

Reading Assessment in Children with Autism Spectrum Disorder

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Abstract

The social-communication and behavioural difficulties experienced by children with autism spectrum disorder (ASD) are well documented in the research literature, however relatively little attention has been paid to their commonly experienced reading difficulties. In this article, we synthesise the findings of the research to date and provide practical recommendations for school psychologists and counsellors tasked with assessing and supporting children with ASD who experience reading difficulties. Central to these recommendations is the need for comprehensive multidisciplinary assessment tailored to each child's needs, at all times avoiding common assumptions regarding literacy and learning in children with ASD.

Reading Assessment in Children with Autism Spectrum Disorder

Autism spectrum disorder (ASD) is characterised by a spectrum of impairments in social-communication skills and the presence of repetitive, restricted, and/or sensory interests and behaviours (American Psychiatric Association [APA], 2013). The challenges faced by children with ASD often create barriers to their education, leading to further social and educational disadvantage. In fact, the most recent national survey of Australian children with ASD (Australian Bureau of Statistics [ABS], 2014) indicated that 95% of children attending school experienced educational restrictions, primarily due to social, communication, and learning difficulties. Thirty-six percent of children with ASD required a counsellor or disability support person to assist in their education and 39% required special tuition. Together, the findings demonstrate the need for further concerted effort amongst teachers, clinicians, and caregivers to improve educational supports and outcomes for children with ASD.

Reading is arguably one of the most important skills children learn at school (National Early Literacy Panel, 2008). Although reading is sometimes highlighted as an area of relative strength for children with ASD (e.g., see review of academic skills by Keen, Webster, & Ridley, 2015), many children with ASD, even those with intelligence in the average range, show difficulties acquiring reading skills (Nation, Clarke, Wright, & Williams, 2006). For those who learn to read, up to 60% may show below average performance in reading comprehension (Ricketts, 2011; Ricketts, Jones, Happé, & Charman, 2013). It is, therefore, important to acknowledge the literacy needs of children with ASD along with their social-communication needs. The focus of this article is on providing an overview of reading profiles in children with ASD and the implications for assessment. Our aim is to provide key information for school psychologists and counsellors to assist them to support children with ASD in this important area of academic achievement.

Learning to Read

The ultimate aim of learning to read is to read with understanding. According to the *Simple View of Reading*, reading comprehension is the product of word recognition (decoding) and oral language comprehension (Gough & Tunmer, 1986). In other words, to understand written text, the reader does not only need to recognise the printed words on a page, but also needs to understand the meaning of those words, sentences, and paragraphs. Learning to read begins in the preschool years, through the development of so-called *emergent* literacy skills which form the foundation for accurate and fluent reading with comprehension (Whitehurst & Lonigan, 1998). Code-related emergent literacy skills include letter knowledge, print concepts, and early developing phonological awareness, which are predictive of word recognition. Meaning-related skills (related to oral language comprehension) include vocabulary, morpho-syntactic skills, and story retelling and comprehension (see Westerveld, Trembath, Shellshear, & Paynter, 2015, for a detailed review).

The unique contributions of word recognition and oral language comprehension to reading comprehension change over time (Catts, Hogan, & Adlof, 2005). During the initial stages of learning to read, reading comprehension relies heavily on word recognition (Catts et al., 2005). Once word recognition becomes automatic and fluent, typically around their fourth year of schooling, children's reading comprehension skills are heavily influenced by their oral language comprehension ability (Catts et al., 2005). Although not explicitly captured in the simple view of reading, reading fluency is an important element of reading and difficulties with reading fluency may indicate underlying word recognition difficulties as well as difficulties in a child's ability to process language for meaning (Barth, Catts, & Anthony, 2009). Thus, while the *Simple View of Reading* by name may imply a relatively straightforward, predictable, and transparent process by which children learn to read, the

reality is that it is a complex and dynamic system with multiple points of vulnerability for children with ASD and other developmental disabilities.

Reading in ASD

There is a lack of strong epidemiological data regarding the proportion of children with ASD who experience reading difficulties, with the best current estimates of between 30-60% based on existing data (e.g., Jones et al., 2009; Nation et al., 2006; Ricketts et al., 2013). The estimated high proportion of children with ASD presenting with reading difficulties is not surprising, given that communication impairments affecting oral language and pragmatics are characteristic of ASD, with approximately 25-35% of children with ASD minimally-verbal (i.e., little or no verbal communication) at school entry (e.g., Anderson et al., 2007; Rose, Trembath, Keen, & Paynter, 2015). Drawing from the simple view of reading, impairments in oral language clearly put children with ASD at risk of later reading challenges. In addition, rates of intellectual disability (approximately 30%) are elevated in ASD (Centers for Disease Control and Prevention, 2014) and the difficulties children with intellectual disability experience in skills including reasoning, planning, and problem-solving are likely to translate to difficulties across educational activities, including learning to read. Although the majority of children with ASD who show reading difficulties experience challenges in reading comprehension skills, with relative strengths in word recognition (Jones et al., 2009; Nation et al., 2006; Ricketts et al., 2013; Troyb et al., 2014), it is important to acknowledge the considerable individual differences in reading ability (Norbury & Nation, 2011).

Reading Ability and Profiles

Two extremes of ability may come to mind when thinking of literacy in children with ASD. First, there are *hyperlexic* readers who show word recognition skills that are far better than their reading comprehension skills (Catts, Hogan, & Fey, 2003; Newman et al., 2007).

Despite the fact that only a small percentage of children with ASD show a hyperlexic profile, considerable attention has been given to hyperlexia in children with ASD in the research literature (Newman et al., 2007; Turkeltaub et al., 2004). On the surface, these children appear to have an advantage to becoming proficient readers due to their strong word recognition skills, but they may be disadvantaged in other ways. For instance, children's reading aptitude may be dismissed as a 'splinter skill' that serves no real purpose (Mirenda, 2013). Alternatively, children who present with hyperlexia may be assumed to have adequate reading comprehension skills, and thus be overlooked for more in-depth assessment

The second extreme that may come to mind when thinking of literacy in children with ASD is that children with intellectual impairments or other significant impairments may be assumed to be too 'low functioning' or not ready for literacy (Mirenda, 2003). Thus, in practice, the literacy needs of children with ASD may not receive adequate attention due to the extent of other needs such as challenging behaviour or severe communication impairments. Professionals may assume children with severe disabilities cannot master prerequisite skills and, thus, not attempt to teach literacy (Kliewer & Biklen, 2001), or in inclusive programs exclude children with ASD from the full literacy curriculum, focussing instead on sight word instruction (Spector, 2011). Such practices limit children's opportunities for learning and may not only lead to difficulties accessing the school curriculum, but also restrict their participation in activities in the community more broadly through reduced opportunities for literacy development. The positive findings of research studies into literacy instruction for children with severe intellectual disability (e.g., Bock & Erickson, 2015; Koppenhaver & Erickson, 2003) attest to the fact that literacy level is amenable to change through intervention, and should be conceptualised as a continuum along which all children have the potential to move.

In reality, the majority of children with ASD show skills somewhere in between these extremes of ability; all require appropriate educational support (Keen et al., 2015), and there is no single “autism profile” for reading (e.g., Nation et al., 2006; Ricketts et al., 2013). Based on the simple view of reading (Gough & Tunmer, 1986), children with reading comprehension difficulties may be classified into three groups: a) children who show difficulties in word recognition alone (i.e., dyslexia); b) children who show adequate word recognition skills, but impaired oral comprehension skills (i.e., specific comprehension impairment); and c) children who show difficulties in both (i.e., mixed reading disability). Understanding the profile of each child with ASD is vital for informing appropriate support, and intervention and starts with a detailed assessment of his or her strengths and weaknesses in both oral language and reading-related skills

Reading Assessment

An important role of school psychologists and school counsellors is the conduct of assessments (Oakland, Faulkner, & Annan, 2005). Keen et al. (2015) recently highlighted the need, “*to identify individual strengths and weaknesses across all academic skill areas. Individualised assessment that leads to profiling the relative strengths and weaknesses of individuals with ASD, irrespective of age and IQ, can inform educational programming and provide a baseline for measuring achievement over time.*” (p. 16). Thus, assessment of reading in children with ASD should seek to understand the specific reading profile for an individual child. Consideration of the child’s characteristics of ASD (i.e., social-communication skills and behaviour) should inform the assessment process in terms of test selection, preparation, administration, and interpretation (see Paynter, 2015). For example, in terms of test selection; verbal ability level, and mental vs. chronological age, should be considered in informing choice of an appropriate measure. In terms of preparation, the use of social stories (see Collet-Klingenberg & Franzone, 2008) and/or visual schedules (see Hume,

2008 for an overview of visual supports) may assist in understanding the social context of the assessment. With regards to administration, managing off-task and challenging behaviour, as well as adapting the physical environment may assist in obtaining a valid assessment. Finally, in terms of interpretation, consideration of associated cognitive strengths and weaknesses in ASD such as potential biases towards local processing (i.e. details over ‘big picture’), and difficulties with executive functioning (e.g., keeping and using information) and/or perspective-taking should be considered when interpreting results.

Consistent with good practice guidelines in ASD (see Prior, Roberts, Rodger, Williams, & Sutherland, 2011), reading assessment requires a multidisciplinary approach, comprising speech pathologists, educators, and other literacy education specialists (e.g., educational psychologist). In many cases, relevant assessment results, such as intellectual assessments, oral language assessments, and/or reading/literacy assessments, may be readily available from speech pathologists or educators. In any case, literacy assessment should be tailored to the child’s level of reading ability and take the child’s general developmental level into account.

Emergent readers. Children who are not yet able to read novel words or sentences (i.e., pre-literate) may be considered to be in the emergent literacy stage and their emergent literacy skills should be assessed across code-related (e.g., letter knowledge, print concepts, and early writing) and meaning-related (e.g., vocabulary, story retell and comprehension) skills. For children who are unable to complete standardised assessments, emergent literacy skills may be assessed using informal measures to determine a baseline level of performance. Table 1 provides examples of assessment tasks that may be administered by members of a multidisciplinary team (e.g., speech pathologists, psychologists, and teachers) during the emergent literacy stage. Moreover, parents and caregivers can play a key role in the assessment process (Arciuli, Stevens, Trembath, & Simpson, 2013). For example, parents

may be asked to describe the home literacy environment using existing questionnaires (e.g., Boudreau, 2005), or asked to rate their children's emergent literacy skills using the *Pre-Literacy Rating Scale* from the *Clinical Evaluation of Language Fundamentals Preschool – Second Edition, Australian and New Zealand Standardised Edition* (Wiig, Secord, & Semel, 2006).

[Table 1 here]

Early and skilled readers. For those children who are able to read simple sentences or short passages, a reading assessment should be administered that yields measures of word recognition (at word, sentence, and paragraph levels) and reading comprehension (see Westerveld, 2009, for a review of reading comprehension tasks and see Table 2 for examples), as well as a measure of reading fluency. Depending on the child's performance (i.e., whether they show needs or strengths) in either of these areas, practitioners are encouraged to conduct follow-up testing to further identify strengths and weaknesses in word recognition and/or oral language comprehension (see Roberts & Scott, 2006, for an excellent discussion of assessment of these areas in terms of the simple view of reading). Table 2 provides examples of assessment tasks that may be used. For a comprehensive discussion of formal and informal reading assessments see Farrall (2012).

[Table 2 here]

Conclusions

While the social, communicative, and behavioural needs of children with ASD are widely acknowledged, academic and learning needs, particularly literacy has received comparably less attention. Literacy is a core area of academic learning and should receive attention for all children, including children with ASD who may be especially vulnerable to difficulties in this area given common challenges in oral language and the frequency of comorbid intellectual impairment. Some attention has been drawn to both children who show

above average word recognition (hyperlexia) skills as well as those who show significant impairments in reading. However, as per the dyad of impairments in ASD (APA, 2013), a spectrum is observed and the range of strengths and needs in word recognition and reading comprehension are observed across individual children with ASD.

Educational and school psychologists have an important role to play in ensuring that children with ASD have access to appropriate assessment and educational support services. They are in an ideal position to evaluate children's individual strengths and needs within educational settings and to inform and contribute to the design, implementation, and evaluation of appropriate interventions (see El Zein, Solis, Vaughn, & McCulley, 2014, for a review) where indicated as part of a multidisciplinary team in conjunction with speech pathologists, teachers, and guidance personnel. Educational and school psychologists are pivotally placed to influence the views, attitudes, and practices of teachers and other educational staff, including the need for individualised reading assessment and instruction for all children, including those with ASD. Routine attention to the strengths and challenges in reading ability in children with ASD will help tailor educational supports for children with ASD, and should ultimately provide them with better opportunities to engage in education, the workforce, and society.

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Table 1 – Brief descriptions and examples of emergent literacy tasks*

	Description	Informal and Parent Report	Formal Direct Assessments
Code-related measures			
Letter name knowledge and Letter sound knowledge	A task that requires the child to name and/or sound out the letters of the alphabet.		York Assessment of Reading Ability – Early Years (Psychological Assessments Australia, 2012) ^A
Print concepts	A task assessing knowledge and understanding of book orientation, simple reading terminology (word, letter, etc) knowledge, and directional arrangement of print on a page.	Concepts About Print (Clay, 2000). ^A Available online.	PALS- PreK (Invernizzi, Sullivan, & Meier, 2001) ^A
Early Phonological awareness	A task asking the child to identify the first sound in words (e.g., /b/ in ball). A task asking the child to recognise or produce rhyming words	Gillon Phonological Awareness Assessment Probes (Gillon, 2000) ^A Dynamic Indicators of Basic Early Literacy Skills (DIBELS) ^A : https://dibels.uoregon.edu/	Preschool and Primary Inventory of Phonological Awareness (PIPA) (Dodd, Crosbie, McIntosh, Teitzel, & Ozanne, 2000) ^A
Meaning related measures			
Vocabulary	A task that requires the child to identify or name pictures of objects and actions.	Parent report measures of receptive and/or expressive vocabulary. ^A	Peabody Picture Vocabulary Test – 4 th Ed. (PPVT-4; Dunn & Dunn, 2007) ^A
Language comprehension	A task tapping understanding of language beyond vocabulary. For example, understanding of simple and complex sentences.	Vineland Adaptive Behaviour Scales – Communication section (Sparrow, Cicchetti, & Balla, 2006) ^P	Preschool Language Scales-5 th Edition- Australian and New Zealand Language Adapted Edition (Zimmerman, Steiner, & Pond, 2012) ^{P, SLP}
Story comprehension	A task tapping understanding of	Edmonton Narrative Norms	Expression, Reception and Recall of

language at the text (story) level.	Instrument (ENNI) (Schneider, Dubé, & Hayward, 2009). ^{SLP, P}	Narrative Instrument (ERRNI) (Bishop, 2004) ^{P, SLP, T}
	Test of Narrative Retell: Preschool (TNR:P) (Spencer & Petersen, 2010). ^{SLP, P}	

*Superscripts indicate who may complete each assessment: ^GGuidance Officer; ^PPsychologist; ^{SLP}Speech Language Pathologist; ^TTeacher; ^AAll of these

Table 2. Assessment process (and examples of tasks) in the early and established reading stages*

Step 1	Start with an assessment that yields both reading accuracy (reading fluency) and reading comprehension scores, such as <ul style="list-style-type: none"> • York Assessment of Reading Ability – Passage Reading (Psychological Assessments Australia, 2012) 	
Step 2	Depending on the child’s relative performance in these areas (compared to peers), conduct follow-up testing in word recognition and/or oral language comprehension as described below.	
	Word recognition *	Oral language comprehension
Sound level	Letter-name knowledge and Letter sound knowledge Phonological awareness. For example Sutherland Phonological Awareness Test – revised (Neilson, 2003)	
Word level	Reading of real words, nonwords, and high frequency (sight) words. For example Macquarie Online Test Interface (MOTIF) http://www.motif.org.au Reading rate or reading fluency. For example the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999) with Australian norms available from http://www.motif.org.au/home/test/11 (Marinus, Kohnen, & MacArthur, 2013)	Morphological awareness. The metalinguistic ability to understand and manipulate the smaller meaningful parts of language (See Wolter & Pike, 2015) Task measuring a child’s receptive vocabulary, for example PPVT-4 (Dunn & Dunn, 2007) ^A .
Sentence level	Any reading test that requires a child to read sentences*	A task measuring a child’s understanding of language at sentence-level. For example, Test of Reception of Grammar (TROG) (Bishop, 1982) ^A . Alternatively, refer to Speech Language Pathologist for administration of the CELF-4 (Semel, Wiig, & Secord, 2006) ^{SLP} , e.g., sentence structure; concepts & following directions.
Paragraph	Any reading test that requires a child to read passages*	A task measuring a child’s understanding of language beyond the

level

sentence level. For example:

- Story comprehension e.g., Test of Narrative Language (Gillam & Pearson, 2004)^{P, SLP}
- CELF-4: Listening to Paragraphs^{SLP};
- Informal: York Assessment of Reading for Comprehension^A
– administer orally and ask comprehension questions

*For an excellent overview of reading assessments tapping different levels of word recognition, see Farrall (2012, Chapter 11); superscripts indicate who may complete each assessment: ^GGuidance Officer; ^PPsychologist; ^{SLP}Speech Language Pathologist; ^TTeacher; ^AAll of these