LSHSS

Tutorial

Emergent Literacy Assessment in Children With Autism Spectrum Disorder Who Have Limited Verbal Communication Skills: A Tutorial

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Purpose: Children with autism spectrum disorder (ASD) are at increased risk of experiencing difficulties with the development of literacy, including the emergent literacy skills recognized to underpin conventional literacy success. Comprehensive assessment is essential. Characteristics of ASD can make assessment challenging, and this can be compounded when children are unable to demonstrate their skills using spoken language. The purpose of this clinical tutorial is to outline the process of emergent literacy assessment for children with ASD who have limited verbal communication skills. A case example of a 5-year-old boy is presented.
Method: Pertinent literature is reviewed around the literacy profiles of children with ASD, the subgroup of children with ASD who have limited verbal communication skills, key components of emergent literacy, and previous research examining the emergent literacy abilities of children with ASD. The case report is described in depth and emphasizes the key factors to consider when designing an assessment battery and protocol.
Results: The case example information is interpreted, and its application is discussed. Key outcomes are highlighted including a greater understanding of the child's literacy strengths and needs and the implications for individualized instruction.
Conclusion: The clinical tutorial highlights the need for a comprehensive, well-planned assessment approach that involves all members of the educational team, and that is considerate to the needs of the individual child and responsive to their communication needs.

Autism spectrum disorder (ASD) is a neurodevelopmental condition that occurs in approximately one in 54 children (Maenner et al., 2020). It is characterized by impairments in social-communication skills and the presence of restricted and/or repetitive behaviors (American Psychiatric Association [APA], 2013). While no longer part of the diagnostic criteria (as of the Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition; APA, 2013), impairments in spoken language are common (for a meta-analysis of receptive and expressive communication impairments, see Kwok et al., 2015). In fact, even following comprehensive early intervention, approximately one quarter of children enter formal education with fewer than five spontaneous or functional words (Rose et al., 2016). Spoken language impairments put children with ASD, as a group, at increased risk of not developing adequate literacy skills (Ebert & Scott, 2016) and it is perhaps not surprising that up to 65% of children with ASD show challenges in developing literacy skills (e.g., Arciuli et al., 2013; Jones et al., 2009; Nation et al., 2006; Westerveld et al., 2018). Until recently, much of the research into the literacy skills of children with ASD has focused on children with verbal communication skills (e.g., Nation et al., 2006; Westerveld et al., 2017). While literacy learning is critical for all children, difficulties in this area can create additional barriers for those who have limited verbal communication skills. Until these children develop

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conventional literacy skills (i.e., the ability to read, write, and spell words), there is a risk that they may be restricted in their communication to the symbols available to them within their augmentative and alternative communication (AAC) system/s; conventional literacy provides a pathway to communicating precisely what they wish to say (Clendon, 2006; Clendon & Erickson, 2009). The purpose of this clinical tutorial is therefore to outline the process of (emergent) literacy assessment for children with ASD who have limited verbal communication skills and are in the early stages of literacy learning, also referred to as the emergent literacy period.

Emergent Literacy

The goal of learning to read is the ability to read with comprehension. Gough and Tunmer's (1986) Simple View of Reading (SVR) is a useful model for conceptualizing the cognitive skills needed to achieve this goal. Within this model, reading comprehension is viewed as the product of two constructs, word recognition and language comprehension, with both recognized as critically important for reading success. The SVR can also be used to categorize emergent literacy skills, with print-related skills (letter name and letter sound knowledge, print concepts, early name writing, and early developing phonological awareness) important precursors for later word recognition, and meaning-related skills (vocabulary knowledge, syntactic knowledge, and narrative skills) essential for language comprehension (National Institute of Child Health and Human Development, 2005).

Children who start school with strengths in emergent literacy skills are more likely to become successful readers (Catts et al., 2015; Tunmer et al., 2006). It is important to recognize that these emergent literacy skills also provide a strong platform for conventional writing development (Rohde, 2015), and that beyond the cognitive components identified above, there are important psychological (e.g., motivation, self-efficacy) and ecological (e.g., social, cultural, and schooling experiences) factors that have a powerful influence (Aaron et al., 2008; Rohde, 2015) and must be considered within broader models of emergent and conventional literacy acquisition.

Emergent Literacy in Children With ASD

Recent research has begun to examine the emergent literacy abilities of children with ASD and the links to later reading skills (e.g., Davidson & Ellis Weismer, 2014; Dynia et al., 2017; Jacobs & Richdale, 2013; Westerveld et al., 2017, 2018). Results from this research have highlighted the wide variability in (emergent literacy) performance in young children with ASD, with some children demonstrating age-appropriate skills (e.g., in alphabet knowledge and phonological awareness) and others demonstrating significant challenges. Davidson and Ellis Weismer (2014) specifically evaluated early reading profiles in a group of 94 five-year-old children with ASD (57–79 months), based on performance on three subtests of the Test of Early Reading Ability, Third Edition (Reid et al., 2001; Alphabet, Conventions, and Meaning). Results revealed four early reading profiles. Two profiles, accounting for 62% of the sample, showed higher print-related skills (alphabet knowledge) relative to meaning-related skills. A third profile (31%) showed poor performance on all three emergent literacy subtests, while 7% (profile 4) showed high levels of performance across all subtests. These results support an overall profile of relative strengths in print-related emergent literacy skills, particularly alphabet knowledge, and challenges in meaning-related skills (e.g., oral narrative comprehension; see Westerveld & Roberts, 2017) in preschool children with ASD. Although we hypothesized that this relative strength in alphabet knowledge could be autism-specific, our recent study revealed no differences in preschoolers with ASD and their peers without ASD when controlling for language ability, IQ, age, gender, and socioeconomic status (Westerveld, Paynter, Brignell, & Reilly, 2020). Further research is clearly needed to better understand why children with ASD are at such a high risk of literacy learning difficulties.

Barriers to Literacy Learning in ASD

There are several reasons why children with ASD may be at particular risk of literacy learning difficulties, including the impact of autism traits, spoken language impairments, and comorbid cognitive features. Restricted and/or repetitive behaviors that characterize a diagnosis of ASD may lead to a fascination of letters and increased alphabet knowledge (Davidson & Ellis Weismer, 2014) and may lead to a false impression of a strength in emergent literacy development more broadly. Conversely, restricted interests and social communication difficulties (e.g., reduced social interest, joint attention impairments) in ASD may also explain a reduced interest in shared book reading in preschoolers with ASD (Westerveld & van Bysterveldt, 2017), which may hinder children's early language and emergent literacy development (Reese & Cox, 1999). Theory of mind (ToM) difficulties, that is understanding mental states of oneself and others (Baron-Cohen, 2000; Baron-Cohen et al., 1985), may explain early challenges in understanding and retelling narratives in preschoolers with ASD, given the need for imputing and understanding story characters' internal mental states such as their beliefs and intentions (Westerveld & Roberts, 2017). This may then impact on later reading comprehension difficulties with ToM linking to reading comprehension in older children (e.g., McIntyre et al., 2018).

The impairments in spoken language development that are often found in children with ASD may be associated with challenges in emergent literacy skills, similar to those found in children with developmental language disorders (Cabell et al., 2009). In support, Lanter et al. (2012) found significant differences in emergent literacy skills in children with ASD who demonstrated language skills within the typical range (on a standardized language test), compared

to their peers with mild-to-moderate and severe language impairment. Finally, comorbid cognitive impairments may affect children's learning in general, including emergent literacy skills, which is consistent with the diagnostic criteria for an intellectual impairment (APA, 2013). Previous research has supported this link between IQ and emergent literacy development, with children with ASD with intellectual impairment demonstrating significantly lower levels of emergent literacy across most skills, except alphabet knowledge (Westerveld et al., 2017).

To address the high literacy needs in this population, it is important to outline some of the beliefs around ASD and literacy that may have influenced the research conducted to date, and served as access barriers to appropriate literacy instruction for children with ASD, including those who have limited verbal communication skills (Westerveld, Paynter, & Trembath, 2016). One prominent misconception is that these children show a particular literacy profile with strengths in decoding. Much research has focused on children with ASD having "hyperlexia" (i.e., precocious abilities to decode text that are incongruent with, and exceed, their reading comprehension abilities; Frith & Snowling, 1983). This contrasts with research findings that indicate a hyperlexic profile (i.e., strong decoding, poor comprehension) is not the most common (e.g., 25% in Nation et al., 2006) profile observed in children with ASD. These findings highlight the importance of including detailed assessment of word recognition skills in children with ASD rather than assuming this is an easily learnt skill. To illustrate, in our recent study (Westerveld et al., 2018) investigating the word reading abilities of 41 children with ASD who were in their first year of schooling, we found that 56% performed below expectations in reading accuracy on a standardized assessment of reading ability (York Assessment of Reading for Comprehension; Snowling et al., 2012).

A second common misconception is that there are prerequisites to literacy learning and that some children will not benefit from literacy instruction. Keefe and Copeland (2011) argued that the belief that some individuals cannot acquire literacy skills can then lead to individuals being denied opportunities to acquire these skills. Mirenda (2003) also highlighted this issue and argued that students with ASD who have cognitive impairments may be excluded from literacy instruction due to mistaken beliefs that they do not have the capacity for acquiring literacy skills, yet show skills that are directly related to literacy learning such as interest in books, print awareness, and recognition of sight words. Mirenda advocated abandoning a "readiness" model and the assumption that spoken language was needed to benefit from instruction, and instead suggested a need for the use of multiple strategies formulated at the child's level of literacy development, underpinned by assessment of the child's strengths and needs.

Several studies have demonstrated that children who have limited verbal communication skills can, and do, develop language and literacy skills when they are provided with high-quality literacy learning opportunities (e.g., Afacan et al., 2018; Allor et al., 2010; Erickson et al., 1997). These findings are consistent with the view that every child sits somewhere on a *literacy learning continuum* (Erickson, 2000), and that no child is "too anything" to learn to read and write (Yoder, 2001, p. 5). To better understand each child's strengths and challenges in literacy-related skills, in-depth assessment is required to help guide individualized literacy instruction.

Literacy Assessment Approach for Children With ASD Who Have Limited Verbal Communication Skills

During the last few years we have conducted a research project that had two key aims: (a) to develop and refine an accessible literacy assessment approach for children with ASD who have limited verbal communication skills and (b) to pilot test this approach in examining the literacy profiles of five children. From a research point of view, the battery and the protocol needed to be comprehensive enough to gather critical information and systematic enough to attain reliable information and ensure adherence to standardized instructions and particular test requirements when possible (Paynter, 2015). However, it also needed to be efficient and flexible to ensure a positive experience for the child with ASD. The project involved revising and adapting assessment materials used in previous research by members of this research team (Westerveld et al., 2018, 2017; Westerveld, Paynter, & Wicks, 2020), as well as including additional tools developed at the Centre for Literacy and Disability Studies at the University of North Carolina at Chapel Hill (Erickson et al., 2005; Erickson et al., 2008).

Our Approach

We will first outline factors we considered when developing this battery, followed by a case example (Max, not his real name).

Factors Considered When Designing the Assessment Approach

Factors considered when designing the assessment approach (battery and protocol) included having an evidence-based theoretical model, using a transdisciplinary model, ensuring the battery was comprehensive, yet allowing for an individualized approach that was suitable for children with ASD who have limited verbal communication skills.

Theoretical Model

Our approach was firmly based on two key theories/models, the SVR and a social constructivist framework (Vygotsky, 1978). In line with the SVR, we categorized the emergent literacy skills as the print-related skills needed for later word recognition and the meaning-related skills that are essential for language comprehension. Social constructivism

refers to the importance of social interactions for developing knowledge. Pertinent to our assessment battery, emergent literacy skills are generally nurtured in the home or (pre) school environment, based on social interactions between the child and the parent/caregiver or educator. Therefore, our assessments extended beyond appraising the child's skills to evaluating the child's literacy environment, at home and/or (pre)school.

Transdisciplinary Approach

The importance of taking a transdisciplinary approach to assessing children with ASD and involving parents in the assessment process is well documented (e.g., Arciuli et al., 2013; Trembath et al., 2019; Westerveld, Paynter, & Trembath, 2016). This research project involved a partnership with an independent school for children with ASD in a large Australian city. The head speech pathologist from the school was a member of the research team and information about the child was collected from educators and parents as part of the assessment approach. This included information from informal questionnaires such as a home literacy questionnaire (as used in Westerveld & van Bysterveldt, 2017), standardized parent questionnaires, such as the communication section from the Vineland Adaptive Behaviour Scales–Second Edition (Sparrow et al., 2005), and prior speech pathology assessment results. In addition, less formal information was collected such as details on the child's communication skills at home and school, their interests, their strengths, and the strategies and supports identified as helping them to learn best (e.g., movement breaks, visual schedules).

Comprehensive Battery

The assessment battery itself needed to take into account the heterogeneity observed in the (emergent) literacy skills of children with ASD (e.g., Nation et al., 2006; Westerveld, Trembath, et al., 2016) and examine the key emergent literacy skills considered important for supporting children's literacy learning (i.e., letter name and letter sound knowledge, print concepts, early name writing, and early developing phonological awareness; and the meaning-related emergent literacy skills of vocabulary knowledge, syntactic knowledge, and text-level language skills). In addition, our battery needed to include measures to evaluate the home and/or (pre)school literacy environment. Finally, this battery included the combination of both formal standardized measures and informal measures consistent with recommendations from Trembath et al. (2019). This combination was deliberately selected to enable both comparison to expectations for age, along with fine-grained investigation of child strengths and needs and to capture discrete skills that standardized assessments may lack sensitivity to in this population due to potential floor effects. Appendix A shows an overview of the comprehensive emergent and early literacy assessment battery.

Individualized Approach

An individualized approach to assessment for children with ASD was critical, consistent with published guidelines (Paynter & Fothergill, 2015; Trembath et al., 2019). An individualized approach suggests considering both the ASD feature presentation in a given child in preparation for the assessment by the examiner and in informing the measure selection, implementation, and interpretation (Paynter & Fothergill, 2015), as well as a focus on looking within the child for areas of strength and need as opposed to comparing the child to neurotypical peers or other children with ASD (see Trembath et al., 2019). An important implication was to go beyond standardized assessment measures where floor effects may be present, limiting meaningful interpretation for individuals with higher levels of need to complement these approaches with informal assessment tasks that could be adapted to an individual child's level of functioning, language ability, interest, or needs.

Considerate, Adapted Approach

It was imperative when designing this battery and the protocol for administration, that the assessment approach itself considered the characteristics commonly associated with ASD (see Paynter, 2015), as well as the unique needs of this subgroup of children who have limited verbal communication skills. As a group, these children are unable to respond to an assessment using spoken language, may use some form of AAC, and may have significant receptive and expressive language challenges.

Specific considerations for children with ASD. As with all assessment sessions with young children, numerous factors needed to be taken into consideration, such as deciding whether a familiar adult (e.g., teacher) should be present, the most suitable environment and setting for the assessment (e.g., location, at desk, or on the floor), watching carefully for signs of tiredness or distress, giving regular short breaks, and/or stopping completely if necessary. However, obtaining valid assessment data from children with ASD can be particularly challenging due to the comorbid conditions and behaviors described earlier. As Paynter (2015) and Paynter and Fothergill (2015) argued, a better understanding of common autism-specific traits may assist the clinician in not only choosing appropriate assessment tools, but also in preparing for the assessment session, and in using the appropriate supports during the assessment. The following factors were therefore taken into consideration in designing the assessment protocol for the current research project and are summarized in the assessment preparation checklist provided in Appendix B.

Routine and structure. Given children with ASD characteristically show rigidity in thinking (APA, 2013) and accordingly benefit from routines and structure, the environment, timing, and structure of assessment sessions should be carefully considered. This may include consideration of the child's usual routine, preferred activities, and circadian rhythm given the high prevalence of sleep disturbances in this population (Carmassi et al., 2019). In addition, flexibility on behalf of the examiner regarding the most appropriate setting and location to allow the child the best opportunity for success is also recommended within this routine/structure. This may include, for example,

assessing the child in a more comfortable or familiar environment and focusing on essential elements of the task rather than whether the child sits at a table or makes eye contact, both of which may be challenging for some children with ASD. Providing routine and structure both in timing of the assessment and during the assessment can also reduce anxiety, which is also often elevated in this population (White et al., 2009), as well as support motivation.

Anxiety, communication challenges, and social understanding impairments can lead young children with ASD to be more challenging to engage in assessment than typically developing children who are often more eager to please examiners (see discussion by Akshoomoff, 2006). Thus, scheduling assessments at a time that does not conflict with preferred activities, considers the child's optimal functioning time in terms of sleep and alertness, and includes alternation of easy/difficult tasks is particularly important for this population (for further discussion, see Paynter & Fothergill, 2015). This alternation may include the use of extrinsic reinforcement (e.g., preferred activities and interests, toys for short breaks, "high fives") to facilitate engagement and motivation (Paynter & Fothergill, 2015). This may be informed by a reinforcer assessment completed in advance by teachers or caregivers (e.g., see http://www.aba-instituut.nl/back-site/upload/content/reinforcementinventory.pdf) to inform items or activities to prepare and use during the assessment.

Careful preparation of assessment materials in advance can also reduce transition times between tasks and provide fewer opportunities for challenges through facilitating a more timely assessment and less time for distractions or challenges. Routine and structure can be complemented through the use of visual supports and social stories to make these more salient and comprehensible to the child with ASD.

Social story and visual supports. Providing a social story (i.e., outlining the process and procedure, and key information about the assessment) beforehand and using visual supports during the assessment can aid the child's understanding of key details such as who will be present, where the assessment will take place, how long it will last, the order of activities, and what will happen at the end. This is important given the social communication challenges and ToM difficulties associated with ASD, and the novelty of an assessment more broadly, may mean children with ASD are unsure of expectations, including appropriate behavior, and whether the assessment has an end. Furthermore, they may be challenged by the change in routine, which may increase anxiety and challenging behaviors. These strategies (social narratives and visual supports) complement the use of routine and structure by making these tangible and comprehensible in advance to the child with ASD and were selected as empirically supported practices (e.g., see Wong et al., 2015) that can reduce anxiety and challenges that may arise in response to the change in routine.

Environmental audit of test location. As with all child assessments, it is important to ensure that the test location and environment is selected to fit with the child's needs and has minimal distractions. However, for children with ASD this is particularly important for two key reasons. First, hypo- or hypersensitivity to sensory input (e.g., sounds) is part of the diagnostic criteria (APA, 2013), and as such, sensory features of the environment can greatly impact on the ability of children with ASD to engage in testing to the best of their ability. Second, executive functioning difficulties such as inattention, difficulties changing from one task to another, and difficulty inhibiting impulses are common in ASD (Geurts et al., 2014), which may be exacerbated by distractions in the environment such as the presence of preferable items or sensory distractions. As such, the use of an environmental audit (e.g., Attfield et al., n.d.) is recommended to consider the sensory features of the environment such as light and noise, in order to reduce or remove potential sources of distress or distraction. Such an approach is consistent with evidence-based practice in ASD and falls under the broader category of an antecedent-based intervention (Wong et al., 2015).

Specific considerations for children who have limited verbal communication skills. Two additional considerations that are essential for children who have limited verbal communication skills are response mode accessibility and receptive language demands. Children were encouraged to bring their AAC system and to use this to communicate during the assessment. It was important to ensure, however, that their ability to demonstrate their (emergent) literacy skills and understandings could not be restricted by their spoken language abilities nor by the language available to them within their AAC system. For this reason, it was important that the children were able to complete the assessment without the requirement to respond using spoken language or AAC.

Response mode accessibility. To make the assessment battery accessible for children who have limited verbal communication skills, some of the tasks needed adaptation. A commonly employed strategy is to ask children to select their response from a field of possible answers. For example, we used an adapted word identification assessment in the pilot research project, which was based on modifications employed by Erickson et al. (2008) and discussed in Clendon and Gillon (2018). In this task, a word list from the Basic Reading Inventory (Johns et al., 2016) was used as the basis of the assessment, but instead of the children being asked to read the words aloud, they were asked to select a target word from a field of four, which included three distracter words that began with the same letter and were of similar length. For example, the child was presented with the words *did, dig, dog,* and *do* and asked to "show me the word that says *dog*." Adaptations such as these need to be carefully considered, both in terms of choosing appropriate distracter items (Erickson et al., 2008) and in terms of interpreting the child's performance on an adapted task. This adapted task, for instance, requires a child to match speech to print but does not require the child to access his or her own phonological representation for the target word. In other words, the adult provides the speech, and the child links it with the print. This process is the opposite of what

occurs when children without spoken language difficulties participate in these kinds of assessment tasks (refer to Clendon & Gillon, 2018, for further information).

Receptive language demands. The receptive language demands of tasks are important to consider, both in terms of possible adaptation for administration, and in terms of interpretation. As discussed, many children with ASD exhibit language difficulties (Eigsti et al., 2011). Furthermore, it is well recognized that children who have limited verbal communication skills are at significant risk for experiencing language learning challenges (Erickson & Geist, 2016; Light, 1997; Sennott et al., 2016; Sturm & Clendon, 2004). We were particularly cognizant of the complexity of the instructions provided to children when administering assessments. It was important that instructions were kept as simple and concrete as possible and were delivered at a pace that allowed sufficient processing time. This was balanced with the need to adhere to standardized instructions and test requirements when standardized tests were used (Paynter, 2015). As recommended in Paynter (2015), adaptations made for individual children were clearly documented in the recording forms and in any reports shared with the educational team and family. The receptive language demands of tasks were also considered when interpreting the child's results. Did the child really not understand the skill or concept being assessed? Or might she/he have been confused by, or unsure of, the task instructions or requirements? The transdisciplinary team approach meant that all stakeholders could contribute to these discussions.

Case Example: Max

General information. Max (age 5 years, 7 months) had attended the school since he was 4 years old. He had been diagnosed with ASD when he was 3 years of age. Although Max's family is bilingual (English/Mandarin), the family speaks English at home (> 90% of the time). Max's performance on the Primary Test of Nonverbal Intelligence (Ehrler & McGhee, 2008) was a Standard Score 59. His score on the Social Communication Questionnaire (Rutter et al., 2003) was 18, consistent with an ASD diagnosis. To help us prepare for the assessment, the school team shared a comprehensive profile document introducing Max's interests, strengths, and the strategies and supports identified as helping him to learn best. Max's profile document revealed that he had several interests at school including reading books, interacting with numbers and counting, and being physically active—climbing, swinging, and swimming. The Profile also documented strengths in a variety of areas including numbers and counting, handwriting, following a visual schedule, using his AAC system, recognizing letters, cooking, and looking after his belongings. Transitions were identified as being difficult at times for Max; he established routines very quickly and could find it challenging to accommodate changes. Visual supports were identified as being supportive during transitions. It was also mentioned that Max benefitted from movement built into his day, particularly if he was needing to sit for periods of time. The Profile indicated that Max used a combination of spoken vocabulary (English and three words in Mandarin), a picture communication folder using picture exchange as his access method, his AAC system (Proloquo2Go) with a combination of line drawings and real photos, gesture, and movement to communicate.

Assessment Results

We used our comprehensive assessment battery (see Appendix A) to gather information on Max's emergent literacy skills. This included information from Max's parents, his teachers, and therapists and through direct assessment.

General communication. Max's mum completed the Vineland Adaptive Behaviour Scales–Second Edition (Sparrow et al., 2005) Communication Domain, which showed receptive (v-score 14; age equivalent [AE] 58 months) and written (v-score 16; AE 68 months) communication skills within age expectations (M = 15; SD = 3), but significant difficulties in expressive communication skills (v-score 11; AE 37 months).

School-specific checklists. The expressive communication checklist indicated that Max was able to communicate *yes* and *no* using spoken language when he was in a well-regulated state and the content was familiar. Using multiple modes of communication (e.g., spoken language, visuals, and/or his AAC system), he was able to make simple requests, as well as label or comment on things of high preference and interest. He mainly communicated using single words or two- to three-word combinations (e.g., "mumma home"). Max rarely initiated interactions in class but would respond to fun interactions initiated by others (e.g., action songs on the trampoline). His ability to jointly attend to an action or item was developing. At times, he would look to an adult for their response, and was starting to shift his gaze from his AAC system to an adult when communicating.

Home literacy. Max's mum also completed a Home Literacy Questionnaire; she indicated that they had more than 20 books at home and that they read to Max approximately 1.5 hr per week at bedtime and had been doing this from about 1 year of age. His mum rated Max's interest in books as 4 out of 5 when compared to other activities and indicated that he would sit for 5–10 min for a story. Although he often filled in words or lines from familiar stories, he reportedly "seldom" independently pointed to or talked about the pictures in the story. Finally, his mum indicated Max was able to recognize all 26 letters of the alphabet and his name. He also recognized five to 10 sight words and was sometimes able to write these.

School literacy environment. An environmental observational tool focused on emergent literacy, the Early Language and Literacy Classroom Observation (ELLCO) Pre-K tool (M. W. Smith et al., 2008) was used to assess the school literacy environment. The ELLCO captures aspects of the classroom literacy environment such as the visibility of literacy-related materials, as well as the quantity and quality of the learning opportunities provided.

Observational data indicated that children were provided with many opportunities to experience success with literacy within the classroom; for example, familiar content was practiced often and all attempts by children were encouraged. Literacy-related materials were available in the classroom and teachers engaged in shared storybook reading with both print and digital versions of stories. Digital versions and animated e-books are not only designed to capture children's attention amid competing demands, but also animate salient features of the text and illustrations to support learning of vocabulary and print concepts. Extensive use of environmental print was evident along with individual AAC systems and other communication supports such as visual choice boards, tactile communication supports, and emotions boards. There was a focus on reading sight words and learning initial letter sounds, and teachers provided many creative ways for children to engage in literacy activities such as using an obstacle course or a water balloon toss game to engage with sight words. Teacher interviews further revealed the use of themed literacy units providing students with a range of focus texts over the course of a semester as well as different types of texts (comics, posters, videos, other digital media, narratives—picture books, short chapter books in a few classes, information texts, fact sheets, websites, etc.). Finally, Max's teacher reported that repetition, predictability, and the use of visual scaffolds had been integral to Max's success in literacy across the school year.

Meaning-Related Emergent Literacy Skills

Direct child assessments. Max was happy to participate and obtained a standard score of 53 on the Peabody Picture Vocabulary Test–Fourth Edition (receptive vocabulary; Dunn & Dunn, 2007). On the Test for the Reception of Grammar–Version 2 (Bishop, 2003), he passed Block A—two element clauses (e.g., *The sheep is running*), but responded inaccurately to subsequent blocks, which tested understanding of structures such as negatives, simple prepositions (*in* vs. *on*), and three element clauses; this yielded a standard score of 55. Max did not respond to text-level questions during the print concepts test.

School-specific checklists. Results indicated that Max was able to follow one- and two-part familiar instructions when the referent was present. He was also able to follow one-part familiar instructions when the referent was not present. In terms of understanding questions, Max was able to respond to *who*/*what* labeling questions (dependent on knowledge of vocabulary), simple *where* questions, and choice questions. His teacher indicated that he was motivated by the shared stories they had focused on in class, and that he was able to "show some basic comprehension skills by identifying main characters and features such as the title of the text."

Print-Related Emergent Literacy Skills

Direct child assessment. Max was able to identify all of the letter sounds in the Letter Sound Knowledge task. Max showed understanding of some early print concepts such as reading from left to right and sweeping back to the beginning of the following line of text, as well as responding to an inverted picture, but was unable to demonstrate understanding in the context of the assessment battery of other early concepts such as the front of the book and awareness that the print carries meaning. On the Phoneme Matching task, Max obtained a score of 7 out of 10 when asked to match the beginning sound of a word to one of three sounds /m/, /b/, or /s/. He was able to represent three initial sounds for words on the Invented Spelling task, writing *feet* as "f," *step* as "s," and *picking* as "p." Max was unable to write his name in the context of the assessment battery. Finally, Max was able to read seven words correctly on the adapted word reading task.

School-specific checklists. Strengths were documented in a number of print-related skills such as writing all of the letters of the alphabet, identifying 50% of letter sounds, blending simple consonant–vowel–consonant words, recognizing some high frequency words, and writing his name.

Assessment summary. The combination of information from direct child assessment, school documentation, and parent questionnaires yielded a rich array of information. Max demonstrated relative strengths in print-related early literacy skills, including strong letter name and letter sound knowledge, some high frequency word recognition, and initial sound awareness. In contrast, Max demonstrated significant weaknesses in meaning-related skills, with results indicating poor performance in receptive language, particularly at sentence and text level. Protective factors include Max's home literacy environment and his interest in books.

The collated information provided a comprehensive overview of Max's literacy profile. This is helpful for a range of reasons including:

Understanding Max's areas of strength and need. In order to maximize outcomes, students need access to a comprehensive literacy program that enables them to build all of the skills and understandings recognized as important for literacy development (Clendon & Erickson, 2009; Erickson & Koppenhaver, 2020). This includes skills that Max has yet to acquire, as well as those he may be able to perform under particular conditions but needs to work on generalizing. For example, even though name writing was a skill that his school checklists indicated he was able to demonstrate in the classroom, Max was unable to do so in the name writing task. This may be due to established challenges in generalization across contexts for children with ASD that have been observed from early experimental learning studies onwards (e.g., Rincover & Koegel, 1975). Understanding Max's areas of need is important because it can influence decision making regarding which team member supports which parts of the literacy program and when (e.g., when his teacher vs. a teaching assistant might work with Max in the classroom) and help with prioritizing any additional input and support that might be available (e.g., speech pathology, occupational therapy) (Erickson et al., 2016).

Understanding Max's instructional needs. As mentioned earlier, sometimes the language learning needs of children with ASD may be overlooked within literacy instructional programming, particularly when children have a literacy profile like Max, demonstrating relative strength in some areas. The SVR provides a framework for recognizing the importance of both print and meaning-related skills to the reading process. Emergent literacy opportunities such as engaging in frequent, rich shared storybook reading (see Clendon et al., 2014) and shared writing opportunities (Koppenhaver & Erickson, 2003), and fostering Max's receptive and expressive language development using AAC will be essential for supporting Max to develop as both a reader and a writer. Children with literacy profiles like Max can be taught conventional literacy skills, including being able to identify sight words. However, it is important that sight words are not taught in isolation, without a focus on developing other skills and understandings (e.g., print concepts, language comprehension at word, sentence, and text levels), because emerging readers and writers will struggle to apply these skills in meaningful ways to support their reading, writing, and/or communication with others (Erickson et al., 2010). Therefore, combining direct child assessments with classroom observations and teacher interviews is important to obtain an in-depth picture of the instructional methods and how these may suit the child's literacy profile.

Understanding Max's interests and motivation for literacy. It is critical that literacy instructional programs for all children feature meaningful activities that promote cognitive engagement. One strategy that can facilitate this engagement, is the personalization of the curriculum so that individual interests and motivations are incorporated (Clendon & Erickson, 2009). Max's teachers reported that he enjoyed being physically active. Photos of Max engaging in physical activities such as climbing, swinging, and swimming were therefore an excellent basis for photo-based storybooks, for example, or prompts for writing.

Taken together, Max's case highlights the importance of taking a comprehensive approach to emergent literacy assessment that is theoretically driven, individualized and adaptive, and that involves contributions from key team members of the transdisciplinary team including parents and teachers. Our assessment battery, which combined both formal and informal assessment measures, collated a wealth of information about Max's emergent literacy skills. This information provided the team with a detailed understanding of Max's areas of strength and need. It also identified next steps for instruction and key supports moving forward.

Future Directions

Further research is needed to identify the optimal emergent literacy assessment approach for children with ASD who have limited verbal communication skills. For some children, such as those with severely limited attention and engagement, a battery of direct assessments such as those administered above may not be feasible or appropriate. For these children, a more naturalistic assessment approach including observational assessments of children's literacy skills in the classroom, which capture the children's abilities in context, will be more suitable. One example of such an assessment is the BRIDGE Assessment (Pierce et al., 2005), which is a portfolio-style assessment drawing on adult observations and work sample analysis to evaluate and document children's emergent literacy skills and understandings.

Research should also further explore the application of tools such as the ELLCO for children with ASD including those who have limited verbal communication skills. While the ELLCO has been used extensively in mainstream classrooms to assess literacy practices, many of the items lacked applicability in Max's classroom environment. A more ASD-specific observational tool that considers factors that can impact student learning and engagement (e.g., environmental management, visual supports, implications of challenges with ToM and executive functioning, sensory considerations, and diversity of learning environments such as classroom, playground, community) is likely to provide richer data with respect to the literacy environment and practices in classrooms specifically designed to cater for children with ASD.

Although appraisal of expressive language skills in children who have limited verbal communication skills may be possible by using naturalistic and ecologically valid approaches such as natural language sampling (Trembath et al., 2019), future research is urgently needed to identify similarly naturalistic approaches for evaluating children's receptive language skills, particularly beyond word and sentence level, which are often difficult to measure using formal assessment tools.

Many children grow up in homes where more than one language is spoken, including Max, our case example. With Max, we administered all assessments in English, based on the family reporting they spoke English in the home. Although we recognize the importance of meeting the needs of students who are culturally and linguistically diverse, including those who speak more than one language and/or use AAC systems (e.g., Mindel & John, 2018; V. Smith et al., 2018), it is beyond the scope of this tutorial.

The assessment approach used in this pilot research project incorporated several formal and informal assessments. A further assessment type that should be explored in future research is use of dynamic assessment (see also Westerveld et al., 2017). With static assessment, a child's performance is examined in the absence of any attempt to modify or enhance it, or provide support (King et al., 2015; Tzuriel, 2000). Static assessment can be useful for evaluating performance on a particular skill and tracking progress, but it does not examine the learning process for the child and/or explore potential barriers to learning (King et al., 2015; Tzuriel, 2000). Furthermore, it does not provide useful information on skills for which a child may have had limited learning opportunities (King et al., 2015). In contrast to static assessment, dynamic assessment combines instruction or feedback with assessment, which

allows the examiner to evaluate what the child is able to do with the addition of input and support (van der Veen et al., 2016).

An additional area requiring research is the role of technology in the emergent literacy assessment process for children with ASD who have limited verbal communication skills. This may include computerized testing and applications (i.e., apps) that may minimize the need for verbal input or test-taking skills such as pointing and support both emergent literacy assessment and development (for a discussion of touch screen tablets and emergent literacy, see Neumann & Neumann, 2014). Trembath et al. (2019) explored the role of technology highlighting advances in areas such as eye-tracking, consumer-worn equipment (e.g., activity sensors in watches, recording vests), and automated approaches to language sample collection and analysis (e.g., Language ENvironment Analysis equipment). These authors reminded clinicians of the importance of critically appraising new technologies; identifying their strengths and weaknesses in terms of the assessment process. They also cautioned that individualized approaches to assessment will remain critical.

As evident from Max's case example, the assessment of emergent literacy skills in children with ASD who have limited verbal communication skills is a multifaceted process. There are various elements requiring careful consideration, from identifying key members of the transdisciplinary team, to determining the information to collect and the assessments to administer, to identifying and implementing strategies for supporting the children's well-being and sustained attention and engagement through the assessment process, and finally to interpreting and applying the assessment findings. Many teams will require professional learning and development support to build their capacity to engage in this assessment process effectively. This highlights a final area for future research in terms of identifying effective training and coaching models to support teams to maximize their effectiveness, and in turn, optimize child outcomes.

Summary

This clinical tutorial has used the case example of Max, a 5-year-old boy with ASD who has limited verbal communication skills to provide an overview of the process for conducting an emergent literacy assessment. Literacy assessment with these children is multifaceted and complex with several important considerations. It requires input from all members of the educational team. Optimizing the assessment process is critical for understanding individual children's literacy profiles including their areas of strength and need, monitoring progress, informing instruction, and prioritizing supports. Emergent literacy skills lay the foundation for later literacy success, which in turn, impacts key elements of living and learning including communication, participation, self-determination, and well-being.

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Emergent and Early Literacy Assessment Battery

Area of assessment	Test/task	Type of test/scoring	Adaptations
General Communication	Vineland Adaptive Behaviour Scales II (Sparrow et al., 2005), Communication subscale: receptive, expressive, written	Formal, standardized, parent-report measure	None
Home Literacy Environment	Based on Boudreau (2005)	Informal parent questionnaire	Added questions about the use of an AAC system; spelling skills.
(Pre)school Literacy Environment	Teacher interview Early Language and Literacy Classroom Observation (ELLCO) Pre-K (M. W. Smith et al., 2008)	Interview Standardized observational tool	None
Meaning-Related Assessment			
Receptive Vocabulary Understanding of Single Words	Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007) vocabulary.	Standardized norm-referenced test	None
Sentence-Level Comprehension	Test for the Reception of Grammar–Version 2 (TROG-2; Bishop, 2003)	Standardized norm-referenced test	Test discontinued after three failed sections.
	School-specific checklist: • Following directions • Understanding yes/no questions	Informal	None
Text-Level Comprehension	Two comprehension questions were asked within the Print Concepts Assessment (see below/Appendix C)	Informal	The following questions were asked: Who is the story about? What happened in the story?
Print-Related Assessment			
Alphabet Knowledge: Letter Name Knowledge and/or Letter Sound Knowledge	Letter-Sound Identification probe (Erickson et al., 2005) —Children are asked to point to a target letter from a field of six.	Informal; maximum score 26	Letters were arranged on an A4 sheet of paper with clear margins. This task can also be administered using eye-gaze technology.
Print Concepts	Assessed based on Marie Clay's (2000) Concepts About Print assessment, with modifications based on Erickson et al. (2005).	Informal; maximum score 12. See Appendix C for the Score sheet	Using *Pip and Posy: The Scary Monster* (Scheffler, 2013), we engaged the child in book sharing for at least 5 min and checked the child's knowledge of orientation, directionality, concepts of words and letters.
Name Writing	Assessed and scored using the procedure outlined in (Bingham et al., 2017) — Children are asked to write their name.	Informal; scored using an 8-point scale: 0 = *refusal*; 1 = *scribbling*; 2 = *drawing as writing*; 3 = *scribble writing*; 4 = *letter-like shapes*; 5 = *letters and letter-like shapes*; 6 = *partial word/name*; 7 = *all letters in name*, *incorrect order*; 8 = *correct*.	All children were provided with a pencil and a blank piece of paper.
Phoneme Awareness	Phonological Awareness Literacy Screening–Pre-Kindergarten (Invernizzi et al., 2004) Initial Phoneme Awareness task.	Subtest from a standardized test; maximum score 10.	Adapted from Westerveld et al. (2017). The examiner labeled a picture; children were then asked to identify the first sound in a word, by posting the picture in one of three cups labeled /m/, /s/, and /b/.

(*table continues*)

Appendix A (p. 2 of 2)

Emergent and Early Literacy Assessment Battery

Area of assessment	Test/task	Type of test/scoring	Adaptations
Invented Spelling	Assessed using the Phoneme Awareness task from the Early Reading Screening Inventory (ERSI; Morris, 1998)—Children are asked to spell 12 words.	Informal. One point is awarded for each phoneme represented within each word.	Children were allowed to use their AAC system.
Word Identification	Assessed using the preprimer word list from the Basic Reading Inventory (BRI; Johns et al., 2016).	Informal; maximum score 12	This task was modified as per Erickson et al. (2008). Children were asked to select a target word from a field of four, which included three distracter words that begin with the same letter and are of similar length.

Note. AAC = augmentative and alternative communication.

Appendix B

Assessment Preparation Checklist (Adapted from Paynter, 2015; Paynter & Fothergill, 2015)

Routine and Structure	Checked
Have you chosen a time of the day that is likely to maximize alertness and motivation and be minimally disruptive of school routines? Have you considered the most suitable environment and setting? Have you organized reinforcers for use during the assessment? Have you prepared the assessment materials in advance to reduce transition times between tasks? Have you arranged the sequence of tasks to include a variety of easy/more challenging tasks throughout the session? Did you consider whether a familiar adult (e.g., teacher) should be present?	
Visual Supports and Social Story	
Have you created a social story to help prepare the child? This should include who will be present, where the assessment will take place, and how long it will last. Have you created a visual schedule, which includes an overview of the tasks, the order of activities, and what will happen at the end?	
Environmental Audit	
Have you considered the effect of lighting (e.g., sunlight through windows, room lighting)? Have you considered the level of noise as well as the pitch of noises? Have you reduced or removed visual distractions, such as room clutter and unnecessary visual displays?	
Responsiveness to Child During the Assessment	
Have you watched carefully for signs of tiredness or distress? Have you provided regular short breaks and stopped completely if necessary?	
Considerations for Children With Autism Spectrum Disorder and Limited Verbal Communication Skills	
Have you ensured that the child has brought their augmentative and alternative communication (AAC) system with them? Have you ensured all tasks are accessible and can be completed without requiring a spoken response? Have you considered any adaptations carefully, including the impact they may have on interpretation? Have you considered the receptive language demands of tasks and kept instructions as simple and concrete as possible and allowed sufficient processing time? Have you considered the receptive language demands when interpreting the results? Did the child really not understand the skill(s) or concept(s) being assessed or might she/he have been unsure of the task instructions or requirements? Have you documented any adaptations in the recording forms and any educational reports?	

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Concepts About Print–Pip and Posy: The Scary Monster

Say to the child: *Let's look at a book.*
Aim: Share the book with the child – aim for the session to last for at least 5 min – use a timer/stopwatch/clock

COVER		
Item 1	Test:	For orientation of book. Put the book in front of the child, upside down, back to front.
☐	Say:	*"Let's read a story."*
	Score:	1 point for the correct response. (i.e., child turns the book the right way.)
Comments:		

This book is called: Pip and Posy, The Scary Monster.
(point to the title of the book).
*Look! (*point to Pip, then point to Posy).
Turn the pages until you get to the beginning of the story.

PAGES 1/2 - rainy day		
Item 2	Test:	Concept that print, not picture, carries the message.
☐	Say:	*Where do I start to read?*
	Read:	Text on page 2
	Score:	1 point for print, 0 for picture
Item 3		Directional rules
☐	Say:	*Now which way do I read?*
	Read:	Text on page 2
	Score:	1 point for left to right directionality
Comments:		

Read the text on page 2 (*It was a rainy day…*) then move to page 3.

PAGES 3/4 + 5/6 - make sure you test the following:		
Item 4	Test:	Left page before a right page
☐	Say:	*Which page do I read first?*
	Score:	1 point if the child points to the left page
Item 5	Test:	Understanding of nouns
☐	Say:	*Where is the (chair, flower, frog)?*
	Score:	1 point for correct pointing
Item 6	Test:	Understanding of verbs
☐	Read:	Page 3/4
	Say:	*Who is baking?*
	Score:	1 point for correct pointing or naming of Posy
Item 7	Test:	Can you turn the page?
☐	Say:	*Can you turn the page?*
	Score:	1 point if the child turns the page independently
Comments:		

PAGES 7/8		
Item 8	Test:	Point to a word
☐	Say:	*Can you point to a word?*
	Score:	1 point for correct pointing
Item 9	Test:	Point to a letter
☐	Say:	*Can you point to a letter?*
	Score:	1 point for correct pointing
Comments:		

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Concepts About Print–Pip and Posy: The Scary Monster

PAGE 10		
Item 10	Test:	Word by word pointing
☐	Say:	*Point to each word while I read.* (read page 10 slowly but fluently)
	Score:	1 point if the child points to each word in the sentence while you read
Comments:		

PAGE 14		
Item 11	Test:	Understanding of inferences
☐	Say:	*Why is Posy crying?*
	Score:	1 point for "she's scared" or "there's a monster"
Comments:		

This time, ask the child to read

PAGE 21/22		
Item 12	Test:	Can the child read the text?
☐	Say:	*Can you read this page? (Do not point)*
	Score:	1 point if the child accurately reads the words on the page
Comments:		

For the remaining pages – read the text (make sure to point to the big bold letters).

Give the child ample opportunity to initiate, read, and comment. Follow the child's lead to get a sense of engagement in story book reading.

You may do this by asking some open-ended questions – for example:

1. What is he doing?
2. What will happen next?
3. Commenting – look at him, he is…
4. Commenting – he is scary isn't he…

When you have finished reading the book – go back to the title page:

Question	Response
Who was that story about?	
What happened in the story?	
Do you like monsters?	
What was the story called?	

These items are not scored but answers are recorded and used to evaluate the child's ability to answer text-level comprehension questions.