Angeles, CA: Western Psychological Services.

Manset-Williamson, G. & Nelson, J. M. (2005). Balanced, strategic reading instruction for upper-elementary and middle school students with reading disabilities: A comparative study of two approaches. *Learning Disability Quarterly, 28*, 59-74.

McGrew, K. S. & Woodcock, R. W. (2001). *Woodcock-Johnson III*. Itasca, IL: The Riverside Publishing Company.

Minshew, N. J., Goldstein, G., Taylor, H. G., & Siegal, D. J. (1994). Academic achievement in high functioning autistic individuals. *Journal of Clinical and Experimental Neuropsychology, 16*(2), 261–270.

Nation, K. (1999). Reading skills in hyperlexia: A developmental perspective. *Psychological Bulletin, 125*(3), 338–355.

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

Nation, K., & Norbury, C. F. (2005). Why reading comprehension fails: Insights from developmental disorders. *Topics in Language Disorders, 25*(1), 21-32.

National Center for Learning Disabilities, NCLD Editorial Team. (2013). Retrieved from http://www.ncld.org/types-learning-disabilities/dyslexia/what-is-dyslexia.

National Institute of Child Health and Human Development. (2000). *Teaching children to read: An evidence-based assessment of the scientific literature on reading and its implications for reading instruction.* Washington, DC: U.S. Government Printing Office.

National Professional Development Center on Autism Spectrum Disorders. (2010). *What Are Evidence-Based Practices (EBP)?* Retrieved from http://autismpdc.fpg.unc.edu/content/evidence-based-practices

Robbins, K. P., Hosp, J. H., Hosp, M. K., & Flynn, L. J. (2010). The relation between specific decoding and spelling skills in elementary students. *Assessment for Effective Intervention, 36*, 21–34. doi: 10.1177/0731948712444277

Robertson, C., & Salter, W. (2007). *The Phonological Awareness Test 2*. East Moline, IL: LinguiSystems.

Rutter, M., Bailey, A., & Lord, C. (2003). *Social Communication Questionnaire.* Los Angeles, CA: Western Psychological Services.

Siegel, B. (2003). Helping children with autism learn: Treatment approaches for parents and professionals. New York, NY: Oxford University Press.

Therrien, W. J. (2004). Fluency and comprehension gains as a result of repeated reading.

Remedial & Special Education, 25(4), 252-262.

Torgesen, J. K. & Mathes, P. G. (1998). What every teacher should know about phonological awareness. Retrieved from http://www.fldoe.org/ese/pdf/phon9872.pdf.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs, *28th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act, 2006,* vol. 1, Washington, D.C., 2009. Retrieved from http://www2.ed.gov/about/reports/annual/osep/2006/parts-b-c/28th-vol-1.pdf.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs, *29th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act, 2007*, vol. 1, Washington, D.C., 2010. Retrieved from http://www2.ed.gov/about/reports/annual/osep/2007/parts-b-c/29th-vol-1.pdf.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs, *30th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act, 2008*. Washington, D.C., 2011. Retrieved from http://www2.ed.gov/about/reports/annual/osep/2008/parts-b-c/30th-idea-arc.pdf.

Wiederholt, J. L. & Bryant, B. R. *Gray Oral Reading Test-IV*. Austin; TX: Pro-Ed.

Whalon, K. J., Al Otaiba, S., Delano, M. E. (2009). Evidence-based reading instruction for individuals with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 24*(1), 3-16.

Williamson, P., Carnahan, C. R., & Jacobs, J. A. (2012). Reading comprehension profiles of

high-functioning students on the autism spectrum: A grounded theory. *Exceptional*

Children, 78(4), 449-469.